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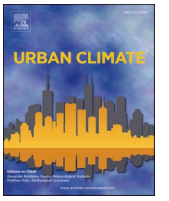

A systematic review of justice integration to climate resilience: Current trends and future directions

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ABSTRACT

Climate resilience has been adopted as a systematic approach for facing climate change. Although the concept of resilience received criticism for failing to address the issues of power imbalance and conservatism, recent approaches include diverse justice perspectives as pathways to address these concerns. However, the lack of clarity regarding the diverse definitions of justice and their relationship to climate resilience hinders our understanding of how to effectively integrate urban climate resilience and justice. This study offers a systematic review of literature on justice and climate resilience in the urban context with the intent of (i) identifying articles addressing justice and climate resilience and classifying them according to the form of justice and resilience framing, (ii) studying trends in the current literature, (iii) identifying research gaps, and (iv) reflecting on the possibility for integration between justice and resilience in different phases of the resilience-building process and proposing future insights. In particular, the results emphasize the importance of (1) enhancing system thinking using people-centered approaches, (2) focusing on the social implications of climate actions, and (3) evaluating different timeframes. The study concludes by suggesting policymaking and research strategies for facilitating the transition toward just and climate-resilient cities.

1. Introduction

Climate change exposes cities to unprecedented risks and increases the vulnerability and uncertainty of citizens concerning their living conditions (IPCC, 2024). As hazards posed by changing climatic conditions increase in frequency and magnitude, cities will be particularly affected by the high density of residents, infrastructure, economic capital, and sociocultural capital (Mou et al., 2021). Therefore, cities are increasingly focusing on becoming more resilient to the rapid shocks and long-term stressors caused by climate change (Meerow et al., 2019; Leitner et al., 2018). At the same time, cities face significant social issues, such as unequal distribution of socioeconomic vulnerability, unequal access to resources and power, and lack of representation of minorities and marginalized communities. To address such issues, international plans and goals as the 100 Resilient Cities, the Sustainable Development Goals, and the United Nations Human Settlements Programme advocate a global agenda for climate resilience that ensures that no one is left behind, particularly marginalized and vulnerable citizens (100 Resilient Cities, 2024; UN-Habitat, 2024; United Nations General Assembly, 2024).

Recent approaches to climate resilience include diverse justice perspectives as pathways to address these issues, and provide a more thorough understanding of the complex sociopolitical processes in which resilience-building practices are embedded. Initially, the

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concept of resilience was criticized for failing to address the issues of power imbalance and conservatism (Meerow et al., 2019; Anguelovski et al., 2016; Chelleri, 2012; Coaffee et al., 2018). The extensive literature on climate and environmental justice has highlighted the necessity of including a justice perspective in the study, design, implementation, and monitoring of policies for climate resilience (Bulkeley et al., 2014; Shi et al., 2016; Schlosberg and Collins, 2014). However, the lack of clarity on the diverse definitions of justice and their relation to actions for climate resilience hinders our understanding of how to effectively integrate urban climate resilience and justice notions, both in theory and practice (Cañizares et al., 2024). Therefore, this research set to answer the question: "*How are different forms of justice integrated into the study and planning of climate resilience in the urban context?*" Answering the question through an in-depth study of current literature allows for a greater understanding of the possibilities of integration between justice and climate resilience. More specifically, this study sets to provide a structured framework for this integration, combining well-established theories for observing trends and gaps in the literature.

To do so, the study proposes a systematic literature review which analyses the integration between urban climate resilience and justice. The review begins with the identification and screening of relevant titles, and then employs deductive analysis for the classification of all selected articles. After classification, different research trends are observed, and meta-analysis is used to highlight the existing research gaps. For deductive analysis and classification of the selected literature, this study was based on two pillars that provide a starting point for future research: the framings of climate resilience proposed by Wardekker (Wardekker, 2021) and the forms of justice proposed by Cañizares et al. (Cañizares et al., 2024). Wardekker (Wardekker, 2021) identifies four distinct framings, each of which implies a diverse set of measures and actions to be taken for cities to achieve climate resilience: (i) Urban shock-proofing (short-term and system focus), (ii) Resilience planning (long-term and system focus), (iii) Community disaster resilience (short-term and community focus), and (iv) Resilient community development (long-term and community focus). Although Wardekker's results provide a fundamental basis for making sense of the plethora of definitions and approaches for urban climate resilience, they lack an overview of the correlation between resilience and justice, and specifically how justice approaches are also applied and integrated in the four resilience framings. By contrast, Cañizares et al. (Cañizares et al., 2024) proposed a classification of six forms of justice applicable to climate adaptation: distributive, procedural, inter-generational, restorative, retributive, and justice in system outcomes. Their study offers a comprehensive view of how justice is integrated into climate action, yet it does not fall under the climate resilience framework, nor does it provide observations concerning applications in the existing literature (Cañizares et al., 2024). These two studies (Cañizares et al., 2024; Wardekker, 2021) are considered pillars for further analysis of the integration of justice into the study and planning of climate resilience in an urban context, because they provide two methodological approaches to shed light on the complexity of this research topic.

Numerous structured analyses have been proposed on the topics of urban climate resilience (Abuwaer et al., 2023; Büyüközkan et al., 2022), environmental justice (Calderón-Argelich et al., 2021a; Clark and Miles, 2021) or justice in climate adaptation and mitigation planning (Brousseau et al., 2024; Zimm et al., 2024). However, no structural analysis has been proposed for observing the intersection between different forms of justice and urban climate resilience. The proposed systematic literature review addresses this gap, providing a key contribution in the study of justice and urban climate resilience. Therefore, the study addresses the following objectives: (i) identifying articles addressing justice and climate resilience and classify them according to the resilience framings and forms of justice integrated into each study, (ii) analyzing trends in the current literature, (iii) identifying research gaps, and (iv) reflecting on the possibility for integration between justice and resilience in different phases of the resilience-building process. Specifically, the review provides a clearly structured analysis of the integration between frameworks for urban climate resilience and different forms of justice, aiming to observe whether certain integrations are more recurrent than others, and where the existing gaps lay. Moreover, the results lead to a discussion on what types of integration are more suitable for different steps of the resilience-building process. With this, the research has different points of strength and innovative relevance: (1) the use of established theories for deductive analysis to classify in a structured manned to current trends in integration between justice and climate resilience in urban contexts, (2) the use of meta-analysis for the identification of the most and least currently-used types of integration, (3) the proposition of future pathways of analysis on the basis of the observed gaps in the existing literature, and (4) the discussion of possibility for integration between justice and climate resilience in the different phases of the resilience-building process. The paper is structured as follows: first, Section 2 briefly introduces the state of the art on the topics of urban climate resilience and justice, in order to define a clear theoretical background for the research. Second, Section 3 presents the systematic methodology used for the review and analysis of the selected papers. The results are presented and discussed in Sections 4 and 5, respectively. Finally, Section 6 summarizes the main findings and discusses the limitations and implications of the research.

2. Theoretical background – resilience, vulnerability, and justice

The term resilience was introduced in ecology, and defined by Holling (Holling, 1973), as a "*measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables.*" Today, this concept is used in multiple fields such as urban planning, sociology, and economics, and each field has proposed a new definition of resilience tailored to serve its specific purpose. In both academic and gray literature, there is a growing emphasis on the concept of urban climate resilience as a means of coping with both the adaptation to and mitigation of climate change in the urban environment (Folke, 2006; Leichenko, 2011; Meerow et al., 2016; Pierce et al., 2011; Solecki et al., 2011).

Although most adaptation and mitigation studies tend to propose and analyze strategies to address specific issues (such as Urban Heath Island effect or GHG emissions (Sharifi, 2020)), the resilience approach builds on both adaptation and mitigation as necessary measures for addressing climate change impacts. Moreover, the resilience approach engages in in a comprehensive understanding of urban systems (Sharifi, 2019). While adaptation and mitigation strategies only refer to the processes or plans implemented for

achieving specific goals, urban climate resilience refers to the overall capacity of an urban system to face climate change and respond with positive transformations (Sharifi, 2021). What this means is also that adaptation and mitigation strategies are usually only framed around a single specific issue, while urban climate resilience entails a more holistic approach to the whole urban system. Therefore, the resilience approach employs a system thinking methodology, recognizing that achieving resilience is a "*complex solution to a complex set of problems*" (Coaffee et al., 2018; Rittel and Webber, 1973). This approach acknowledges that climate risk affects many interrelated aspects of the urban context, including justice and vulnerability.

However, scholars have raised several concerns about the extensive use of resilience. Cannon and Müller-Mahn (Cannon and Müller-Mahn, 2010) note that when the concept of resilience is used beyond its original definition and applied to adaptation to climate change, it removes the inherent power-related connotation of vulnerability, because it disregards the social, political, and economic processes that shape vulnerability and injustice in cities. Furthermore, others point to the conservative nature of resilience research, because it focuses on the idea of bouncing back to the status quo rather than promoting transformations that can make the system more sustainable in the long term (Bonds, 2018; MacKinnon and Derickson, 2013).

Nonetheless, responses to these criticisms argue that although adaptation and mitigation efforts alone can have unintended negative effects in the long term, the systemic vision of resilience gives this approach relevance and validity (Chelleri, 2012). In addition, contemporary definitions of resilience recognize the need to not only bounce back after sudden disasters but also transform the current system to make it more sustainable for the future (Folke et al., 2010). For instance, Merrow et al. (Meerow et al., 2016) define urban resilience as "*the ability of an urban system and all its constituent socio-ecological and socio-technical networks across temporal and spatial scales to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change, and to quickly transform systems that limit current or future adaptive capacity.*" Finally, although the original engineering-based definition of resilience overlooked the issues of power and vulnerability, embedding urban resilience within a justice framework enabled a more inclusive and just conceptualization of resilience (Meerow et al., 2019).

The need to include justice in the debate on climate change emerged when it became clear that countries that historically contributed less to climate change might face the strongest future impacts (Alves and Mariano, 2018). Evidence shows that the effects of climate change are mediated by social, political, and economic processes and thus need to be analyzed in connection with the power imbalances embedded within our society (Khan et al., 2022). Climate justice scholars initially introduced the notions of rights and responsibilities in the prevention and mitigation of climate change (Bulkeley et al., 2014; Porter et al., 2020). They highlighted the significant imbalance between those responsible for climate change and those who have suffered its consequences. They called for the use of distributive and/or procedural mechanisms to ensure the fair allocation of rights and responsibilities (Schlosberg and Collins, 2014). However, according to Bulkeley et al. (Bulkeley et al., 2014), a climate justice perspective is insufficient when looking at adaptation and mitigation solutions in the urban context because it disregards issues of participation and recognition. Therefore, the analysis, design, and implementation of measures for climate resilience at an urban scale can greatly benefit from the use of an environmental justice perspective that considers issues of distribution, procedure, and recognition. In other words, when focusing on the local rather than the global level, a justice perspective applied to climate resilience cannot be limited by the original definition of climate justice. Therefore, urban climate resilience also needs to consider elements proposed by environmental justice movements,

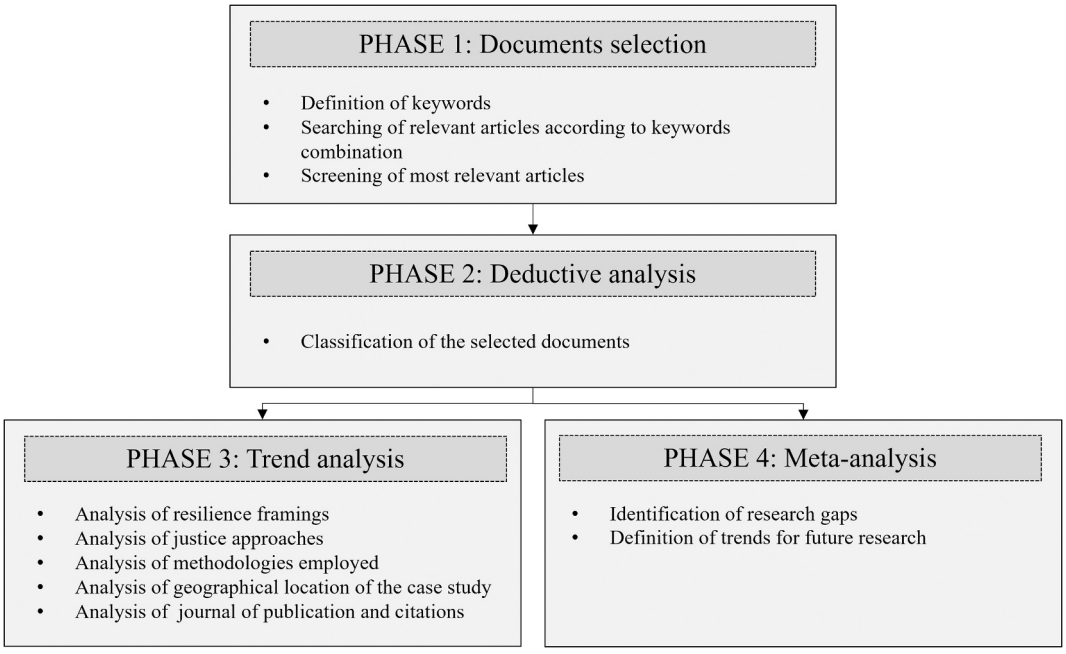

Fig. 1. Diagram of the four phases of the methodology for the systematic literature review.

which call for recognition of the existence of structural inequalities that affect citizens' vulnerability, as well as their capacity to adapt to and mitigate climate change (Bulkeley et al., 2014; Shi et al., 2016; Schlosberg and Collins, 2014). Recently, the tripartite mode of justice has been criticized for not being sufficiently comprehensive to cover all justice issues emerging from climate change and actions for climate resilience (Cañizares et al., 2024). Therefore, the application of a justice approach to the study of resilience remains unclear, particularly concerning its application to climate change in urban contexts (Khan et al., 2022; Moglia et al., 2018; Ziervogel et al., 2017).

3. Methodology

This section outlines the systematic literature review methodology adopted in this study to select and review journal articles. The methodology was divided into four phases, as shown in Fig. 1: (i) document selection, (ii) document classification, (iii) trend analysis, and (iv) meta-analysis (Escorcia Hernández et al., 2023; Torabi Moghadam et al., 2017).

This study began with the identification, screening, and selection of relevant articles. Once the sources were selected, the first step was the classification of all articles using deductive analysis. The completed classification was then used for two additional analyses: trend analysis, which reported the overall trends observed in the selected articles, and meta-analysis, which highlighted existing literature gaps. Fig. 2 presents a detailed flowchart of the methodology.

3.1. Phase 1: document selection

Data were collected from 714 studies on climate resilience and justice in an urban context. The Web of Science and Scopus databases were used for literature search. To find papers, searches were performed by combining the following keywords:

((“Climate resilience” OR “Climate resilient” OR “Climate actions” or “Climate vulnerability”) AND (“Justice”)) OR (“Just climate resilience”).

The keywords selected had the following two objectives: first, we identified articles specifically related to climate action aimed at achieving climate resilience and reducing climate vulnerability; second, we identified articles that focused on justice, regardless of the justice type or approach adopted. Searches were not limited by time and encompassed articles published between 2012 and 2024, ensuring a comprehensive scope. Because the articles were retrieved from two separate databases (Scopus and Web of Science), the first step was to remove duplicate articles and maintain only one copy of each identified article. After the initial step, 443 articles were identified and included in the analysis.

After removing duplicates (271 articles removed), three quality control procedures were employed to refine the selection process, exclude non-relevant articles, and ensure the relevance of the selected articles. First, only peer-reviewed articles published in academic journals were included to ensure unbiased sources. For this step, 49 sources were removed, such as conferences proceedings, book

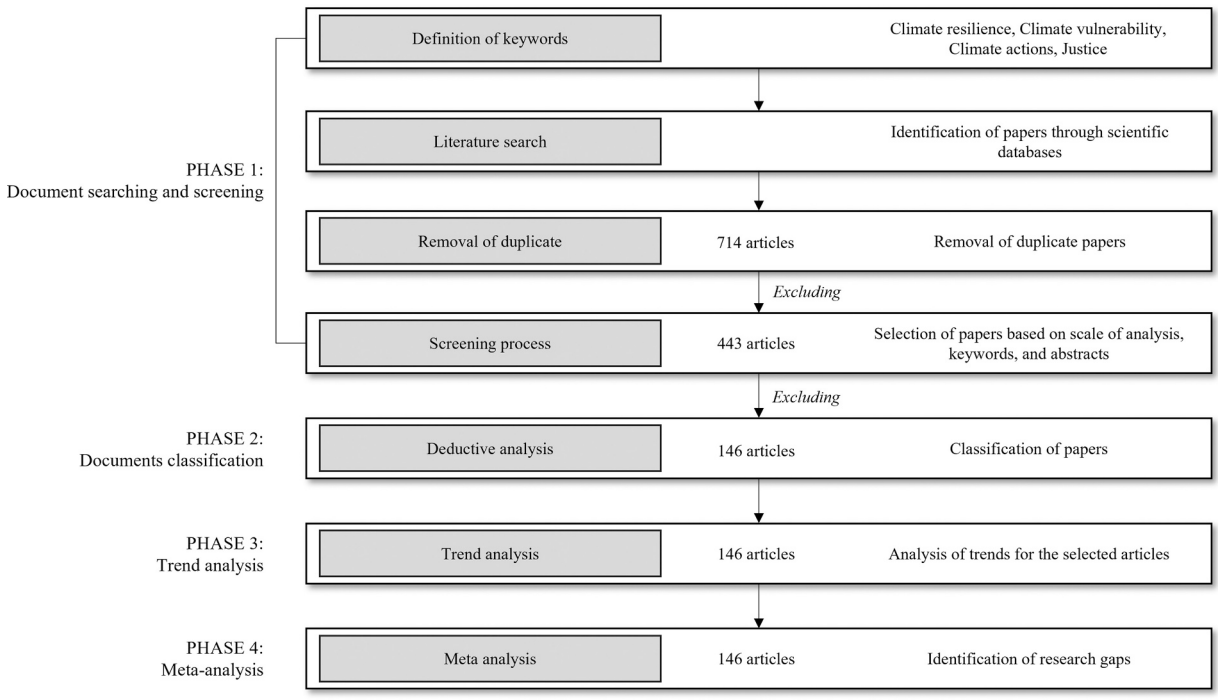

Fig. 2. Flowchart of the methodology for systematic literature review.

chapters, or editorial notes. Second, we required that both empirical studies and reviews were specifically focused on the urban or peri-urban contexts. In this stage, 186 articles were removed as they focused on rural climate resilience or nation-scale measures. Third, all sources had to explicitly address the topics of climate resilience, resilience-building measures, and climate vulnerability while focusing on justice. In this last step, 40 articles were excluded when they did not clearly mention in the abstract an observation of the integration between justice and climate resilience. These quality control procedures were performed by screening the abstracts and main findings of all identified articles and filtering out articles unacceptable for our study. In total, 146 articles were identified and selected after quality control.

3.2. Phase 2: deductive analysis

All the 146 selected articles were read and classified. First, a general overview of the methodologies employed, the geographical location of the case study, and journal of publication and citations were extracted from the initial reading of the articles. Second, articles were classified through deductive analysis (as suggested in (Nazmul Haque and Sharifi, 2024)) according to existing peer-reviewed theoretical frameworks.

Justice and climate resilience are extensive research fields that have been approached in diverse ways over the years. The integration of these two fields has also been discussed in different ways; still, a simple, comprehensive, and replicable framework remains lacking (Byskov et al., 2021; Ossewaarde et al., 2021; Swanson, 2021). Recently, however, two proposed frameworks have offered promising foundations for research at the intersection of justice and climate resilience: (i) the four urban resilience framings defined by Wardekker (Wardekker, 2021) and (ii) the six forms of justice defined by Cañizares et al. (Cañizares et al., 2024).

The first framework proposes a classification of four framings for urban climate resilience: Urban shock-proofing, Resilience planning, Community disaster resilience, and Resilient community development. For easier understanding, these four framings are subdivided into top-down (*Urban shock-proofing*, *Resilience planning*) and bottom-up (*Community disaster resilience*, *Resilient community development*) approaches, and into long-term (*Resilience planning*, *Resilient community development*) and short-term (*Urban shock-proofing*, *Community disaster resilience*) approaches. Fig. 3 summarizes the characteristics of each of the four resilience framings proposed by Wardekker (Wardekker, 2021). To classify the 146 articles selected, each article was read in depth and assigned to one of the four framings. For this, we observed the temporal framing of each study (short-term or long-term) and whether the measures proposed were top-down or bottom-up strategies, as suggested by Wardekker (Wardekker, 2021). This clearly defined and peer-reviewed structure allowed us to reduce the risk of assigning articles to the wrong framing.

The second framework identifies six forms of justice that can be integrated into the assessment of climate resilience (Cañizares et al., 2024): Retributive justice, Restorative justice, Procedural justice, Inter-generational justice, Distributive justice, and Justice in system outcomes. Fig. 4 summarizes the characteristics of each form of justice, highlighting their temporal focus as described by

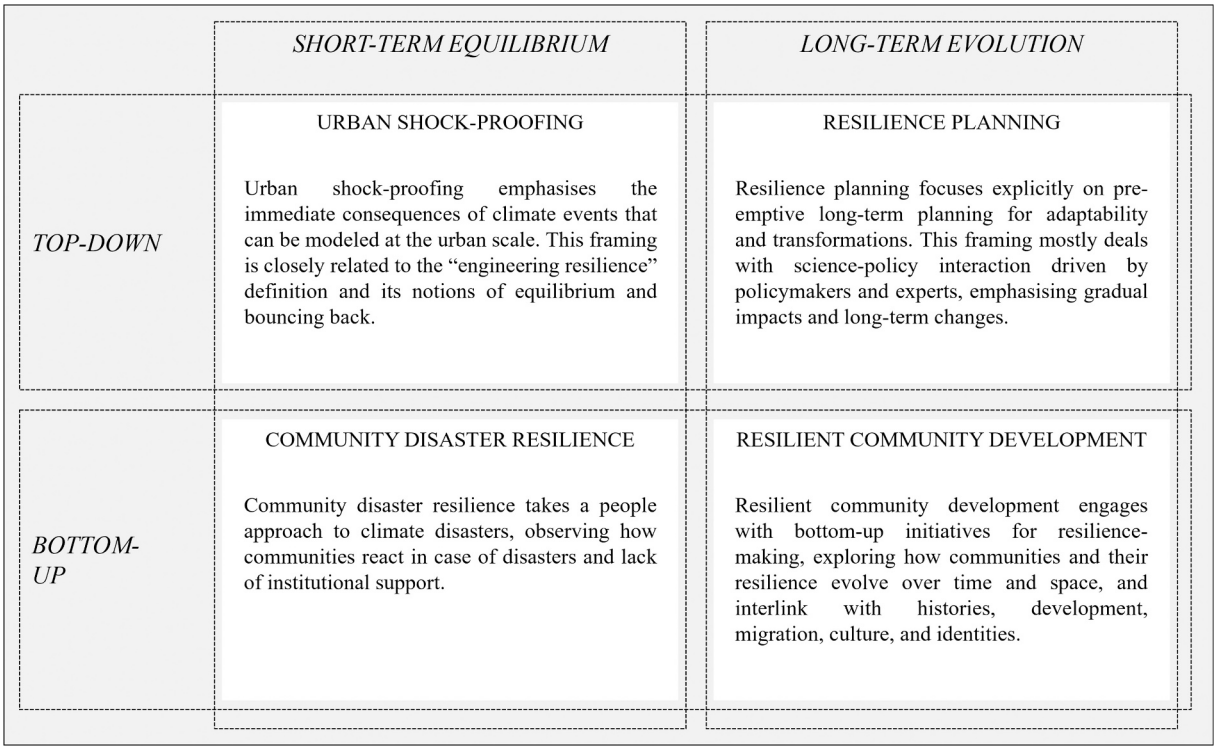

Fig. 3. Four resilience framings proposed by Wardekker, 2021.

Cañizares et al. (Cañizares et al., 2024). As for the previous framework, the clear structure provided by Cañizares et al. (Cañizares et al., 2024) was used as guideline for the deductive classification. According to Table 3 of Cañizares et al. (Cañizares et al., 2024), the elements observed for the classification of each article were: temporal focus (past, present, near future, distant future), normative level (system, individual community), central normative concern (value, distribution of impacts, future options, agency of individuals or community, responsibilities, victims of wrongdoing, agents of wrongdoing).

Classification results for the 146 articles were collected in a comprehensive Excel spreadsheet and used to identify trends in the selected literature. To ensure that no bias or similar risks diminished the quality of the results, we purposely decided to base all deductive classification (and following analyses) on well-established and objective measures. For instance, the observation of variables like year of publication, journal, number of citations, geographical location, and methodology employed are all objective measures. For resilience framings and forms of justice, validity in articles' classification was ensured through the use of well-defined, peer-reviewed and schematic theories.

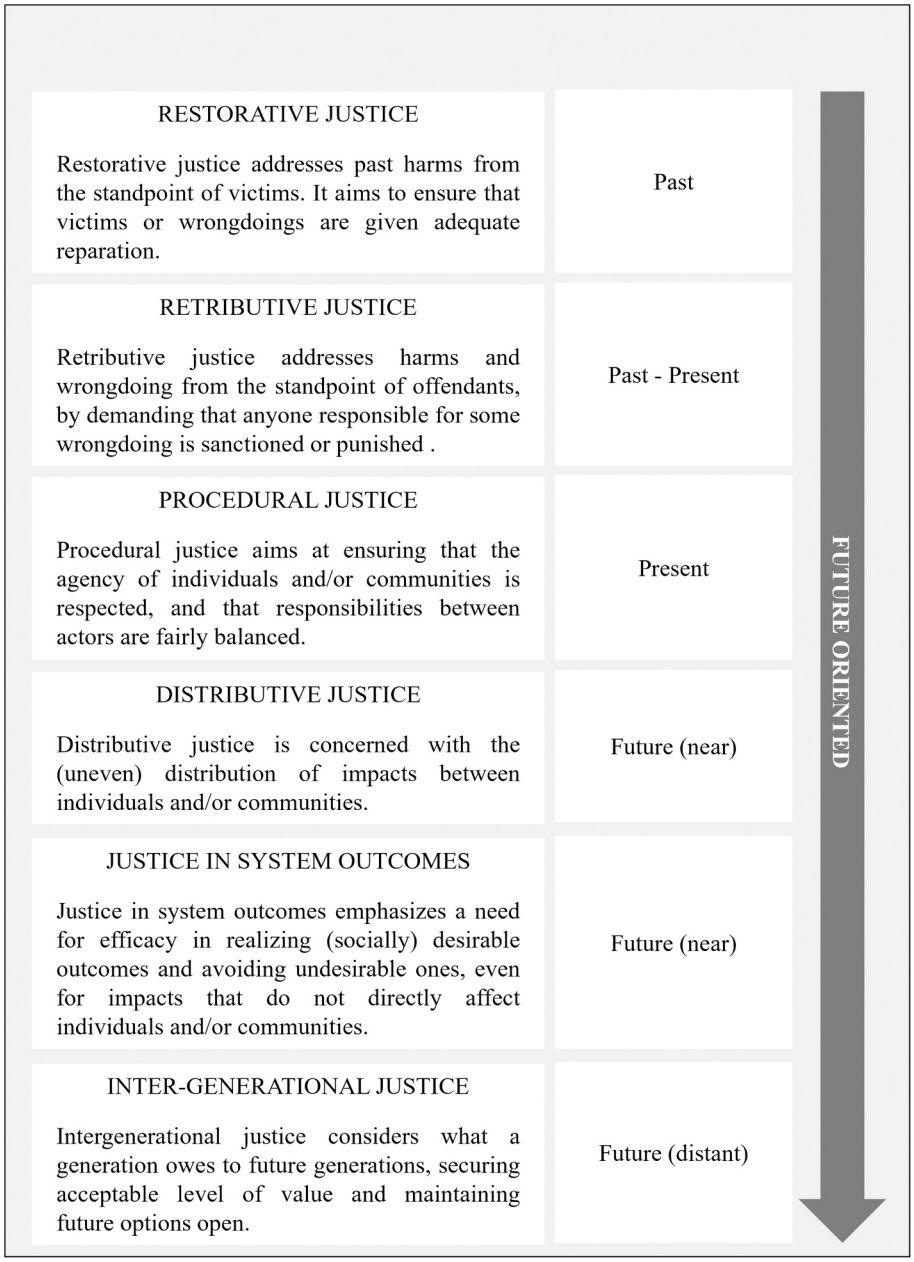

Fig. 4. Six forms of justice proposed by Cañizares et al., 2024.

Table 1
Classification of articles for resilience framings and forms of justice according to the deductive analysis.

		RESILIENCE FRAMINGS			
		Urban shock-proofing	Resilience planning	Community disaster resilience	Resilient community development
FORMS OF JUSTICE	**Retributive**	No articles available	No articles available	No articles available	Studies draw attention to how the status quo prevents the accumulation of capital rather than promoting comprehensive climate resilience measures. With the intent of stopping and reverting such processes for future transitions, authors suggest not only the inclusion of cities of the Global South in the discourse, but actually the adaptation of Global North measures to the achievements and successes of the Global South. Classified articles (1): (Sharma, 2023)
	Restorative	No articles available	Studies propose new solutions for centering justice in governance of climate transitions by institutionalizing the representation of marginalized and vulnerable communities in policymaking for climate resilience. Classified articles (5): (Trundle and Organo, 2023; Hughes et al., 2021; Zavar and Fischer, 2021; Rumbach and Nemeth, 2018; Grove et al., 2020) Example: (Hughes et al., 2021; Zavar and Fischer, 2021)	Articles argue for emphasized observation of the impacts of climate disasters on vulnerable communities, and on how the provision of local support can increase resilience capacity of the vulnerable communities. Classified articles (4): (Shen and Ristroph, 2020; Rice et al., 2022; Ranganathan and Bratman, 2021; Taylor et al., 2022) Example: (Rice et al., 2022)	Example: (Sharma, 2023) Studies observe the role of communities in resilience-making, but with a specific focus on allowing vulnerable communities to be the ones who reimagine the role of cities and citizens in future transitions. Classified articles (5): (Ziervogel et al., 2017; Grove et al., 2023; Strange et al., 2024; Rosa et al., 2023; Wijsman and Feagan, 2019) Example: (Ziervogel et al., 2017; Wijsman and Feagan, 2019)
	Procedural	Articles observe the underlying social and spatial processes leading to uneven patterns of vulnerability and how they emerge as reasons for differences in impacts in case of climate disasters. Classified articles (2): (Carvalho et al., 2022; Douglass and Miller, 2018)	Studies assess local policies and plans to evaluate the extent to which justice and inclusion are embedded in institutional actions for resilience transitions. Classified articles (14): (Chiesi and Forte, 2022; Suárez et al., 2024; Swanson, 2023; Fuller, 2020; Garcia et al., 2022; Barrett et al., 2016; Mendez, 2015; Grabowski et al., 2023; Chu and	Articles emphasize citizens' agency as the most important active participant in resilience-making, and it addresses the factors that hinder their agency and thus reduce resilience in the case of climate disasters. Classified articles (21): (Shi et al., 2016; Byskov et al., 2021; Cavalcanti et al., 2022; Summers et al., 2024; Wohldmann et al., 2022; Collado	Papers explore strategies and tools used by communities and grassroots movements to initiate change and climate actions. Classified articles (11): (Kmoch et al., 2024; Moretti et al., 2024; Mohtat and Khirfan, 2023; Mcmillan et al., 2022; Tschakert et al., 2023; Veronesi et al., 2022; Oscilowicz et al.,

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Table 1 (*continued*)

		RESILIENCE FRAMINGS			
		Urban shock-proofing	Resilience planning	Community disaster resilience	Resilient community development
			Cannon, 2021; Colenbrander et al., 2018; Friend et al., 2014; Cousins, 2021; Fitzgibbons and Mitchell, 2019; Friend and Moench, 2013)	and Potangaroa, 2023; Nielsen et al., 2023; Truong et al., 2022; Boso et al., 2022; Møller-Jensen et al., 2023; Shokry et al., 2023; Hoang and Pulliat, 2019; Rudge, 2021; Yazar and York, 2022; Bautista et al., 2015; Jurjonas et al., 2020; Miller, 2020; Michael et al., 2019; Archer and Dodman, 2015; Méndez et al., 2020; Anguelovski et al., 2020)	2023; Mabon et al., 2022; Amorim-Maia et al., 2022; Amorim-Maia et al., 2024; Yazar et al., 2022)
		Example: (Douglass and Miller, 2018)			
			Example: (Colenbrander et al., 2018; Fitzgibbons and Mitchell, 2019)		Example: (Oscilowicz et al., 2023)
				Example: (Archer and Dodman, 2015)	
		Studies focus on the assessment of the impact of extreme weather events at the urban scale, with specific focus on vulnerability hotspots: communities more exposed to hazards and simultaneously more socioeconomically vulnerable.	Articles observe how the uneven distribution of resources for climate actions (on behalf of the local institutions) has direct implications on the distribution of impacts of climate disasters.	Studies explore how underlying sensitivity factors (socioeconomic characteristics) affect the capacity of communities to be resilient in case of climate disasters. Specifically, papers that use this approach engage with the distribution of capacities, and the factors that affect uneven distribution.	
	Distributive	Classified articles (9): (Lee and First, 2023; Yazar et al., 2023; Suleimany, 2023; Meixler et al., 2023; Eugenio Pappalardo et al., 2023; Wu et al., 2021; Herreros-Cantis and McPhearson, 2021; Mitchell and Chakraborty, 2018; Romero-Lankao et al., 2013)	Classified articles (3): (Nelson and Molloy, 2021; Kuhl, 2021; Agache et al., 2022)	Classified articles (17): (Swanson, 2021; Bergonzini, 2024; Herath et al., 2024; Jiang et al., 2024; Kim et al., 2023; Tagtachian and Balk, 2023; Greiving and Fleischhauer, 2022; Liu and Fan, 2023; Vercillo et al., 2022; Marí-Dell'Olmo et al., 2022; Granberg and Glover, 2021; Arthurson and Baum, 2015; Kim et al., 2018; Grasham et al., 2019; Reckien et al., 2017; Amorim-Maia et al., 2023; Mitchell and Chakraborty, 2014)	No articles available
		Example: (Mitchell and Chakraborty, 2018; Romero-Lankao et al., 2013; Nelson and Molloy, 2021)	Example: (Nelson and Molloy, 2021)	Example: (Herath et al., 2024)	
	System outcomes	The focus of articles engaging with this approach are the effects of climate change impacts on the urban system. Rather than posing the focus on how the distribution of impacts can unevenly affect vulnerable communities, these studies observe the vulnerability of other components of the urban system, such as ecological vulnerability or vulnerability of infrastructures.	Studies are concerned with the institutional planning activities for climate actions and climate resilience and their repercussion on different components of the urban system, on how the local characteristics of the system are themselves a factor affecting policymaking and urban planning.	Articles engage with climate resilience as a co-created phenomenon that focuses on bottom-up initiatives that can create resilience from the everyday practices of local communities. With this approach, it is stressed that these actions not only increase citizens' capacities to be resilient in case of disasters, but also affect the whole urban system.	Studies aim to gain and understand insights into citizens' and communities' opinions and visions regarding the development trajectory of their city, with specific focus on the relationship between citizens and the built environment, and the opportunities that citizens have to make changes (toward climate resilience) to the built environment.

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Table 1 (*continued*)

		RESILIENCE FRAMINGS			
		Urban shock-proofing	Resilience planning	Community disaster resilience	Resilient community development
		Classified articles (16): (Rosa et al., 2023; McCloy et al., 2024; Zhu et al., 2023; Balk et al., 2022; Gower, 2021; Cheng, 2019; Maxim and Grubert, 2021; Dawodu et al., 2022; Sardeshpande et al., 2021; Ye and Niyogi, 2022; Sharifi, 2023; Hill, 2016; Khirfan et al., 2020; Sovacool et al., 2018; Schlör et al., 2018; Mohtat and Khirfan, 2022) Example: (Cheng, 2019; Dawodu et al., 2022)	Classified articles (27): (Ossewaarde et al., 2021; Almulhim and Cobbinah, 2024; Kato-Huerta and Geneletti, 2023; Yazar et al., 2024; Mullenbach and Wilhelm Stanis, 2024; Snep et al., 2023; Fuentealba and Verrest, 2020; Chang et al., 2021; Cheng et al., 2017; Williams et al., 2022; Eakin et al., 2022; Bhardwaj and Khosla, 2021; Goodwin et al., 2023; Shokry et al., 2022; Fieuw et al., 2022; Li et al., 2021; Fiack et al., 2021; Steele et al., 2015; Bentley, 2014; Shi, 2021; Pineda-Pinto et al., 2022; Mabon and Shih, 2018; Calderón-Argelich et al., 2021b; Thomalla et al., 2018; Hölscher et al., 2019; Tyler and Moench, 2012; Kabisch et al., 2016) Example: (Thomalla et al., 2018; Tyler and Moench, 2012)	Classified articles (2): (Mabon, 2020; Canal Vieira et al., 2021) Example: (Canal Vieira et al., 2021)	Classified articles (5): (Rosan et al., 2022; Palliwoda et al., 2022; Corburn et al., 2022; Kinol et al., 2023; Meyer et al., 2018) Example: (Palliwoda et al., 2022)
	Inter-generational	No articles available	Articles focus on how even distribution of resources and responsibilities should be addressed in policies for resilient development with long-term horizons. These studies do not pose attention on specific communities of citizens but aim to maximize value for the future generations. Classified articles (1): (Holden et al., 2016) Example: (Holden et al., 2016)	No articles available	Studies call for rethinking knowledge production, and how this can affect future transitions toward more resilient and just cities. Moreover, shifting knowledge production toward local communities can support human capacity in organization and mobilization for climate actions. Classified articles (3): (Grabowski et al., 2019; Anderson, 2022; Campbell et al., 2022) Example: (Grabowski et al., 2019; Campbell et al., 2022)

3.3. Phase 3 and Phase 4: trend analysis and meta-analysis

The results of the classification of the selected articles (Phase 2) were used to perform a twofold analysis: trend analysis for observing current research trajectories and changes over time (Phase 3), and meta-analysis showing research gaps and highlighting possible directions for future research (Phase 4). A comprehensive Excel spreadsheet was used for both trend analysis and meta-analysis in Phase 3 and Phase 4. The spreadsheet was compiled to collect all information extracted during in-depth reading of all 146 articles, and to analyze and visualize all information extracted.

4. Results

Sections 4.1, 4.2, and 4.3 report the results of the systematic literature review.

4.1. Deductive analysis

In total, 146 articles were read and classified using deductive analysis. According to the described methodology, each article was read thoroughly and assigned to one resilience framing (according to the structure proposed by Wardekker (Wardekker, 2021) and one form of justice (according to the structure proposed by Cañizares et al. (Cañizares et al., 2024)). Afterwards, articles were grouped within the matrix of resilience framing and forms of justice (as shown in Table 1). Each group of articles was then re-examined for a second time to identify commonalities within that group.

The results of this analysis are presented in Table 1, which summarizes the deductive analysis and provides a description of how each resilience framing and justice form can be integrated to demonstrate different integration pathways for incorporating them into the study and planning of equitable urban climate resilience. Moreover, the table reports all the citations of articles that fall under each group, along with a selected number of examples where the integration between the resilience framing and form of justice is clearly explained and discussed.

The first key observation from the deductive analysis is that multiple integration possibilities emerge. There is no single way to integrate justice and climate resilience in the urban context, as evidenced by Table 1, which identifies and describes 17 different integration pathways. These pathways vary based on factors such as the temporal focus, the planning stage, and the agents involved in each study. For instance, some integration possibilities are more related to the top-down monitoring of present or past climate events with the intention of identifying possible types of injustice (*Urban shock-proofing + System outcomes; Urban shock-proofing + Distributive*). On the other hand, other types of integration are concerned with the role of different agents in the imagination and definition of future transitions (*Resilient community development + Restorative; Community disaster resilience + Inter-generational*). Finally, many integration typologies observe the role of institutional agents at different stages of the resilience-building process, such as involving the community in decision-making, promoting resilience strategies and activities, or ensuring the long-term implementation of policies and plans (*Resilience planning + Procedural; Community disaster resilience + System outcomes*).

The second important observation emerging from deductive analysis concerns the frequency of integration between the different

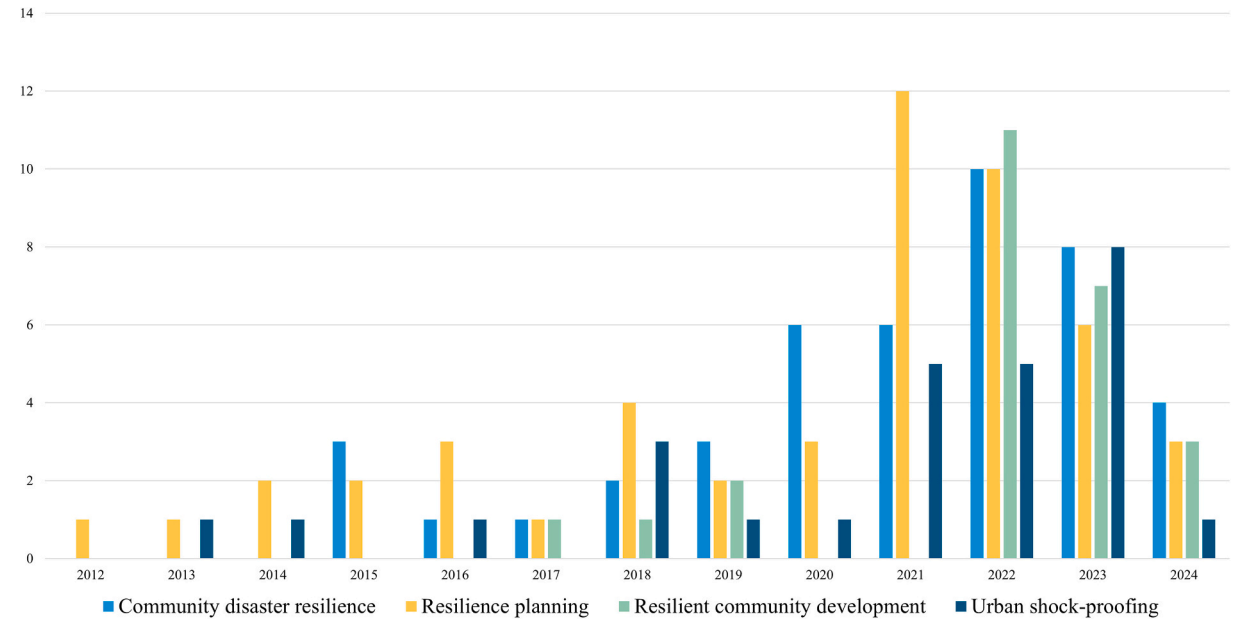

Fig. 5. Trend analysis of resilience framings.

resilience framing and forms of justice. Although the distribution of resilience framings, forms of justice, and their integration is discussed in detail in Sections 4.2. (Trend analysis) and 4.3. (Meta-analysis), the initial findings from the deductive analysis already allows us to identify the most common integrations and highlight the distinct characteristics of each integration type.

For instance, it is evident that *Retributive* and *Inter-generational* justice are the most challenging forms of justice to integrate, whereas *Procedural* and *System outcomes* justice are the approaches most commonly integrated. This is easy to explain, since both approaches emphasize procedural and systemic measures, which are central to both top-down and bottom-up resilience-building strategies (Wood et al., 2018). Concerning resilience framings, *Resilience planning* is the framing with the greatest integration with different forms of justice, while *Resilient community development* is the one with the least examples of integration. This seems counterintuitive, as bottom-up approaches like *Resilient community development* are often proposed as pathways for just transitions (Basta, 2016). However, these results show that top-down approaches must also be considered, especially when addressing multiple form of justice (Uitermark and Nicholls, 2017).

4.2. Trend analysis

4.2.1. Analysis of resilience framings

Fig. 5 shows the number of papers in the past 12 years that used each of the four resilience framings as defined by Wardekker (Wardekker, 2021). This result considers the number of times each frame was used in an article. Most of the selected articles employed a *Resilience planning* framing (50 articles in total), thus focusing on systematic and institutional future-oriented measures to achieve climate resilience. The second-most employed framing is *Community disaster resilience* (44 articles in total), a bottom-up and short-term equilibrium approach. These two framings seem to be the most employed because they are relatively more in line with well-known urban planning processes, namely the proposition of long-term institutionalized plans (*Resilience planning*) and the application of short-term actions of experimental urbanism (*Community disaster resilience*) (Van Neste et al., 2024).

On the other hand, the other two framings present greater challenges for implementation, as they address issues that are well known in the urban planning field. These include the long-term implications and maintenance of grassroots actions (*Resilient community development*), and the need for an immediate response to exogenous events (*Urban shock-proofing*) (Feola and Nunes, 2014). This explains why a smaller number of articles (25 for *Resilient community development* and 27 for *Urban shock-proofing*) address these difficult to tackle issues. In addition, the focus on just transformations and the community-centered co-creation of knowledge has emerged in the literature more recently compared to the discussion on institutional responses to climate hazards (Muñoz-Erickson et al., 2021). This trend is evident because the two more systemic framings (*Urban shock-proofing* and *Resilience planning*) have exhibited consistent organic growth over the years, while the two bottom-up framings (*Community disaster resilience* and *Resilient community development*) have experienced a significant spike in interest since 2020. Overall, there has been a noticeable increase in the number of articles dealing with justice and climate resilience at the urban scale, indicating growing interest in this field.

4.2.2. Analysis of forms of justice

Fig. 6 shows the number of articles divided by year which apply to each specific form of justice as defined by Cañizares et al. (Cañizares et al., 2024). Over the years, the most commonly used forms of justice are *System outcomes* (50 articles in total) and

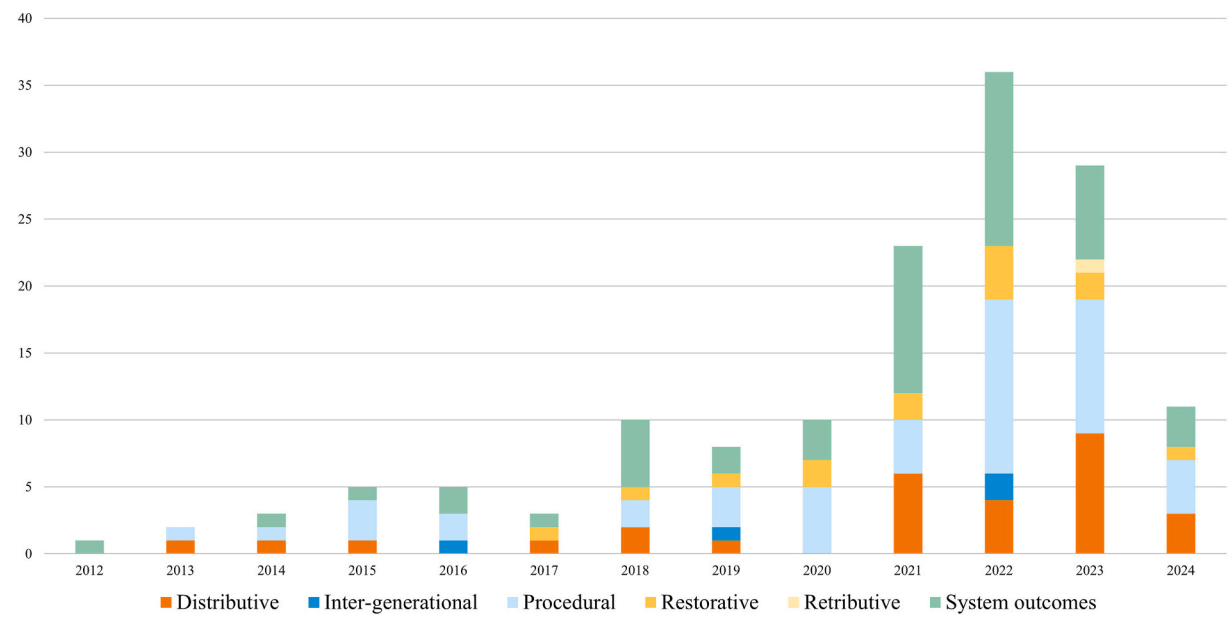

Fig. 6. Trend analysis of forms of justice.

Procedural (48 articles in total). These two forms of justice prioritize achieving the highest value through the distribution of agency and responsibilities, differing primarily in their temporal focus. Given their broader scope - compared with other justice forms - it is expected that more articles will adopt these broader perspectives, whereas other perspectives are typically employed in more niche and narrowly defined studies.

For instance, *Restorative* (14 articles in total), *Retributive* (1 article in total), and *Inter-generational (*4 articles in total) justice are the least employed forms of justice, probably because of their niche temporal focus. In fact, applying forms of justice that have a past temporal focus (*Restorative* and *Retributive* justice) is very challenging in combination with climate resilience efforts, because the definition of resilience inherently implies a transition toward new equilibria (Meerow et al., 2016). At the same time, *Inter-generational* justice might be concerned with too long a term and a distant temporal focus, thus posing challenges to the practical implementation of climate actions.

4.2.3. Analysis of methodologies

Fig. 7 presents a subdivision of the methodologies used in articles that combine climate resilience framing and forms of justice. The methodologies were categorized based on empirical and theoretical studies. Results show that more than half of the articles (62 %) presented empirical research, while only 38 % discussed theoretical contributions. This highlights how, while the importance of theoretical analysis on the topic is still relevant, the use of empirical observations for understanding the complex interactions between justice and climate resilience in the urban context is the most commonly employed approach.

As an additional subclassification, empirical studies are divided into qualitative (29 % of the articles), quantitative (11 % of the articles), mixed methods, meaning the integration of qualitative and quantitative (11 % of the articles), and spatial assessments (16 % of the articles). Specifically, spatial assessment was kept as a separate subcategory to highlight studies assessing and showing spatial distributions, which are indeed more prevalent than qualitative methodologies.

Theoretical studies can be classified into reviews (29 % of the articles) and content analyses (9 % of the articles). While these two groups are very different (reviews are a type of research, while content analysis is a type of research methods), they are grouped together as they both do not conduct empirical research on one or more specific case studies. Rather, they both engage in the analysis of existing material). Yet, the two subcategories are important to differentiate as the former considers existing academic literature and employs a diverse range of research methods, whereas the latter focuses on existing policies and official documents and uses the same research method (content analysis) for all studies.

From these results, it is evident that the most widespread methodologies are reviews and qualitative methods of data collection and analysis. This prevalence can be attributed to two factors. First, qualitative methods allow scholars to interact directly with a population, enabling them to collect in-depth insights into the social dynamics in which resilience and justice are embedded. Second, accessing valid quantitative data on political and social processes is a significant challenge, especially for marginalized vulnerable communities (MacDonald, 2012). Additionally, given the theoretical complexity of climate resilience efforts and justice transitions, many scholars are expected to focus on defining innovative theoretical frameworks before empirically dealing with the topic.

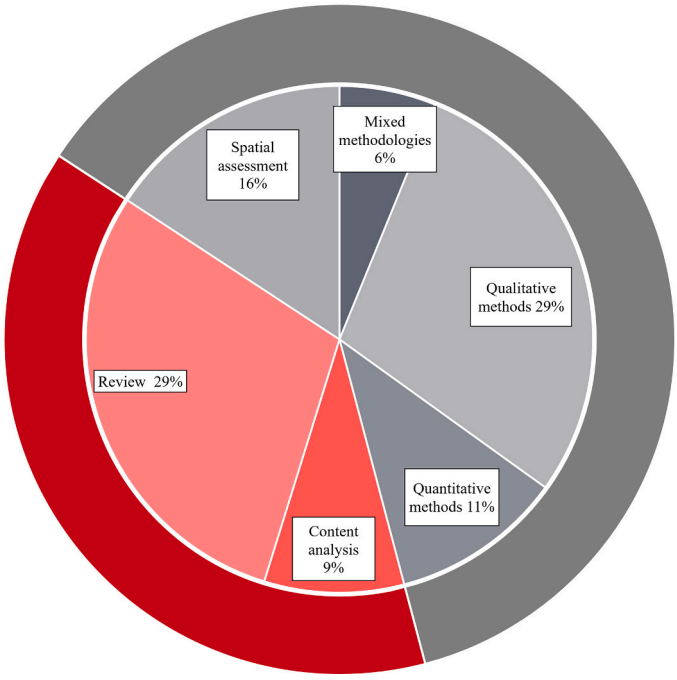

Fig. 7. Trend analysis of methodologies.

Conversely, the extensive use of content analysis as a research methodology is unexpected and highlights the significant trend toward observing and analyzing implemented policies, plans, and institutional actions.

4.2.4. Analysis of active countries

Fig. 8 and Table 2 illustrate the number of empirical case studies conducted worldwide. Specifically, Table 2 only reports countries with more than three case studies considered, and also includes the average year of publication of the studies concerning such countries. The findings demonstrate a noticeable imbalance in the locations of the studies, with 42 cases focusing on cities in the United States. There are three causes of such an imbalance: (i) large data availability, especially for quantitative data, in the United States; (ii) the origins of the fields of resilience and environmental justice that originate from North American scholarship; and (iii) a Western and English language bias in the literature databases. Outside the United States, the number of case studies is more evenly distributed, particularly in Europe, where most countries have at least one or two case studies. In the rest of the world, clusters of cases can be found in the Pacific and Caribbean regions, two areas that have already suffered significant damage caused by climate change, such as flooding and coastal erosion. Finally, the central and northern parts of the African continent and the Persian Gulf area have the least number of case studies, possibly owing to difficulties in data collection due to an unstable political situation. In particular, Araos et al. (Araos et al., 2021) found that resilience efforts in Africa and Asia are more likely to consider equity issues in resilience planning; this analysis did not find any relationship between the typology of the approach and the location of the studies. In terms of the average year of publication, studies conducted in Spain and the Netherlands have the highest average years (2023 and 2022), possibly indicating that research in Europe has started to observe this field more recently, especially compared to countries in Asia, such as India (2018) and Vietnam (2019), where climate change hazards became a threat earlier than in other locations.

To integrate the analysis of active countries, climate change hazards were also observed with the intent of identifying possible relations between locations and hazards. For each of the case studies selected, we noted whether the study considered a specific climate hazard or not. In the latter case, the hazard was marked as “Unspecified”, meaning that the study encompassed multiple climate hazards rather than focusing on a specific hazard. The majority of articles (44 out of 95 studies with empirical cases) fall under the Unspecified category, since they take an overarching approach that encompasses all issues related to urban climate resilience. Yet, it is still possible to observe that flooding is the main climate hazard studies in all parts of the world (18 out of 44 studies). On the other hand, the other climate hazards seem to be more specifically connected to the geographical location of the case studies. For instance, Urban heat is an hazard studied in the European continent (Italy, Spain, Turkey), which is to be expected since the urban heath island is a challenge that most European cities are facing (Eugenio Pappalardo et al., 2023). Similarly, Water scarcity and drought is an hazard mostly observed in arid countries like Morocco or Ethiopia, or countries that are experiencing unusual absence of rain (Haiti and Honduras). Finally, disasters like hurricanes and earthquakes are observed in countries that are located in earthquake prone (India) or hurricane prone areas (Puerto Rico and the United States). Table 2 and Fig. 9 also reports the main climate change hazards studies in

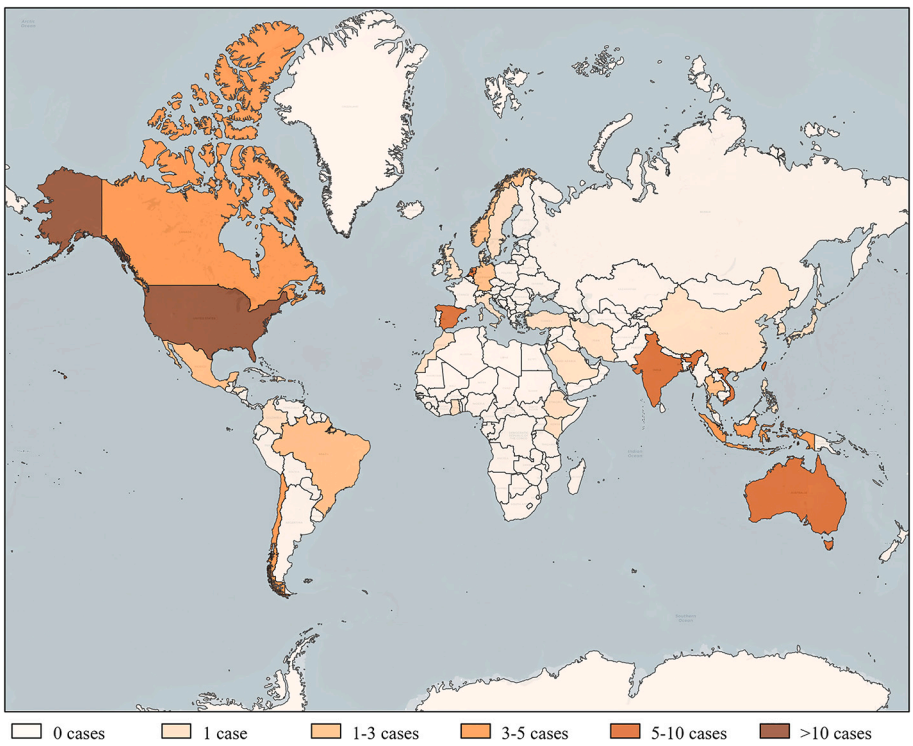

Fig. 8. Trend analysis of locations of case studies.

Table 2
Number of empirical case studies and average year of publication.

Country	Number of empirical case studies	Average publication year	Main hazards observed
United States of America	42	2020	Flooding, Heat, Sea-level rise, Hurricanes
Taiwan	6	2020	Flooding, Heat
Vietnam	5	2019	Flooding, Sea-level rise, Soil degradation
Australia	4	2020	Heat, Flooding
India	4	2018	Earthquakes
The Netherlands	4	2022	Flooding
Spain	4	2023	Heat
Canada	3	2021	Flooding
Chile	3	2021	Air pollution
Indonesia	3	2020	Flooding

the most active countries.

4.2.5. *Analysis of sources*

The sources of justice- and climate resilience-related research publications were also examined. Table 3 lists the journals with a total citation count of at least 20. The journals with the highest number of citations and articles were well-known journals in the fields of development, environmental justice, climate change, geography, and urban studies. The results indicated that "Urban Climate," "Sustainability," "Landscape and Urban Planning," and "Frontiers in Sustainable Cities" topped the list for number of articles selected, with seven articles selected for each. However, these articles were only cited on average 17.8 times. The journal with the highest number of average citations is "Ecology and Society," with two articles cited 318.5 times on average. After "Ecology and Society," the following six journals with the highest average citations are "Climate and Development," "Environment and Urbanization," "Natural Climate Change," "Urban Climate," "Geoforum," "Annals of the American Association of Geographers," and "World Development." They all had articles cited more than 40 times on average, and more than 140 total citations of the selected articles. All of these journals share an explicit focus on the topic of climate change planning strategies for climate resilience. Interestingly, however, the list of sources encompasses a wide range of disciplines including education, health, technology, energy, and governance. This is because of the interdisciplinarity of climate resilience and justice, which are two topics that affect many aspects of the urban environment.

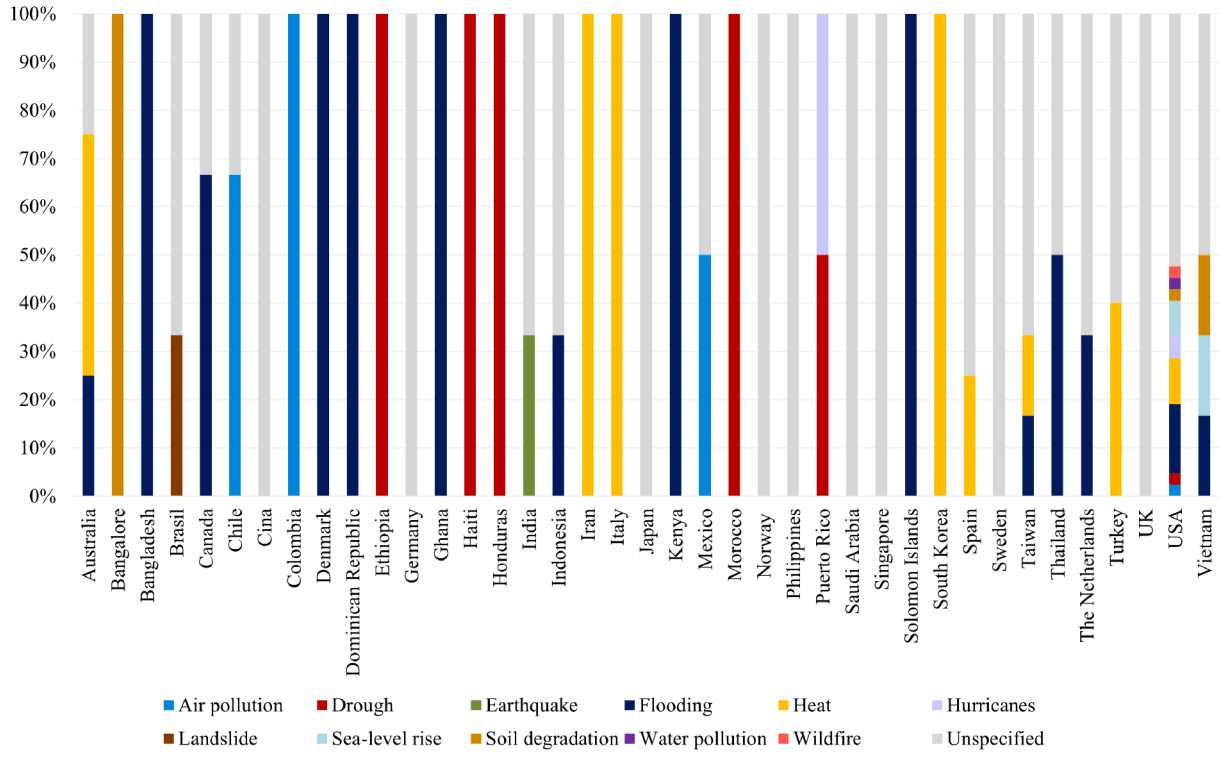

Fig. 9. Type of climate hazards observed in active countries.

Table 3
Journals with the most articles and citations selected for the literature review.

Name of Journal	Number of Selected Articles	Total Number of Citations	Average Number of Citations
Ecology and Society	2	637	318.5
Climate and Development	4	446	111.5
Environment and Urbanization	4	325	81.25
Natural Climate Change	1	316	316
Urban Climate	7	277	39.6
Geoforum	4	164	41
Annals of the American Association of Geographers	1	145	145
World Development	3	143	47.7
Sustainability	7	125	17.9
Applied Energy	1	118	118
Environmental Research Letters	1	117	117
Antipode	1	111	111
Environmental Planning *E*-Nature and Space	4	100	25
Local Environment	6	98	16.3
Social Science and Medicine	1	80	80
Landscape and Urban Planning	7	78	11.1
Ecological Economics	1	74	74
Environmental Science and Policy	5	66	13.2
Journal of Environmental Management	1	63	63
Current Opinion on Environmental Sustainability	2	59	29.5
Geographical Review	2	56	28
Ambio	2	51	25.5
Allergy	1	49	49
Climate Policy	1	44	44
International Journal of Disaster Resilience in the Built Environment	1	44	44
Landscape and Urban Planning	2	39	19.5
Ecological Applications	1	38	38
Wiley Interdisciplinary Reviews-Water	1	38	38
Urban Affairs Review	1	31	31
Urban Planning	4	31	7.8
Urban Studies	2	28	14
Cities	3	27	9
Health Promotion Internal	1	26	26
Methodsx	1	25	25
Frontiers in Sustainable Cities	7	20	2.9
Land Use Policy	1	20	20

4.2.6. Analysis of top-cited articles

Table 4 lists the 10 articles with the highest number of citations from the 146 selected. Of 146 articles selected, 23 had no citations, 7 only had 1 citation, 96 had between 2 and 50 citations, 9 had between 51 and 100, and 11 had more than 100. The total number of

Table 4
Top cited articles included in the literature review.

Document	Title	Journal	Number of Citations
Kabisch et al., 2016 (Kabisch et al., 2016)	Nature-based solutions to climate change mitigation and adaptation in urban areas: perspectives on indicators, knowledge gaps, barriers, and opportunities for action	Ecology and Society	633
Tyler and Moench, 2012 (Tyler and Moench, 2012)	A framework for urban climate resilience	Climate and Development	379
Shi et al., 2016 (Shi et al., 2016)	Roadmap toward justice in urban climate adaptation research	Natural Climate Change	316
Ziervogel et al., 2017 (Ziervogel et al., 2017)	Inserting rights and justice into urban resilience: a focus on everyday risk	Environment and Urbanization	193
Anguelovski et al., 2020 (Anguelovski et al., 2020)	Expanding the Boundaries of Justice in Urban Greening Scholarship: Toward an Emancipatory, Ant subordination, Intersectional, and Relational Approach	Annals of the American Association of Geographers	145
Reckien et al., 2017 (Reckien et al., 2017)	Climate change, equity and the Sustainable Development Goals: an urban perspective	Environment and Urbanization	130
Schlor et al., 2018 (Schlör et al., 2018)	The FEW-Nexus city index - Measuring urban resilience	Applied Energy	118
Sovacool et al., 2018 (Sovacool et al., 2018)	The neglected social dimensions to a vehicle-to-grid (V2G) transition: a critical and systematic review	Environmental Research Letters	117
Ranganathan and Bratman, 2021 (Ranganathan and Bratman, 2021)	From Urban Resilience to Abolitionist Climate Justice in Washington, DC	Antipode	111
Méndez et al., 2020 (Méndez et al., 2020)	The (in)visible victims of disaster: Understanding the vulnerability of undocumented Latino/a and indigenous immigrants	Geoforum	111

citations indicates the impact of each article. The top-cited article was written by Kabisch et al. (Kabisch et al., 2016) (633 citations) and discusses the potential of Nature-based Solutions (NbS) in addressing climate adaptation and mitigation while also enhancing justice in urban settings. In this article, the authors propose an observation of the *System outcomes* of the effectiveness of NbS as

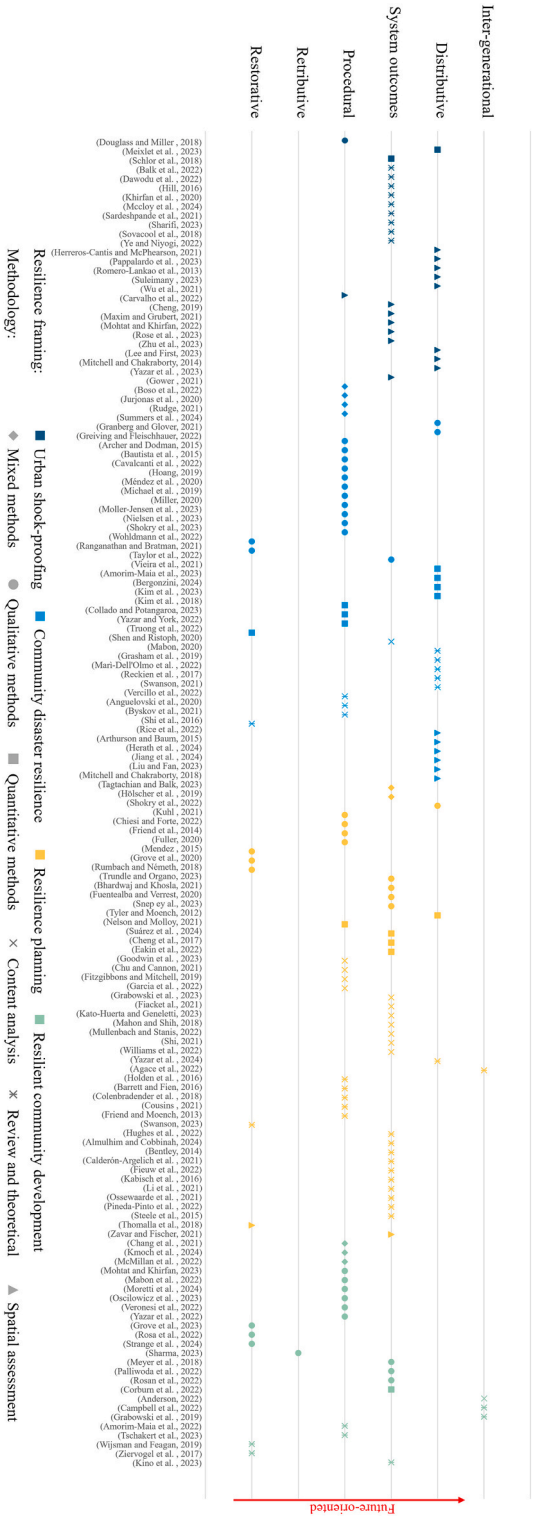

Fig. 10. Meta-analysis of the 146 selected articles.

Resilience planning measures, setting important bases for a topic that has gained increased attention in recent years (Nature-based Solutions as climate resilience measures in dense urban areas). Other highly cited articles discuss how the uneven distribution of resources or the uneven adaptive capacity of the population can affect both exposure to climate risks and climate resilience. On the other hand, the second-most cited article is a qualitative case study that presents and discusses an innovative framework for assessment of urban climate resilience, with the integration of justice considerations (Tyler and Moench, 2012). This article receives numerous citations because it serves as a theoretical base and analytical framework for other studies on justice and climate-resilience planning.

4.3. Meta-analysis

Fig. 10 presents the meta-analysis of 146 selected articles classified according to three criteria: (i) the type of resilience framing employed, (ii) the form of justice incorporated, and (iii) the research methodology used (as defined in Fig. 7). Through the use of different symbols and colors, the figure allows us to visualize the distribution of integrations between resilience framings, forms of justice, and research methodologies. The figure clearly shows that no single combination of methodologies and approaches was used significantly more than others. Instead, a wide range of theoretical and methodological approaches have been used. Still, some clusters emerge as most relevant: qualitative studies dealing with *Community disaster resilience* and *Procedural* justice (11 articles), and theoretical analyses dealing with *Urban shock-proofing*, *Resilience planning* and *System outcomes* (19 articles). Another interesting observation is the fact that spatial assessment is almost solely employed in the *Urban shock-proofing* resilience framing and engaging with the *System outcomes* or *distributive justice*.

Fig. 11 illustrates the meta-analysis by clustering articles based on a combination of four resilience framings and six forms of justice. It is a more simplified version of Fig. 10, and it is more useful for an intuitive observation of the most and least used integrations between resilience framings and forms of justice. In this figure the forms of justice are ordered from past-oriented (bottom) to top oriented (top), showing the evident presence of a main research cluster for present and near-future oriented studies. Similarly, certain resilience framings are more used for the analysis of present or near-future oriented integrations (*Urban shock-proofing*), while others are more suitable for a diverse range of temporal domains (*Resilient community development*). Moreover, the figure also highlights the two resilience framings that employ a more inclusive research and planning approach (*Community disaster resilience* and *Resilient community development*), showing how these two approaches are slightly more integrated with a larger number of forms of justice compared to the top-down approaches.

The results of the meta-analysis allow us to identify the main areas of research as well as the main research gaps. Specifically, the important findings of the analysis are as follows.

- Ranking the six forms of justice from past-oriented to future-oriented, as defined by Cañizares et al. (Cañizares et al., 2024) it can be noted that most papers integrate justice forms that deal with present procedures or future distribution of value and impacts (87 % of

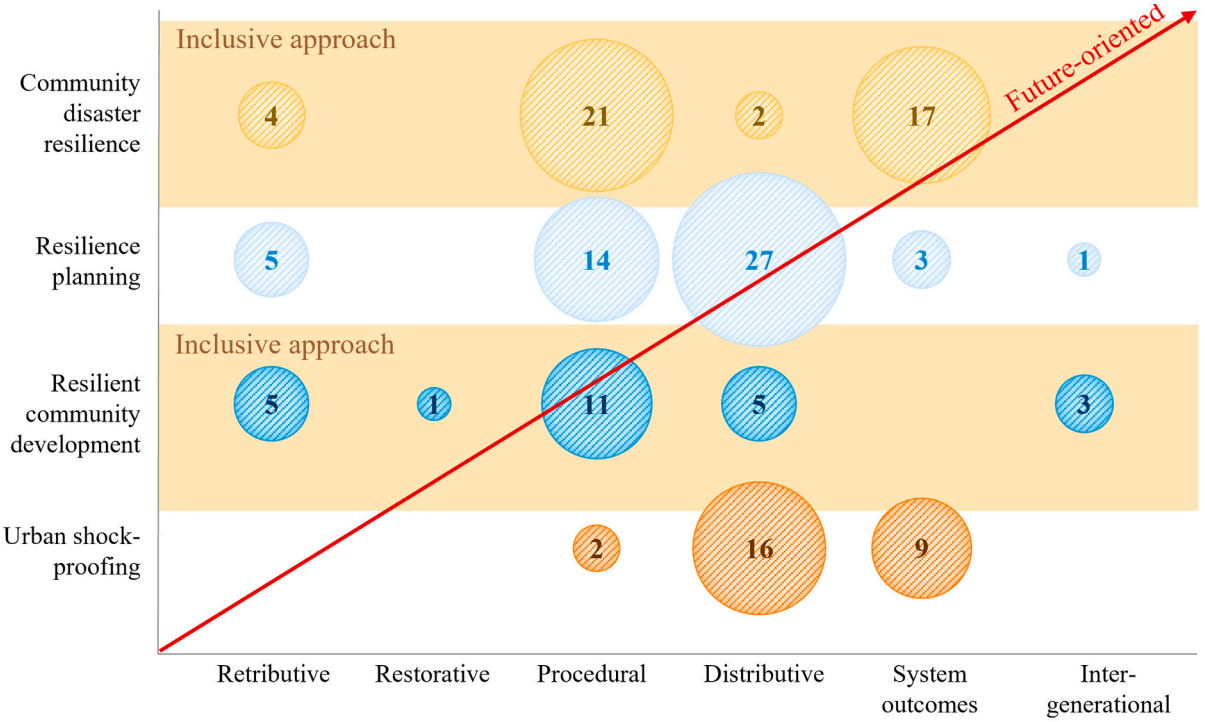

Fig. 11. Meta-analysis of the selected articles - combined.

papers). This shows that, although there is a fair amount of justice integrated into research on urban climate resilience, it is primarily centered on observations from the present and near future.

- There was no significant difference between the use of systematic, top-down resilience framing (*Urban shock-proofing* and *Resilience planning* – 53 % of articles) and the use of bottom-up inclusive framing (*Resilient community development* and *Community disaster resilience* – 47 % of articles). Similarly, there was no significant difference between the use of short-term resilience framing (*Urban shock-proofing* and *Community disaster resilience* – 49 % of articles) and long-term resilience framings (*Resilience planning* and *Resilient community development* – 51 % of articles).
- Although no significant observation emerges when combining resilience framings in macro groups, important clusters emerge when analyzing the intersection between each resilience framing and each form of justice. The most commonly employed combination of approaches was the integration of *Resilience planning* with *System outcomes* justice (18 %). These articles analyze governance enablers or limitations to successful climate resilience transformations at the city scale, where the benefits of climate action are maximized for the entire urban system. For example, Hölscher et al. (2019) stressed the need for institutional and organizational frameworks that prioritize climate change across various levels and sectors and facilitate broader coordination, collaboration, and learning. Another commonly employed combination was the integration of *Community disaster resilience* and *Procedural* justice (14 %). Articles that fall under this category are concerned with how and why different citizens have varying rights to resilience and their capacities to take action in the pursuit of resilience (Archer and Dodman, 2015).
- Interestingly, only a few papers addressed past-oriented forms of justice (10 %) and long-term future forms (3 %). In the first case, studies tend to combine bottom-up resilience framings with *Restorative* justice approaches to challenge technocentric dominant frames and address new epistemological questions by focusing on the co-development of knowledge and solutions to address climate change (Wright et al., 2022). Similarly, future-oriented studies that integrate *Inter-generational* justice and *Resilient community development* (2 %) acknowledge that individual and collective experiences in framing knowledge need to ensure that future transitions meet the needs of future generations (Grabowski et al., 2019). Although very similar, the main difference between these two groups of articles is the subject of the studies; papers integrating the *Restorative* approach focus on residents who have historically been marginalized and oppressed, while *Inter-generational* approaches are not concerned with specific communities but try to envision societal transitions that will generally ensure the well-being of future generations.
- The research methodologies employed in the selected studies were clustered according to resilience framings and justice forms. The most evident clusters appearing from the meta-analysis were (1) spatial assessment for studies integrating *Distributive* justice and *Urban shock-proofing*, (2) qualitative research for studies integrating *Procedural* justice and *Community disaster resilience*, and (3) content analysis for studies integrating *System outcomes* justice and *Resilience planning*. This highlights that certain methodologies are better suited for examining specific aspects of justice and/or climate resilience. For instance, spatial assessment is a well-suited methodology for observing the distribution of impacts at the urban scale, and thus evaluating whether certain communities are more affected than others in cases of climate emergencies (Herreros-Cantis and McPhearson, 2021). Further, procedural barriers affecting the capacity of communities to face climate hazards are often observed through in-depth analysis of case studies, where qualitative methods such as ethnographic interviews can reveal insights into the social and political dynamics of resilience-making. Finally, the assessment of resilience plans and governance strategies can be strategically carried out through content analysis of existing (or proposed) policy documents that reveal the governance objectives for future trajectories of change.

5. Discussion

This review of the integration of justice and climate resilience in urban context reveals important key findings that can be discussed in relation to previous literature and used as pillars for the proposition of practical implication and future insights.

5.1. Key findings

Notably, the research key findings show no clear predominance of either short-term versus long-term resilience framings or between top-down versus bottom-up approaches. This result implies that the literature on the topics of urban climate resilience and justice has broadened its boarders, expanding from the original notion of climate resilience as a top-down engineering framework (Folke, 2006). On the other hand, the findings showed notable differences in the temporal focus, with almost 90 % of articles solely engaging in observations from the present and near-future. Moreover, the meta-analysis shows that there are some forms of justice that are still overlooked, i.e., *Inter-generation*, *Restorative*, and *Retributive* justice. This means that, while it is true that the analysis of justice and urban climate resilience has not broadened its scope to include a large variety of integration possibilities, it is yet to be completed and sufficient for addressing all forms of (in)justice comprehensively.

The findings are particularly interesting with respect to existing research on this topic and can be used as a benchmark to assess progress toward goals outlined in four previous literature reviews. First, in 2018, Béné et al. (Béné et al., 2018) argued that almost none of the articles on urban resilience analyzed in their research included observations on the characterizing factors of the urban context —such as poverty or informality — which are the root causes of vulnerability, inequality, and injustice. With this, the authors called for a more transformative resilience approach aiming not only to bounce-back but also to change the status quo (Béné et al., 2018). The findings – which include more recent research trends and progresses – show that this goal is partially addressed by current literature, as many of the selected articles (51 %) engage with long-term resilience framings that proposed strategies for resilient urban transformations. Still, a very restricted number of articles actually engages with forms of justice that take the needs and preferences of marginalized communities into account for envisioning future transformation pathways (*Retributive* and/or *Inter-generational* justice –

5 articles), or the possibilities for retribution as a way to reverse the status-quo (*Restorative* justice – 14 articles).

Second, Amorim-Maia et al.'s (Oscilowicz et al., 2023) set the goal to pay greater attention to the issue of intersectionality in climate justice. While it is true that some forms of justice are currently overlooked, it is also worth noting that the current findings show that the integrations between resilience framings and forms of justice are a good tool for observing and analyzing intersectionality – a "conceptual lens to understand how various forms of social inequalities and vulnerability interconnect and overlap with each other" (Oscilowicz et al., 2023) – in the urban context. Specifically, this objective can be effectively addressed through the integration of *Procedural* and *Distributive* justice in order to look at the complexity of procedural and resource barriers that prevent certain groups of residents from becoming resilient. Moreover, the integration of these forms of justice with inclusive resilience framings (*Community*

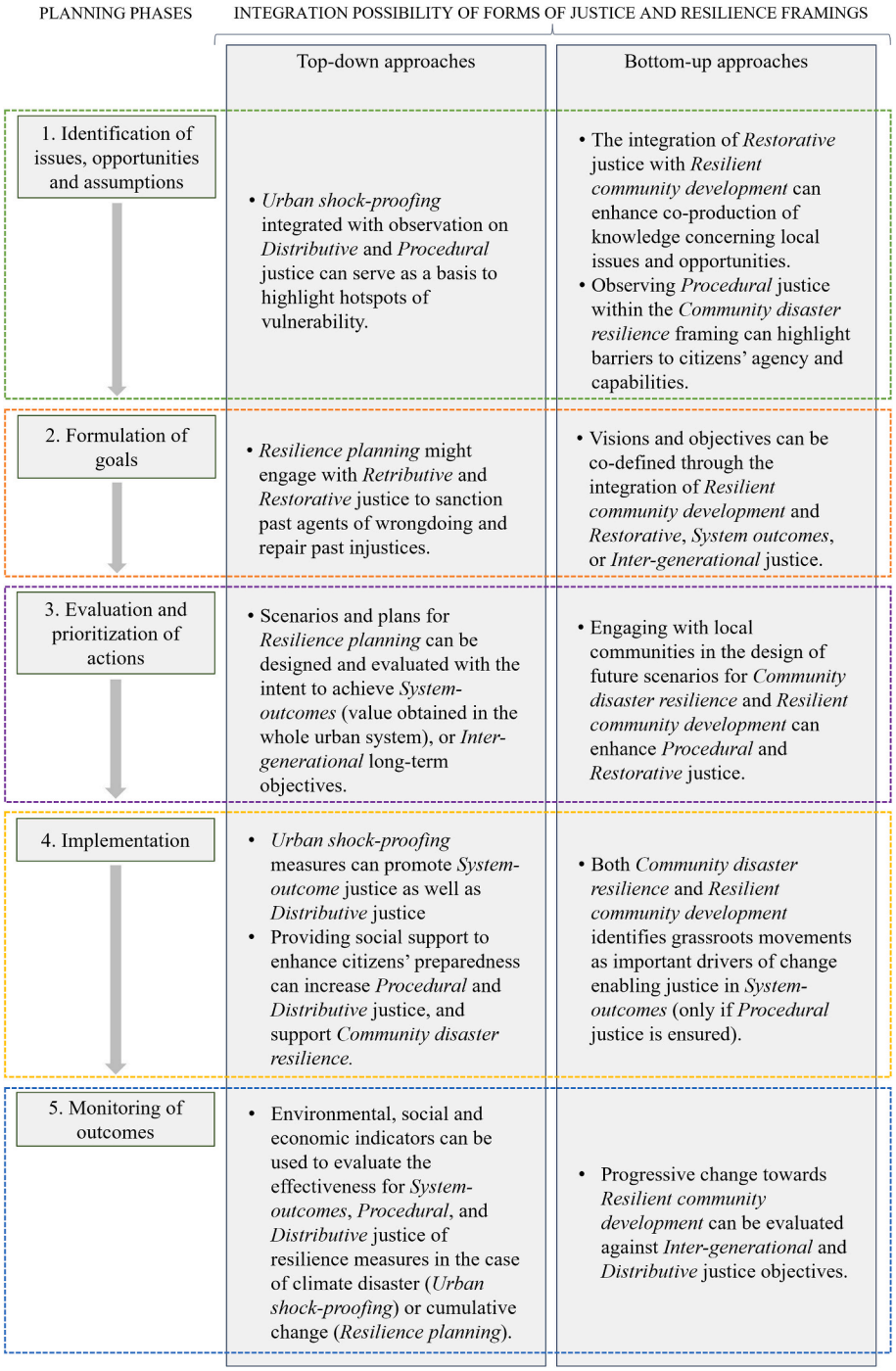

Fig. 12. Integration possibilities for policymaking.

disaster resilience and *Resilient community development*) can ensure that marginalized communities are at the center of the resilience-building process.

The third relevant goal emerging from previous literature is the development and implementation of new evaluation frameworks to support researches and policymakers in keeping track of the effectiveness of climate actions (Brown et al., 2018). The results show that 20 % of the articles focus on approaches that track and observe the impacts of climate hazards and disasters (e.g., articles focusing on *Distributive* justice), and 28 % of the articles deal with the barriers and outcomes of implemented measures (*System-outcomes* and *Procedural* justice) that can be integrated with both top-down (*Urban shock-proofing*) and bottom-up (*Community disaster resilience*) resilience framings.

While many of the past research goals have been somehow addressed in the most recent literature on urban climate resilience and justice, the fourth goal emerges as unanswered. Newell et al.'s (Newell et al., 2021) set the goal for more in-depth investigations on the drivers of injustice. While all articles included in this review look at the intersection between injustice and climate resilience in the urban context, few address the past and root causes of injustice, namely the articles (10 % of the total) engaging with *Restorative* and *Retributive* justice. Moreover, none of the four resilience framings entails a specific observation at the root causes of vulnerability of injustice. This might also be the reason why *Restorative* and *Retributive* are two of the least integrated forms of justice. Yet, as correctly pointed out by Newell et al. (Newell et al., 2021), an in-depth analysis on the root causes of inequality and injustice is necessary to ensure just future resilient transformations, and this issue is yet to be fully addressed in the existing literature.

5.2. Research implications

This systematic literature review entails implications that span both theoretical (i.e., researcher) and practical aspects (i.e., policy maker). The theoretical implications are those lessons that can serve as support and basis for future academic research. In particular, this review has contributed to deeper understanding of the complex interplay between two well-studied fields: urban climate resilience and justice in planning and policymaking. While extensive literature has already explored and discussed the integration of these two topics, this paper proposes a structured framework based on existing peer-reviewed studies. By utilizing a well-defined structure for deductive analysis, the framework helps to minimize normative biases and provide clear results. These results are organized and shown in the deductive analysis, trend analysis and the meta-analysis, offering a comprehensive picture of the current state of the art.

The results of the analysis on the integration between different resilience framing and justice approaches are not only purposeful from an academic standpoint, but also holds practical significance for policymakers. For instance, the results have shown that the use of a single resilience framing, or the integration of a single form of justice in policymaking for climate resilience are not sufficient to ensure just resilience transitions. Instead, a combination of integrated approaches could be a more suitable pathway for just urban climate resilience. Fig. 12 presents strategies for the effective integration of different forms of justice in policymaking for urban climate resilience. The strategies are based on the five simplified steps of resilience-building defined by Tyler and Moench (Tyler and Moench, 2012): (1) identification of issues, opportunities, and assumptions; (2) formulation of goals; (3) evaluation and prioritization of actions; (4) implementation; and (5) monitoring of outcomes. This figure is intended to support policymakers in choosing appropriate integration strategies for each step. It does so by suggesting different possibilities for the integration of forms of justice and resilience framing, depending on the approach (top-down or bottom-up) with which policymakers might want to engage. Not all integration strategies are suitable for all resilience-building phases, and policymakers must choose the most appropriate strategy for each step of the process.

5.3. Limitations and future insights

Although this study presents a systematic review of current literature, the results are limited to the articles found in scientific databases. While these databases are extensive, they are not exhaustive; thus, it can be assumed that some articles were automatically excluded from selection solely because they were not included in the Web of Science and Scopus databases. This is particularly relevant for articles published in languages other than English, in emerging journals, or in journals from the Global South. Despite this limitation, this study can be used as a preliminary theoretical framework for future research on inclusive climate resilience and for planning inclusive climate resilience measures in urban areas. A second important limitation relates to the practical implementation of the research and key findings. While the study implications provide important recommendations for research as well as policymaking, it is also important to note that the integration of different forms of justice and different resilience framings poses a threat to feasibility. The analysis of the integration of justice forms might require complex methodologies and difficulties in data collection, e.g. empirical data is not always openly available. Furthermore, the inclusion of local actors and stakeholders might be very challenging, and significantly slow down the research and policymaking process. Still, feasibility issues do not undermine the results and findings, but they set new challenges to be addressed in future developments.

In spite of the discussed limitations, and with the intent of fostering and enhancing future knowledge, the authors suggest applying the proposed framework for future empirical research to experimentally validate the findings of this study. Moreover, the analysis and discussion of the results has highlighted three main insights for the future that can become pillars for new research:

- Enhancement of system thinking with people-centered approaches

The first important observation is the necessity of integrating a top-down system thinking with bottom-up, people-centered approaches. Fitzgerard (Fitzgerald, 2022) recognized the need to merge top-down governmental plans with bottom-up inclusivity and co-

creation to promote equity in the planning process. However, scholars warn about the danger of relying solely on community-based approaches. Although providing more resources to marginalized communities and including them in the participatory co-creation of resilience is important for justice concerns, it is not sufficient to face all risks emerging from climate change (Domingue, 2020). Grove et al. (Grove et al., 2020) argued that design thinking in Miami's resilience planning is bound by the competing experiences of different groups and might even exacerbate the path-dependent dynamics of conflict. By comparing climate governance in Rotterdam and New York, Hölscher et al. (Hölscher et al., 2019) stressed the critical role of governmental actors in coordinating, motivating, and mandating climate action at multiple scales, while incentivizing the integration of the co-creation of knowledge, planning, and implementation of actions for climate resilience through a bottom-up design thinking approach. The results of this analysis also highlight this need because top-down resilience framing is more suitable for specific forms of justice, whereas bottom-up framing is more suitable for others. For instance, system thinking is employed more for the identification of *Distributive* injustice, for the successful achievement and monitoring of *System-outcomes*, or for inflicting sanctions for *Retributive* justice. In contrast, people-centered approaches to climate resilience are better suited for *Restorative* or *Inter-generational* justice, because they encourage the co-production of knowledge and vision for future transformations. Finally, *Procedural* justice is a transversal issue that is necessary for successful inclusion and balance of responsibilities in the resilience-planning process.

- Focus on the social implications of climate actions

Another relevant issue is the lack of research on the implications of climate action on resilience. Most of the selected papers dealt with the evaluation of resilience (how much damage would a climate disaster cause?), or the (co-)creation of climate resilience plans and policies (How can we achieve climate resilience? What is the process of developing resilience?), while a limited number of studies are directly concerned with the social implications of climate action (Has this action reduced or increased justice?). Kato-Huerta and Geneletti (Kato-Huerta and Geneletti, 2023) observed that "while it is known that climate response could asymmetrically affect marginalized communities, researchers and practitioners have expressed concerns regarding the lack of attention given to the justice implications of climate action planning." Although a greater focus on this issue would not directly enhance a specific form of justice or highlight forms of injustice, it is necessary to evaluate the justice implications of implemented measures and provide useful insights on (1) where more attention is required in the future (*Distributive* and *System-outcomes* justice), or (2) the barriers that have possibly prevented *Procedural* justice.

- Evaluation of different timeframes

A final factor that emerged from this study is the inclusion of different timeframes in the analysis. Some scholars highlight the lack of future orientation in many resilience studies, whereas others highlight a lack of attention to path-dependent cycles that reproduce climate injustice (Moser et al., 2019). Duvat et al. (Duvat et al., 2021) and Shokry et al. (Shokry et al., 2020) focus on causal historical development chains, which lead to the accumulation of exposure and lack of adaptive capacity. Particularly, Duvat et al. (Duvat et al., 2021) describe how the sociopolitical processes of dispossession have amplified the impact of tropical cyclones due to the lack of preparedness and higher exposure of formerly colonized territories. Shokry et al. (Shokry et al., 2020) analyzed the spatial change between 2000 and 2016 in terms of resilience as vulnerability, showing that the benefits of resilient infrastructure have always gone to areas with wealthier residents. On the other hand, Møller-Jensen et al. (Møller-Jensen et al., 2023) stressed that many interventions focus only on short-term benefits, rather than preparing for the long-term effects of climate change. Observing and evaluating resilience through different timeframes would not only shed light on path dependence or long-term trajectories of change but would also allow for the integration of forms of justice that are currently engaged with less than other forms. For instance, a greater focus on the co-creation of visions, objectives, and scenarios for future actions or plans could significantly enhance *Inter-generational* justice. Similarly, greater knowledge of past injustices (in terms of the distribution of the impact of agency and capabilities) might stress the need for *Restorative* and *Retributive* measures.

6. Conclusion

This article presented a review of the most recent literature on justice and climate resilience in the urban context to address the proposed research question: *How are different forms of justice integrated into the study and planning of climate resilience in the urban context?* The results of this research provide key contributions for both academic and planning purposes, because they (i) make use of established theories for deductive analysis to classify and structure the current trends in integration between justice and climate resilience in urban contexts (ii) use meta-analysis for the identification of the most and least currently-used types of integration (iii) propose future pathways of analysis on the basis of the observed gaps in the existing literature, and (iv) discuss the possibility for integration between justice and climate resilience in the different phases of the resilience-building process.

The systematic literature review identified 146 articles which present and discuss the integration between climate resilience and justice in the urban context. Results of the review highlight that there is no single type of integration more commonly used than others. Yet, aspects like the temporal domain, the agents observed, or the methodology employed might be determining factors in deciding which type of integration is more appropriate. Similarly, integrating different types of resilience framings and forms of justice at different phases of the resilience-building process could eventually lead to more just transitions. From the analysis, three main issues emerge as future insights for just climate resilience: enhancement of system thinking with people-centered approaches, focus on the social implications of climate actions, and evaluation of different timeframes.

CRediT authorship contribution statement

Virginia Pellerey: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Conceptualization. **Sara Torabi Moghadam:** Writing – review & editing, Validation, Supervision, Methodology, Conceptualization. **Patrizia Lombardi:** Supervision.

Declaration of competing interest

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

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Data availability

No data was used for the research described in the article.

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