

Review Article

Community resilience: A multidisciplinary exploration for inclusive strategies and scalable solutions



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ABSTRACT

This paper evaluates literature across multiple disciplines and stakeholder types to identify commonalities and contradictions in definitions for community resilience. It aims to support cross-disciplinary discourse to build an interdisciplinary understanding of community resilience. This work identifies the differences between mono-, multi-, inter-, and cross-disciplinary approaches to inform community resilience strategies in academic and practice-based contexts.

Four themes for community resilience were identified through a review of cross-disciplinary literature. These include (1) diverse yet convergent definitions of community resilience and the evolution from equilibrium to adaptation to transformation; (2) equitable and inclusive strategies for the development of community resilience initiatives; (3) when and at what scale strategies should be implemented; and (4) community resilience as a process or an outcome.

This work is valuable to those seeking to familiarise themselves with the concept of community resilience, including educators who deliver courses on community resilience and policy-makers. It is novel in that it presents an interdisciplinary framework for navigating the community resilience discourse beyond individual professional boundaries.

1. Introduction

The literature on community resilience is replete with diverse opinions and definitions. As ‘resilience’ emerges as an essential concept in the 21st century, the idea is informed by multi-, inter-, and trans-disciplinary knowledge and skills. This shapes how resilience is understood, applied, and measured, and the term is becoming increasingly contested. The concept of resilience first emerged in ecological theory [1] and has since been adopted and adapted by various disciplines relating to the built environment, including engineering, design, planning, architecture, disaster risk reduction, and economics. There is an observed pattern that scholars in each field initially sought to define resilience in a way that relates specifically to their disciplinary modes of thinking. This disciplinary-specific siloed resilience thinking led to confusion and ambiguity in the application, potentially hindering the collaborative abilities of multidisciplinary teams.

As the body of theory around resilience matures, many scholars recognise the need to broaden its use and applicability beyond individual disciplines to position ‘resilience’ as a pivotal concept for societal well-being. Not only is it necessary to better establish how resilience is understood, but it is also necessary to determine the different methods used to quantify resilience. Across disciplines, resilience is measured or quantified as an outcome, a state, a property, and a process [2,3]. However, the absence of a clear definition makes it difficult to apply and measure in a broader context [4–6].

By examining resilience theory, this paper seeks to understand how ‘resilience’, specifically ‘community resilience’, is defined in literature across disciplinary boundaries. The findings have implications for applying community resilience theory with specific consideration of the built environment. This paper presents a multi-disciplinary systematic

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review of community resilience literature exploring four identified community resilience themes. These include:

- i. Diversity and consensus in defining community resilience;
- ii. Equitable and inclusive development of community resilience;
- iii. Spatial and temporal scales for planning and creating community resilience; and
- iv. Meaningful impact – community resilience, a process or an outcome.

This paper addresses the observed problem of inconsistent definitions for community resilience across disciplinary domains hindering conceptual clarity. Through the development of a conceptual framework, various disciplinary perspectives on community resilience as a ‘boundary object’ are synthesised to aid interdisciplinary discourse.

1.1. Framing community resilience as a boundary object

Boundary objects were initially defined by Star [7,8] and Star and Griesemer in 1988 and 1989. The purpose of boundary objects is to provide commonality (the object) between disciplines working in the same space (a boundary) where the disciplines may have different definitions or expectations around an idea. According to Star [9], three components are required for a boundary object: 1. interpretive flexibility, 2. organisational structure, scale and granularity, and 3. implied processes. Community Resilience is a boundary object that allows actors across disciplines to work in shared spaces without a unifying definition but towards a common goal.

Holling [1], p.14 first defined resilience as a “measure of the persistence of systems and of their ability to absorb change and disturbance and maintain the same relationships between ... variables.” Since the 1970s, various disciplines have applied resilience theory to different contexts, situations, and fields, including disaster scenarios, urban planning, community development, and social-ecological considerations [10]. Given the variety of fields using resilience theory, a range of definitions and methods for resilience have evolved, specific to each discipline’s needs and practices. This divergence in definitions amongst disciplines shows interpretive flexibility for the term community resilience.

Furthermore, approaches to community resilience must also consider the multiple stakeholders and perspectives in a community, including across many dimensions of city governance [11]. The current mono- or multi-disciplinary resilience theories often fail to address the complex and interconnected needs of an entire community. Such definitions do not meet the needs of the most vulnerable, nor the requirements for social resilience [12]. Such theories are often based on dominant Eurocentric or Western values [13] and risk misrepresentation or exclusion of minority groups [14]. Siloed resilience perspectives may favour particular social structures [15] and obscure conflicts or hidden priorities [16]. Future considerations of resilience must be inclusive and representative of all community members.

While a holistic understanding of resilience can strengthen its application, some scholars argue against a unified definition [17–19]. The concept and implementation of resilience should remain sufficiently narrow in vision or use [17,19] and suggest that it can instead be a driver to generate strategies for healing and equity [19]. However, these strategies become challenging to construct and execute without a collective understanding of resilience [20] and for whom resilience is defined. Rather than acting as a divisive concept, resilience has the potential to unite actors across different sectors who share common objectives of improving community planning, implementation, and performance [21,22]. In line with this, community resilience meets the second component mentioned by Star: scale and granularity. This component requires that the boundary object is flexible enough to meet the requirements of a large group of actors. However, subgroups or disciplines should have discipline-specific definitions.

Within policy-making, a siloed understanding of resilience hinders its practical development, integration, implementation, and application due to obscured, uncertain, and misunderstood objectives brought about

by different underpinning frameworks [17,23]. This diversity in philosophical and methodological frameworks for resilience presents a crucial challenge in navigating a shared understanding of resilience. Resilience is framed through simple definitions such as ‘bouncing back’, ‘build back better’, and ‘learning from an event’ to more complex considerations of measurement, timeframes, and spatial scales [6]. These processes meet the third requirement of a boundary object, implied processes. These community resilience models allow action without consensus on a common community resilience definition. There are also overlaps across disciplinary frameworks; for example, resilience is frequently defined as a positive or desirable trait, as a response to a clear threat, and is understood to have fixed starting and ending points [12].

Despite often contradicting definitions, resilience presents a valuable entry point for bridging sustainability discourse between academic disciplines [2,3,24], community sectors [11,16], and community actors [25,26]. The challenge is to connect knowledge domains using the concept of resilience without limiting its definition to one disciplinary position. Béné et al. [21] suggest that limiting definitions to one discipline may, in fact, impede progress. Instead, they argue that we should ask how resilience discourse can retain a clear focus while serving a range of diverse, interrelated fields and contribute to the ongoing development of resilience as a boundary object.

This paper responds to the opportunity to redefine an inclusive community resilience framework, which is presented by developing a combined understanding of community resilience from various disciplines [6,27].

2. Methodology

The interdisciplinary nature of the research problem guided a qualitative, multi-phased research design, with methods employed by a multidisciplinary team of researchers. The research presents a systematic review of literature relating to community resilience, in which the team aimed to develop “a detailed and comprehensive plan and search strategy derived a priori, with the goal of reducing bias by identifying, appraising, and synthesizing all relevant studies on a particular topic” [28], p. 57).

This method was chosen for two reasons. First, because it supported a cohesive approach across a multidisciplinary research team. Second, a systematic review ensured a comprehensive answer to the research question: *how can different disciplinary perspectives on community resilience as a ‘boundary object’ be synthesised as a conceptual framework?* According to the literature, a systematic review typically contains eight steps, of which the steps followed are outlined:

1. Formulate the review question
2. Define inclusion and exclusion criteria
3. Develop a search strategy and locate studies
4. Select studies
5. Extract data
6. Assess study quality
7. Analyze and interpret results
8. Disseminate findings

The review was completed by an international, multidisciplinary team of academics, with representation across architecture, engineering, design, planning, and construction disciplines. The diversity of perspectives is strengthened by the broad range of geographic locations of the research team, spanning Oceania, Africa, and the UK.

The inclusion and exclusion criteria and search strategy (steps 2 and 3) involved each of the researchers on the authorship team, who identified four-to-six peer-reviewed journal articles that offered disciplinary value and were either highly cited (between 100 – 4000+ citations at the point of review) or seminal to the development of resilience within their fields. Citations were based on both Scopus and Google Scholar metrics. Selected articles addressed community resilience as a whole. Articles

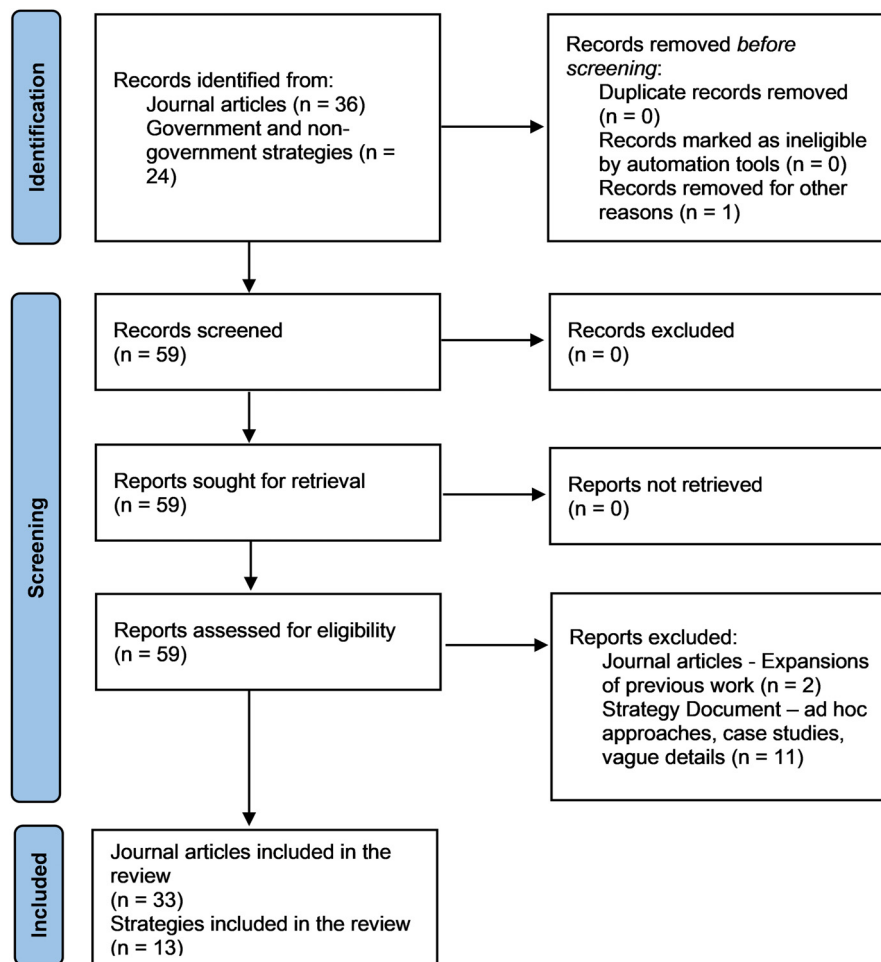


Fig. 1. Screening process for identifying relevant journal and strategy documents for the review.

focused on specific components or sub-components were excluded. Additionally, articles needed to be available in English. All the selected articles (step 4) had approximately double the citations on Google Scholar, compared to Scopus, accounting for Google Scholar's inclusion of a broader range of publications, including book chapters, theses and dissertations, and other non-journal publications. Google Scholar citations help show the broader impact of work beyond academic journal articles [29].

The authors chose a citation rather than a keyword approach for two reasons. First, the authors represent a wide range of disciplines and geographical locations. Initial discussions highlighted that each approached community resilience differently, had different definitions for community resilience, and had varying ideas on how to apply it. As such, we elected to bring together a collection of journal articles representative of how our various disciplines viewed resilience to form a common understanding of what community resilience means for cross-disciplinary teams. Second, citations were used as a proxy for determining the relevance of the community resilience approaches in different fields. An initial list of 35 papers was compiled based on these criteria (refer to Supplementary Material). The identification and screening details are provided in Fig. 1.

Further screening of the selected journal articles was undertaken to determine eligibility for the study. At this stage, two additional articles were excluded. Both instances were expansions of previous work by the same authors. The original study was excluded in these cases, and the expanded work was included. This was done to prevent double-counting approaches but allow for the most recent work to be included. All of the articles identified were published between 2001 and 2016.

Data were extracted from these papers (step 5) to identify the key focus, results, methods, target discipline/s, and resilience themes. Data extraction was a team-based approach. Working together during twice-monthly conference calls, the team set up a spreadsheet for extracting data from all the articles. Using one article as an example, the team extracted data to set a common procedure and expectations. From this, the remaining articles were distributed across the team members, with everyone reading and extracting data from articles from their discipline and other disciplines. One team member reviewed all 36 journal articles to ensure consistency in the data extraction. During the regular conference calls, team members would report on their progress and discuss the data extracted for the articles.

Each paper's study quality (step 6) was assessed based on the contribution to defining disciplinary or community-level resilience. This was based on the use of the papers within different disciplines, the number of citations, and whether the paper provided a definition or measurement of resilience. The data extracted from the papers were analysed (step 7) to determine relevant themes that can be used to understand resilience across multiple disciplines and how to best apply resilience. Understanding of resilience is enhanced by the thematic approach. Originally, six ideas were prominent: why resilience is important to each discipline, whom resilience strategies are intended for and by whom they are enacted, what standard methods are used to define resilience, when resilience principles should be applied or theorised, where and at what scale resilience strategies should be applied, and how the strategies should be measured or quantified. Further review of the selected articles led to the converging of some ideas and rearranging others to create the four themes discussed in this review. These

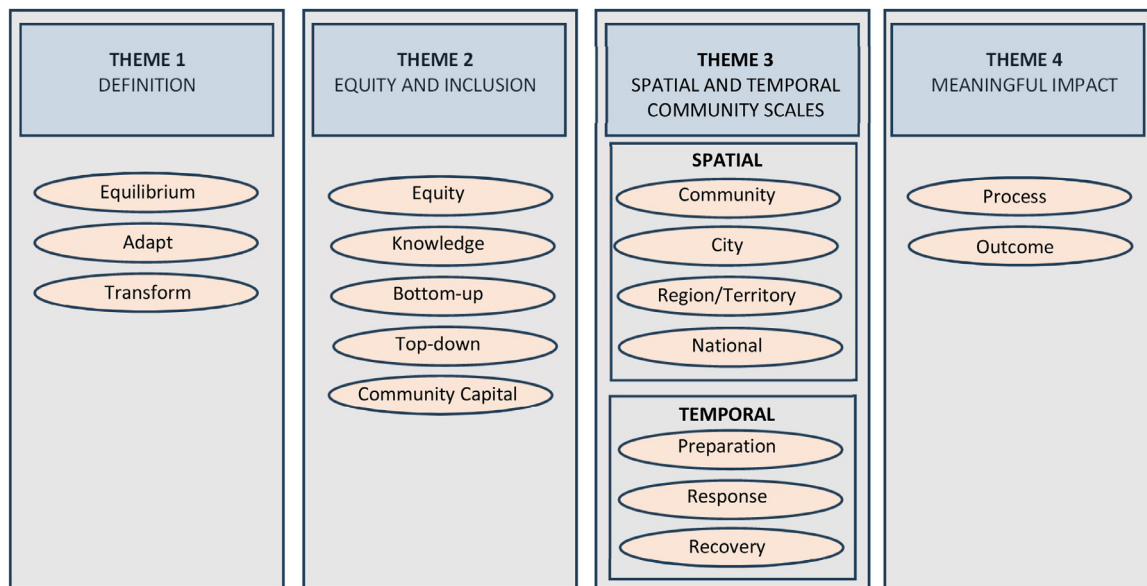


Fig. 2. Community resilience framework showing the four themes identified from the literature, together with their corresponding attributes.

four themes are the basis for a community resilience framework that can enable cross-discipline collaboration in executing meaningful community resilience strategies. The framework and supporting themes are illustrated in Fig. 2. The first theme is diverse methods of defining community resilience, which considers what community resilience is across disciplines and three paradigms for community resilience goals. The second theme, inclusive and equitable implementation of community resilience practices, considers the actors in community resilience and approaches to ensure community resilience strategies reflect the community where they are implemented. When and where to implement resilience strategies is covered in theme three, the scales for deploying resilience strategies. This theme looks at temporal and spatial scales for community resilience. Finally, how resilience can be implemented as either an outcome or a process is covered in theme four. These central themes distil what can seem to be an overwhelming volume of considerations in the literature. This should be particularly insightful for those entrusted with developing or deploying resilience-oriented operations. While the initially identified articles from the review process were used to determine the themes, the ideas discussed in each section are further supported by more recent (2016–2023) papers to provide further examples of how community resilience has been or can be implemented across disciplines.

The reviewed papers used a variety of methodologies in their community resilience approaches. These methodologies include systematic and non-systematic literature reviews (ten articles), qualitative studies (three articles), theoretical studies (two articles), and system or other forms of analysis. The papers also covered an assortment of empirical settings ranging from place-based to community-based to sustainability-based. Further, the reviewed papers covered a range of disciplines, with eight taking a specific multidisciplinary approach, six focusing on city or government officials, four on social scientists, and four on urban and city planners. This breadth of focus for the selected articles strengthens the framework's applicability for a cross-disciplinary understanding of resilience.

In addition to the identified journal articles, government and non-government strategy documents were reviewed to provide examples of how community resilience can, and is being implemented worldwide. An initial 24 strategy documents were identified. Criteria for the initial consideration were documents published in English and publicly available. Following further assessment, 11 documents were excluded. Exclusion reasons included documents not representing a strategy but an ad

hoc solution, case studies without underlying strategies, or not providing enough details for comparison. This left thirteen government and non-government reports, strategies, and guidelines representing community resilience practices in the United States, Europe, Africa, Australia, and New Zealand. Each of these were reviewed to highlight how community resilience is implemented across the four themes. Each document was mapped, see Table 1, against the identified community resilience themes and sub-themes to provide insight into how community resilience is understood and implemented across different scales, countries, and cultures. Table 1 shows that, overall, strategies widely cover the four themes examined in this paper. However, several topics are not covered in some of the strategy documents, highlighting differences in how community resilience is applied. The table further indicates gaps in how community resilience is implemented and the need for more comprehensive and inclusive strategies.

3. Theme 1: diversity and consensus in community resilience definitions

3.1. Defining resilience

An evolving concept of community resilience has led to multiple definitions across disciplines. Often, these definitions are derived from existing concepts within disciplines. For example, in engineering, resilience is firmly grounded in the idea of maintaining or preserving a state of equilibrium [43,44], which is derived from the material properties of resilience. A material is deemed resilient when it can absorb energy while undergoing elastic deformation and then return to its initial condition when the load is removed. In engineering, community resilience has evolved from this concept by defining community resilience as the community's ability to likewise 'bounce back' or recover from a disturbance [45]. Juxtaposed against this frame are definitions that focus on adapting, changing or transforming to 'new normals' following a disturbance. To provide an insight into the diversity of definitions for resilience, a selection of definitions for resilience across disciplines is provided in Table 2. As multiple authors have compiled similar lists [2,46–49], this list is not intended to be exhaustive; instead, it contextualises the divergent yet similar definitions for resilience that exist across disciplines.

Despite varied definitions for resilience, there are common trends in how it is defined and applied. Ninety-one unique definitions of resilience can be listed by combining the definitions from Cai et al. [2],

Table 1
Community Resilience Strategies mapped against the four identified themes of resilience.

Guideline	Resilient Cities Network	United Nations National Adaptation Plans	Adapt and Thrive: Building a Climate-Resilient NZ	NZ National Disaster Resilience Strategy	Wellington Community Resilience Strategy	National Strategy for Disaster Resilience	Community Engagement for Disaster Resilience	Community Resilience Planning Guide for Building and Infrastructure Systems	City Resilience Action Planning (CityRAP)	Community Resilience Development Framework	The UK Government Resilience Framework	ReBus Resilient Building Strategies Toolkit	The Recovery and Resilience Facility
Reference Location	[30] Global	[31] Global	[32] New Zealand	[33] New Zealand	[34] Wellington New Zealand	[35] Australia	[36] Australia	[37] USA	[38] Africa	[39] United Kingdom	[40] United Kingdom	[41] European Union	[42] European Union
Focus	City	Country	Country	Country	City	Country	Country	Community	City	Country	Country	Region	Country
Theme 1. Equilibrium				✓					✓			✓	
Definitions Adapt		✓	✓			✓		✓		✓			✓
Transform	✓											✓	✓
Theme 2. Equity	✓	✓	✓	✓		✓	✓		✓		✓	✓	✓
Equity and Knowledge				✓	✓			✓		✓		✓	✓
Inclusion Bottom-up							✓		✓	✓			✓
Top-down			✓	✓		✓		✓	✓		✓		✓
Community Capital				✓	✓			✓	✓	✓		✓	
Theme 3. Preparation	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
Temporal Response	✓			✓			✓	✓	✓	✓	✓	✓	
Recovery				✓			✓	✓	✓	✓	✓	✓	✓
Theme 3. Community					✓		✓	✓	✓	✓			✓
Spatial City	✓	✓			✓		✓	✓	✓	✓			
Region/Territory		✓										✓	
Theme 4. National		✓	✓	✓		✓				✓	✓	✓	✓
Process	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓
ImplementationOutcome				✓		✓					✓		✓

Table 2
Discipline definitions of resilience.

Discipline	Definition	Reference
Economic	“inherent and adaptive responses to disasters that enable individuals and communities to avoid some potential losses”	[[50], p. 307]
Organisation	“a multidimensional, sociotechnical phenomenon that addresses how people, as individuals or groups, manage uncertainty”	[[51], p. 29]
Urban	“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”	[[48], p. 39]
Community seismic	“the ability of social units (e.g., organisations, communities) to mitigate hazards, contain the effects of disasters when they occur, and carry out recovery activities in ways that minimise social disruption and mitigate the effects of future earthquakes”	[[45], p. 735]
Supply Chain	“the ability to proactively plan and design ... for anticipating unexpected disruptive (negative) events, respond adaptively to disruptions while maintaining control over structure and function and transcending to a postevent robust state of operations, if possible, more favorable than the one prior to the event, thus gaining competitive advantage”	[[52], p. 925]
Social-ecological	“the potential of a system to remain in a particular configuration and to maintain its feedbacks and functions, and involves the ability of the system to reorganise following disturbance driven change”	[[44], p. 14]
General	“the capability of a system to maintain its functions and structure in the face of internal and external change and to degrade gracefully when it must”	[53]
Infrastructure	“the ability to reduce the magnitude and/or duration of disruptive events. The effectiveness of a resilient infrastructure or enterprise depends upon its ability to anticipate, absorb, adapt to, and/or rapidly recover from a potentially disruptive event”	[[54], p. 8]
Engineering	“able effectively to adjust its functioning prior to, during, or following changes and disturbances, so that it can continue to perform as required after a disruption or a major mishap, and in the presence of continuous stresses”	[[43], p. 117]

Francis & Bekera [46], Koliou et al. [47], Meerow et al. [48], and Norris et al. [49] with the definitions listed in Table 2. Reviewing these definitions helps to understand how resilience is defined across disciplines. Repeating ideas include capacity, ability, adaptation, change, and recovery—other ideas centre on system stability, including retaining or restoring functionality after a disturbance.

Notwithstanding the commonalities, there are key differences between disciplinary definitions and approaches to addressing community resilience. Combining all the definitions by constructing a word cloud helps to visualise common words used between definitions. Fig. 3 shows the word cloud developed from the 91 definitions of resilience. The word cloud was created by combining stemming words (e.g. adapt and adaptation) and excluding words such as “and” and “the”. A common yet flexible definition of resilience can be constructed across disciplines using the word cloud and dividing words based on actors, actions, methods, and results.

This interdisciplinary understanding allows for the creation of a community resilience boundary object, where a flexible interpretation is based on the aptitude (ability/ capacity) of a system (individual/

community/ system) to perform some action (resist/ restore/ adapt /transform) when confronted with adversity (disturbance/ disaster/ disruption) to improve an outcome. This broad definition allows a common language between disciplines, enabling communication for cross-disciplinary work without a consensus as to what exactly community resilience is while allowing individual disciplines to have unique and discipline-specific definitions.

3.2. Evolution of the community resilience paradigm

While diverse disciplinary definitions of resilience exist, three paradigms are used across disciplines to explain how community resilience can be achieved. From the flexible interpretation given in Section 3.1, these are specific to the ability to perform an action (resist, restore, adapt, or transform). The three processes defined in the literature are resilience equilibrium, adaptation, and transformation. These ideas evolve from each other, each expanding the capacity of community resilience.

3.2.1. Resilience equilibrium

Resilience equilibrium focuses on a system’s ability to absorb the impact of a disaster while maintaining services and functionality. This form of resilience is commonly used in engineering systems to improve performance during and after a disruptive event [45,55]. Resilience equilibrium looks at how an engineering system performs over time, often plotting functionality over time (Fig. 4). A resilient system remains close to the designated functionality level. The performance of the system can then be established based on defined attributes. One of these is robustness [45,56] or resistance [57] to a disturbance, measured by the initial drop in functionality after a disturbance. Functionality disruption is reduced when the system is strong enough to withstand impact (e.g. a building that is not damaged during a major earthquake due to being constructed beyond minimum code requirements) or has multiple redundant systems [45,58,59] that preserve function if a part of the systems is lost (e.g. multiple wastewater treatment plants servicing a single community).

Recovery is based on a system’s ability to return to equilibrium. Equilibrium could be (1) a previous state, (2) a new state with greater functionality than before the disruption, or (3) a new state with lesser functionality. The process of reaching equilibrium can be defined in terms of the ability to mobilise resources or resourcefulness [45,60], or by the time taken to reach equilibrium, often referred to as rapidity [45,59,61]. The recovery curve’s shape can provide additional insight into recovery processes. A quick restoration indicates fast mobilisation of resources and restoration of functionality. A shallower recovery represents a less resilient system with slow resource mobilisation and gradual restoration [59]. Consideration of equilibrium in recovery helps understand system performance.

Generally, it is considered a positive trait for the engineered components of the built environment to be robust and to obtain a quick recovery. This type of thinking can be considered ‘fail-safe’, where robust enough systems can maintain their functionality even in the presence of disruptions [63]. However, resilience strategies focusing solely on resistance and returning to equilibrium can do a disservice to or misrepresent aspects of resilience across the community. It is critical to understand the difference between enduring a disaster and absorbing the disaster to rebound [64]. Some areas of a community may adapt by absorbing a disaster’s impacts and using it to recover. Still, others will be more significantly affected, which is not necessarily quantifiable through resilience equilibrium, nor through the frame of reaching or maintaining equilibrium. Uekusa et al. [65] assert that previous experience and existing conditions can create resilience through earned strength, but this level of resilience can also be misrepresented. If the initial baseline is already low and there is a small margin for functionality to drop, or a lower goal for recovery, the system can appear resilient. However, by

Furthering the quest for equilibrium should not come at the expense of adapting negative coping strategies such as increasing personal debt, decreased quality of life, or increased working hours due to decreased earning potential [66]. Adopting resilience techniques that focus solely on resistance and absorption of disaster risks can result in systems that are too rigid for adaptation and transformation [70]. Any implementation of resilience measures should consider the whole system and recognise that, at times, it may be better to decrease resilience in one area to increase resilience in another [71]. By solely seeking to achieve equilibrium, actors can overlook critical opportunities for change in a community. Indeed, this equilibrium view of resilience discounts the inherent dynamics that exist within a community [72]. Allowing options for recovery to a higher level of functionality or building back to a better state helps to build future resilience and improve ongoing issues of inequality that can be perpetrated through the narrow lens of resilience equilibrium.

Equilibrium approaches to resilience also encompass ‘bouncing back’ and ‘building back better’. Bouncing back focuses on protecting and preserving the existing system [19,73], considering what should be kept, and identifying what is needed. Building back methods focus solely on conserving and restoring the existing system, often failing to address opportunities to improve social-economical gaps within a community. These approaches can be applied to infrastructure systems that support a community by strengthening components to reduce disruption, thus reducing the work required to restore the community back to its original level [74]. Designing for bouncing back should consider whether protecting the current system should be the end goal [27] or if changes should be made to improve the community.

Bouncing back is based on the community’s capacity to resist change or disruption [19,75], utilising existing resources, preserving the built environment, ensuring business continuity, and minimising overall disruption [76]. While bouncing back is often viewed strictly in the context of a pre-disaster reset, if done well, the recovery will build the community to be better than before. Hence the phrase ‘build back better’. However, as discussed previously, this needs to be inclusive of all actors in the community [77].

Somewhat confusingly, the ideas of ‘building back better’ or ‘bouncing forward’ are part of the ‘bouncing back’ process. Building back better seeks to reach a new equilibrium condition higher than before the disruption. In contrast to bouncing back, building back better allows for some adaptation during recovery to improve the community [19,78]. Building back better provides opportunities to address injustice in a community and enables a recovery process that meets the needs of vulnerable and marginalised groups [73,79]. Although building back better allows for some adaptation, it is primarily an equilibrium-based methodology, which defines a new stable level of functionality. Adding attributes of adaptability and transformation strengthens resilience approaches for a community’s social and cultural dimensions. Equilibrium-based strategies can, therefore, be considered discipline-centric or monodisciplinary, where single areas recover independently, or multidisciplinary if multiple areas are considered in an additive but not integrated manner, as defined by Choi and Pak [80].

The *City Resilience Action Plans* (CityRAP) detailed by Spialivero et al. [38] embody a ‘build-back better’ framework. This collaborative framework was developed by the United National Human Settlements Programme and the Technical Centre for Disaster Risk Management, Sustainability, and Urban Resilience (DiMSUP). The programme focuses on enabling small cities or districts of larger cities to create action plans to increase the city’s ability to resist and respond to threats. The process requires collaboration between government and urban stakeholders. In this case, plans might be implemented in a community unaffected by a physical disaster. An action plan can be necessary if the basic level of community functionality is low due to poor planning and a lack of resources. The City Resilience Action Plans focus on improving the community’s existing conditions and the built environment.

3.2.2. Adaptation

Adaptation occurs when a community changes in response to a disturbance. Adaptation is a positive attribute of resilience; it goes beyond maintaining and improving towards increasing quality of life [81]. An adaptive community is flexible and can incorporate new knowledge and technology to evolve and change after a disturbance [82].

In resilience theory, some researchers view adaptation as a continuation of equilibrium frameworks, suggesting that adaptive strategies are conservative and only aim to preserve or return to the previous condition [83]. Folke et al. [84] reinforce this view of adaptability as the capacity to adjust, allow development along a current trajectory, and generate new operating methods to maintain functioning systems. Further to this, Engle [85] relates higher adaptive capacity to a higher likelihood of a system being able to either retain its current state (e.g. maintain equilibrium) or to transition to a more desirable state. However, unlike equilibrium theories, adaptive resilience allows for scenarios where the structure may change [86].

In contrast, other researchers discuss adaptability as an ongoing process of change to a system. Where equilibrium methods focus on restoring and recovering existing systems, adaptation focuses on shifting to a new normal [21]. Carpenter et al. [87] state that social-ecological systems do not have stable systems but are constantly adapting. Magis et al. [88] describe resilience as adaptability by responding, staying viable, and developing the ability to thrive in a changing environment. Adaptation incorporates learning and reorganisation with opportunities for evolving, renewing and emerging in new directions [79]. From a planning perspective, adaptability adds to resilience through the ability to plan [85], to have a plan but be flexible [49], and the ability to plan differently for different areas for safe-to-fail systems [63].

Through this review, adaptation is commonly referenced as an aspect of resilience [2,49,78,89–91]. This capacity refers to learning and adapting from past experiences [92]. It can also address the drivers of change, such as social agents that anticipate and develop responses [93]. Adapting to change builds the basis for responding to future disruptions [94,95]. Therefore, adaptation within a resilience framework is more than the capacity to change. It also preserves the community’s culture and local traditions [96].

The United Nations National Adaptation Plans [31] exemplify a resilience adaptation strategy. These plans, targeted towards developing and least developed countries, focus on adapting current communities to prepare for, respond to, and recover from climate-related disasters. Adaptation is achieved by identifying and addressing vulnerabilities by increasing the adaptive capacity. It recognises the multifaceted structure of a community and seeks to provide a method to preserve a community’s identity through change. The action plans take an interdisciplinary approach to resilience that enables the synthesis of multiple disciplines working together to foster constructive change to achieve resilience goals.

3.2.3. Transformation

Whereas equilibrium and adaptability imply the need to reach a stable, known end goal, transformation refers to complete change to a system or community to address vulnerabilities and inequalities without an endpoint. Focusing on the outcomes and processes of resilience, transformation is a transdisciplinary approach that considers disaster circumstances and human conditions without pushing to obtain and maintain equilibrium [19,165].

The capacity for transformation increases when the resilience lens shifts from individual leaders to interactions with key individuals [97]. This approach tends to be more representative of community stakeholders and residents. Reframing resilience through transformation allows one to account for marginalised and vulnerable populations [73]. This is achieved by identifying pathways of change [98] and solving social and environmental problems [97] through a shift in the knowledge system [99]. Transformational resilience enables communities to continue to build capacity to resist disruptions through allowing change, exper-

imentation, and innovation [69]. Indeed, resilience efforts to achieve transformational change require transdisciplinary approaches incorporating shared conceptual frameworks. Such efforts require that the enablers of resilience transcend traditional disciplinary boundaries, share knowledge bases, and use skills from all relevant disciplines [80].

Building transformational resilience is a form of evolutionary change that focuses on a situation's uncertainties [27] and seeks fundamental change [83]. Such transformation breaks away from previously stable scenarios to create fundamentally different systems, sometimes breaking down old perceptions [84]. Where equilibrium definitions frame resilience as the ability of a system to maintain its current state, the current state may not be desirable. In this case, Engle [85] asserts that adaptive capacities can be used to transform systems, moving them toward new, more desirable states. Resilience goals can reinforce the status quo. Instead, adaptive systems can be used to induce transformation so that community members or whole communities can assume more favourable functionality [86]. However, transformation may not always be positive if a community transitions to a less desirable state [18]. With the flexibility to change, a society can develop the capacity to live with a disastrous event, which is more potent than avoiding an inevitable hazard [21]. As system equilibrium and stability can maintain undesirable qualities, communities must be able to enact change, be flexible and transform into desirable states.

The European Union's Recovery and Resilience Facility [42] exemplifies transformative resilience measures. Through this Facility, the 27 participating countries are required to invest in transformation strategies to move nations into green and digital environments. Many initiatives include revamping transportation networks to reduce dependency on non-renewable energy sources and moving government and businesses into digital and accessible environments. These countries are transforming their current transportation, government, education, health, and justice systems to better address current and future needs. Ultimately, this programme aims to improve social and economic resilience across the European Union.

4. Theme 2: Equitable and inclusive community resilience

To whom a resilience strategy is intended is of primary importance when defining resilience. When building on foundational fields of ecology, principal considerations of resilience have always incorporated the importance of people and place [100]. This review identifies that resilience measures must address (1) who resilience is for [21,22,27,79], (2) who pays for it [27], and (3) who defines its agendas [27,48,91]. These three considerations show how resilience strategies must be positioned to consider equity, community engagement, and current community capital to ensure the needs of all community members are met.

4.1. Resilience equity

Many existing resilience frameworks are not applied equitably across all parts of the community. Cutter *et al.* [94] state that all communities have inherent resilience; however, not all groups within a community will be at the same starting point when dealing with disruption. Current community resilience methods lack the ability to account for complex social and cultural dynamics [101]. Resilience definitions and frameworks should consider tolerance levels across all groups in a community and carefully consider who benefits and who does not [27]. Common approaches to resilience planning frequently consider only 'what' a particular system is resilient to. As such, they can be exclusive and prone to capacity reduction outside the perceived system [27,102].

Developed definitions of resilience may also fail to meet the cultural diversity requirements of a community [15,103]. Equitable community resilience frameworks are just [102], inclusive [104], and considerate of current social and environmental vulnerabilities [15]. Importantly, approaches to resilience should be evaluated to determine if they disproportionately favour privileged sectors of a community while causing

or amplifying vulnerability for others [14,102,105]. Beyond considering vulnerable areas, the needs of vulnerable people, such as those with disabilities, mental illness, and children [106], should be considered in all resilience plans and strategies. Efforts should explore how the most vulnerable and under-represented community members can be empowered to build capacity [98]. Through empowerment, vulnerable sectors of a community can be transformed.

Existing research on recovery from disasters and extreme events shows that the impact is most severe for low-income and minority groups. These areas often have the least capacity for recovery due to a lack of economic capital, deficiencies in their built environments, or a combination of both. This disparity is evident in several recent studies, including mobility data after the 2017 Hurricane Harvey [107,108], power distribution during the 2021 Texas winter storm [109,110], the evacuation and reentry patterns following the 2017 Hurricane Irma [111], and flood protection support for poor populations in Sri Lanka [112]. Each study had a similar finding: vulnerable parts of a community showed longer recovery times and lower final recovery levels than affluent areas. Another study looking at Typhoon Yolanda in the Philippines demonstrated that, while resilience is admirable, it commonly shores up persisting power structures and maintains or increases inequalities [66].

The need for equity is apparent in many recent community resilience plans and guidelines, with ten of thirteen reviewed documents emphasising equity (Table 1). Recent guidelines highlight the need to consider all voices in a community and to recognise that vulnerability and disaster resistance are not evenly spread throughout a community [32,36,40]. Recognising initial deficiencies in providing for equitable resilience, Australia's National Strategy for Disaster Resilience [35] produced updated companion documents that explicitly outline the importance of equity in creating community resilience. As a companion volume to Australia's National Strategy for Disaster Resilience, the *Community Engagement for Disaster Resilience* [36] provides detailed instructions on effectively engaging with communities to ensure a fair understanding of community needs and lay the foundation of equitable community resilience strategies. Further, the UK Government Resilience Framework [40] lists a key priority of community resilience as a 'whole of society' endeavour and emphasises the importance of everyone contributing to community resilience initiatives.

Some researchers argue that resilience frameworks are inherently neoliberal [13,113] and that the focus of resilience must shift from communities to individuals [91,98]. To improve resilience frameworks and applications, the definition of resilience must transition to focus on the needs and aspirations of marginalised groups [114]. This transformation can be achieved by emphasising local knowledge to augment existing capacity [115], enabling and empowering all participants (especially minorities and Indigenous groups) with viable options and opportunities [64]. Such opportunities can include ground-level community engagement that allows 'the invisible to become visible' [14]. While obvious gaps exist in equitable resilience frameworks, integrating diverse community member perspectives through interdisciplinary thinking will progress work towards equitable resilience frameworks.

4.2. Community knowledge

Yumagulova and Vertinsky [99] describe a range of common knowledge types for creating community resilience, including academic research and professional practice, political and bureaucratic knowledge, and institutional memory. Local knowledge influences how communities perceive threats from hazards or other disruptions. Another type of knowledge that Paton and Johnston [76] mention is Indigenous knowledge, which comes from the practices and beliefs embedded in First Nations peoples' cultural practices. However, Indigenous knowledge is commonly excluded from resilient planning processes [99]. This exclusion often means that communities overlook valuable insights and ways to consider resource use, including traditional design practices developed over time to improve resilience through adaptation.

The growing awareness that inclusive community engagement practices should incorporate local Indigenous knowledge [116–120] is a significant factor in community resilience discourse. Some governments now require Indigenous knowledge to be incorporated into government and research projects. In New Zealand, ‘Mātauranga Māori’ is the traditional language, knowledge, and culture of the Indigenous Māori, and must be authentically integrated into all new spatial development proposals, plans, and research proposals [121,122]. Key to this initiative is including Māori stakeholders and community members in the design, implementation and analysis of all projects as key contributors.

Including Mātauranga Māori in community resilience requires a shift from a single disciplinary perspective to a transdisciplinary approach, emphasising people, family, and community guardianship rather than just the planning, architectural or structural components alone [123]. The recovery patterns of Māori communities following disasters reinforce the significance of cultural knowledge, values, and practices in building community resilience [124]. In line with this, New Zealand’s *National Disaster Resilience Strategy* [33] and New Zealand’s Ministry for the Environment’s [32] *Adapt and Thrive: Building a Climate Resilient New Zealand* include provisions for working with Māori communities to ensure the Indigenous cultural view is included. This indicates a growing awareness that incorporating Indigenous perspectives through community engagement is essential to comprehensively define and assess community resilience.

4.3. Community engagement: bottom-up and top-down approaches

Academic literature and approaches to professional practice both reinforce the idea that community engagement is best achieved through a bottom-up approach [16,125]. Borie et al. [16] state that bottom-up approaches help integrate community members’ individual lived experiences into resilience definitions. This is especially important for marginalised groups and provides opportunities to identify essential disturbances to the individual through substantial community involvement [114,125]. Grassroots engagement enables the formation of social networks and helps improve individual resilience through increasing social capital [101,125,126]. Furthermore, community engagement is most successful when it is transparent and inclusive [11] and includes individual perspectives of the broader community. Community resilience requires proper connections between knowledge makers and knowledge users [113].

Top-down and bottom-up resilience approaches result in different outcomes due to different drivers and areas of focus. This is illustrated in Soubry & Sherren’s [127] study, which examined the drivers that improved climate change resilience in farming communities. They found polarised priorities between the farmers and the policymakers, where farmers’ views were guided by long-term planning, flexibility and diversification, and policymakers focused on economic growth, markets, and sustainability [127]. While some similarities in priorities exist between the two groups, this study highlights the importance of considering both members of the community and the systemic considerations when addressing resilience issues.

Current community resilience practices tend to incorporate top-down and bottom-up approaches. Government resilience initiatives commonly focus on national or regional scale community resilience and take a top-down approach to defining overarching goals, strategies and financial mechanisms (Table 1). The European Union’s [42] response to the COVID-19 pandemic was to develop a Recovery and Resilience Facility, a mechanism intended to increase community resilience based on national strategies that take a top-down approach. The strategies aim to improve country and regional infrastructure by considering overarching government plans, strategies, and sustainability.

In contrast, the *CityRAP* [38] and the *United Nations Climate Change National Adaptation Plans* (NAPs) [31] demonstrate a bottom-up approach to improving community resilience. *CityRAP* [38] specifically targets vulnerable areas, including informal settlements, to create

community-led action plans that address needs. Both plans are developed through stakeholder and community engagement and are country/community-led plans that address community resilience to climate change. In this way, the plans can be tailored to the country’s or community’s needs.

The literature reveals that the approach taken during discussion is critical for successful community engagement. Resilience definitions and levels should be negotiated in consultation with the community [4,165]. Dialogue around community resilience must ensure that discussions with community delegates are characteristic of the community profile and accurately present the existing vulnerabilities, social and economic capitals, and the desires and goals of those they represent. Efforts to remove biases allow for open communication and increase the likelihood of receptive participation and implementation of findings. Appropriate engagement can also support the transition between short and long-term recovery by fostering the capital required to meet community needs. In short, Blackman et al. [128] assert that resilience is for the people more than the community. Therefore, community engagement must be genuine and inclusive, and bottom-up and top-down approaches must be combined to ensure proper understanding and implementation of resilience strategies.

4.4. Community capital

Community capital is essential for fostering resilience. Communities cannot control all possible hazards, but they can increase their overall resilience and response to disasters by actively building community capital, also referred to as social capital [129]. Wilkin et al. [78] state that social capital is cultivated through social networks, trust, and cooperation. Magis [88] emphasises the importance of planning, collective action, innovation and learning. Across the literature, the main aspects of community capital include diversity [130,131], flexibility [82,131], adaptability [131], planning [88], and learning and innovation [88,131].

In contrast to these positions on community and social capital, some researchers argue that communities must be resilient rather than individuals [132]. While it is essential for individuals to be resilient, a community must form a collective and cohesive resilience strategy based on community capital to create community resilience. Individuals must see themselves as part of a larger group to bond and form social capital. This can be achieved through social imagery [100] to create collective narratives [133] specific to a community and, in turn, shape community resilience and recovery outcomes. While individual resilience is essential, extensive networks within the community are also crucial for overall resilience [64]. Thus, it is vital to understand the resilience of marginalised and vulnerable groups within a community to transform those groups through engagement and strengthening their social networks [134]. Part of this process is to decentralise the resilience efforts of individual leaders [82,97,134] and transfer responsibility to key individuals or community groups that are best placed to enact multi-level, multi-phase, and multi-group resilient strategies.

Of the reviewed strategy documents, six addressed some form of community capital, with each highlighting the importance of building and strengthening different types of community capital prior to a stress event. At a city scale, the *Wellington Community Resilience Strategy* [34] values forming social networks for facilitating access to resources in everyday and emergency environments. As part of its strategy, Wellington seeks to encourage connections between communities with similar and dissimilar interests to strengthen community cohesion and improve community capital. At a country level, the *Community Resilience Planning Guide for Buildings and Infrastructure Systems* [37], published by the National Institute of Standards and Testing (NIST) in the United States, adopts a community capital framework that considers how financial, built, political, social, human, cultural, and natural capitals contribute to a community’s identity. While the guide focuses on improving built capital (i.e. buildings and infrastructure), it emphasises the importance

of considering the interaction and influence of all the different parts of a community working together. Strengthening capital, especially social capital, improves a community's ability to function and respond to stresses.

5. Theme 3: Spatial and temporal community scales

Resilience is most effective when incorporated and executed consistently within a community. From the literature, spatial and temporal considerations are necessary for successful implementation.

5.1. Temporal – when to implement community resilience

While implementing resilience consistently before and after a disruption is vital to improving overall outcomes, many papers and reviewed community resilience strategies emphasise that resilience practices should be deployed during the planning and preparation phases of the disaster cycle.

Authentic implementation of resilience in communities recognises that it is impossible to resist all disruptions, but it is also essential to have plans that allow for adaptation and transformation. Moreover, when resilience is considered in line with risk analysis and management, risk assessments enable planners to understand the possible impacts of disruption and identify how to plan and prepare for these events. By adding resilience management, planners can integrate absorption, recovery, and adaptation capacities to improve recovery time and outcomes [135]. This requires understanding the community's functional requirements and how different parts of the community interact. Resilience must be considered part of the recovery process and included throughout the preparation, mitigation, response, and recovery phases, as well as through adaptation, change and transformation [136].

5.1.1. Planning and preparation

It is impossible to prevent every possible negative impact. However, it is possible to increase individuals' and communities' ability to respond to known and unknown disruptions [88]. Resilience planners should consider what systems they seek to improve and what potential disruptive events can impact those systems; in essence, they are thinking, "Resilience of what, to what?" [79,87].

The planning and preparation phase is critical for defining resilience initiatives and instigating resilience policies. During this phase, resilience must be integrated into community planning processes as planners develop an awareness of potential challenges or disruptions. Doing so will allow planners to prepare for possible disruptions [85], enact policies to improve adaptation [137], and create strategies to improve readiness and reduce disruptions [64,138] by being proactive instead of reactive [126]. Resilience thinking requires considering interactions of a community's spatial and temporal scales, including how people interact with space and how spaces shape behaviours, thinking, and feelings within communities [139].

While considering individual systems or community resilience, this process must be inclusive and not take a bounded approach. Planners, designers, engineers, and policymakers must ensure that improving resilience in one group does not negatively impact another system or decrease resilience later [27,87]. This requires careful consideration of who sets the agenda [91] and how resilience is enacted [140]. Without proper care of all stakeholders in the community, resilience policies aiming to strengthen one area can inadvertently hinder resilience in other areas, possibly increasing vulnerabilities or further entrenching inherent inequalities. Thorough and equitable resilience planning helps identify and address issues in the community [140], meaning proper resilience planning requires a holistic approach to managing all sources of shock and stress [141]. It must be an inclusionary process considering all areas, individuals, groups, and infrastructure within that community.

Eleven of the community resilience strategies reviewed for this study focus on improving resilience during the preparation stage of the disaster

cycle, Table 1. Several focus on strengthening community capital, improving buildings and infrastructure robustness, and addressing vulnerabilities. Several of the frameworks, such as NIST's *Community Resilience Planning Guide for Building and Infrastructure Systems* [37], the United Kingdom's *Community Resilience Development Framework* [39], and the Australian *Community Engagement for Disaster Planning* [36], also include primary or secondary considerations for disaster response and recovery.

5.1.2. Response and recovery

Even with good planning, communities will still encounter stresses that will challenge or disrupt their standard level of functioning. Thus, communities also need to consider and plan for their response and recovery from these stress events. The mobilisation and involvement of community members heavily influence recovery [118]. Full engagement of a community requires that they have the required capital, knowledge and skills [142] to respond. Building up social capital decreases the impacts of a disaster and improves the recovery [103]. In addition to building up social capital, improving community cohesion [118], and strengthening infrastructure [143] will further improve a community's response and recovery, thus, their resilience to a stress event. This can be indirectly measured through indicator-based approaches that consider multiple dimensions of a community, including social, technical, organisational, and economic [144,145]. Indicators can be used to determine a level of function before a disruption and estimate functionality after the event. The functionality of a community before a stress event can contribute to how well it responds [145].

Further, the recovery period needs to consider the vulnerabilities and recovery needs in order to sustain coping capacity [146]. While considering the current and future needs of a community, it is important to ensure that a community is not too rigid, deterring it from embracing positive adaptation or transformation [70].

Response and Recovery is specifically included in six of the reviewed strategy documents. The *ReBus Resilient Building Strategies Toolkit* addresses the engagement of citizens and stakeholders in the pre-disaster, disaster, and post-disaster phases [41]. This document emphasises the importance of community engagement during the recovery phase, especially if the recovery requires extensive changes, transforming the community. Engagement will enable citizens to assume ownership of the changes, enabling better consensus. *The New Zealand National Disaster Resilience Strategy* [33] prioritises effective response and recovery from emergencies through capacity and capability development. This includes building relationships and trust between citizens, cultural groups, stakeholders, and emergency management. This strategy also emphasises the importance of transparent, informed, timely, and consistent decisions throughout the recovery period.

5.2. Spatial scales – the small to the big

Every community has unique circumstances driving resilience-building initiatives. Resilience frameworks should be place-based to properly consider local conditions, social expectations, and community priorities. To develop a place-based community resilience framework, characteristics to consider include location [147], vulnerabilities [94], capacities to resist, absorb, and adapt to change [126], pooled resources [148], risk level [25], and baseline community function [149]. Resilience practices and policies depend on the community for whom they are developed.

Location-specific data can vary across regions and in scale. Many existing methodologies for assessing community-level resilience use large datasets for county or city-level resilience indicators [144,145,150–152]. These methods provide a broad understanding of the overall resilience of an area based on generalised assumptions. However, the resulting data can lack the granularity required to consider more nuanced community conditions, individual needs, or aspects of daily life in a particular place [16]. Resilience indicators must be adjusted based on scale

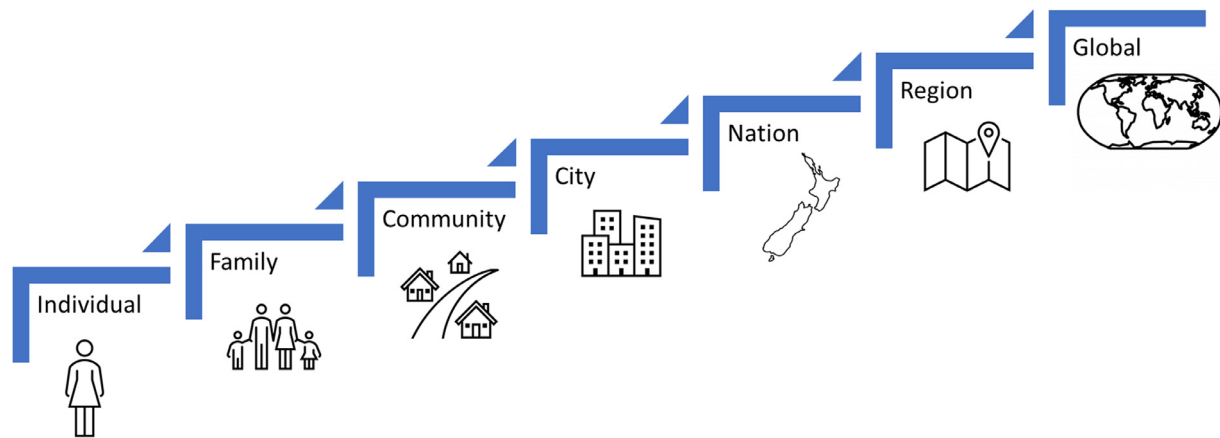


Fig. 5. Scales to consider when planning for resilience.

[153] as indicators work at different levels [154] and should be considered across multiple scales. Implementation of successful resilience strategies tends to progress from smaller entities to more significant regions, diagrammatically reflected in Fig. 5. As depicted, resilience processes should start with understanding the needs and capacity of an individual before progressing up to the joint needs of a larger social unit, such as a family or cluster of individuals. Community resilience processes are employed at different scales in the community, successful resilience initiatives work across multiple scales [63,69]. This should likewise progress to a community level (or grouping of family units) and continue to larger scales of resilience.

In practice, incorporating community resilience embodies different levels of detail and planning, depending on the target community's scale. The seven resilience strategies focused at a national level strategies generally set the foundation for legal frameworks, economic policies, and financial resources to support building resilience. At more localised scales, such as in cities, community resilience programmes focus on equity and the public good, lay the groundwork for community engagement, enable communities to build social capital, and focus on city- or community-led initiatives (Table 1). These programmes address specific local hazards, vulnerabilities, and socioeconomic diversity. Having separate frameworks for localised governments allows for a more equitable understanding of resilience needs and creates place-based, community-centric policies and resource allocation. The level of detail required to address resilience at this scale is not readily achievable through top-down, national community resilience initiatives. For some communities within a city, even further localised activation of resilience initiatives is necessary to address inherent vulnerabilities due to socio-economic deprivation, limited financial resources, degradation of the built environment, or increased exposure to natural-, climate-, or anthropogenic hazards. For these communities, localised knowledge and empowerment are essential for building and maintaining community resilience [38].

Generalised community resilience at regional, country or city levels is essential to understanding relative resilience and community vulnerabilities. However, community-specific resilience processes necessitate a greater level of detailed understanding of the needs, capacities, and expectations of individuals and communities that cannot be achieved with generalised data or without understanding the unique requirements of a community. The literature shows a place for considering resilience across multiple scales. De Carli [114] cautions against mapping resilience at larger scales (e.g. urban, regional or national) as these measurements can hinder community resilience. Instead, researchers have identified several approaches to assess resilience and resilience indicators, including at individual, household, community, regional, and national scales [5,47,155–158].

Resilience scales should also consider demographics, cultural groups, and ecosystems [156,157], and given that all scales are interconnected,

data should be collected throughout to understand the resilience of an area or region. Changes and adaptation at small-scale segments of the community propagate upwards, enabling transformation at the larger-scale community sectors [84]. Thus, scale is critical when deliberating on resilience implementation and disciplinary understanding.

It is difficult, if not impossible, to create a universal model for resilience that works across all communities and disciplines. A comprehensive model requires thinking across knowledge domains and authentically integrates expertise and skills from all relevant disciplines. This requires involved parties to learn skill sets and become relevant experts across disciplines rather than multiple discipline experts working in parallel [80]. Unique spatial and temporal factors for every community need to be considered. This comes through engagement, localised knowledge and resources, policies, recovery plans, and bottom-up engagement.

6. Theme 4: Meaningful impact – Community resilience, a process or an outcome?

The question of how to implement, measure and quantify resilience has propagated as many types of methodologies as it has definitions. Nevertheless, to stay relevant, resilience needs to be implemented in practice through demonstrably sound methodologies [129]. As a practical concept, resilience is not readily applicable and is usually translated into qualitative, quantitative, or operational tools to provide meaning to the construct [17,91]. Resilience experts are divided across knowledge domains, often defending the validity of various approaches. Based on the reviewed literature, two main ideologies were identified. One approach analyses resilience as a process, whereas the other considers resilience as an outcome or goal that can be clearly defined and measured. Regardless of the approach, the implementation at the urban scale must be considered [159].

6.1. Resilience as a process

Those who view resilience as a process tend to focus on the adaptation and transformation of a system. Harris et al. [4] assert that resilience is a process, not a goal or outcome. Redman [83] elaborates further, explaining that resilience is about ‘weathering the storm’ through adaption and robustness. These experts tend not to believe that resilience is built from a predicted outcome and instead focus on building capacity to cope with unanticipated disruptions. Collier et al. [160] specify that resilience is integral in a risk analysis process by considering likely disruptive scenarios (‘what can go wrong?’, ‘how likely is it?’, and ‘what are the consequences?’) and providing a means for planning, preparing, adapting, and recovering to a generic threat through

resource allocation. These ideas build on an abstract concept of resilience and are primarily focused on creating pathways for improving and changing the system, rather than creating means to resist and preserve existing community constructs.

Nine of the reviewed community resilience frameworks that focus on the city scale or smaller groups favour considering community resilience as a process (Table 1). These frameworks identify risks and vulnerabilities and then create processes for increasing social capacity, financing retrofit projects, or strengthening works to reduce vulnerabilities. Notably, they shift away from using disaster management planning scenarios for high-impact, low-frequency events and have a growing focus on chronic, slow-occurring hazards (i.e. climate change) or broader ongoing community challenges (i.e. cost of living crises and poverty) [30,41]. These programmes focus on the continued process of assessing risk, decreasing vulnerabilities, and improving overall community resilience capacity.

6.2. Resilience as a measurable outcome

The second approach to implementing resilience initiatives involves viewing resilience as a demonstrable end goal or outcome. The experts producing these studies and guides focus on measuring resilience and quantifying the ability to reach a predetermined outcome. As discussed earlier in this paper, a common challenge in implementing and quantifying resilience is the lack of a commonly accepted definition for community resilience. Achieving a common ground for defining resilience could provide clarity for measuring resilience, but without a clear purpose, measuring the success of resilience applications is difficult [5,87]. Sherrieb et al. [75] argue that widespread acceptance of a standard definition for resilience would enable the selection of appropriate indicators for measuring resilience. Nunes et al. [3] assert that it would guide systems characterisation to understand resilience requirements. These scholars, among others, believe that agreeing on a standard definition for resilience across disciplines will allow resilience to be meaningfully implemented and assessed across community scales and disciplines. Additionally, they assert that indicators should represent multiple community assets and be correctly combined to represent community-wide resilience instead of discipline-specific resilience.

A range of tools for measuring resilience exist. The tools are typically based on disciplinary perspectives and reflect definitions for resilience specific to a disciplinary background. When considering available tools, their use and applicability must be assessed to guarantee valuable results for the representative system [161]. Such tools for measuring community resilience involve modelling, simulations, and scenario testing [23]. One such example is using a virtual community testbed to verify or validate the impacts of community resilience policies and strategies [162]. However, regardless of the selected method, the input variables and internal processes must be representative, consistent and transferable to the assessed context. Some essential considerations include (1) the validity of the tools; for example, indicators are commonly combined in large-scale community models and simulations [145,161] and (2) whether the right indicators are assessed based on the desired outputs [163]. Eadie [66] comments that commonly used economic indicators will not always accurately reflect socio-cultural aspects of resilience. Therefore, selected indicators must be appropriate for the desired outputs and inclusive of all essential components of the community.

Further, recognising how resilience modelling is scaled is essential to determining the validity of quantified assessments. Koliou et al. [47] found that most research focuses on the resilience of a single component to a single hazard. This level of detail may not be sufficient for understanding the resilience of an entire system to multiple threats. In a community, this thinking relates to individual and community resilience. Evaluating the resilience of one component or individual does not provide insight into the resilience of the greater whole. Instead, modelling should consider how one component interacts with other members across an entire system (e.g. a building in the centre of an area that

is cordoned off will be unable to function even if the building itself is undamaged). Modelling physical and social aspects together allows better simulation of the impacts and recovery from a disruption [164]. Still, a complete picture of community resilience comes from understanding how that individual factor interacts with others and how all parts of a community interact and contribute positively and negatively to a system.

Four of the reviewed resilience frameworks take an outcomes-based approach to framing community resilience (Table 1). National and regional scale community resilience strategies, such as those from the UK [40], New Zealand [33], Australia [35] and the European Union [42] are outcome-based, with clear targets intended to increase overall community resilience. The New Zealand Disaster Resilience Strategy [33] uses an outcomes-based approach to improve community resilience by measuring success against 18 objectives, across three action areas. Setting specific targets for each of the objectives clearly defines a set of community resilience goals as well as how to measure progress toward the completion of those goals. Outcome-based community resilience plans allow for big-picture thinking of an overarching system and fit well for national or regional resilience plans. This is a notable contrast to city, and small communities process-oriented strategies that address localised and ongoing needs at a smaller scale.

7. Conclusion

This systematic review clarifies an interdisciplinary conceptual framework for navigating definitions of community resilience, drawing together and analysing a significant body of literature and structures it in a coherent manner, making it readily accessible to an array of resilience stakeholders that are often siloed in thinking and practice. Creating connectivity between these resilience stakeholders should facilitate greater awareness of the need for cross-disciplinary work that reflects the complexity of the challenges confronting those entrusted with supporting resilience solutions. The paper sought to frame community resilience as a boundary object reflecting difficulties in classical attempts to define the subject within a contested academic space. In addition, four themes were presented as the basis of a cross-disciplinary community resilience framework.

In summary, Theme 1 - Diversity and consensus in community resilience definitions provides a flexible definition of resilience as a boundary object, an aptitude (ability/ capacity) of a system (individual/ community/ system) to perform some action (resist/ restore/ adapt /transform) when confronted with adversity (disturbance/ disaster/ disruption). This definition can be adapted by individual disciplines to be specific to the discipline's requirements but is flexible enough to be useful when working across multiple disciplines in multi-, inter-, or transdisciplinary teams. This theme also explores the evolution of resilience from equilibrium approaches to adaption and transformation. Theme 2 – Equitable and inclusive community resilience, highlights the importance of equity in community resilience. This includes the needs of vulnerable people (including disabilities, mental illness, and children). It further highlights the need to be inclusive when creating community resilience strategies drawing on a combination of bottom-up and top-down approaches. Where bottom-up approaches allow for increased involvement of community members, including indigenous communities, to create strategies relevant at city or community scales that consider individual or family values and priorities. In contrast, a top-down approach allows for an overarching strategy to be developed for larger geographical areas considering competing government priorities and large-scale hazard planning.

Theme 3 – Spatial and temporal community scales emphasises the importance of considering community resilience across spatial scales ranging from individuals and neighbourhoods up to countries and regions. Additionally, community resilience must be considered while planning and preparing for a disruption with plans that allow adaptation and transformation. While responding and recovering from disruption, it

is necessary to include community engagement to enable consensus and ownership of the changes to the community, further allowing adaptation or transformation to a higher level of functionality. Finally, Theme 4 – Meaningful impact, looks at resilience from two angles. Resilience as a process focusses on assessing risk, decreasing vulnerabilities, and improving overall resilience capacity. Conversely, resilience as a measurable outcome allows for big-picture thinking that is well suited to national as well as regional resilience plans, but might not work as well for city and small communities that require process-oriented strategies that address localised and ongoing needs at a smaller scale.

The urgency of this research has never been higher, given the climate emergency that confronts us globally and the need for enhanced community resilience capacity. When approaching resilience with an interdisciplinary lens, it is essential to consider how disciplines have defined community resilience, for whom community resilience initiatives are created to benefit, when and at what scale community resilience should be applied, and what the standard measurement methods are. While multiple discipline-specific definitions for community resilience exist, some commonalities can inform practical approaches to applying resilience strategies.

Fundamental considerations for positioning community resilience and the importance of understanding power structures, such as ‘top-down’ or ‘bottom-up’, can radically alter transitional processes and outcomes. The attainment of an understanding of power structures is essential to develop meaningful, engaging resilience systems. This could arguably be resisted by those currently invested in such structures and have much to lose. Equity in resilience and meaningful community engagement is underrepresented in traditional resilience policy, but these considerations are critical for successful community engagement, empowerment, and, ultimately, achieving resilience outcomes.

It is evident that a significant amount of choice confronts the researcher in terms of selection of methodological approaches and theoretical constructs for investigating resilience. The literature that has been evaluated reflects this, and an increase in the prevalence of collaborative, cross-disciplinary work is noted. What is of fundamental importance is for the investigator to recognise the complexity of resilience and design their methodologies accordingly. Our work outlines an array of permutations for cross-disciplinary working and approaches at the disposal of those undertaking resilience research.

This paper will benefit those attempting to develop an overarching educational framework for teaching resilience in multi-, inter-, or transdisciplinary contexts. Policymakers and individual professional disciplines wishing to understand broader, interconnected issues usually poorly considered in the conventional dialogue between limited stakeholders will benefit from analysing the four resilience themes to understand how to broaden their work. The democratisation of community resilience – meaningfully engaging with disenfranchised stakeholders is essential and requires a transdisciplinary approach.

As we move towards equitable community resilience, it is necessary to adjust the bounds of whom we focus our efforts and how this is done. As communities are diverse in makeup and function, community resilience should be defined, evaluated, and created using transdisciplinary approaches to genuinely represent, preserve, and strengthen the whole community. It is hoped that an interdisciplinary conceptual framework for defining community resilience that is presented in this research will aid such approaches.

Relevance to resilience

This paper presents a novel review of the community resilience field, authored by an international team with expertise spanning diverse disciplines. It explores how the interplay between actors and disciplines in shaping socially resilient cities through the lens of community resilience. The review provides an overview of how resilience has been conceptualised and evolved within individual disciplines, emphasising methods that facilitate a more integrated approach to community re-

silience planning. Furthermore, this manuscript delves into the connections between societal dynamics and the framing and implementation of resilience across disciplines. As a result, this paper serves as a valuable guide for policymakers and educators, promoting equitable strategies for addressing community resilience.

Declaration of competing interests

The authors declare that they have no competing interest.

CRediT authorship contribution statement

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Supplementary materials

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