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Article

Extreme Heat Governance Futures For Sydney – What Now, and What If?

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Abstract

Sydney, Australia is experiencing more frequent and intense extreme heat instances. Climate change is exacerbating climate patterns that result in prolonged hot and dry conditions, such as El Nino, and increasing the frequency and intensity of heatwaves. There is a lack of literature identifying and analysing the governance pathologies of extreme heat in Sydney and the barriers to overcome such pathologies. This article uses futures methodologies, namely the Futures Triangle and the Change Progression Scenario (CPS) method, to analyse the status quo of extreme heat governance in Sydney, and map alternative futures for extreme heat governance in Sydney.

Keywords

Climate Change, Extreme Heat, Governance, Causal Layered Analysis, Futures Triangle

Introduction

Extreme heat is a growing challenge; with the frequency and intensity of extreme heat events increasing due to climate change. Extreme heat's impacts are highly intersectional - existing at the intersection of social, economic and environmental impacts (Hatvani-Kovacs et al., 2018; Corburn, 2009). While technical solutions are well understood, including urban greening, blue-green infrastructure and community cooling centres, there is a dearth of literature exploring the governance dimensions of extreme heat management. Previous work by Russo (2016a, 2016b) highlights the role futures methods play in analysing the deeper systemic layers of urban management in Australia, particularly as urban planning and management involves multiple stakeholders with contesting views and competing interests. This article seeks to build upon this notion – applying futures methods to the complexity of urban heat management.

Sydney, Australia has experienced notable increases in extreme heat instances and average temperatures over the last 20 years, and the 2019-2020 bushfires were largely a result of record-breaking temperatures in an El Nino weather pattern, with this weather pattern set to become more frequent (CSIRO, 2022).

The existing literature assessing Sydney's extreme heat governance identifies the lackluster policy capacity in local governments in Sydney - affecting their ability to coordinate and plan for extreme heat events (City of Sydney, 2018; Zografos et al., 2016). Such literature emphasises a lack of investment in urban cooling initiatives and a poor consideration of climate adaptation in Local Environment Plans (LEPs) and State Environmental Planning Policies (SEPPs) (Bolitho & Miller, 2017).

This article explores the current state of extreme heat governance practices across local governments in Sydney, using the anti-fragile and agile principles developed by Spitz & Zuin (2021) as an analytical framework. It explores how anti-fragile and agile governance characteristics are determinants of the effectiveness of extreme heat governance scenarios.

It also uses the Futures Triangle (Inayatullah, 2008) to map the push of the present, pull of the future and weights

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of the past that motivate yet undermine anti-fragile and agile extreme heat governance in Sydney. Subsequently, it uses the Change Progression Scenario (CPS) Method to identify alternative extreme heat governance futures for Sydney (see Milojevic, 2005).

Methods

The article is split into 2 components:

1. Understanding Anti-fragile and Agile Governance for Extreme Heat in Sydney
2. Identifying and Analysing Alternative Futures for Extreme Heat Governance in Sydney

Both sections are based on systematic literature reviews of grey and peer-reviewed literature. These includes several 'resilience' strategies in Sydney, including:

- The Whole of Sydney Resilience Plan (City of Sydney, 2018)
- Ryde Resilience Plan 2030 (City of Ryde, 2020)
- The Penrith City Council Resilient Action Plan (Penrith City Council, 2021)
- The Northern Beaches Resilience Strategy (Northern Beaches Council, 2022)

The article begins by analysing the anti-fragile and agile characteristics of extreme heat governance in Sydney, substantiated by literature reviews and semi-structured interviews with extreme heat and urban resilience experts.

Afterwards, the Futures Triangle is used to map the push of the present, pull of the future and weights of the past motivating yet preventing proper extreme heat governance for Sydney (see Inayatullah, 1998, 2008, 2013). Then, the Change Progression Scenario (CPS) method is used to map alternative extreme heat governance scenarios for Sydney, including a preferred future (see Milojevic, 2005).

Understanding Anti-fragile and Agile Governance for Extreme Heat in Sydney

Spitz & Zuin (2021) argues that anti-fragile and agile principles are a necessity for the future of strategic decision making in a Volatile, Uncertain, Complex and Ambiguous (VUCA) world (also see Snowden & Boone, 2007).

Anti-fragile governance

According to Spitz & Zuin (2021), anti-fragility is a phenomenon where the recovery from a shock or a stress enables an entity or society to be stronger than before. In the context of extreme heat governance, this depends on local governments possessing strong organisational policy capacity (Wu et al., 2015; Peters, 2005), in which they have the resources and competencies to prepare for and respond to extreme heat. Spitz (2020) and Feduzi et al. (2022) implore organisations to be more anticipatory and manage complex societal systems to be more anti-fragile.

To support anti-fragility, it is important local governments institutionalise extreme heat governance across a variety of its functions, using their position as a top-down policy actor to conduct the coordination and coherence often not possible by civil society actors alone (Mees et al., 2014; Boin, 2014). Anti-fragility therefore necessitates a mixed governance arrangement between private, civil society and public sector actors (Kjaer, 2004; Bolitho & Miller, 2017; Bevir, 2009). Importantly, in the context of anti-fragility, local governments should seek to "orchestrate" and "activate" various policy actors across civil society and the private sector - using their top-down authority to develop antifragility within their jurisdiction (Salamon, 2002, p.6; Boin, 2014; Moser & Boykoff, 2013).

However, in the context of Sydney, there are currently large lapses in anti-fragile governance, largely due to lackluster engagement with community actors, and a lacking ability to "activate" and "orchestrate" community actors (Salamon, 2002, p.6). In large part, this is due to a lack of organisational policy capacity amongst local governments - lacking resources and competencies necessary for bridging community and government actors, in addition to competing with other government priorities (City of Sydney, 2018). Keith et al. (2019, p.5) argue, "extreme heat planning must compete for limited time and resources with numerous other urgent urban issues, some of which are usually seen as higher priority." For example, land use planning and other technical solutions to extreme

heat take greater priority, often as they are more visible and politically palatable.

This lack of anti-fragility is compounded by a lack of coordination between different levels of government and between local governments. City of Sydney (2018, p.106) refers to this, citing: "Disjointed governance makes integrated decision making difficult…it also makes it difficult to obtain a clear picture of the metropolitan scale of risks facing our city, or where the responsibility for managing different risks rests between agencies, government or business". Russo (2016a) also highlights the need to conduct coherent, multi-stakeholder urban planning between top-down and bottom-up stakeholders, as gleaned by his use of Causal Layered Analysis (see Inayatullah, 2013, 1998).

Agile governance

Agile governance is the ability to make rapid, consequential governance decisions with rapid information feedback loops from multiple sources. Spitz & Zuin (2021) posit that organisations must reconcile decision-making systems and processes for both short-term and long-term objectives. Achieving this requires bridging knowledge gaps between multiple stakeholders and data sources, and the ability to make quick decisions in complex environments.

Agile thinking requires debiasing our assumptions and knowledge, and uncertainty can be addressed by experimentation, trial and error and the ability to receive information from numerous sources in quick patterns. The conditions necessary for sensemaking depend on multiple stakeholders in "self-organised local relationships" (Spitz & Zuin, 2021, p.287; Rancati & Snowden, 2021), that can cohere disparate, incoherent and weak signals into coherent and practical information for local governments. Spitz (2020) highlights the path dependence and inertia evident in the management practices of numerous contemporary organisations; limiting their ability to understand complex, emergent and rapidly evolving phenomena.

In the context of extreme heat governance, this involves a strong sense of "network governance" (Kjaer, 2004, p.13; Bevir, 2009) - based on the organising relationships of community and civil society actors within local government jurisdictions. In such a context, local governments can embrace the bottom-up self-organising capacities of community actors (Osborne, 2006; Ostrom, 2010) - demonstrating systemic policy capacity. Russo (2016a) also emphasises the role of local socio-cultural norms and worldviews in promoting social cohesion and resilience in urban planning, and how this can illuminate nuanced and tailored community preferences that overly top-down governance cannot.

In Sydney, there are major disparities in the systemic policy capacities for extreme heat governance. Various communities, across differing socio-economic and socio-cultural characteristics, possess different capacities to self-organise and develop their own community resilience, which is consequential in the context of systems breaking down in extreme heat (Zografos et al., 2016). Accordingly, City of Sydney (2018, p.85) state: "Our community have expressed concerns about declining social cohesion. They have asked for action to ensure the diversity of our people and the strength of local connections is valued to maintain a cohesive, inclusive and prosperous metropolitan city".

Looking at policy capacity through the lens of the anti-fragile and agile governance, it is possible to develop an appraisal framework for extreme heat in Sydney, through which alternative futures can be understood and analysed (see Table 1).

Table 1 – Appraisal Framework for Extreme Heat Governance

Principles	**Policy Capacity**	**Manifestations**	**Diagnostic Questions**
Anti-fragile	Organisational Policy Capacity	Coherent and coordinated local government top-down governance to ensure a return to a state stronger than before a crisis (Taleb, 2014). Local government 'activating' and 'enabling' networks via top-down means to enable their jurisdiction's cohesion and growth in a pre and post recovery setting (Salamon, 2002; Taleb, 2014).	1.1 How can extreme heat management be best institutionalised in a horizontal, non-siloed fashion across a variety of local government functions to ensure an alignment of responsibility, accountability and implementation of evaluation activities post extreme heat instances? 1.2 How can parochial and short-term, understandings of extreme heat impacts and recovery be overcome to capacitate longer-term, post-recovery focus; centred on improving the status quo and learning from the impacts of extreme heat instances?
Agile	Systemic Policy Capacity	Bottom-up, networked governance from community and civil society stakeholders (Kjaer, 2004; Osborne, 2006; Bevir, 2009)	3.1 How can community actors, especially across the private and civil society sectors, rapidly coordinate together to understand and respond to both the immediate and oncoming threat of extreme heat; self-organising to complement each actors' strengths and compensate for each actors' weaknesses? 3.2 How can society-at-large adequately and rapidly communicate with local government functions for managing extreme heat; bridging knowledge-action gaps between various stakeholders through building feedback loops?

The framework guided the appraisal of Sydney's extreme heat governance characteristics, as explored in Section 2. It also informed the questions asked in the semi-structured interviews that informed the research for this article.

Identifying and Analysing Alternative Futures for Extreme Heat Governance in Sydney

The Futures Triangle

Based on the analysis of anti-fragile and agile extreme heat governance in Sydney, it is possible to apply the Futures Triangle in exploring extreme heat governance futures in Sydney. The Futures Triangle complements scenario methods well, as it is useful in informing policy strategies and interventions (Inayatullah, 2023), meaning it can be used to inform extreme heat governance interventions.

Push of the Present

Milojevic (2023) argues the push of the present corner of the Futures Triangle are the factors that propel transformative change towards a preferred future.

In Sydney, the push of the present for stronger extreme heat governance derives from an increasing understanding of the social, economic and environmental consequences of extreme heat by local governments (WSROC, 2018; City of Sydney, 2018). There is a growing desire and imperative to govern extreme heat in an equitable and robust fashion (Zografos et al., 2016). Local governments recognise the threat of climate change, and that extreme heat is a major component of that. There is also a clear understanding of the socio-economic and socio-cultural dimensions of extreme heat vulnerability, including amongst low socio-economic status, CALD and elderly communities (City of Ryde, 2020). In turn, this highlights how there is an awareness of the need for stronger anti-fragile and agile extreme heat governance.

The desire to build anti-fragile governance, and the coherent systemic and organisational policy capacity for extreme heat management provides a clear vision for local governments to work towards (Mees et al., 2014). The prospect of blending the networked, multi stakeholder nature of governance with strong organisational policy capacities provides impetus for the creation of an efficient and equitable implementation of extreme heat governance in Sydney.

Organisations such as the Committee for Sydney and Resilient Sydney already offer a manifestation of what this looks like. Sam Kernaghan believes: “The answer is in what Resilient Sydney has been trying to do - that is, build a local government platform and mandate to demand action of themselves and demand action of others” (Kernaghan, S. 2023, 14 August, personal interview).

Pull of the Future

Milojevic (2023) posits the pull of the future is the situation that multiple organisations and stakeholders agree is the preferred future.

For extreme heat governance, there is desire for local councils to have more coherent governance and direction on matters of extreme heat. The advent of Resilient Sydney has given local governments hope and understanding about what the future of extreme heat governance could look like in Sydney, which provides some level of hope and prospects for stronger long-term extreme heat governance. Sam Kernaghan reinforces this point, explaining: “You have 33 local governments, all have their own experience, and try to find what the shared spatial, or shared sectoral, or shared issue agenda is across all of those things, and say, ‘what is it that we can do ourselves to solve this with the capacities and funding that we have, within our limitations, and what is it we can seek help from regarding financial help, or governance help, from others?’ I think that’s one of the things that Resilient Sydney has done very well is show the value of what it is doing in creating that platform” (Kernaghan, S. 2023, 14 August, personal interview).

This is especially important in the context of constrained organisational policy capacity as it currently stands, with many councils being disjointed within and between each other, and are often under-resourced. This makes decision making ambiguous, because no one organisation ‘owns’ the management of extreme heat (Boin, 2009; Roberts, 2000).

Likewise, City of Ryde (2020, p.7) states “we have recently seen and experienced the impact of an unprecedented combination of ongoing drought, heatwaves, severe and widespread bushfires and hazardous air pollution. These events have been exacerbated and become more intense by accelerating climate change caused by increasing carbon

emissions from human activities and global warming". In this context, public leaders can frame and understand the risks and consequences of extreme heat, providing a "common operational picture" of such consequences (Boin, 2009, p.372). Kathy Baughman McLeod argues: "I think [extreme heat] governance starts with knowledge and understanding and the scoping of what you're facing…that itself is not true governance, but I don't think you can get to true governance without doing that" (Baughman-McLeod, K. 2023, September 7, personal interview).

In Western Sydney, some attempts have been made for a higher, more coherent peak body, including the Western Sydney Regional Organisation of Councils (WSROC) to address resourcing and governance constraints (WSROC, 2018). Awais Piracha remarked: "Some councils have been working with WSROC, and WSROC has been very keenly interested in developing heat mitigation strategies. Some of the western councils have worked with them, and they've tried to include clauses in their LEPs. Changes in LEPs take a long time…so there is realisation, and they are doing that, but they also do other things like information for the community" (Piracha, A. 2023, August 19, personal interview).

Weights of the Past

However, there are major weights of the past preventing anti-fragile and agile extreme heat governance for Sydney. Milojevic (2023) presents the weights of the past as factors that maintain the status quo.

For local governments, it is not just a matter of understanding the threat of extreme heat, but having the organisational and systemic policy capacities to enable anti-fragile and agile governance, indicating "reluctant inaction" among policymakers. "Reluctant inaction" is driven by resource constraints and poor operational policy capacity (McConnell & 'tHart, 2019, p.652). Arguably, COVID-19 addressed endemic reluctant inaction in governance, as governments of all scales demonstrated their ability to mobilise resources and pivot focus in times of crises (Dickinson et al., 2024).

While many local governments have an awareness of the multidimensional threats of extreme heat, enacting governance changes to manage extreme heat is more difficult, largely because of resourcing constraints and the need to meet more immediate public concerns. Sam Kernaghan shares this concern, stating: "These things [climate and environment] which are important…have they been mainstreamed and embedded into all the decisions that local government is making? No. Are they aware at a political and senior level of that extreme heat risk - yes, absolutely" (Kernaghan, S. 2023, 14 August, personal interview).

Sebastian Pfautsch also shared this sentiment, remarking: "there's a great risk that we get stuck in the discussions about who needs to do what…a heatwave strikes, and we have a massive power grid failure…just pointing at one agency as the head organisation that should now lead the response to this emergency is not good enough…you will need to have everyone working in the same direction, including the provider of power and the ones who operate the networks" (Pfautsch, S. 2023, 1 September, personal interview).

Extreme heat and climate resilience functions need to be institutionalised at a local level, rather than dictated by the state government of New South Wales. Sam Kernaghan argues: "Local government might be highly aware of these issues. But are they responsible for the building code that have allowed buildings that don't have thermo performance allowing people to survive in extreme heat? No. They have absolutely no control over that. Equally, do they have the money to provide extreme heat refuges that meet the scale of need that would be revealed in an extreme heat event? No, they don't" (Kernaghan, S. 2023, 14 August, personal interview).

Compounding this, Gee & Gissing (2021) believe NSW lacks a specific organisation directly accountable for the prevention and preparedness towards heatwaves, unlike other natural disasters, such as bushfires, floods and storms. This creates confusion regarding which government agencies, and which levels of government, should be responsible for heatwave emergency planning. In this context, it is difficult to understand the nuanced, disparate and unequal impacts of heatwaves are understood, which leads to institutional siloing and policy turfs with regard to the governance of the various extreme heat impacts (Peters, 2018). Complementing this sentiment, Dr Awais Piracha remarked "their capacity is constrained by their lack of empowerment…they [local governments] are completely at the mercy of the state" (Piracha, A. 2023, August 19, personal interview).

Regarding such matters, Kylie McMahon, Executive Officer for City Resilience at City of Ryde Council, mentioned: "I don't think it's intentional that there's silos…because it [extreme heat] is a stressor that's largely intangible… You're dealing with multiple agencies…you've got your overarching state [NSW], who set a planning

precedent based upon needs or imperative…some of those decisions sometimes can result in poor outcomes…because they haven't run through things like considerations for material use, placement, quality, and that has flow effects…into community health" (McMahon, K. 2023, September 7, personal interview).

Sebastian Pfautsch shares this sentiment, remarking: "it's about taking responsibility really, for community safety, and that must come from federal and state, and that must trickle down to local [government]...but when you get the marching order from state government that 'this is the new suburb you need to build, and therefore our state rules apply'...then what do you do with your local planning package? It gets overruled" (Pfautsch, S. 2023, 1 September, personal interview).

There are also issues in communicating with and campaigning for the impacts of extreme heat among community members. Sebastian Pfautsch claims, there are major knowledge gaps in society that prevent extreme heat preparation, which implore: "really serious media campaigns that go across, not just the SBS and ABC, that reach the intellectual people who probably already have this kind of knowledge that is necessary to protect yourself during summer, but really go through the media that inform the non-intellectual, let's call it that part of the population" (Pfautsch, S. 2023, 1 September, personal interview).

Change Progression Scenario (CPS) Method

While the Futures Triangle provides a clear understanding of the motivations and barriers to achieving a preferred extreme heat governance future for Sydney, the Change Progression Scenario (CPS) method facilitates a systemic, multi-layered understanding of a phenomenon or trend (Milojevic, 2005). This provides an in-depth exploration of the systemic (in)adequacies of extreme heat governance in Sydney, but also alternative futures (see Table 2).

Table 2 – Change Progression Scenario for Sydney's Extreme Heat Governance Futures

	No Change	**Marginal Change**	**Adaptive Change**	**Radical Change**
Scenario Title	Business-as-usual	Bottom-up improvements	Top-down improvements	Joint governance improvements
Systemic Change	No change in governance practices	Societal stakeholders want to build heat resilience, but local government is unresponsive.	Improvements to top-down governance, but there's disconnect from bottom-up, community stakeholders	Mutual trust, understanding and collaboration between local governments and community stakeholders, and joint objectives are understood and appreciated.
Worldview	Siloed thinking and disconnection between government and society	Personal responsibility	Government knows best	All in this together.
Core Myth/Metaphor	Titanic failing to avoid the iceberg	Frontier town	Puppet strings	Matching puzzle pieces
Consequence	Fragility	Incoherent heat resilience	Coherent but tone-deaf heat resilience	Holistic resilience

Business-as-usual

This scenario is what has been analysed so far regarding Sydney's lack of anti-fragile and agile heat governance. It indicates a poor connection between organisational and systemic policy capacity in promoting holistic heat resilience. Milojevic (2023) argues the 'weight of the past' corner of the Futures Triangle reflects characteristics of the business-as-usual scenario.

Bottom-up improvements

This scenario results from a recognition that community actors need to use their networks to manage their own unique extreme heat risks (agile governance), resulting from lackluster organisational capacity at the local government level (poor anti-fragile governance).

In this future, community networks work together in lieu of local government organisational capacities. This requires a strong sense of systemic policy capacities (Wu et al., 2015; Parsons, 2004). Such a future embodies concepts of networked governance - that is, governing beyond government, and through community networks (Bevir, 2009; Watson, 2000). In this future, there is a dependence on bottom-up, decentralised and multi-stakeholder collaboration for preparing for and responding to extreme heat. Kjaer (2004) and Osborne (2006) emphasise the power of community cohesion and networks and is perhaps even a necessity in contexts of poor governmental organisational policy capacity and consequently, poor anti-fragile government. As a result, the worldview in this scenario is a matter of 'personal responsibility', and a metaphor being the existence of a 'frontier town' on the frontline (or 'frontier') of climate change impacts.

Sebastian Pfautsch emphasised the notion of: "true community resilience. Not one that is put onto a community from the outside, but one that grows from the inside. We've seen that this type of community knowledge is the number one help factor after the bushfires. That's where the real help comes from" (Pfautsch, S. 2023, 1 September, personal interview).

Complementing this idea, Zografos et al. (2016) glean that institutional and community elements are crucial for shaping Sydneysiders' ability to respond and adapt to increasing occurrences of these events, hence conceptualising those elements as drivers of adaptive capacity. In the context of a poor and inconsistent state response to heatwave risks and exposure, low-income residents in multicultural communities need to find informal resources and pragmatic mechanisms to cope with extreme heatwaves (Friend et al., 2014; Gee & Gissing, 2021).

The Northern Beaches Council (2022, p.49), states that "social cohesion and connectedness is critical for a community's vitality and wellbeing. COVID-19 has emphasised the absolute importance of social connections in dealing with crisis events and provides a platform for individual and collective adaptive resilience", and that "the concepts of community wellbeing and resilience are intrinsically linked".

Penrith City Council (2021, p.16), also state that "a strong connection to family and friends was identified as a strength of the community. There is a high dependency on family and friends as a key source of information, assistance and support, particularly for youth and people from CALD backgrounds, rather than seeking out and approaching professional or expert services. This recognises that people in the community without family or a close support system may be disadvantaged and more vulnerable in responding and coping with shocks and stresses".

Therefore, in this heat governance future, there is an identified need for community members to enact agile governance via their own communal networks.

Top-down improvements

Top-down improvements is a result of lackluster systemic policy capacity (agile governance), despite strong organisational policy capacity within local governments (anti-fragile governance). This results from a disconnect, or 'chasm', between local governments' capacity (top-down) and that of civil society and community policy actors (bottom-up). Roberts (2000, p.4) emphasises the need to "get the whole system in the room" for ideating and understanding wicked problems such as extreme heat, which is made difficult without adequate agile governance.

The 'top-down improvements' scenario involves local governments developing their own organisational policy capacity to prepare for and respond to extreme heat, yet lack the ability to use their top-down authority to "activate" or "orchestrate" with community actors (Salamon 2002, p.6; Boin, 2014). In turn, local government organisational

policy capacity does not complement or support the systemic policy capacities of community members, hence creating a 'chasm' between community actors and the government itself.

The 'puppet strings' metaphor indicates an awkward, uncollaborative control between governments and the systemic communal systems they could otherwise activate or orchestrate. This is especially in the scenario where top-down government is insisted upon, and the path dependency of "clinging to the plan" is instilled in political-administrative culture (Boin, 2014; McConnell & 'tHart, 2019).

In the context of Sydney, Zografos et al. (2016) assesses how inconsistent information and awareness about climate impacts, in addition to social isolation and exclusion, exaggerates vulnerability to extreme heat. These lapses in systemic policy capacity reduce agile, stakeholder-driven governance, especially as it leaves lower socio-economic status, elderly and disabled individuals more vulnerable and disconnected.

This is currently a major issue in Sydney more generally, with Sam Kernaghan, Director of the Resilience Program the Committee for Sydney, remarking community actors' resilience in extreme heat is "partly on their [local governments'] ability to consult with the communities representing the 150 or so different languages that are spoken in a local government area like Blacktown or Campbelltown" (Kernaghan, S. 2023, 14 August, personal interview).

Furthermore, in this scenario it is possible there could be a major lapse in political policy capacity, as politicians and the political authorising environment might not prioritise a focus on extreme heat response or climate change policymaking. Regarding this, Awais Piracha remarked: "I think politicians are scared to discuss this…in general politicians like to give good news…they hate to talk about difficult issues". (Piracha, A. 2023, August 19, personal interview). Dr Sebastian Pfautsch, Associate Professor in Urban Studies at Western Sydney University, echoed this, stating: "politicians want to not be seen as the ones that increase taxes, and write more rules into our rule books, they want to be seen as the ones that liberate us, and support us in our development…they're not really responding to the boundary conditions that we now have to deal with" (Pfautsch, S. 2023, 1 September, personal interview).

City of Sydney (2018, p.68) is aware of these issues; referencing the need for community engagement, highlighting how the "the community have asked for a greater say in the strategic decisions that shape metropolitan Sydney, and their lives. This requires commitment and effort on the part of multiple organisations within our city, both, to engage communities and in metropolitan-scale decisions". Penrith City Council (2021, p.18) also identifies issues with community engagement, imploring the need to bolster "reliable and equal access to services and information" and the "capacity to deal with unexpected emergencies through engaging with community members, service providers and key stakeholders."

Sebastian Pfautsch argues: "there's just a knowledge gap, and it's not just the protection, 'how do I protect myself at a 45-degree day'…but all these other bits of information that need to be communicated as well: How do we work against extreme heat? What materials should you use to build a home? How can you contribute to community cooling? Should you open your pool to the community?... Do you know where the old lady down the road is, whose husband died, and probably dehyrdates very quickly?" (Pfautsch, S. 2023, 1 September, personal interview).

Joint governance improvements

The 'joint governance improvements' future involves matching organisational and systemic policy capacities, therefore blending the best of anti-fragile and agile governance. Milojevic (2023) would argue a transformative, preferred future like this reflects characteristics of the 'pull of the future' corner of the Futures Triangle.

This future involves a blend of bottom-up, network and community governance and top-down, coordinated and coherent extreme heat governance from local governments themselves. This allows for a blend of anti-fragile and agile extreme heat governance in Sydney - indicative of strong crisis management governance that allows for the fluidity of bottom-up governance and the rigidity and resourcing of top-down governance (Boin, 2009, 2014).

In this future, there is a benevolent breakdown of the complex governance silos within local governments and between different levels of government and their jurisdictions' community, bottom-up actors. Resultantly, this is a worldview of 'all in this together', with there being a metaphor of 'matching puzzle pieces' between bottom-up and top-down government and community actors. This is a blend of anti-fragile and agile governance. This is an adjunct to multi-stakeholderism, based on "agility to connect, then bridge the vision with constantly updating and evolving complex environments" (Spitz and Zuin 2021, p.312).

Krista Milne, Co-Chief Heat Officer at the City of Melbourne, reinforces the validity of this future, stating: "in any climate function, you need both coordination and decentralisation…with no one at the front thinking about what's next, then you lose momentum. So, you need both the whole organisation to take responsibility as well as having a core central coordination function, and leadership function" (Milne, K. 2023, August 18, personal interview).

Kurt Shickman reinforces this by stating: "we really are starting to see the linkage of extreme heat and impacts in cities or in communities in ways that wasn't really talked about before…so not just talking about heat deaths, but looking at the impact on the energy system, the impact on the health system…that's really been critical to bring emergency departments and emergency planners to the table in a new way. Because they're not just seeing this as a short-term event". (Shickman, K. 2023, August 26, personal interview).

These sentiments are also echoed in the 'Turn Down the Heat' Action Plan (WSROC, 2018), which emphasises the need to 'take action, together' and 'build a community that is healthy and prepared'. According to Kim et al. (2021, p.226) "adaptation pathways can be articulated through feedback loops", particularly when anti-fragile and agile governance acts in accordance with each other. City of Sydney (2018) highlights Direction 1 for Sydney's resilience being a People Centred City, Direction 3 being Connect for Strength and Direction 5 being One City. These 3 directions alone indicate the need for coherent top-down anti-fragile governance, combined with community connection and cohesion amongst their own communities (Friend et al., 2014).

For example, City of Ryde (2020, p.70) emphasise the need for "social inclusion, cohesion and cross-cultural engagement", including allowing people to "feel informed, connected and contribute to society socially, culturally, economically and politically". This emphasises the importance of social understanding of shocks and stresses, including extreme heat events. To achieve this, the plan emphasises multi-stakeholder and multi-sectoral collaboration between civil society, public sector and private sector stakeholders. In this way, City of Ryde (2020, p.70) argues the need to embed resilience in "every level of government, the community sector, businesses and all individuals."

Northern Beaches Council (2022, p.53) also draws attention to this, remarking: "adaptive services, assets and infrastructure are lynchpins in our society" and as the "'glue that holds us together". This thinking recognises the important interlinkages between government service provision, derived from organisational policy capacity, and society-at-large resilience, derived from systemic policy capacities.

Sam Kernaghan supported this sentiment, positing: "How will this extreme shock play out, in terms of city systems, and their ability to cope. But it's the intersection between those, and whose it is going to impact on. And it's not just about vulnerable people and how they will cope, but actually the services that we rely on, that work of understanding what this actually looks like, and what that looks like from each sector…I think that's the game…in Sydney, we don't have an organisation…to actually think about what's the coordinating body" (Kernaghan, S. 2023, 14 August, personal interview).

The Novel Contribution of These Methods to Futures Literacy

The use of the Futures Triangle and the Change Progression Scenario (CPS) method in the context of extreme heat governance demonstrates a novel contribution to futures literacy, as there is minimal literature exploring extreme heat governance through the lens of futures methodologies, and even less literature combining the Futures Triangle and the CPS method to assess extreme heat governance futures. Therefore, this article is novel and unique, as it establishes a precedent within climate futures discourse regarding the application of these futures methods to chart preferred climate resilient futures.

The use of the Futures Triangle supports discussion about how to achieve the 'Joint Governance Improvements' future, and what factors prevent the attainment of this preferred future. In practical terms, this illuminates the policy and political pathologies in public administration that prevent stronger extreme heat governance. There is a dearth of literature exploring the motivations and barriers to (in)effective heat governance, making this a unique and impactful contribution to futures literacy.

The CPS method helps concretise scenarios which are otherwise not very tangible, as it allows for a deeper reflection on the mindset and drivers behind each scenario, which helps detail the psychology and ideology

underpinning (in)effective governance practices. Based on my literature review, there is a lack of literature, even in futures literacy, exploring these dimensions of governance practice, so applying the CPS method in this context a novel contribution to futures and policy literature.

Using these methods, further research can be conducted about the practical avenues to achieve the preferred extreme heat governance future for Sydney or other cities, and which political-administrative barriers must be overcome to do so.

Conclusion

Extreme heat has become a pressing and damaging threat in the contemporary world. The Anthropocene is manifesting significant climate change impacts, presenting multifaceted consequences across social, economic and environmental domains. In Sydney, this has presented problems for many local governments, especially their ability to enact anti-fragile and agile governance, underpinned by proper policy capacities.

Lapses in organisational and systemic policy capacity undermine the ability for Sydney's local governments to anticipate and manage the immediate and future impacts of extreme heat. The lack of resourcing and coordination between and within local councils adversely affects their ability to enact anti-fragile and agile extreme heat governance. Circumstances where local governments struggle to coordinate with civil society and community actors can affect their governance capabilities, demonstrating a lack of organisational policy capacity alongside agile and anti-fragile governance.

In the context of the Futures Triangle, the weights of the past prevent the progress of anti-fragile and agile governance, compounded by the underlying policy incapacities for extreme heat governance. These include a lack of cohesion and coordination between themselves and other actors, and a lack of power at the local council level. Meanwhile, the Change Progression Scenario (CPS) method identifies alternative and preferred futures for extreme heat governance.

To pursue the desired future for Sydney's extreme heat governance, there must be a cohesion between organisational and systemic policy capacity. This enables the best of both top-down organisational capacities and bottom-up, networked and multi-stakeholder governance in extreme heat.

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