Multilevel and Regional Governance Models for Urban Climate Action: A Case Study of the Philadelphia Metropolitan Area

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Abstract

Climate change and urbanisation are the paramount processes of the present globalised era. I explore several interdisciplinary models of urban practice in order to identify how they can better prioritise the urgency and severity of anthropogenic climate change. In particular, I consider three models: "urban governance theory" from urban studies, "regime theory" from ecology, and "multilevel climate governance" newly emerging from international climate policy. Using a US case study of the Philadelphia Metropolitan Area, I argue that updated models, such as multilevel "climate consortia", are urgently needed that address the complex reality of urban sustainability governance.

Introduction

In 2018, the Intergovernmental Panel on Climate Change (IPCC) stunned societies worldwide by announcing that humanity had just twelve years to reduce planetary greenhouse gas emissions by 45 percent by 2030 in order to avoid the most catastrophic damages from climate change (IPCC, 2018a). The situation remains dire today: many anthropogenic changes to the Earth are already locked-in (IPCC, 2018b) and most countries seem not to be on the path toward deep decarbonisation (UNEP, 2019).

In light of the Trump Administration's planned withdrawal of the US from the 2015 Paris Agreement, many subnational actors in the US reaffirmed their emissions reduction commitments – such as through the "America's Pledge" or "We Are Still In" campaigns (America's Pledge, 2020; We Are Still In, 2020). This subnational US effort, plus a proliferation of domestic and transnational city networks sharing best practice on climate action, indicates that novel governance structures are being piloted at the local scale to cope with the threat of climate change (Rapoport et al., 2019).

I investigate three models of urban practice – from three interdisciplinary fields – to identify necessary theoretical updates in a world with a rapidly changing physical climate as well as fast-moving urbanisation. I then present an urban case study that explores the climate-disaster preparedness of two counties within the Philadelphia Metropolitan Area, using it as a proof of concept to demonstrate the need for a viable new model of multilevel and regional governance.

Literature Review

Urban Governance Theory

Scholars, practitioners, and policymakers alike have noted the proliferation of urban areas across the globe and referenced the now well-known prediction that around two-thirds of the world's increasing population will come to live in those areas in just the next few decades (e.g., Lustgarten, 2020; Habitat III, 2017).

Brenner and Schmid (2015) put forth a nuanced understanding of the "urban" as a diverse but nevertheless global process. This planetary, "urban fabric" is not just represented by bounded cities, but in fact much more accurately by all regions (including rural or hinterland areas) because all have been touched by interconnected, global urbanisation processes. These processes manifest themselves differently in different parts of the world (Thriving Cities, 2020), and trends in uneven economic, infrastructural, and spatial development are becoming apparent.[1] Roy (2015) warns against describing rural or Global South communities only in relation to the urban – as well as cautions against telling their contemporary stories as inherently urban/European-influenced. Nonetheless, the urban fabric is an important articulation of a process that is happening, for better or worse, in innumerable parts of the world – albeit a process with a plurality of manifestations and uneven outcomes for people's lived experience (Brenner, 2018).

Brenner and Schmid's conceptualisation of the urban process helps contextualise theories of governance for the modern age. Urban scholars often differentiate "government" (policymaking bodies with jurisdiction over a particular area) from "governance" (a process of decision-making that includes, but extends far beyond, government) (Rapoport et al., 2019). Patterson et al. (2017) ask whether governance might be harnessed to foster societal transformation toward sustainability, in an approach they call "earth system" governance. Because "the city now looms large on the international climate change agenda" (Bulkeley & Betsill, 2013: 136), urban governance research is a major theoretical concern – and specifically, governance for transformation.

Patterson et al. (2017) call for a recognition that transformations toward a sustainable world will occur via intersectional and sometimes conflictual approaches. Albrechts (2015) refers to a process that actively fosters dialogue among such varied approaches as "agonistic" – that is, one that encourages debate even when consensus may seem impossible. Local contexts very often embody multiple governance approaches at once (Pierre, 1999), but traditional models of urban governance generally aim to fit a case study environment into just one dominant governance type – such as "progrowth" or "welfare" (Pierre, 2011). Models that instead acknowledge plurality and incorporate agonism may be more pragmatic for understanding the complex reality of urban governance.

[1] For example, "new centers of agglomeration… may emerge within zones that previously served mainly as operational hinterland" (Brenner & Schmid, 2015: p. 169) while others lag behind in terms of modern industrialisation.

Regime Theory

Ecology's regime theory[2] first emerged in the 1970s to describe periods of stability and change within ecological systems (Folke et al., 2010; Holling, 1973). Systems that are resilient undergo periodic phases in order to adapt to change while maintaining an overall "regime state" (Folke et al., 2010). Sometimes, change is great enough that it forces transformation, leading to a "regime shift" (Allen et al., 2014). The ecological concept of regime states has been increasingly integrated with social systems (Brown et al., 2013), in part to better understand anthropogenic impacts at all ecological scales (Folke et al., 2010). An important contemporary question is whether regime shifts in social systems can be intentionally facilitated by particular governance practices.

A 2016 *Journal of Extreme Events* series of comparative studies used regime theory to evaluate urban governance for disaster risk management. Parallel methodology was initially used in five cities across the globe: Kolkata, Lagos, London, New York, and Tokyo (respectively: Parasuram et al., 2016; Ajibade et al., 2016; Pelling et al., 2016; Solecki et al., 2016; Nishi et al., 2016), with some follow-up in more recent years (García Sánchez et al., 2018; Solecki et al., 2017a; Solecki et al., 2017b). Using stakeholder interviews, these studies aimed to determine: the currently dominant disaster risk management regime state for each city, whether a different regime state might be emerging, and factors that contributed to or limited change potential. The various researchers explored four pre-identified regime states: resistant, resilient, transformative, and collapse (see Pelling et al., 2016). Solecki et al. (2017b) write that a transformative regime "is open to the need for significant change in fundamental development trends in order to avoid unacceptable risk and future loss" (p. 2). With unacceptable risk and significant loss due to anthropogenic climate change on the horizon (IPCC, 2018a), modelling transformative urban change is imperative.

Multilevel Climate Governance[3]

Today, cities emit 70 percent or more of the world's emissions (Thriving Cities, 2020). Global urbanisation processes mean that this number will continue to increase unless significant emissions reduction strategies are undertaken (Bailey et al., 2019). Of relevance is the fact that commitments to the global Paris Agreement are made only at the national level; cities and other "sub-national actors" do not have direct membership to the UN (Coalition for Urban Transitions, 2019; Mehling et al., 2017). The "global climate governance landscape" has been changing, however, with more bottom-up approaches developing that are distinct from (though typically referential to) the UN (Betsill et al., 2015).

There is an increasing recognition within the climate policy literature of the need to link subnational commitments with national indicators (UCLG & UN-Habitat, 2020; UN-Habitat, 2020; Chan et al., 2018). To this point, Fuhr et al. (2018) introduce the concept of "embedded upscaling", whereby governance intentionally incorporates the sharing of climate-related best practice among: cities and their parent countries, cities and international bodies, and cities participating in transnational networks. The time appears to be ripe for new governance models

[2] Also sometimes referred to as panarchy theory or resilience theory (Allen et al., 2014). It is worth also noting that urban studies scholars sometimes refer to a "regime theory" as well; for the purposes of this paper, however, urban studies' regime theory is not distinct enough from urban governance theory to merit an in-depth explanation.

[3] "Multilevel" and "polycentric" are both very commonly used in governance literature (Carlisle & Gruby, 2019). I have opted to use "multilevel" throughout this paper.

that address these multiscale relationships. In fact, Lee and Koski (2015) pronounce that "climate change is *the* quintessential multilevel governance problem" and that "future climate policy would do well to *plan* for multilevel climate governance" (p. 1512-1513, original emphasis).

The growth in transnational city networks has already led to developments in urban governance (Rapoport et al., 2019). Trends, particularly in the Global North, of increased urbanisation and devolution, as well as frustration with stragglers on national climate policy action have increased cities' participation in sustainability-focused organisations such as C40 and ICLEI (Rapoport et al., 2019; Davidson & Gleeson, 2015). To date, cities' involvement in such networks has "demonstrated a clear appetite to bypass their national executives", instead of (on the part of both local and national governments) to intentionally design new forms of multilevel governance (Rapoport et al., 2019: 51).

In the midst of the COVID-19 pandemic, however, there may be a growing recognition of this need. For example, a recent UN policy brief about the pandemic claims that "inclusive, participatory, multi-level governance are [sic] at the heart of local responses, and collaboration between all levels of government needs to be institutionalised" (UN, 2020: 6). Perhaps the time is ripe for multilevel governance approaches that unify calls for better climate and pandemic risk management.

A final consideration for the future of urban governance models is the study of greater metropolitan areas – as opposed to limiting analyses to cities' strict jurisdictional boundaries (Rapoport et al., 2019). The effects of climate change and other environmental hazards do not limit themselves to governmental borders; thus, "it might be more conducive to consider functional areas that better take into account the actual territorial extent within which different processes take place" (Valencia et al., 2019: 8). Thus, both multilevel and regional collaborations for sustainability governance are needed.

Interlinking & Updating Existing Models

Urban governance theory makes clear that urbanism is a contemporary planetary process (albeit one with myriad local variations and uneven outcomes) that international climate policymaking must grapple with. All communities are now embedded in a global fabric of urbanism; at present, no assessment of or planning for "socially equitable, democratically managed and environmentally sane" societies (Brenner & Schmid, 2015: p.178) would be complete without a robust understanding of the characteristics and consequences of these urban processes.

Regime theory reminds us that far-reaching transformations are needed to shift decarbonisation efforts into high gear; simply tweaking governance regimes is insufficient at this late stage of the climate crisis. Sustainability governance must be harnessed to usher in transformative change, a process which also must meaningfully incorporate the urban scale.

Finally, ongoing developments in multilevel climate governance (and the very recent interplay with pandemic risk response) demonstrate the need for better collaboration between levels of government with overlapping jurisdictions as well as increased coordination among communities of a given region.

These developments in theory and praxis will need to be pluralistic to safeguard against overgeneralisations (Thriving Cities, 2020); agonistic to ensure inclusion of different points of view within governance approaches (Albrechts, 2015); and reflexive to allow for redirection toward innovative methods that are currently unknown (Patterson et al., 2017). Together, these takeaways form the theoretical backdrop to motivate the present case study of the greater Philadelphia Metropolitan Area.

Methods

Survey Structure & Goals

Data were collected in 2019 via semi-structured stakeholder interviews, which incorporated both qualitative and quantitative questions. The interview questions drew on a series of studies on urban risk management regimes published in the *Journal of Extreme Events* in 2016 (Parasuram et al., 2016; Ajibade et al., 2016; Pelling et al., 2016; Solecki et al., 2016; Nishi et al., 2016).

The interview began by assessing participants' views on the importance of seven pre-identified hazards and how much participants believed their local governments were prioritising these hazard risks. Participants were also asked about their local government's current risk management approach and future scenarios that could make risk management more challenging. A final section refocused risk management questions in the context of climate change explicitly, and assessed participants' perceptions of future climate risk in the region.

Participants

32 participants were interviewed in total, with 16 participants from Delaware County and 13 distinct participants from Philadelphia. The two locations had similar distributions of stakeholders (see **Table 1a & 1b**). Participants were selected based on relevant work or volunteer activity, as well as by snowball sampling from those who were interviewed earlier on.

Table 1a | Participant Categories for Delaware County. n=16.

Categories	Sub-Categories	Specialisations
Government or quasi-government (6)	State (1)	Elected office (1)
	Regional (1)	Environmental planning (1)
	County (3)	Elected office (2)
		Emergency management (1)
	Municipal (1)	Municipal oversight (1)
Academia (4)	University faculty (1)	Geography (1)
	University staff (3)	Institutional environmental sustainability (3)
Private sector (1)	Local business (1)	Waste management (1)
Civil society (5)	Volunteer group (1)	Environmental and/or climate work (5)
	Non-profit organisation (4)	

Table 1b | Participant Categories for Philadelphia. n=13.		
Categories	**Sub-Categories**	**Specialisations**
Government or quasi-government (5)	Regional (1)	Environmental planning (1)
	City (4)	Environmental planning (2)
		Parks and recreation (1)
		Waste management (1)
Academia (3)	University faculty (1)	Economics (1)
	University staff (2)	Institutional environmental sustainability (2)
Private sector (1)	Local business (1)	Law (1)
Civil society (4)	Non-profit organisation (4)	Environmental and/or climate work (1)
		Local businesses (1)
		Media (1)
		Waste management (1)

Data Analysis

Quantitative comparisons between the two locations of the scaled questions were analysed using Fisher's Exact Tests in R. Qualitative responses (anonymised quotes) provided substantial depth to scaled responses, and more directly informed the analysis of trends in each location. Finally, a number of relevant government, quasi-governmental, and NGO reports were reviewed to provide context for the references, constraints, and opportunities mentioned by participants (see **Table 2**).

Table 2 | Contextual Reports.			
Report Title (Year)	**Scale of Assessment**	**Publishing Body**	**(Author, Year)**
Climate Change Impacts in the United States: Northeast	National	National Climate Assessment	(Horton et al., 2014)
Confronting Climate Change in the U.S. Northeast	National	Northeast Climate Impacts Assessment	(Frumhoff et al., 2007)
Leaving No U.S. City Behind: The U.S. Cities SDGs Index	National	SDSN	(Espey et al., 2018)
US Cities Sustainable Development Report	National	SDSN	(SDSN, 2019)
PA Climate Action Plan	State	PA DEP	(ICF, 2018)
Connections: The Regional Plan for a Sustainable Future	Regional	DVRPC	(DVRPC, 2009)
Beat the Heat: Hunting Park. A Community Heat Relief Plan	County (Philly)	Philadelphia	(Philly OOS, 2019a)
Green City, Clean Waters: The City of Philadelphia's Program for Combined Sewer Overflow Control	County (Philly)	Philadelphia	(Philly Water, 2011)
Greenworks: A Vision for a Sustainable Philadelphia	County (Philly)	Philadelphia	(Philly OOS, 2016)
Greenworks Review	County (Philly)	Philadelphia	(Philly OOS, 2019b)
Growing Stronger: Toward A Climate Ready Philadelphia	County (Philly)	Philadelphia	(Philly OOS, 2015)
Options for Achieving Deep Reductions in Carbon Emissions in Philadelphia by 2050	County (Philly)	Drexel University	(Drexel, 2015)
Philadelphia: The State of the City	County (Philly)	Pew Charitable Trusts	(Pew, 2019)
Powering Our Future: A Clean Energy Vision for Philadelphia	County (Philly)	Philadelphia	(Philly OOS, 2018)
Zero Waste Litter Cabinet Action Plan	County (Philly)	Philadelphia	(Philly, 2017)
Delaware County 2035: Implementation Metrics Report	County (DelCo)	Delaware County	(DelCo, 2017)
Delaware County Hazard Mitigation Plan	County (DelCo)	Delaware County	(DCPD, 2016)
Land Use Policy Framework Plan	County (DelCo)	Delaware County	(DelCo, 2013)
Swarthmore Area Greenhouse Gas Emissions Inventory and Action Plan Project	Municipality (DelCo)	Temple University	(Temple, 2010)
The City of Chester Vision 2020: Climate Adaptation Planning Elements	Municipality (DelCo)	Chester	(Chester, 2014)
Township of Haverford Climate Change Action Plan	Municipality (DelCo)	ICLEI	(ICLEI, 2008)

Case Study Context

A 2018 *Climate Action Plan* finds that Pennsylvania (PA) is at risk for more frequent and more severe storms, droughts, heatwaves, snowfalls, and general precipitation (ICF, 2018: 12). Additionally, the Delaware Valley, where the study took place, is at particular risk of riparian flooding due to sea level rise (ICF, 2018). These findings are well in line with general projections for the US Northeast (Horton et al., 2014).

City of Philadelphia

Philadelphia, commonly called Philly, is the sixth largest city in the US and the eighth largest in terms of greater metropolitan area[4] (Census, 2018a). Much like the research on the US Northeast and on PA, the city's Office of Sustainability (OOS) has found that Philadelphia is increasingly vulnerable to hotter and wetter weather, more extreme weather events, and sea level rise – with consequential social impacts also loosely predicted (Philadelphia OOS, 2016).

Philadelphia was selected by Bloomberg Philanthropies in 2018 for its American Cities Climate Challenge (Philadelphia OOS, 2019b) and participates in transnational networks such as C40 and ICLEI. That said, Philadelphia continues to rank middle-of-the-road in assessments of its sustainability progress as compared to other cities both domestically and internationally. For example, the Philadelphia Metropolitan Area was ranked 40 out of 105 American cities by the Sustainable Development Solutions Network in 2019 in terms of achievement of the Sustainable Development Goals (SDSN, 2019). Similarly, Rosenzweig & Solecki (2018) scored six international cities on five pathways for sustainable transformation, and found that Philadelphia had only middling success.

Delaware County

Delaware County, commonly called DelCo, contains 49 distinct municipalities (DCPD, 2016). The total population of the county is about a third of the size of Philadelphia (Census, 2018b). Substantial governing authority is left to the municipalities – although the county is primarily responsible for emergency services and distribution of federal money, among other activities.

Delaware County does not have an OOS or other department devoted to environmental issues. That said, the county's 2013 *Land Use Policy Framework Plan* repeatedly calls for "sustainable communities," "sustainable living," and "sustainable development" (DelCo, 2013). Additionally, the 2016 *Hazard Mitigation Plan* identifies the 22 most significant hazards[5] to the county (DCPD, 2016); the worsening of some hazards due to climate change is lightly recognised. The 2016 plan also notes that a "County Climate Adaptation Component Plan" is forthcoming in three years that will "identify opportunities to improve resiliency" (DCPD, 2016: 212 & 260) – but as of 2020 such a document has not yet been published. Finally, the plan recognises that certain municipalities have modelled climate adaptation plans and highlights work done by its subsidiary municipality of Chester.

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[4] The city population is 1.5 million (Census, 2018c), while the Philadelphia Metropolitan Area is 6 million (Census, 2018a).

[5] The 22 are: Droughts, earthquakes, extreme temperatures, floods, hailstorms, hurricanes, landslides, lightning, pandemics, radon exposure, sinkholes, windstorms, wildfires, winter storms, civil disturbances, dam failures, hazardous material releases, levee failures, terrorism, transportation accidents, fires, and utility interruptions.

Results & Discussion

Three research questions permeate the data analysis:

> ***Research Question 1:*** Is there a difference between the climate readiness of the Delaware County government and the Philadelphia city government? (Quantitative)
>
> ***Research Question 2:*** What are the trends in each location, and how are they causing differences or contributing to similarities between the two locations? (Qualitative)
>
> ***Research Question 3:*** What implications does this case study have for urban sustainability governance models?

Quantitative Comparison Between Locations

Core Interview Questions
Four core interview questions were designed to assess the quantitative research question. These four interview questions explored various aspects of seven pre-identified hazards (blizzards, coastal flooding, rainfall flooding, heatwaves, fires, gun violence, and terrorism).

The core questions were, in brief:

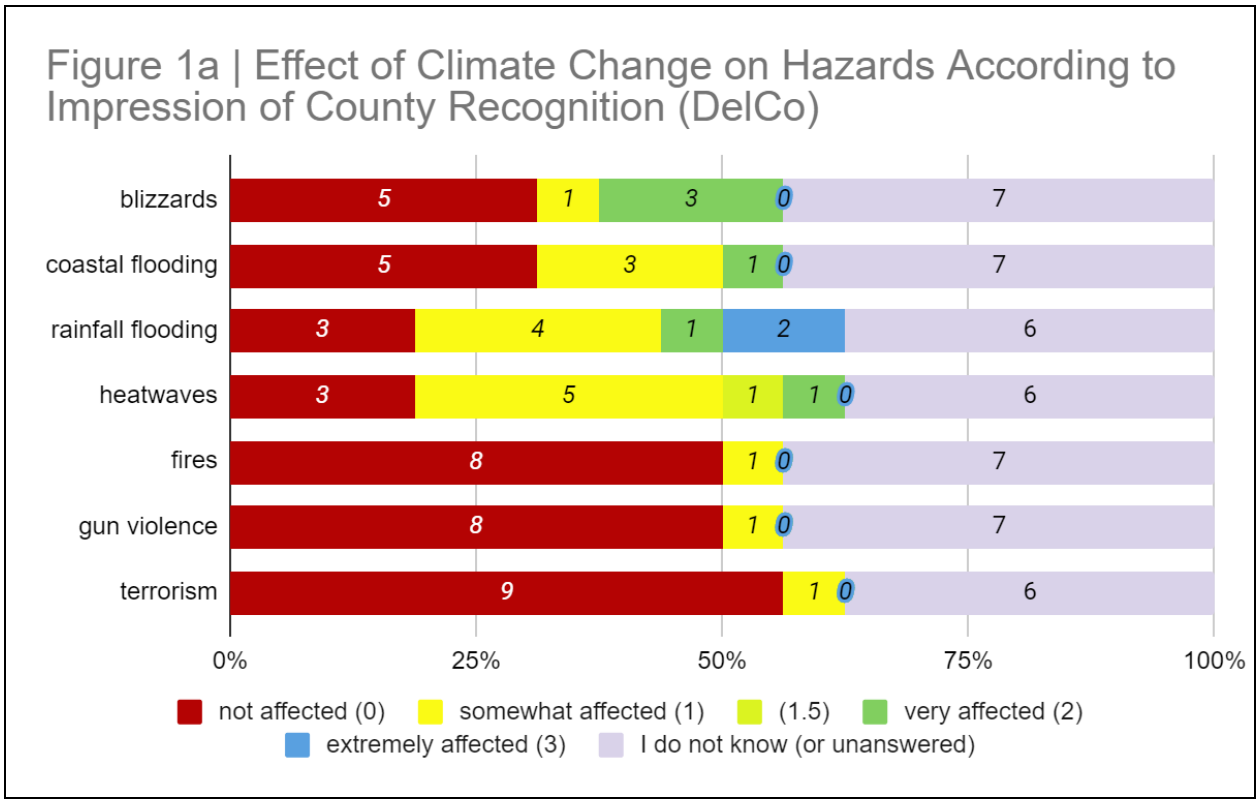
> ***Core Interview Question A:*** How important do you think each hazard is?
>
> ***Core Interview Question B:*** How important does your government think each hazard is?
>
> ***Core Interview Question C:*** How affected do you think each hazard will be by climate change?
>
> ***Core Interview Question D:*** How affected does your government think each hazard will be by climate change?

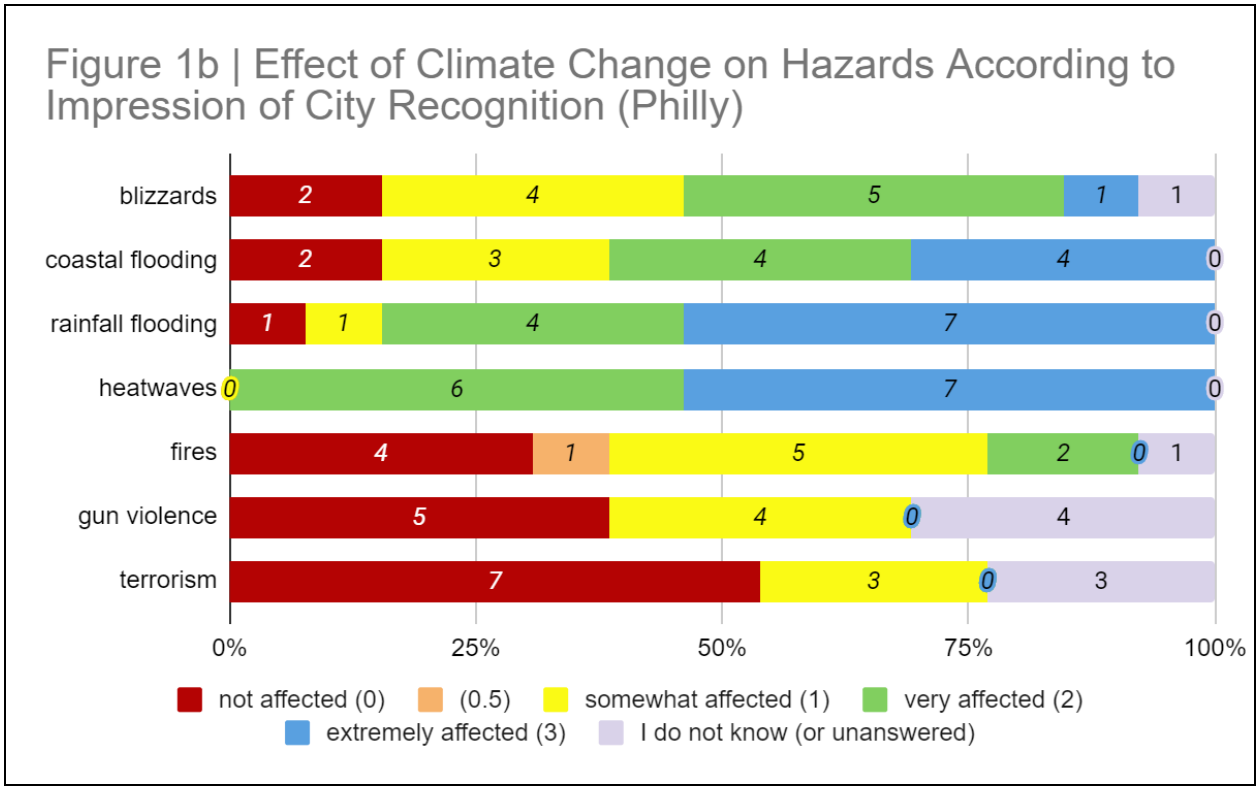
Participants from both locations held similar views about the varying importance of the seven hazards (**Question A**), about their sense of their governments' prioritisation of the hazards (**Question B**), and about the projected impacts of climate change to the hazards (**Question C**). This finding validates that the hazard risks for these two regions of the Philadelphia Metropolitan Area (PMA) are similar, and that stakeholders in both locations are somewhat aware of the expected increase in risks due to climate change.

A large difference between DelCo and Philly participants became apparent with **Question D** – how affected their governments thought each hazard would be due to climate change in their location over the next 20 years (according to participant perceptions). In answering this question, DelCo participants did not rank any hazard very highly. Philly participants, on the other hand, ranked both rainfall flooding and heatwaves very highly. The difference in responses between locations for both rainfall flooding and heatwaves was statistically significant ($p<0.01$

for both). Participants from Philly also ranked blizzards and coastal flooding as moderately affected; DelCo participants ranked them as minimally affected. The difference in responses for coastal flooding was statistically significant ($p<0.01$). Participants from both locations ranked fires, gun violence, and terrorism as minimally affected. Still, for fires, the difference was statistically significant ($p=0.01$), with DelCo's ranking being much lower. See **Figure 1a & 1b**.

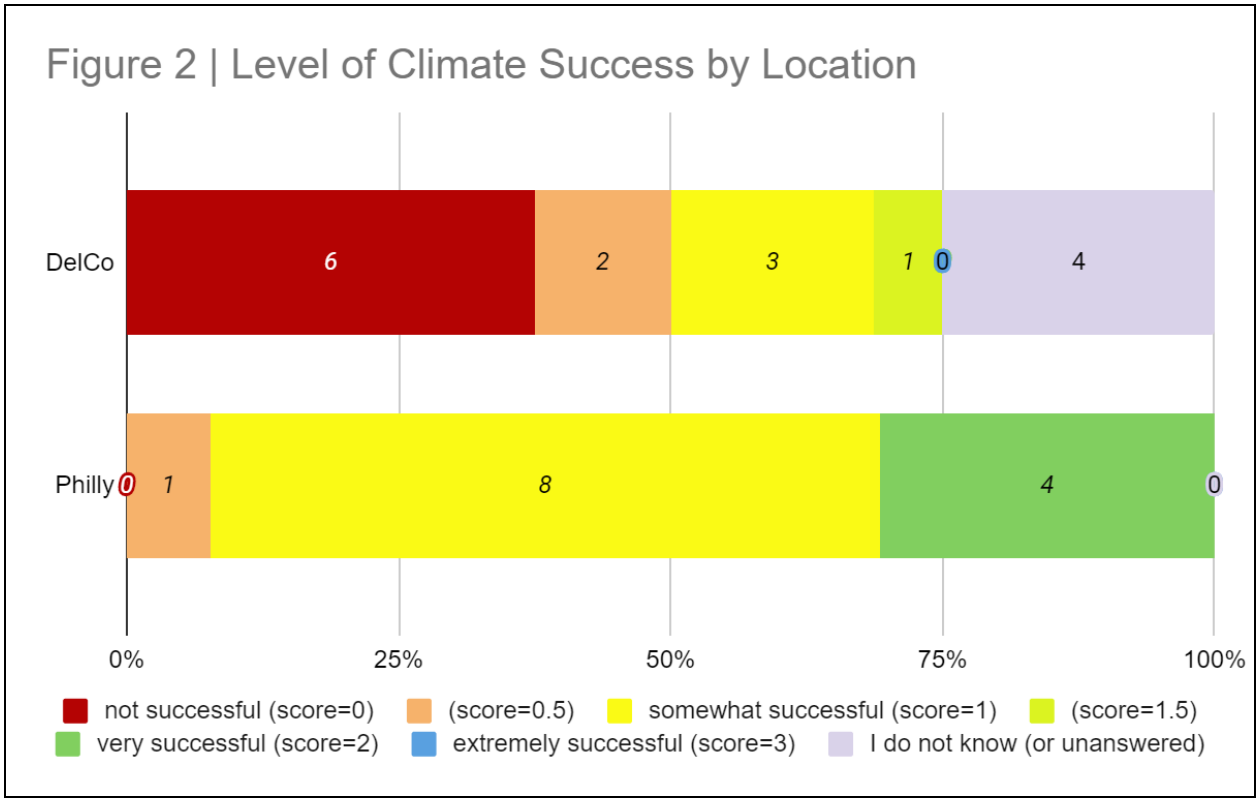
DelCo participants clearly indicated that their county government was not meaningfully considering the impacts of climate change (particularly for coastal flooding, rainfall flooding, and heatwaves), a result which is highly corroborated by the qualitative analysis below.





Government Climate Action Success

Participants were also asked how successful they felt their government had been to date in terms of climate action and mitigation (**Figure 2**). There was a strong indication here that DelCo participants were disappointed in their county government's climate action, rating them as not or minimally successful. Philly participants were somewhat more positive (and the difference in responses was statistically significant at $p<0.01$), but did not rank their city government as particularly successful.



Qualitative Comparison Between Locations
I identify three themes from the qualitative portions of the interviews.

Theme 1: *Participants in each location had consistent views about their own government's climate action to date.*

There was a high amount of internal consistency in opinions among participants from each location. For example, DelCo participants were very clear about their county government's current lack of interest in taking climate action:

> I don't think that the majority of our County Council members take climate change seriously. And there haven't been any substantive efforts at the county level to address it or even to explore it. *(Government participant 6 from DelCo.)*

> I think there have been times where we have seen catastrophic weather events, and there has been perhaps some implied acknowledgement that perhaps climate change is responsible for some of that, but we've never made any sort of official comment or taken any official action that would recognise there being a linkage. *(Government participant 3 from DelCo.)*

Additionally, nearly all DelCo participants tied this inaction to long-standing Republican rule in the county, often calling the party's dominance a "political machine". The importance of an upcoming council election was repeatedly noted. For example:

> Everyone seems to expect that there'll be more [Democrats] added [to County Council] so that they will get the majority of the five seats.[6] So things are going to change. We'll see how it shakes out. *(Civil society participant 2 from DelCo.)*

Philly participants were also quite consistent: they felt that their city government was doing some proactive work with regard to hazard management – but their comments also contained significant criticisms. For example:

> The bottom third of the city is projected to be underwater in some capacity in the next 30 to 50 years. That's the airport. That's the Navy Yard.[7] That's an entire neighbourhood. Like, that's the rail line. What's being done to plan for the protection, if not relocation of that infrastructure? I don't know. I don't get the sense that that's happening. So yeah, I think that we're doing something but I think that a lot more can and should be done. *(Civil society participant 3 from Philly.)*

Many saw the stability of the political systems in Philly as important to the hazard management approach that it has taken to date, as well as leadership from the Mayor and key city departments. For example:

> I think the overall approach endured. And so, even though some of the structures changed, I think there was an ongoing stability that maintained a sense of responsibility for risk management. *(Academia participant 1 from Philly.)*

> 20 years ago, there wasn't an Office of Sustainability… The city's thinking, particularly around climate change, has evolved significantly. And how we've looked at all those individual risk factors [i.e., the present study's hazard list] has evolved as well. *(Government participant 4 from Philly.)*

That said, many felt that Philly struggles with financial resources, leading to an overpriotisation of short-term issues and a lack of preparedness for how climate change will exacerbate existing challenges:

> Sometimes we have trouble looking at the long game of investment when you're trying to solve really drastic, immediate needs. Gun violence, poverty, crumbling infrastructure: we're trying to deal with this now. *(Government participant 1 from Philly.)*

[6] This did come to pass in November 2019, with all 5 seats going Democratic. This was the first Democratic majority of the Council since the 19th century (Bate & Benshoff, 2019).

[7] The Navy Yard is a neighborhood of Philly along the Delaware River.

Theme 2: *Participants in both locations noted important roles of non-governmental actors.*

Participants from both locations commonly referenced the role of local activists, civil society, and the private sector. Particularly among Philly participants, the role of the business community and of the increasing need for private funding to manage worsening hazards was a common theme, tying back to the sense of the city's financial challenges. For example:

> I think that there's a trend that we're seeing where the city is beginning to understand that they can't, and shouldn't, ignore the business community. But I think that their core significant percentage of the business community is also quite resistant, and it's quite traditional. *(Civil society participant 3 from Philly.)*

> Public safety, meaning like police, fire and emergency has come to sort of dominate our budget… But it has kind of led to a scenario where there are very few public dollars for us to spend on anything outside of that. …We are going to have to start engaging the private world more to engage some of these other things like resilience. *(Government participant 5 from Philly.)*

Unlocking such resources is clearly important for local communities, but at the same time – as hinted at by one participant above – there is a concern about becoming increasingly beholden to private interests. Governments will need to adeptly navigate how to invite the private sector more robustly into a holistic governance approach, while also remaining on the path toward deep decarbonisation.

Theme 3: *Participant comments reveal important implications for multilevel governance approaches.*

Participants in both locations felt strongly about the influence of other government scales on their local government's climate action, particularly from the state and federal governments. They explained that higher levels of government offer funding and enforce regulations. As one individual put it:

> With a lot of these, state and federal dollars often follow. So I think they have more of an impact… So when policy changes happen [at the] state or federal level, that results in an increase or decrease in funding that's available to counties. *(Government participant 1 from DelCo.)*

An additional consideration for DelCo is the critical role of subsidiary municipalities:

> I think there are things the county can do, but it's also somewhat limited based on its authority… Municipalities have a lot of the control. And the municipalities, like I said earlier, can vary as far as the resources they have available to them. *(Government participant 2 from DelCo.)*

Despite historical levels of municipal independence, one DelCo participant suggested that the county government could do significantly more to coordinate among municipalities:

> There's not a lot of coordination between the communities… Potentially, there's more that can be done to foster that collaboration… Could also be the county applying to DCNR[8] for funding to help prepare plans together. *(Government participant 2 from DelCo.)*

One could imagine that it would not just be state agencies that the DelCo government could help municipalities to coordinate with – though these are certainly key. For example, they could additionally support coordination with the Delaware Valley Regional Planning Commission (DVRPC)[9] or the federal Environmental Protection Agency.

Case Study Implications

Although there are key differences between the two study locations, taken together the characteristics of the PMA demonstrate a lack of coordination throughout the region (among both governmental and non-governmental actors), jurisdictional confusion among levels of government, and a lack of interest in/capacity for transformative action to meet the demands of the looming climate crisis.

As a telling example, participants in both locations often noted the threat of riparian flooding from slow water rise. The Delaware River borders substantial amounts of public transportation infrastructure, as well as the Philadelphia International Airport (which actually sits in both DelCo and Philly). It is in these two areas' best interests to develop hazard management plans in unison, with support and resources from the DVRPC, state agencies, and federal government, and with input from non-governmental community members. A recent *Climate Action Plan* released jointly by two cities in the state of Florida is a good initial (though perhaps simplistic) example of such an approach (Oakland Park & Wilton Manors, 2019).

Furthermore, the PMA would benefit from a governance network dedicated to sustainability and social justice. Moss et al. (2019), while making a case for continuing the work of the US National Climate Assessment[10], recommend a novel "climate consortium" to include not just state and local governments, but also indigenous nations, community-based organisations, foundations, businesses, universities, and more – with the goal of creating a comprehensive system for managing and communicating climate risk data throughout the country. Such consortia should aim not just to evaluate climate risk and communicate climate science, however, but should actually introduce novel governance structures. As Pelling et al. (2016) write, "governing transformational change requires transformation of governance systems themselves" (p. 5).

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[8] The PA Department of Conservation and Natural Resources (DCNR); in other words, a state agency.

[9] The DVRPC is a federally mandated metropolitan planning organisation that coordinates among both counties and municipalities in Pennsylvania and New Jersey (DVRPC, 2009). The DVRPC offers research, tools, and some funding opportunities in domains such as smart growth, transit development, coastal management, climate change resiliency, and more (DVRPC, 2019).

[10] The National Climate Assessment is a federal, interagency initiative to develop domestic-focused climate science research (NCA, 2018).

Conclusion

The present research on the Philadelphia Metropolitan Area (PMA) is a valuable example of how to synthesise (often siloed) disciplinary perspectives on urban governance for sustainability. The analysis shows that each study location's political trends, financial resources, non-governmental actors, and relationships with other governments are key to their climate planning – and that there is a need for transformative change that incorporates these various actors and factors in innovative ways.

The PMA would benefit from a regional climate consortium – as would many greater metropolitan areas in the US, if not globally. The forms these governance structures take would certainly vary by metropolitan area. Still, the recommendation of better multilevel and increased regional systems likely holds true in innumerable locations.

Both case study locations could coordinate much more actively with state and federal environmental agencies – as well as with the Delaware Valley Regional Planning Commission (DVRPC), which already aims to support PMA counties and municipalities. The Delaware County government could also better harness its county-level role to organise multimunicipal efforts. Additionally, the federal government could coordinate more directly with urban municipalities and counties. This may disrupt standard hierarchies of government jurisdictions, but will be necessary in order for cities to unlock resources and for countries to target essential emissions reductions in their metropolitan areas (Coalition for Urban Transitions, 2019).

Both locations could also do substantially more to harness the power of all local stakeholders. Building up enough trust to productively engage a wide range of stakeholders, however, would require that local governments take the lead in modelling transparent and inclusive practices, and that all stakeholders learn to work with agonistic dialogue (Albrechts, 2015). The establishment of a sustainability or resilience office, especially if empowered to take meaningful climate action, can go a long way in initiating this governance approach.

Delaware County and Philadelphia (and other PMA counties) would also do well to recognise each other as regional partners regardless of shifting political winds or financial resources. In the coming decades, substantial theory developments and field experiments will need to explore unconventional multi-municipal partnerships that can better handle increasing threats posed by climate, pandemic, and other risks. As with the changing relationship between federal and local urban governments, there is a growing need for multi-county and multi-municipal discussions that challenge orthodox understandings of jurisdictional authority. In the PMA, this could be achieved in part by empowering the DVRPC in particular with more financial or legislative authority to support multi-municipal climate initiatives.

A climate consortium would allow for the various types of relationships described in these recommendations – among governments and non-governmental actors; among municipal, county, regional, state, and federal governments; and among the multiple jurisdictions of a greater metropolitan area – to coexist. Future research and other disciplines should build on these recommendations to further develop urban climate governance models in which governments' primary role is to facilitate such coordination, with the direct goal of achieving more sustainable systems. Such models would inherently vary locally; still, as more and more cities achieve transformative regime states, factors will likely arise that tend to instigate

transformation. Further work should also be done to explore case studies of entire metropolitan areas, and to evaluate the impacts of various governance experiments.

It is clear that climate change has made the development of new urban governance models imperative. The coming years will no doubt see a proliferation of experimental collaborations and theoretical frameworks to meet this urgent demand. This case study of the PMA offers a powerful, early unification of concepts from urban studies, ecology, and climate policy that validates the viability of this interdisciplinary perspective.

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