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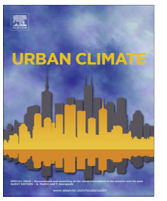

A meta-analysis of urban climate change adaptation planning in the U.S.

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ABSTRACT

The concentration of people, infrastructure, and ecosystem services in urban areas make them prime sites for climate change adaptation. While advances have been made in the development of frameworks for adaptation planning and in identifying both real and potential barriers to action, empirical work evaluating urban adaptation planning processes has been relatively piecemeal. Existing assessments of current experience with urban adaptation provide necessarily broad generalizations based on the available peer-reviewed literature. This paper uses a meta-analysis of U.S. cities' current experience with urban adaptation planning drawing from 54 sources that include peer-reviewed literature, government reports, white papers, and reports published by non-governmental organizations. The analysis specifically evaluates the institutional support structures being developed for urban climate change adaptation. The results demonstrate that adaptation planning is driven by a desire to reduce vulnerability and often catalyzes new collaborations and coordination mechanisms in urban governance. As a result, building capacity for urban climate change adaptation planning requires a focus not only on city governments themselves but also on the complex horizontal and vertical networks that have arisen around such efforts. Existing adaptation planning often lacks attention to equity issues, social vulnerability, and the influence of non-climatic factors on vulnerability. Engaging city governments and communities in adaptation planning – whether to initiate or expand such efforts – may require that adaptation planning is framed to capitalize on their motivation to protect assets and reduce vulnerability.

1. Introduction

Due to past and current greenhouse gas emissions, we are committed to some degree of accelerated climatic change and it is unlikely that emissions will be significantly reduced in the near future (IPCC, 2012; Unruh and Carrillo-Hermosilla, 2006). The high concentration of infrastructure and people in cities leave urban areas in the U.S. particularly vulnerable to changes in precipitation patterns and temperature extremes, placing cities as important sites of climate change adaptation planning. Proactive adaptation in cities can be highly cost effective: the National Institute of Building Sciences estimates that every dollar invested in building resilience and reducing exposure to disaster risks (i.e., adaptation) saves $4 in disaster response and recovery (Multihazard Mitigation Council, 2005). Accordingly, attention to urban climate change adaptation planning has grown among academics, advocates, and practitioners in the U.S. (Cutter et al., 2014; Cruce, 2009;

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Rosenzweig et al., 2010). Advances have subsequently been made in developing frameworks for adaptation planning and identifying both real and potential barriers to action. However, empirical work evaluating urban adaptation planning processes has been relatively piecemeal, and existing assessments (e.g., by the Intergovernmental Panel on Climate Change and the National Climate Assessment) provide necessarily broad generalizations based on the available peer-reviewed literature. We therefore lack detailed understandings of the extent, aims, and implications of urban adaptation planning in the U.S. Such an understanding would help to guide practice and identify promising and useful areas for future research.

Of particular importance is improving our understanding of the institutional changes and strategies that arise as city governments begin adaptation planning and the insights this provides for fostering more action in the future. Adapting to climate change is likely to require that city governments develop new partnerships and identify new funding sources (Bidwell et al., 2013; Birkmann et al., 2010). For example, adaptation may require greater coordination among water services and land use planning departments and the use of long-term climate forecasts. Existing funding sources and levels may be inadequate or unable to be diverted to adaptation activities (Moser and Ekstrom, 2010). Elected decision makers may need to build political support for new projects and policy directions. Taken together, adaptation generates new governance demands and requires institutional strategies able to build and support needed capacities.

This paper uses a meta-analysis of U.S. cities' current experience with urban adaptation planning to provide a better understanding for researchers and practitioners of the institutional support structures being developed for urban climate change adaptation. The contribution of the analysis is unique in that it focuses specifically on collating cities' experiences with institution building for climate change adaptation and, unlike previous assessments, draws from the peer-reviewed literature, government reports, white papers and reports published by non-governmental organizations, and urban adaptation support programs. Specifically, this paper evaluates the (1) motivations and framing of urban climate change adaptation planning; (2) the emerging partnerships and governing arrangements engaged in adaptation planning; and (3) the ways in which urban climate change adaptation planning is financed.

2. Institutional strategies for urban climate change adaptation

Climate change adaptation is an emerging policy and planning area for U.S. cities. Climate change adaptation refers to actions to reduce risk and vulnerability through, "the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2007, p. 6)". Adaptation is often linked to other concepts such as resilience (e.g., Rockefeller Foundation (2009)), climate proofing (e.g., Vrolijks et al. (2011)), and disaster management (e.g., U.S. Environmental Protection Agency (2011)). For example, in San Francisco's climate action plan, "the plan's motivation was framed in terms of San Francisco having a responsibility to do its part in...averting not just global problems, but reducing the city's vulnerability to local impacts (Moser and Ekstrom, 2012, 46)." While we expect that some of what can and will be called climate change adaptation will be unplanned, or reactive instead of proactive, or come from outside of government. Similarly, decisions made at other levels of government can also shape the opportunities and priorities in urban adaptation planning (Amundsen et al., 2010; Betsill and Bulkeley, 2006; Bulkeley and Betsill, 2003). However, this paper focuses on understanding climate change adaptation planning being undertaken by local governments. Therefore, urban adaptation planning is defined here as the purposeful development by local governments of activities and strategies designed to reduce the effects of climate change on natural, built, and social systems.

Previous research presents two perspectives on the extent of urban climate change adaptation planning in the U.S. From one perspective there is evidence that awareness of climate change impacts and the need for adaptation is often high among local managers and decision makers (Tang et al., 2010; Center for Clean Air Policy, 2009; Vrolijks et al., 2011; McIntosh and Cone, 2014; Mozumder et al., 2011b). In addition, most of the adaptation planning that is happening in the U.S. is taking place in cities and at the local level (Bierbaum et al., 2013; Romero-Lankao et al., 2014), raising the importance and visibility of urban adaptation planning. Geographically, examples of adaptation planning can be found in large and small, coastal and inland cities in every major region of the country.

However, a second perspective reveals that the concrete adaptation actions taking place in cities are quite limited and the adaptation "success stories" largely rely on a handful of leaders. Recent surveys of Local Governments for Sustainability (ICLEI) members reveal that, relative to other countries, U.S. cities have the lowest rate of adaptation planning (59% of surveyed cities) (Aylett, 2014), with the vast majority of these (48% of surveyed cities) in the preliminary planning and discussion phases (Carmin et al., 2012). The cities that are undertaking adaptation planning represent a very small fraction (less than 1%) of the total counties, cities, and incorporated areas in the U.S. (Hansen et al., 2013). Adaptation support programs tend to include a small set of early adopters and leaders. For example, several cities are part of both the Rockefeller Foundation's Urban Leaders Adaptation Initiative and ICLEI's Climate Resilient Communities program. The scale of urban adaptation in the U.S. is also low relative to other parts of the world, and a "stubborn gap," exists, "between the rhetoric and reality of local climate policy (Betsill and Bulkeley, 2007)." As a result, much of urban adaptation research in the U.S. remains focused on documenting – rather than critically evaluating – existing adaptation planning by identifying best practices, providing snapshots and highlights of different cities' experiences, and showcasing lessons learned (exceptions include Preston et al. (2011), Tang et al. (2010), and U.S. Environmental Protection Agency (2011)). In many cases, options and possibilities for adaptation have been laid out in a plan but, "few municipalities or regional governments have yet taken the next

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