

Report Part Title: COMPARATIVE ANALYSIS

Report Title: Flood Management Infrastructure in a Changing Climate

Report Subtitle: A Comparative Analysis of London, Rotterdam, New York, and Miami

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COMPARATIVE ANALYSIS

The four cities analyzed in this paper provide a firsthand account of how addressing climate change is part of a larger equation in which complex political, social, economic, and environmental systems interact and shape prospects for sustainable development.¹²²

Extreme weather conditions such as Hurricane Sandy in New York, inherent vulnerabilities in Rotterdam where the land is mostly below sea level, and frequent flooding from high tide, precipitation, and storm surges have increased awareness of climate change and its impacts. In turn, this has provided political leaders with the support to actively respond to the threats of climate change and increase buy-in from diverse segments of the population.

A multilevel governance of various types supports climate change adaptation in these cities.¹²³ Of the cities, Rotterdam is the only one that follows a vertical approach in which national, subnational, and regulatory frameworks directly influence the city's decisions on adaptation. In the two European case studies, high-level national vision, political mandates, and national adaptation plans and strategies provide a framework for accelerating adaptation in cities. At the same time, Rotterdam is a good illustration of the critical role that local governments play in scaling up community adaptation efforts. Across the Atlantic, the US federal government has a much smaller role in the development of the cities' climate visions and strategies. In Miami, efforts to address climate change are primarily undertaken by the county, with the city itself having limited jurisdiction and responsibilities. Conversely, New York makes relatively autonomous decisions, with limited involvement from the state and federal government.

This analysis shows that regardless of the governance structure, the political clout necessary for comprehensive adaptation planning and implementation is first enabled by strong mayoral leadership on climate change issues, commitment to

integrating climate change adaptation in the city's broader development framework strategies, and the sphere of influence outside the city's boundaries. Figure 1 presents the mayoral powers of the four cities.¹²⁴ The degree of political engagement of the city government will also determine the involvement and buy-in of the private sector, including utility providers and small and medium-sized enterprises. The same applies to the local community.¹²⁵

At the operational level, cities have also modified their institutional structures to better address emerging issues such as sustainable development, technological advances, and climate change. In the past ten years, climate change institutional arrangements have been established in local authorities, building on existing ones and acting as coordination mechanisms. They are composed of a spearheading committee, which provides political guidance, and a multiagency technical committee. In addition to addressing the immediate risks associated with infrastructure, a robust coordination mechanism will also help identify trade-offs, synergies, and co-benefits, e.g., between adaptation and mitigation.

In all four case studies, strong scientific input is essential for decision making, addressing urgent, medium- and long-term adaptation needs, and setting ambitious mitigation targets. In this respect, global cities, such as London, New York, and Miami, are clearly at an advantage as they can tap into a pool of world-class experts and institutions, covering a broad range of environmental- and social science-related disciplines. Rotterdam also benefits from hosting a high-caliber climate research program in coastal protection.

However, while data and models have good near-term precision, they are less accurate over planning horizons longer than thirty to fifty years. The three cities and one county (Miami-Dade) realized the necessity of planning for adaptation, even when the best data were not available. Despite limited access to cutting-edge

cities and taking steps to urge state and federal governments to enact climate policies.

122 "Home," Meridian Institute, <http://www.merid.org>.

123 "Home," Connecting Delta Cities, <http://www.deltacities.com>.

124 Arup and C40 Cities, *Climate Action in Megacities: C40 Cities Baseline and Opportunities*, Volume 2.0, 2014, http://www.c40.org/blog_posts/CAM2.

125 Headwaters Economics, *Implementing Climate Change Adaptation: Lessons Learned from Ten Examples*, February 2012, https://headwaterseconomics.org/wp-content/uploads/Climate_Adaptation_Lessons_Learned.pdf.

Figure 1. Mayoral powers on areas relating to flood management infrastructure

LONDON				
Finance and economy				
Water				
Urban and land use				
ROTTERDAM				
Finance and economy				
Water				
Urban and land use				
NEW YORK				
Finance and economy				
Water				
Urban and land use				
MIAMI CITY				
Finance and economy				
Water				
Urban and land use				

	Strong powers
	Partial powers
	Limited powers

Source: Adapted from the C40 website, available at <http://www.c40.org/> cities, and complemented by the findings of this paper, in particular for the case of Miami, which is not a member of the C40.

information, the four locations were in agreement that they would have started planning for adaptation regardless, focusing on no-regrets options. They have adopted risk management approaches with respective degrees of flexibility to make room for necessary adjustments as the understanding of climate change and its impacts improves over time. More specifically, New York, London, and Rotterdam have developed adaptation pathways as a tool to explore and

sequence possible adaptation decisions and actions over time. This entails a dynamic sequence of analysis and action followed by evaluation, further analysis, and refinement.¹²⁶ In all cities, planning for flood management takes into consideration the interface between the cities' administrative boundaries and the adjacent areas. New York also proposes tailored climate responses for each of its areas/boroughs.

¹²⁶ Rosenzweig, Solecki, Blake, Bowman, et al., "Developing Coastal Adaptation to Climate Change in the New York City Infrastructure-Shed."

Figure 2. Climate risks and actions taken by cities

	London	Rotterdam	New York	Miami City/ Miami-Dade County
Flood (river, flash, and/or permanent inundations)	■■■	■■■	■■	■■■
Coastal flood	■■■■	■■■■	■■	■■
Storm (rain storm and/or severe wind)	■	■■■■	■■■	■■■
Water scarcity	■■■	■	■	■

■ Recognized, but not currently being implemented

■■ Currently in effect and being piloted

■■■ Currently in effect at a significant scale across most of the city

■■■■ Currently in effect city-wide

Source: Adopted from the C40 website, available at <http://www.c40.org/cities>, and complemented by the findings of this paper, in particular for the case of Miami, which is not a member of the C40.

Adaptation measures for flood mitigation include a mix of hard engineering solutions (e.g., storm surge barriers, flood defenses, draining and pumping infrastructure), green infrastructure (e.g., green roofs), and policy measures (changes in building codes and zoning). Measures also include the development of innovative tools to further enhance climate-proofing assets.¹²⁷ Several of these measures are in the process of implementation or have already been implemented across the case study cities. Figure 2 provides an overview of the progress made by each city in addressing some of the climate risks affecting flood mitigation infrastructure.

Our analysis indicates that reframing the adaptation discourse can prove to be useful for identifying opportunities to mobilize adaptation funding. In fact, as cities and regional governments take on primary adaptation roles and responsibilities, there is a need for added capital at these levels. Both in the United States and in Europe, many local and regional governments rely heavily on property tax revenue, but if property values depreciate because of increasing flooding risks, or if properties that have increasing flood insurance premiums cannot be sold or have to be abandoned due to sea level rise, city and regional governments could see decreased tax revenue. Decreased tax revenue could mean less availability of funds for adaptation investments. And, although private developers are seeing benefits in creating and marketing new developments such as resilient buildings, the longevity and success of these developments depend on broader municipal and public infrastructure systems being resilient too, in order to truly create adaptive and

resilient communities. The case of Miami is particularly compelling and demonstrates that policy makers should see climate change adaptation as protecting not only people and properties, but also sources of funding for continued adaptation investment.

Initial findings also tend to show that when major national political shifts are likely to affect subnational levels, such as the climate-skeptic federal administration of the United States led by President Donald Trump, cities may have to explore innovative ways to communicate their climate adaptation needs to national-level decision makers. If subnational governments are to protect existing federal support and continue to mobilize the national government funding necessary for large-scale infrastructure investments, climate projects may need to be framed in the context of their other beneficial effects, such as providing poverty reduction, job creation, improved health outcomes, and disaster risk reduction to overcome national-level resistance to climate change-themed projects.

The case studies in this report also highlight the importance of engaging city stakeholders at various stages of the planning and implementation phases. Most of these stakeholders are associated with long-existing public, private, and community networks and organizations. They can also represent more recently founded networks, in particular those whose primary mission is to combat climate change, such as the London Climate Change Partnership. Careful consideration needs to be given to the engaged organizations and networks to ensure that the needs

¹²⁷ "Home," Connecting Delta Cities, <http://www.deltacities.com/>.

of the most vulnerable segments of the population are fully taken on board. Similarly, the engagement should go beyond simple consultations to sustain public participation. While all cities recognize the added threat to vulnerable low-income populations, the majority of flood protection infrastructure investments are going to wealthier neighborhoods, creating protections for high-end coastal properties that bring in higher tax revenue and exacerbating inequality. By placing its inhabitants at the center of its adaptation strategy, Rotterdam offers practices that can be replicated in other cities.

Cities are increasingly engaged in international climate change forums. Leaders of cities such as New York, London, and Rotterdam have been instrumental in raising awareness of the role and responsibility of local governments in the fight against climate change. Cities' leadership roles are fostered through national and international city networks like the C40 and

ICLEI, which provide platforms for sharing lessons learned and best practices, forging partnerships, and bringing cities into the formal international discourse on climate change. The Paris Agreement gives visibility to subnational leadership;¹²⁸ the adoption and entry into force of the agreement has provided additional momentum and empowerment to cities as they continue to scale up their adaptation and mitigation action.

Against this backdrop and regardless of the supranational and national political contexts, cities with relatively high GDP, like the case studies, are unlikely to stop their climate efforts.¹²⁹ On the contrary, with sustained political leadership at the city/county level and strengthened international partnerships, these cities are likely to continue to enact progressive climate change policies and will strive to address, at the very least, their urgent adaptation needs.

128 United Nations, *Report of the Conference of the Parties on Its Twenty-First Session, Held in Paris from 30 November to 13 December 2015*, "Addendum: Part Two: Action Taken by the Conference of the Parties at Its Twenty-First session," January 29, 2016, <https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf>.

129 Wong, "Bloomberg Says Cities Will Fight Climate Change, with or without Trump."