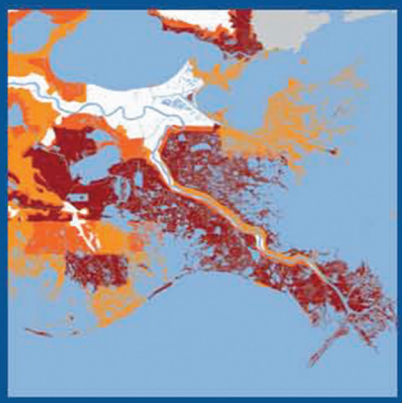
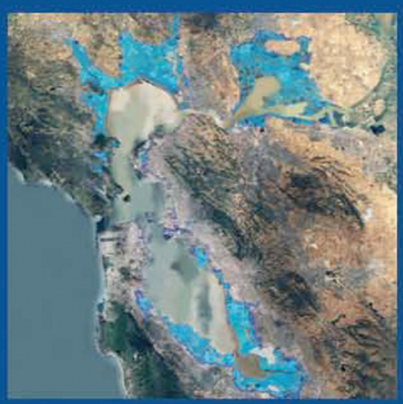
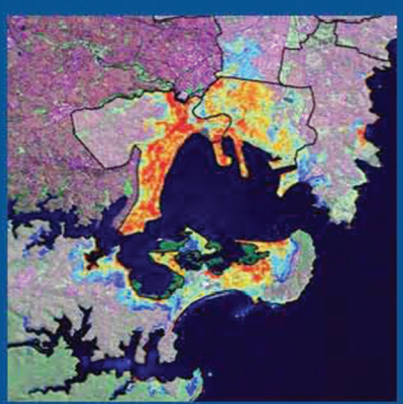
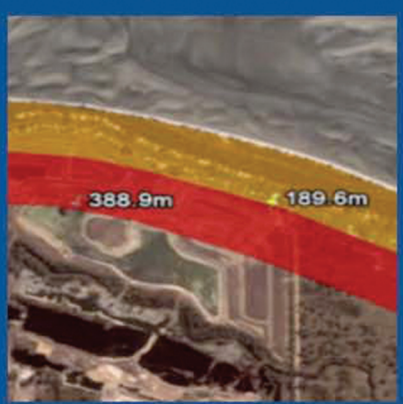


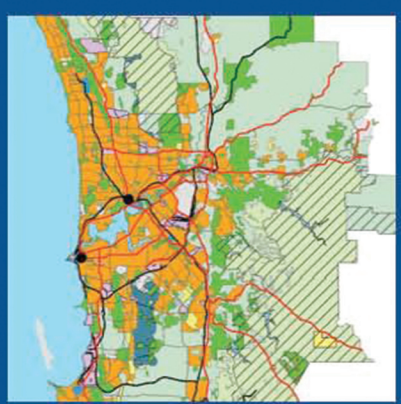


Resilient Coastal City Regions


Planning for Climate Change in the United States and Australia



Edited by **Edward J. Blakely** and **Armando Carbonell**

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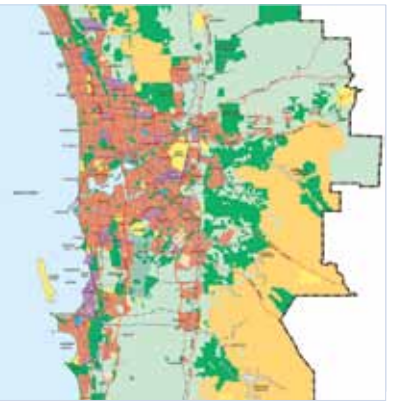

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Sea level maps:
The maps of the United States, Australia, and the nine coastal regions were prepared by Jeremy Weiss, senior research specialist, and Jonathan T. Overpeck, professor, Department of Geosciences, University of Arizona, Tucson. www.geo.arizona.edu/dgesl/

An explanation of how Weiss and Overpeck developed the elevation datasets of low-lying coastal areas is available in: J. L. Weiss, J. T. Overpeck, and B. Strauss. 2011. Implications of recent sea level rise science for low-elevation areas in coastal cities of the conterminous U.S.A. *Climatic Change* 105: 635–645.

On each map, the dark blue overlay areas indicate low-lying coastal areas of $\leq$ 1 meter elevation vulnerable to future sea level rise.

Cover images are details of figures and photographs as follows: top (left to right): figures 1.4, 2.5b, and 3.2; middle: aqueduct, Central Valley, CA (chapter 4), figure 5.3, and Yarra River pollution plume (chapter 6); bottom: figures 7.5, 8.7, and 9.2

CONTENTS

Introduction

Climate Change and Coastal City Regions

Armando Carbonell and Edward J. Blakely

This book reports on responses to climate change in nine coastal cities and metropolitan regions in the United States and Australia. When it comes to climate change, these large, sprawling countries have much in common beyond their predilections for coastal development. First, per capita they are among the highest greenhouse gas (GHG) emitters in the developed world, with Australia usually heading the list and the United States close behind. Second, both countries are exposed to significant climate-related risk relative to sea level rise and storm surge, drought and water shortage, floods, wildfires, and heat waves. The urban regions documented here are exposed to some of the most critical conditions either country faces.

The importance of dealing with potentially severe climate impacts has become increasingly clear. In recent years, we have seen a number of extreme temperature and precipitation events, and climate records were set in countries around the globe. For example, according to the U.S. National Oceanic and Atmospheric Administration (NOAA 2011), in the United States and Australia during 2010 alone:

- The year tied with 2005 as the warmest since record keeping began in 1880. The global combined land- and ocean-surface temperature was 0.62ºC (1.12ºF) above the twentieth-century average of 13.9°C (57.0°F).
- During the first months of the year, a strong negative Arctic Oscillation—a climate pattern that allows chilly Arctic air to slide south while warmer air moves north—brought snowstorms and record cold to much of the Northern Hemisphere. Polar air reached far into the deep-southern United States in January and February. The record cold weather caused ocean temperatures in the Florida Keys to drop below 15ºC (59ºF), bleaching and killing coral reefs, which cannot survive sustained cool water temperatures.
- In the Southern Hemisphere, Australia's Bureau of Meteorology reported its warmest summer on record, with an average temperature 0.2ºC (0.4ºF) higher than the previous record set during the summer of 1997/1998. Australia also experienced its coolest winter in 13 years.

- La Niña brought record rainfall to most of Australia toward the end of the year. The country had its wettest spring on record (from September through November). In contrast to the rest of the country, however, southwestern Western Australia had its driest spring on record.
- In September, following its second-coolest summer on record, the western United States experienced a scorching heat wave during which downtown Los Angeles reached the highest temperature ever recorded there: On September 27, the temperature reached 45ºC (113ºF), breaking the old record of 44.4ºC (112ºF) set on June 26, 1990.

In terms of cost impacts, eight of the ten most expensive presidentially declared disasters in the United States were storm-related (FEMA 2010):

Most Expensive Presidentially Declared Disasters*

Event	Year	FEMA Funding
Hurricane Katrina (FL, LA, MS, AL)	2005	$29,318,576,948**
9/11 Attack on America (NY, NJ, VA)	2001	$8,818,350,120
Northridge Earthquake (CA)	1994	$6,978,325,877
Hurricane Rita (TX, LA)	2005	$3,749,698,351
Hurricane Ivan (LA, AL, MS, FL, NC, GA, NJ, PA, WV, NY, TN)	2004	$2,431,034,355
Hurricane Georges (AL, FL, MS, PR, VI)	1998	$2,245,157,178
Hurricane Wilma (FL)	2005	$2,110,738,364
Hurricane Charley (FL, SC)	2004	$1,885,466,628
Hurricane Andrew (FL, LA)	1992	$1,813,594,813
Hurricane Frances (FL, NC, PA, OH, NY, GA, SC)	2004	$1,773,440,505

** Numbers are in actual dollars, not adjusted for inflation.*

*** Approximately 68 percent funded.*

Similarly, in Australia the last decade has seen tens of billions of dollars in damage from floods in Brisbane and Victoria, fires in Melbourne and Canberra, and Cyclones Yasi and Larry.

This book deals with both *mitigation* (the reduction of GHG emissions) and *adaptation* (managing the climate-impact risks that cannot be avoided), as the terms are generally used in this field. Stern (2007, 24) has laid out the mitigation dilemma:

> Much economic activity involves the emission of GHGs. As GHGs accumulate in the atmosphere, temperatures increase, and the climatic changes that result impose costs (and some benefits) on society. However, the full costs of GHG emissions, in terms of climate change, are not immediately—indeed they are unlikely ever to be—borne by the emitter, so they face little or no economic incentive to reduce emis-

> sions. Similarly, emitters do not have to compensate those who lose out because of climate change. [Symmetrically, those who benefit from climate change do not have to reward emitters.] In this sense, human-induced climate change is an externality, one that is not "corrected" through any institution or market [Pigou 1912], unless policy intervenes.

The Lincoln Institute of Land Policy initially became involved in the issue of climate change through our work with planning directors in the 30 largest cities of the United States. As early as 2006 these city planners were raising a new question: How do we respond when our mayors ask about global warming?

In 2005 as the Kyoto Protocol was going into effect—before Nicholas Stern (2007, i), in his important review, declared climate change the "greatest and widest-ranging market failure ever seen," or the fourth report of the Intergovernmental Panel on Climate Change (IPCC 2007) laid out in stark terms the consequences of inaction—many big-city mayors had joined with those from more than 1,000 other municipalities in signing the U.S. Conference of Mayors Climate Protection Agreement, launched by Seattle Mayor Greg Nickels. Other mayors had joined the pioneering ICLEI (now Local Governments for Sustainability) Cities for Climate Protection. Still others were working with either the Clinton Climate Initiative or the C40 Cities Climate Leadership Group, two efforts to help large cities reduce their GHG emissions that since have merged. The planning directors' queries led to a series of briefings in Cambridge, Massachusetts, at a 2007 seminar that was part of an annual program convened by the Lincoln Institute in collaboration with the American Planning Association and the Graduate School of Design at Harvard University.

Around the same time, the Lincoln Institute commissioned longtime colleague Edward J. Blakely to write a working paper on the topic of urban planning for climate change (Blakely 2007), shortly before he was called to New Orleans to head the city's post–Hurricane Katrina recovery effort. Working with other North American colleagues, the Institute also published two policy focus reports on related topics: *Urban Planning Tools for Climate Change Mitigation* (Condon, Cavens, and Miller 2009) and *Planning for Climate Change in the West* (Carter and Culp 2010).

The present volume has benefited from Ed's experiences in the trenches in New Orleans, Australia, and elsewhere, Armando's seminars on climate change and cities, and the studio on Climate Change, Water, Land Development, and Adaptation that he taught at the Harvard Graduate School of Design, with sponsorship support from the Dutch government. But above all, this book is the work of the contributing authors from the United States and Australia, who diligently prepared their chapters, brought them to Cambridge to be critiqued in a seminar in 2010, and provided revisions and updates throughout the copyediting and book design process. Some of the U.S. authors also traveled to Perth

in Western Australia to meet with Ed Blakely and several of the Australian authors to present our findings at the World Planners Congress in July 2011.

At least from the vantage point of the United States, it appears that the pendulum has swung from an initial emphasis on mitigation, as reflected in the mayors' initiatives in response to the Kyoto Protocol, to one focusing on adaptation, as cities begin to prepare for the onslaught of climate-related impacts. The nine cases presented in the following chapters show a range of adaptation responses. As we will consider in the concluding chapter, however, in order to avoid catastrophic results it remains necessary to reduce GHG emissions significantly. While there are encouraging developments at the national level in Australia, recent analysis suggests that the time for action is critically short. It remains to be seen whether governments will rise to meet the global challenge.

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