



# Cities and Climate Change



# Cities and Climate Change

372/4391  
Leibniz Universität Hannover  
Institut für  
Meteorologie und Klimatologie  
Herrenhäuser Str. 2 · 30419 Hannover



## Table of Contents

Acronyms and Abbreviations .....	12
Executive Summary .....	17
Introduction .....	29
<b>Part I</b>	
<b>Trends</b>	
<b>Chapter 1. Urbanisation, Economic Growth and Climate Change</b> .....	<b>37</b>
The worldwide urbanisation process .....	39
Cities and economic concentration .....	44
Economic growth, energy use and greenhouse gas emissions .....	47
The urban form matters – the impact of sprawl .....	53
Notes .....	60
Bibliography .....	60
<b>Chapter 2. Climate Change Impacts Specific to Urban Regions</b> .....	<b>63</b>
Urban climate impacts and vulnerabilities .....	65
Coastal flooding risks .....	67
Precipitation and storm impacts .....	68
Heat impacts and heat-island effects .....	70
Effects of increased drought and water scarcity .....	73
The costs of urban inaction .....	74
Notes .....	75
Bibliography .....	76
<b>Chapter 3. Economic Benefits of Climate Action: The Urban Dimension</b> .....	<b>81</b>
Effects of urban policies on global energy demand and carbon emissions .....	83
Environment and economic growth at the urban scale: From trade-offs to policy complementarity .....	85
Other benefits of urban climate policies .....	88
Notes .....	92
Bibliography .....	92
Annex 3.A1. Computable General Equilibrium Model of Cities and Climate Change: IMACLIM-R and OECD Metropolitan Database ...	94

*Part II*  
**Competitiveness Policies**

<b>Chapter 4. The Urban Policy Package</b> .....	105
Urban governance and policy complementarities .....	107
Density and spatial urban form in combating climate change .....	130
Strategic urban planning for climate change .....	135
Notes .....	139
Bibliography .....	140
<b>Chapter 5. Contribution of Cities to a Green Growth Model</b> .....	145
Facilitating job creation through green growth: The role of cities and regions ....	147
Systemic changes through regional eco-innovation. ....	160
Notes .....	164
Bibliography .....	166

*Part III*  
**Governance**

<b>Chapter 6. Multi-level Governance: A Conceptual Framework</b> .....	171
Methodology and key questions to structure the analysis .....	175
Notes .....	177
Bibliography .....	177
<b>Chapter 7. Local and Regional Governance</b> .....	179
The public policy process: The planning behind climate change action plans and policies .....	181
Collaboration between municipalities and regional government. ....	190
Notes .....	193
Bibliography .....	194
<b>Chapter 8. Local-National Climate Policy Linkages</b> .....	197
Main rationale for local-national policy linkages .....	199
Institutional models: Local-national co-operation on climate change .....	202
Incorporating climate change into existing national, regional and urban development frameworks .....	213
Addressing national barriers to local action .....	219
Summary points. ....	221
Notes .....	222
Bibliography .....	223
<b>Chapter 9. Financial Instruments and Funding New Expenditure Needs</b> .....	227
Financial instruments and incentives .....	229
New urban expenditures and new funding sources .....	241
An optimal mix of revenue sources. ....	246

Notes .....	247
Bibliography .....	247
<b>Chapter 10. Building Institutions to Enhance Local Knowledge and Strengthen Action.....</b>	<b>251</b>
Analytic-deliberative capacity and policy networks.....	253
Developing the toolbox to harness city-scale decision making .....	255
Urban policy networks and climate change.....	263
Summary points.....	268
Notes .....	271
Bibliography .....	272
<b>Tables</b>	
1.1. Categories of urban energy use .....	51
1.2. Total GHG emissions, including end-use, life cycle, and within city measures, for ten world cities .....	53
2.1. Cities are highly concentrated in coastal zones .....	67
3.1. GDP changes under implementation of alternative climate policy packages... ..	89
3.2. Related aims and co-benefits of sector policies to reduce GHGs at urban scale .....	90
4.1. Urban sectoral interactions: Potential for climate policy complementarity and tradeoffs.....	109
4.2. Policy tools for local-level action on climate change .....	128
4.3. Compact city characteristics.....	131
4.4. Policy instruments to manage urban sprawl .....	135
5.1. Green firms and green jobs.....	149
5.2. Top innovators in renewable energy, counts of patents by region (2004-07) . . . .	161
8.1. Climate change and multi-level governance: Key actors, functions and tools at different scales of action .....	200
8.2. Overview of Swedish National Local Climate Programme .....	210
8.3. Frameworks and institutional models of multi-level governance on climate change .....	215
8.4. Examples of antagonistic interplays among adaptive sectoral policies with respect to adaptive responses: A bottom-up perspective .....	220
8.5. National <i>versus</i> local strengths putting principles of good governance into practice .....	222
9.1. Financial instruments in selected city's climate change plans.....	230
9.2. Main urban congestion charges in operation and their environmental outcomes .....	238
10.1. Selected city-scale GHG inventory reports: Comparison of key features.....	258
10.2. Institutional models for climate change information development and exchange .....	264
<b>Figures</b>	
1.1. Urban and rural population in the world and the OECD .....	39
1.2. Trends in urbanisation by continent .....	40

1.3. Population growth in OECD regions . . . . .	41
1.4. Urbanisation in OECD countries . . . . .	42
1.5. Urban concentration in Europe . . . . .	42
1.6. Urban concentration in Asian OECD countries . . . . .	43
1.7. Urban concentration in North America . . . . .	44
1.8. Urbanisation and city size . . . . .	45
1.9. Population growth in OECD metropolitan areas . . . . .	46
1.10. Urbanisation and income . . . . .	47
1.11. Factors determining per capita GDP differentials . . . . .	48
1.12. Economic concentration in Europe . . . . .	49
1.13. Economic concentration in Japan and Korea . . . . .	49
1.14. US energy consumption by sector (1949-2008) . . . . .	51
1.15. Total energy consumption in OECD countries (2007) . . . . .	52
1.16. Carbon emissions in US cities . . . . .	54
1.17. Urban sprawl . . . . .	54
1.18. Suburbanisation in OECD metropolitan regions . . . . .	55
1.19. Urbanisation and electricity consumption . . . . .	56
1.20. Urban density and electricity consumption . . . . .	57
1.21. Urbanisation and carbon emissions . . . . .	57
1.22. Urban density and carbon emissions in transport . . . . .	58
1.23. Urbanisation, density and carbon emissions . . . . .	58
1.24. CO <sub>2</sub> emissions in the OECD . . . . .	59
1.25. Concentration of carbon emissions in the United States . . . . .	59
2.1. Top 20 port cities' exposed assets (a) and exposed population (b) . . . . .	69
2.2. Apparent southward shift of European cities due to climate change (2070-2100) . . . . .	71
3.1. Energy demand with a densification policy . . . . .	84
3.2. Carbon emission reductions with a densification policy . . . . .	84
3.3. Economic growth with local policies . . . . .	85
3.4. Trends in carbon emissions under a 450 ppm urban climate policy scenario compared with the baseline . . . . .	88
3.5. Attractiveness and carbon emissions related to automobiles across metropolitan regions . . . . .	89
3.6. Changes in attractiveness and local pollution emissions across metropolitan regions . . . . .	90
3.A1.1. Economic impact of a climate policy alone using the baseline scenario . . . . .	102
4.1. Urban sectoral interactions: Impact on other sectors' climate policies . . . . .	110
4.2. Projected CO <sub>2</sub> emissions reductions in London (2008-2025) . . . . .	137
4.3. Breakdown of projected reductions in London's CO <sub>2</sub> emissions by energy efficiency and energy supply savings (2008-2025) . . . . .	138
5.1. Percentage share of recycling sector employees among total employees in 2001 and 2006 . . . . .	153
5.2. Employment effects of renewable energies . . . . .	155
5.3. Estimated levelised cost of generation, various technologies . . . . .	156
7.1. Stages in the public policy process . . . . .	181
8.1. Multi-level governance framework for cities . . . . .	207
9.1. Main revenue sources of selected cities within the OECD . . . . .	231

9.2. Main taxes of selected cities within the OECD.....	231
9.3. National, state and local motor vehicle taxes in unitary OECD countries (2006).....	234
9.4. National, state and local fuel taxes in unitary OECD countries (2006).....	235
9.5. National and sub-national expenditures on environmental protection in OECD countries (2005).....	242
10.1. Boundaries for GHG emissions accounting: Direct and indirect emissions (US, by sector, 2007) .....	259

This book has...



**StatLinks** 

**A service that delivers Excel® files  
from the printed page!**

Look for the *StatLinks* at the bottom right-hand corner of the tables or graphs in this book. To download the matching Excel® spreadsheet, just type the link into your Internet browser, starting with the **<http://dx.doi.org>** prefix.

If you're reading the PDF e-book edition, and your PC is connected to the Internet, simply click on the link. You'll find *StatLinks* appearing in more OECD books.