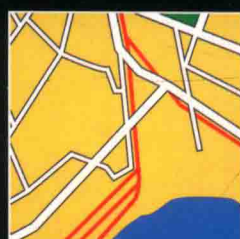
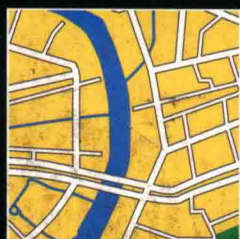
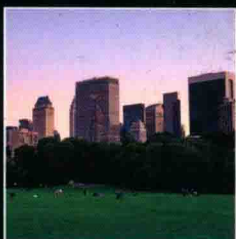
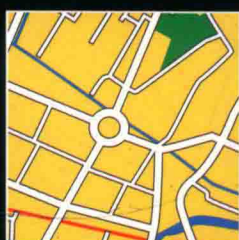
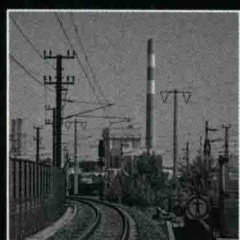
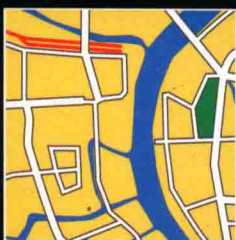
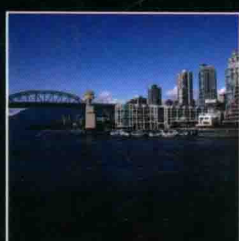
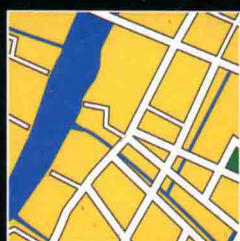
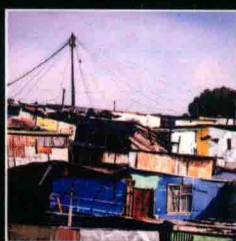


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Assessing Urban Energy



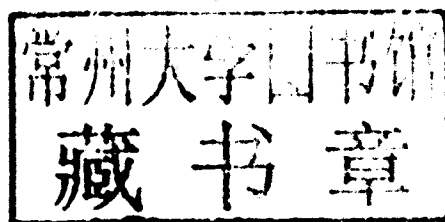
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ENERGIZING SUSTAINABLE CITIES

Assessing Urban Energy

*Edited by
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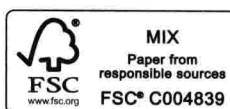
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ENERGIZING SUSTAINABLE CITIES

Urban systems now house about half of the world's population, but determine some three-quarters of the global economy and its associated energy use and resulting environmental impacts. The twenty-first century will be increasingly urban. Sustainable development therefore needs first to be defined and analyzed, and then realized in urban settings. Energy is one of the key challenges, but also one of the key opportunities in the required urban sustainability transition.

The book is the result of a major international effort to conduct the first comprehensive assessment of energy-related urban sustainability issues conducted under the auspices of the Global Energy Assessment (GEA). The assessment is also unique in that it embeds energy issues into the broader sustainability agenda of cities: including housing for the poor, functional transport systems, as well as environmental quality, in addition to the challenges imposed by climate change.

Written by an eminent team of internationally renowned scholars, it presents new data, new analysis, as well as new policy insights. It includes the first comprehensive global coverage overview of urban energy use and of the specifics of urban energy demand and supply. Major development and sustainability challenges of cities are assessed in detail and public and private sector opportunities and constraints of a sustainability transition examined. Technological and policy options are put in a much-needed context in terms of their respective roles as drivers of urban energy demand as well as potentials for reductions in energy use and associated emissions of local pollutants as well as greenhouse gases. The analysis presents both a comprehensive literature review as well as novel, spatially explicit models of integrated urban energy policy analysis. The volume concludes with a summary assessment of policy options, priorities as well as paradoxes.

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David Fisk is a co-director of the BP Urban Energy Project, and holds the Laing O'Rourke Chair in Systems Engineering and Innovation at Imperial College London.

Plates

- 1 Rank-size distribution of cities in the world, AD 900 to 2000
- 2 Estimates of global urban population (billions) and fraction urban AD 900–1950
- 3 Urban population of the 10 largest cities, by continent, in millions, AD 900 to 1800 and 1900–2000
- 4 Population by residence and settlement type (millions). Historical (1950–2005) and projection data (to 2050)
- 5 Total GHG emissions from Toronto
- 6 Per capita (direct) final energy consumption (TFC) (GJ) versus cumulative population (millions) in urban areas ($n=160$) of Annex-I (industrialized) countries
- 7 Per capita (direct) final energy consumption (TFC) (GJ) versus cumulative population (millions) in urban areas ($n=65$) of non-Annex-I (developing) countries
- 8 Example of assessing local renewable potentials: suitable roof-area identification for solar PV applications Osnabrück (Germany)
- 9 Spatially explicit energy demand densities in Europe (W/m^2), indicating where local renewables can satisfy low-density energy demand ($<0.5\text{--}1\text{ W}/\text{m}^2$). Distribution of population and final energy demand (%) as function of energy demand density classes in W/m^2 for Western and Eastern Europe
- 10 Sensible and latent anthropogenic heat emission in Tokyo (W/m^2)
- 11 Energy and exergy flows in Vienna (2007) between secondary and useful energy/exergy
- 12 Modal split for cities and towns on all continents
- 13 Modal split of journeys to work in medium-sized towns with population below 1 m. people and in cities with population above 1 m. people in high-income economies (2001 and 2004 and selected time trends since 1960)
- 14 Urban layouts: assumed mononuclear city, a compact city with high-density housing, a sparse city with low-density housing
- 15 Human risk exposure to PM10 pollution in 3,200 cities worldwide
- 16 Urban concentrations of PM10 and NO_2 concentration in Asian cities (2008)

Figures

2.1	Ratio of agricultural to non-agricultural workforce and rural to urban population for England and Wales, United States, Japan, and Brazil	20
2.2	Rank-size distribution of cities in the world, AD 900 to 2000	21
2.3	Estimates of global urban population (billions) and fraction urban AD 900–1950	22
2.4	Urban population of the 10 largest cities, by continent, in millions, AD 900 to 1800 and 1900–2000	22
2.5	Global urban and rural population (in millions)	27
2.6	Regional scenarios of urban and rural population (millions). Historical trends 1950–2005 and scenarios to 2100 for five world regions (in millions)	27
2.7	Population by residence and settlement type (millions). Historical (1950–2005) and projection data (to 2050)	29
3.1	Rank-size distribution of global cities	33
4.1	Estimates of direct (final) versus embodied (via imports of goods and services) energy use of Asian megacities	48
4.2	Comparison of scope for the regional production approach and household consumption approach	49
4.3	Total GHG emissions from Toronto	53
5.1	Per capita (direct) final energy consumption (TFC) (GJ) versus cumulative population (millions) in urban areas ($n=160$) of Annex-I (industrialized) countries	65
5.2	Per capita (direct) final energy consumption (TFC) (GJ) versus cumulative population (millions) in urban areas ($n=65$) of non-Annex-I (developing) countries	65
5.3	Comparison of urban total final energy consumption (TFC) and urban income (GRP/GDP at PPP in Int. \$2005) per capita for cities in Annex-I and non-Annex-I countries	67
5.4	Comparison of urban energy intensity and urban per capita income (at PPP) for cities in Annex-I and non-Annex-I countries	68
5.5	Rank-size distribution of urban energy use	69
6.1	Nations' per capita GDP against percentage of urban population using wood/charcoal for cooking	81
6.2	Nations' per capita GDP against percentage of urban population with electricity	87
7.1	Energy densities of energy supply from fossil and renewable sources versus density of energy demand for typical settings (in W/m^2 and m^2 area)	96
7.2	Energy-demand densities (W/m^2) for London (33 boroughs) and Tokyo (1 km^2 grid cells, 23 wards) versus cumulative energy use of these spatial entities (in joules)	97
7.3	Example of assessing local renewable potentials: suitable roof-area identification for solar PV applications for Osnabrück (Germany)	98
7.4	Spatially explicit energy demand densities in Europe (W/m^2), indicating where local renewables can satisfy low-density energy demand ($<0.5\text{--}1 \text{ W/m}^2$). Distribution of population and final energy demand (%) as function of energy demand density classes in W/m^2 for Western and Eastern Europe	100

7.5	Human exposure to sulfur emissions in China (2000)	101
7.6	Sensible and latent anthropogenic heat emission in Tokyo (W/m^2)	102
7.7	Estimated urban heat island intensity in large Asian cities	103
7.8	Daily electric power demand and maximum temperature (Tokyo, 1998)	104
9.1	Per capita energy use versus income for a sample of Chinese cities (2006), illustrating path dependency	122
9.2	Longitudinal trends in final energy (GJ) versus income (at PPP, in Int. \$ 1990) per capita for six megacities	122
9.3	Full per capita energy accounting for both direct and embodied energy flows of Singapore (in GJ/capita)	124
9.4	CO_2 balance of Tokyo (1990, 1995, and 2000) using I–O analyses (million tons CO_2)	125
9.5	Energy and exergy flows in Vienna (2007) between secondary and useful energy/exergy	128
9.6	Contribution of factors to changes in energy-related CO_2 emissions (million tonnes CO_2) for four Chinese cities	134
10.1	Modal split for cities and towns on all continents	137
10.2	Modal split of journeys to work in medium-sized towns with population below 1m. people and in cities with population above 1 m. people in high-income economies (2001 and 2004 and selected time trends since 1960)	139
10.3	Average energy use per capita in transport (average for countries/regions in 1991 and for selected global cities in 2001) versus share of private motorized transport in modal split	140
10.4	Relation of urban density and share of private motorized transport modes (calculated from total mobility, including non-motorized modes) for individual cities and regional average cities	142
10.5	Dynamic negative feedback effects between urban sprawl, car traffic, the quality of the environment, and viability of neighbourhood stores in urban areas	143
10.6	Cost-effectiveness of policy measures to reduce transport fossil energy use and absolute and relative reduction potentials for Austria, by measure (2005)	147
11.1	Urban layouts: the assumed mononuclear city, a compact city with high-density housing, a sparse city with low-density housing	158
11.2	Energy use for five alternative urban designs by major energy level and type	160
11.3	Total life-cycle costs (capital plus fuel) of five city designs indexed to sparse city	161
12.1	Trends of major criteria air pollutants (1993–2009) for selected Asian cities	165
12.2	Human risk exposure to PM10 pollution in 3,200 cities worldwide	166
12.3	Urban concentrations of PM10 and NO_2 concentration in Asian cities (2008)	168
12.4	Overview of vehicle emissions standards, Europe versus Asia	169
12.5	RECLAIM's impacts on emissions in SCAQMD area of California on NO_x and SO_x emissions versus allowable emission cap (RTCs) (in tons)	171

Boxes

2.1	Urbanization projections methodology	26
2.2	Shrinking cities	29
4.1	Urban energy data: measurement and quality issues	55
8.1	Zero-carbon cities	113
9.1	Singapore: the importance of trade	124
9.2	Urban exergy analysis: efficiency – how far to go?	127
11.1	The SynCity toolkit	157

Tables

2.1	Various indicators of urbanization for year 2000 at global level in absolute amounts	19
2.2	Urban total population (millions) and as a percentage of world total urban population, and total population (in millions) for five world regions and the world since 1950	24
2.3	Population in urban locations by city size class (2005)	28
4.1	Overview of urban energy-accounting frameworks	43
4.2	Energy and material flows of selected cities showing the importance of energy flows in the total metabolism of cities	46
4.3	Results for two different energy-accounting approaches for three cities for which (partial) data are available: Melbourne, London, and Beijing	51
5.1	Estimates of urban (direct) final energy use (including traditional biomass) for the GEA regions and the world (2005)	60
5.2	Comparison of per capita urban final energy (GJ/capita), GRP or GDP (Int. \$2005/capita) and energy intensity (MJ/Int. \$) statistics (number of observations and indicator values) at the urban compared to national levels	62
6.1	The housing submarkets used by low-income urban dwellers and their energy-use implications	76
6.2	The proportion and number of the urban population that lacks electricity and access to 'modern fuels' in developing countries, least-developed countries, and sub-Saharan Africa	78
6.3	The main fuels used for cooking in urban areas in developing countries, least-developed countries, and sub-Saharan Africa (% of urban population using particular fuels)	81
6.4	Cooking fuel and access to electricity for urban populations	82
6.5	The cost per household (in current US\$) of providing electricity in different cities	89
6.6	Grouping households in India by amount of energy consumed and energy services available to them (average household of five persons) in Watt-years	92
7.1	Global exposure equivalents to particulate emissions	101
9.1	Comparison of the efficiency of useful exergy to that of secondary and primary exergy	128
10.1	Primary energy use per passenger-kilometre travelled for different modes, characteristic ranges (2005)	140
10.2	Comparison of characteristic capacities of modes (assuming free-flowing traffic), space required with typical occupancy rates at peak-traffic hours, infrastructure costs in urban settings, and maximum accepted distance for daily trips	141
10.3	Estimates of external costs of road traffic and rail transport for passengers and freight in Austria and Germany (2005)	144
10.4	Overview of bundles of policy measures analysed in an illustrative cost-effectiveness study on the reduction of fossil energy use of motorized transport in Austria	146

11.1	Primary energy use of five alternative urban designs for a town of 20,000 inhabitants.	159
12.1	Number of cities and residing population categorized by ambient PM10 WHO air quality standards	167
12.2	Classification of urban air-quality management capacity in Asian cities	172

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Contents

<i>List of plates</i>	<i>vii</i>
<i>List of figures</i>	<i>ix</i>
<i>List of boxes</i>	<i>xi</i>
<i>List of tables</i>	<i>xiii</i>
<i>Notes on contributors</i>	<i>xv</i>
1 Introduction and overview	1
ARNULF GRUBLER AND DAVID FISK	
PART I The urbanization context	15
2 Urbanization past and future	17
ARNULF GRUBLER AND THOMAS BUETTNER	
3 Urbanization dynamics	31
DAVID FISK	
4 City walls and urban hinterlands: the importance of system boundaries	41
JULIA STEINBERGER AND HELGA WEISZ	
5 Urban energy use	57
ARNULF GRUBLER AND NIELS B. SCHULZ	
PART II The urban challenges	71
6 Energy access and housing for low-income groups in urban areas	73
DAVID SATTERTHWAITE AND ALICE SVERDLIK	
7 Energy demand and air pollution densities, including heat island effects	95
NIELS B. SCHULZ, ARNULF GRUBLER AND TOSHIAKI ICHINOSE	
8 Supply constraints and urban policy frameworks	109
DAVID FISK	
PART III Urban policy opportunities and responses	117
9 Drivers of urban energy use and main policy leverages	119
XUEMEI BAI, SHOBHAKAR DHAKAL, JULIA STEINBERGER, AND HELGA WEISZ	

10	Transport systems	135
	GERD SAMMER	
11	Urban energy systems planning, design and implementation	155
	JAMES E. KEIRSTEAD AND NILAY SHAH	
12	Urban air quality management	163
	SHOBHAKAR DHAKAL	
13	Summary and conclusion	175
	ARNULF GRUBLER AND DAVID FISK	
	<i>References</i>	189
	<i>Index</i>	207

1

Introduction and overview

Arnulf Grubler and David Fisk

1.1 Setting the urban stage

The decade 2000–2010 marked an important watershed in human history: for the first time more than 50 percent of the global population are urban dwellers. Estimates as reviewed in this book indicate that already some three-quarters of global energy use takes place in an urban context.

Given the robust trends toward further urbanization, the energy and sustainability challenges of equitable access to clean-energy services, of energy security, and of environmental compatibility at local through global scales cannot be addressed without explicit consideration of the specific opportunities and challenges of urban energy systems. The future development of the demand for energy cannot be described without understanding changes at the level of urban settlements. Research shows how the properties of urban areas across the world, while appearing diverse, are in fact scalable, revealing distinct patterns. Just as it is possible ‘to fail to see the forest for the trees’, it is possible ‘to fail to see the city for the buildings’. A comprehensive energy assessment with an explicit urban focus and embracing a systems view has to date been missing. This book aims towards filling that gap. A systems perspective on urban energy use remains underdeveloped to date and paradoxes and conundrums in conventional analysis abound. A single urban agglomeration, such as greater Tokyo, generates more gross domestic product (GDP) than the venerable pioneer country of the Industrial Revolution – the current United Kingdom. And yet, our statistical reporting systems almost exclusively focus on nation states, as represented by Systems of National Accounts, Energy Balances, or similar international reporting standards. In fact, as detailed throughout this book, the difficulty of finding data at the urban scale starts with the search for an operational definition of urban areas and thus urban populations and their energy use.

From the perspectives outlined in this book the traditional territorial-administrative boundaries that define distinct ‘cities’ is complemented by an ‘urban system’ perspective, where the urban phenomenon is seen from a *functional perspective* that transcends traditional territorial or administrative system boundaries. Thus, an *urban energy system* comprises all components related to the use and provision of energy