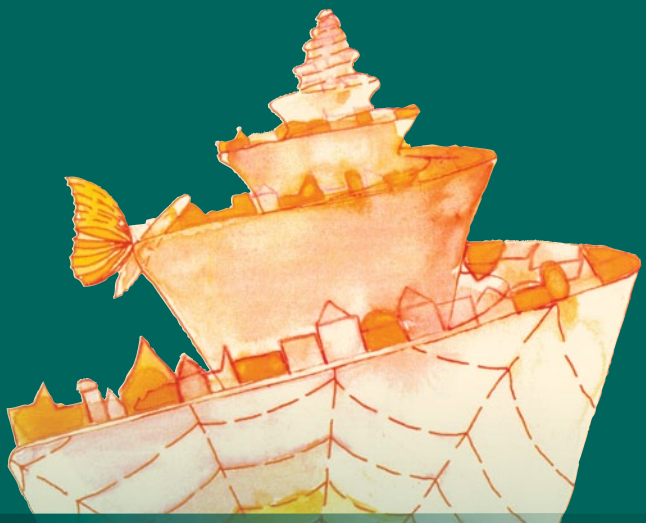
Voula Mega



Quintessential Cities, Accountable to the Future

Sustainability, Innovation and Citizenship

Springer

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Voula Mega
Brussels, Belgium

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Preface

What could the journey of cities into to the world of tomorrow be like? What auspicious and adverse winds might there be? What role do cities, as democratic spaces and communities, wish to play in a complex and uncertain globalized world? What could they do to extend the limits of the possible? These are the interlinked questions that this book addresses in the aftermath of Rio+20. In an increasingly complex and interconnected world, cities become key players in future geostrategies. As unique human ecosystems, vulnerable but full of potential and determination, cities promise to turn liabilities into assets and create opportunities out of challenges and advance towards sustainable development, equitable globalization and a more ethical world order.

Sixty-five million people come to cities every year. Cities offer them a range of possibilities to make vital choices. Cities can mobilize all their forces and enhance their human, social, natural, financial, and constructed, cultural and political capital to create a better world. The first reason is simply their sheer size and the extraordinary concentration of diverse people, resources, and activities. Cities are the only places where people and resources congregate to optimize possible outcomes. Furthermore, cities are influential centers of power and command and forceful enablers of value chains. They also create patterns and models that are disseminated to the whole planet. Last but not least, cities have always promoted open democracies. Citizenship now has to be accountable to the future and ensure that the crisis of values is transcended by a more equitable world.

This book presents the global horizon of challenges facing cities in terms of smart, sustainable, and inclusive growth, active social integration of everyone and everything, welcoming of immigrants, education and science, culture and the arts, urban renaissance, governance, and planning. It points towards innovative models and policy responses by pioneer cities. It suggests that citizenship, leadership, and innovation are the most important elements for cities to advance towards the civilization of sustainability.

The book can be seen as the third part of a trilogy on *Sustainable Cities of the Future*, following the previous volumes *Sustainable Development, Energy and the*

City and *Sustainable Cities for the Third Millennium; the Odyssey of Urban Excellence*. All three books address the concerns of experts, policy makers, and interested citizens and trace the evolving forefront of innovations in the desired transition towards sustainable cities. They adopt an integrated systems approach and increasingly advocate multibeneficial innovations addressing simultaneously the interrelated environmental, social, economic, and cultural challenges, while strengthening the political capital of cities. They collectively try to respond to the questions: What future do cities wish to build, with their scarcities and capacities, on a finite planet? What strategies do they envision and implement? How do they contribute to redesign a better world? What are the practices that can act as beacons and offer examples for the sustainable cities of tomorrow?

The planet has changed much since 2004–2005 when the first part of this trilogy was written. In less than a decade since then, the world has become much more multipolar and networked. Many shocks made tangible that our world holds much potential for surprise, insecurity, and threats to resilience. The second book was written during the year after the 2008 shock and focused on the ability of cities in search of excellence to lead the world out of the crisis and onto sustainable trajectories. But the crisis has persisted and become more multidimensional.

This third book adopts a broader and deeper strategic foresight approach including a review of possible future trends, tensions, and risks. It insists on the mobilizing effect of consensual visions, sheds light on the preferable and desirable futures, explores emerging policy issues and responses, such as intergenerational cities or cities welcoming immigrants, green growth and bioeconomy, and discusses the Rio+20 prospects and the effects of the prolonged crisis. Finally, the book reviews efforts by world innovative cities, and provides a broader array than previously of exemplary urban policies and strategic partnerships. It also suggests the harnessing of 2.0 processes for cities and citizens wishing to reinvent their future together.

Humanity's entrance into the era of *homo urbanus* is irreversible. As the second decade of the millennium advances, the future of the planet seems to be more and more decided in cities. Their sheer size is of the utmost importance, but also their potential to generate and capture positive synergies, their capacity for creativity and innovations and the interconnected local political leadership that heralded the era of urban geopolitics.

The first chapter examines the trends, risks, and opportunities that may affect cities as major nodes of all energy fluxes of the planet, including diverging demographics in the developed and the developing world, migration movements, the rise of empowered citizens and sustainability ethics, the emergence of a new consuming class and evolving modes of production and consumption, scientific and technological breakthroughs, citizen expectations, and governance deficits.

Cities are wonderlands of ingenuity and possibilities. Their ability to pool together so many diverse resources makes them seedbeds of invention and laboratories of innovation. Cities promise to address all interacting challenges concretely on the ground and offer a better life for all citizens, present and future, within the limits of the planet. After Rio+20, cities have to out-innovate and enhance all aspects of their unique urban capital, natural and physical; human, intellectual, and

social; cultural and political; financial and constructed. In the context of protracted crisis, strong sustainability asks for all forms of urban capital to be preserved, enhanced, and transmitted to future generations.

The Rio+20 conference insisted on the ecoresponsibility of cities, which have to become more resource-conscious and reduce their ecological debts. Sustainable cities, one of the seven priority areas of the conference, can also do much for other priorities, promoting decent jobs and preventing disasters and tensions over energy, food, and water. To thrive in harmony with the planet, cities need ecological and environmentally friendly cells and neurons. Urban organs and functions have to boost the resilience of urban areas and assist in the transition to the civilization of sustainability.

The second chapter focuses on cities as vital ecosystems able to manage crucial amounts of scarce resources and materials and reduce emissions and waste. Urbanization affects land use and cover, biodiversity, the hydrologic cycle locally and regionally, air quality, and global climate. Cities should invent new resources if they wish to continue to prosper, while improving efficiency and reducing poverty, emissions, and pollution. Industry suggests that it is possible to live well with not one particle of waste, and in ecological balance by 2050.

Responsible cities have to ensure access for all to clean, secure, competitive, and affordable energy. The advent of local renewable energy *procumers*, producers and consumers, of green energy, can lead to energy-producing cities instead of energy-(over)consuming cities. The third chapter offers an insight into the components and vectors of sustainable energy production and consumption in cities and the efforts made at the local level to overcome national and supranational energy policy targets. Green electricity and hydrogen seem to be the energy vectors of the future and there is great potential for achieving energy efficiency in conjunction with cleaner energy options and technologies and behavioral improvements.

Sustainable energy is at the heart of the EU Europe 2020 Strategy for smart, sustainable, and inclusive growth. Renewables are becoming a major and competitive player in the European energy market and a significant generator of employment. European leaders recognized that sustainable and renewable energy sources and smart systems will make the difference in safely reaching the ambitious EU 2050 goal of decarbonization and cities prepared action plans to surpass the European targets. In the United States, cities choose to invest in efficient lighting, better building materials, and solar energy for electricity.

Sustainable mobility and accessibility are fundamental to urban societies and economies, vital for balanced growth and quality job creation. The quality of transport services has a crucial impact on citizens' quality of life. The transport sector is highly energy intensive and a major intractable contributor to global warming. Its performance has to be radically improved.

The fourth chapter sheds light on the challenges for the future of transport services and infrastructure and the patterns and models in search of cleaner and better transport options. It discusses alternative mobility actions and focuses on sustainable public transport and social innovations for moving differently and better around

the city. A bouquet of examples from events celebrating improved mobility demonstrate how cities can be made accessible to all.

The future of cities depends largely on their capacity to innovate out of the crisis and generate and distribute sustainable wealth, while enhancing well-being in harmony with nature. As central scenes in national dramas and the global chessboard, cities generate agglomeration dynamics, enhanced by the mutual reinforcement of activities that cluster together. In times of uncertainty, the search for sustainable growth, in balance with the other components of sustainability, is critical. Multi-win innovations are essential for creating new assets, often out of liabilities, and ecoresponsible businesses have a key role to play in creating "value out of values."

Competitive cities try to foster, attract, and retain talent and promote smart and green businesses to generate wealth and move up the urban value stair. Cities themselves are important direct and indirect sources of new green employment and can influence markets in line with sustainable development. Green growth and the bioeconomy have a great potential for a more enduring and profitable use of resources. Innovative partnerships with ecobusinesses are cardinal for reconciling short-term economic benefits with long-term sustainability goals. Quality of life and sustainable access to resources and knowledge are key features of urban attractiveness and power.

Concentration and diversity of people and activities are invaluable assets for cities, colorful beehives and schools for respecting difference and learning how to live in society. One chapter sheds light on the evolving social capital of cities and their capacity for intergenerational and intracity equity, social justice, and solidarity. Urban social capital is of increasing importance in cities that face new forms of poverty and exclusion, where more than three generations coexist, and immigrants come looking for better living and working conditions.

Citizens can play a major role in shaping vital urban spaces and forging bonds out of degraded spaces and estranged relationships. Distressed urban areas, the backstage of urban theatres where disadvantaged and excluded citizens come together, can be transformed into innovative neighborhoods and vibrant inclusive communities acting as extended families for the disadvantaged. Participation of youths and women in projects can further extend opportunities, and education is always the most decisive productive investment towards a skill-intensive economy.

Cities are places of interactions and exchanges where people can greatly benefit from the experience of others to learn, interact and innovate. Their identity is defined by heritage and traditions, culture, science, and the arts. They also constitute forums of intercultural dialogue, places where patterns and lifestyles are collectively shaped before they are disseminated to the wider world. A sustainable city has to cultivate the seeds of freedom and offer a space to all for expressing their creativity and enhancing their abilities.

The seventh chapter examines the role of intellectual and cultural resources as key assets for urban sustainability and presents a spectrum of inspiring actions to reinforce urban identity and make citizens proud of the places in which they live. Knowledge cities invest in education, and partnerships with universities and businesses provide valuable models for targeting investments towards world cities of excellence.

Cities are living heritages and legacies in which citizens project their hopes and desires for a better future. The urban cultural heritage is as important for humanity as the exceptional rural natural sites. Arts in the city represent the ultimate expression of collective intelligence, imagination, and ingenuity. Many innovative actions focus on the cultural enhancement of urban spaces and the artistic creation that transforms everyday environments into unique experiences.

Initiating a continuous process of renewal is essential for sustainability. Land use planning and transport are fundamental instruments for the sustainable regeneration of the cities, of their physical parts and of their extraordinary diversity. Brownfields and ageing infrastructure should be converted into smart, green, and welcoming spaces, well integrated into the urban fabric. Many cities demonstrate that the intensification and consolidation of the urban fabric can prevent uncontrolled urban sprawl and reduce the heavy burden of emissions and congestion.

Sustainable architecture in search of excellence can lead to new forms of urban expression and a better performance of buildings and neighborhoods. Public and cultural buildings and spaces can promote collective life and local democracy and bring more value to places. Symbolic and structural projects can become beacons of the urban future. Breaking down barriers, forging partnerships with citizens, and sealing relationships with the surrounding regions and the world are cardinal values to be enhanced in imagineering the cities of the future. Collective imagination and engineering have to be mobilized and cross-fertilized for creating the fair cities of the new generations.

Present and future citizens are the political stakeholders of cities in a multipolar and interconnected world. They have the right to consultation and involvement and the duty to exercise democratic scrutiny of policies. Active citizenship means participation in and responsibility for decisions on the future of a city. New governance architectures seek to enhance the potential of all invisible hands of urban societies and economies and build a social consensus on a future vision to be realized with the efforts of all. Citizen empowerment is increasingly considered as ethically correct and a recognized driver of change.

The ninth chapter examines the emergence of new models of citizen participation in responsible cities, a sine qua non condition for sustainability. Innovative partnerships can maximize the potential of synergies, enrich the content and the methods of cooperation, and serve as catalysts of change. Institutional alliances are enriched with a variety of participatory schemes. A World Bond involving coalitions of cities, both from the developing and the developed world, can play a major role in addressing global common challenges and achieving the millennium goals for the renaissance of the planet.

From enlightenment and anticipation to action, strategic foresight can provide the insights to build a sustainable vision for a preferred future out of many possible futures. Thinking ahead and together with citizens can spectacularly open the spectrum of optimal futures but also help coevaluate the drivers, barriers, and the conditions for change. Strategic planning for the implementation of a compelling transformative urban agenda has to address many spatiotemporal patterns in cities and must therefore focus not only on the three spatial dimensions but also the time

dimension. Time is a scarce and most precious resource. Local time plans can enhance the capacities of cities as chronotopes and improve resource efficiency and quality of life.

The aim of better codesigned policies is to achieve better lives. Urban observatories and sustainability indicators can take the pulse of cities and their citizens and serve as compasses on the journey of sustainability. Impact indicators are powerful instruments and could serve as yardsticks and compasses for prospective policy making and also for assessing and reorienting policy implementation.

The book suggests that the creation of a strategic global CityPedia by and for world cities and citizens could bring together trends and opportunities, visions and plans, best, good, and appalling practices, and enrich distributed capacity to synthesize insights. Such a global effort could foster solidarity among world citizens and enhance noble emulation towards the civilization of sustainability.

The final chapter addresses the European urban constellation, a unique polycentric structure of large, medium, and small cities, and reviews, in a nutshell, two decades of visions, declarations, and policies for urban sustainability in the European Union. The recognition of the four dimensions of subsidiarity, local, regional, national, and European by the Lisbon treaty highlighted the importance of multilevel governance. Cities have an essential role for the implementation of the strategy Europe 2020 for a smart and sustainable and inclusive Europe on the ground and the upholding of the European social model, the shared value of social justice and citizenship, human rights, and democracy.

The urban clock is ticking. From Brussels to Bangkok and the world, there is urgency for local responses to global urban challenges that can inspire but also be inspired by urban laboratories of the future. Strategic partnerships, such as the European Union–China Partnership on Sustainable Urbanization, are crucial in order to share international experiences with China as it prepares for its urban billion citizens. Joint Initiatives for Urban Sustainability offer exemplary public–private partnerships of cities and citizens working together, across nations, to show the way for the emerging urban worlds of tomorrow.

As in the previous volumes of the trilogy, all chapters trace the horizon of the most prominent issues at the heart of the matter and present, in a nutshell, the issues at stake. The evolving forefront of innovations is illustrated by selected cases that can act as beacons and inspire emulation and action. Many of them have been directly witnessed by the author. At the end of the book, the enclosed literature and an array of selected Internet links offer the specialized reader the opportunity to delve deeper into the issues.

Brussels, Belgium Voula Mega

…"He is richest who is content with the least for content is the wealth of nature."

Socrates (469–399 BC)

…*Stadtluft macht frei.* ("Urban air makes you free.")

German saying describing a principle of law
in the Middle Ages

…"Cities have always served humanity as a motor to project themselves into the future and as an anchor not to lose contact with the past."

L. Benevolo *The European City*, 1995

…"We agree that, in tackling the challenges of urban development, innovation offers solutions and the concept of "Cities of Harmony" embodies our dreams."

Shanghai Expo 2010 Declaration

…"We need to do more than help our cities weather this economic storm. We need to rebuild them on a newer, firmer, stronger foundation for our future. That requires a new strategy for our cities and metropolitan areas that focuses on advancing opportunity through competitive, sustainable and inclusive growth."

President Barack Obama 2009

Acknowledgments

When I submitted, in 2004, my manuscript for *Sustainable Development, Energy and the City*, I was totally unaware that I was embarking on a major trilogy, tracing the forefront of urban innovations towards the sustainable cities of the future.

This wonderful journey is now going into its final phase and I would like to thank, from the bottom of my heart, all my dear mentors, colleagues and friends who shared with me wisdom and insights on the great array of the cities of the future.

Among my mentors who repeatedly honored me with their trust, great respect is due to Professor Sir Peter Hall. By hailing my first volume as "a brilliant achievement," Peter inspired me to excel. The second volume was naturally devoted to urban excellence and paved the way to this third one projecting the urban world into the future.

I will be grateful for life to Dr. Suthawan Sathirathai, most precious friend, who introduced me to so many Asian civilizations, the concept of oriental wisdom, and Bangkok's challenges and opportunities.

I am also grateful to the European Commission for granting me the permission to publish the results of my research. Among the colleagues who helped on the learning journey, a particular thank you is due to Anna-Carin Krokstäde-Kneip for the attentive reading of the final manuscript and the formulation of most precious remarks.

Last but not least, my deep thanks go to Melinda Paul, senior editor with Springer, and her team, for their warm professionalism and kind efficiency.

Acronyms

ACE	Architects' Council of Europe
ACRR	Association of Cities and Regions for Recycling
ARAU	Atelier de Recherche et d'Action Urbaines, Brussels
BASD	Business Action for Sustainable Development
BBP	Better Buildings Partnership, Toronto
BMA	Bangkok Metropolitan Administration
CCI	Clinton Climate Initiative
cCCR	Carbon Cities Climate Registry
CCS	Carbon Capture and Storage
CBD	Convention on Biological Diversity (UN)
CDP	Carbon Disclosure Program
CEMR	Council of European Municipalities and Regions
CERES	Coalition of Environmentally Responsible Economies and Societies
CHP	Combined Heat and Power
COP	Conference of the Parties
CoR	Committee of the Regions
CSD	Commission on Sustainable Development (UN)
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
EEA	European Environment Agency
EFTA	European Free Trade Association (Iceland, Liechtenstein, Norway, Switzerland)
EFUS	European Forum for Urban Safety
EPA	Environmental Protection Agency (U.S.)
EPBD	Energy Performance of Buildings Directive
ESCT	European Sustainable Cities and Towns
ETS	Emission Trading System
EU	European Union
EU15	European Union of 15 member states (1.1.1995–30.4.2004)

EU25	European Union of 25 member states (1.5.2004–1.1.2007)
EU27	European Union of 27 member states (since 1.1.2007)
FMCU-UTO	World Federation of United Cities
G7	The world's seven biggest economies (Canada, France, Germany, Italy, Japan, United Kingdom, and United States)
G8	The above plus Russia
G20	Countries: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, United Kingdom, United States, and the European Union, represented by the Council and the European Central Bank
GDP	Gross Domestic Product
GHG	Greenhouse Gases (carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O) and the three main fluorinated gases)
GPP	Green Public Procurement
GGBP	Greener, Greater Buildings Plan (NY)
HDI	Human Development Index
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
ICLEI	International Council for Local Environmental Initiatives
ICT	Information and Communications Technologies
IEA	International Energy Agency
ILO	International Labor Organization
IPR	Intellectual Property Rights
IPCC	Intergovernmental Panel on Climate Change
ISOCARP	International Association of City and Regional Planners
ITER	International Thermonuclear Experimental Reactor
ITF	International Transport Forum
JIUS	Joint Initiative on Urban Sustainability
LNG	Liquefied Natural Gas
LZC	Low/Zero Carbon
MDG	Millennium Development Goals
nZEB	Near Zero-Energy Buildings
NGO	Nongovernmental Organization
OECD	Organization for Economic Cooperation and Development
OPEC	Organization of the Petroleum Exporting Countries (Iran, Iraq, Kuwait, Saudi Arabia, Venezuela, Qatar, Libya, the United Arab Emirates, Algeria, Nigeria, Ecuador, Gabon, Angola)
OWHC	Organization of the World Heritage Cities
PPP	Purchase Power Parity (but also Public–Private Partnerships)
PV	Photovoltaics
RES	Renewable Energy Systems
RES-E	Electricity from Renewable Energy Sources
SME	Small and Medium-Sized Enterprise
UITP	Union Internationale des Transports Publics

UNCED	UN Conference on Environment and Development (Rio de Janeiro, 1992)
UNDP	UN Development Programme
UNEP	UN Environmental Program
UNESCO	UN Educational, Scientific, and Cultural Organization
UNFCCC	UN Framework Convention on Climate Change
UNFPA	UN Population Fund
WBCSD	World Business Council for Sustainable Development
WEF	World Economic Forum
WFF	World Foresight Forum
WHO	World Health Organization
WTO	World Trade Organization

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Watercolour 1

Rio+20: Still a Long Way to Sustainable Development

Chapter 1
Insights from the Future: Trends, Risks, and Opportunities

Abstract Humanity's entrance into the era of *homo urbanus* is irreversible. As the second decade of the millennium advances, the future of the planet seems to be more and more decided in cities. Their sheer size is of the utmost importance, but also their potential to generate and capture positive synergies, their capacity for creativity and innovations, and the interconnected local political leadership that heralded the era of urban geopolitics. This chapter examines the trends, risks, and opportunities which may affect cities as major nodes of all energy fluxes of the planet, including diverging demographics in the developed and the developing world, migration movements, the rise of empowered citizens and sustainability ethics, the emergence of a new consuming class, and evolving modes of production and consumption, scientific and technological breakthroughs, citizen expectations, and governance deficits.

Cities are wonderlands of ingenuity and possibilities. Their ability to pool together so many diverse resources makes them seedbeds of invention and laboratories of innovation. Cities promise to address all interacting challenges concretely on the ground and offer a better life for all citizens, present and future, within the limits of the planet. In the post Rio+20 era, cities have to out-innovate and enhance all aspects of their unique urban capital, natural and physical, human, intellectual and social, cultural and political, financial and constructed. In the context of protracted crisis, strong sustainability asks for all forms of urban capital to be preserved, enhanced, and transmitted to future generations.

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1.1 "The Future is an Open Space" (R.M. Rilke): The Arrow of Prospects

1.1.1 Divergent Demographics, Sustainability, and Human Progress

In 2011, the world hit the watershed of seven billion people. The world population had reached six billion by 2000 and is estimated to exceed nine billion in 2050. It took more than 100 years for humanity to go from one billion in 1804 to two billion in 1927 and more than 30 years to reach three billion in 1960. Fifteen years later, the world population had reached four billion in 1975 and by 1987 and 1999 had gained one and two additional billion, respectively. Population in the world is growing at a rate of around 1.15 % per year. The average population change is estimated at around 75 million per year. Average densities in developing countries are double than those in Europe and Japan, and densities in Europe and Japan are double those of the United States, Canada, and Australia. Annual growth rate reached its peak in the 1960s, with more than 2 % annual increase (UN 2011, UN 2012a).

Urban population was more than 2.5 billion in 2000 and is expected to be more than five billion in 2050. More than 50 % of the citizens of the planet live in cities, "the new countries," as R. Florida called them. Cities concentrated 3 % of the world population in 1800 and 14 % in 1900. They are expected to host 60 % of the world citizens by 2030 and 70 % by 2050. Sixty-five million people, five times the population of London, come to live in cities every year. The future is clearly not a linear continuation of the past; it has to be envisioned and invented.

Twenty years after the UN Conference on Environment and Development (Rio de Janeiro 1992), the Rio + 20 conference highlighted that cities occupy just 2 % of the Earth's land cover, but account for 60–80 % of energy consumption and 75 % of carbon emissions. Almost all of the urban growth is expected in the less-developed world and this brings dramatic changes to the composition of the global population and further strain on limited natural resources. A vicious circle brings more urban poverty and environmental degradation to an unprecedented extent (UN Rio + 20 2012).

Projections highlight that, during the twenty-first century, the demographic explosion will reach its apogee. The population will have quadrupled during the period 1950–2100 with many ripple effects including increased migration flows. The UN World Population Prospects foresee a global population of 9.3 billion people in 2050, and more than 10 billion by the end of the century. Much of this increase is expected to come from high fertility countries, including the least-developed countries. They are the most rural and the most rapidly urbanizing countries in the world (UN 2011; UNFPA 2011).

Demographic dynamics are shifting from high mortality and high fertility to low mortality and low fertility (Millennium Project 2012). The global fertility rate has fallen from 6 children in 1900 to 2.5 in 2012. Life expectancy at birth is 68 years,

and it is expected to be 81 by 2100. By 2050, there could be as many people over 65 as under 15. The EU fertility rate remains below the level of generation replacement and from 2015 onwards, positive net migration is expected to be the only growth factor for its population, projected to peak some years later at around 0.74 billion and decline thereafter. By 2060, adults over 65 are expected to account for 30 % of the EU population (EC 2012c). Offering better opportunities to young and poor is a major challenge in developing countries and cities, and shrinking labor forces and healthy and active ageing become a major issue in industrialised regions (CSIRO 2011).

Horizon scanning exercises suggest that cities will play a crucial role in the transition to a low/zero carbon society and economy. Cities are, and will continue to be, the epicenters of distribution of increasingly limited resources and creation of wealth. The state of cities will determine the quality of life for most citizens of the planet (ICLEI 2010). If present patterns persist, the global urban population is expected to double in 43 years, whereas the urban land cover could double in only 19 years. The urban population of the developing countries is expected to double between 2000 and 2030 and the built-up area of their cities can be expected to triple. In least-developed countries, 62 % of carbon emissions come from changes in land uses (Angel et al. 2011, 2005).

Asia will remain the most populous area in the world by 2050. Asian population is expected to peak over five billion around the middle of the century and then start a slow decline. Africa will gain weight as its population more than triples. Africa has weathered several global crises fairly well and moved from economic stagnation to above 5 % GDP growth on average. Africa's urban population is expected to increase from 414 million to over 1.2 billion by 2050 whereas that of Asia will soar from 1.9 billion to 3.3 billion. Both regions together will account for 86 % of all increase in the world's urban population The total populations of all other major regions, the Americas, Europe, and Oceania, amounted to 1.7 billion in 2011, and are projected to rise to nearly two billion by 2060 and then decline very slowly, remaining still near two billion by the next turn of century (UN 2012a).

Urban growth rates of an average 3.4 % make Africa the fastest urbanizing continent (World Bank 2012c). Sound urbanization could help development in Africa. However, rapid urbanization can also contribute to social and environmental problems. Africa is home to nearly two thirds of the global slum population and over 70 % of the urban population suffers from inadequate housing, water supply, or sanitation.

At the level of individual countries, the largest increases in urban population are expected in India, China, Nigeria, the United States of America, and Indonesia. Up to 2050, the urban population of India is expected to be increased by 497 million and of China by 341 million. The corresponding figures for Nigeria, the United States, and Indonesia are 200 million, 103 million, and 92 million inhabitants respectively. Nigeria will experience the quickest increase of its urban population which grew by only 65 million between 1970 and 2010, and yet it is projected to increase more than three times between 2010 and 2050.

The situation is particularly challenging for countries such as China which experienced the most rapid metamorphosis from a land of villages and rural communities into an urban country. By 2025, one billion people, or 64 % of the Chinese population, are expected to live in cities. The country will have 221 cities with more than one million inhabitants, including 23 cities with more than five million people and eight megacities with a population over 10 million (MGI 2009).

Climate change is already having serious consequences and irreversibly affects living standards in countries such as Bangladesh. Environmental degradation is provoking extreme disasters, including desertification, floods, and storms of increasing magnitude. Humanitarian crises, mainly due to water scarcity and high food pressures and health emergencies, could become recurrent. Competition for resources is likely to exacerbate tensions and trigger conflicts. Biodiversity losses and ecosystem crises may increase the sense that the world is entering an "age of scarcity."

Cities are both causes and victims of environmental degradation. Urban population growth and excessive consumption exert huge pressure on global assets such as soil, water, food, natural resources, and raw materials. Furthermore, most cities are located in regions exposed to at least one major risk of natural disaster, especially in Latin America, the Caribbean, Northern America, and mainly in Asia. And although dynamic growth, especially in the emerging economies, has changed the economic and political landscape of the planet, around 1.4 billion people still live in extreme poverty, mostly in sub-Saharan Africa and South Asia, and one sixth of the world's population is undernourished.

The world's commitment to eradicate poverty and hunger and collectively advance towards sustainable development was renewed in the United Nations Conference on Sustainable Development Rio + 20. The conference highlighted that exploding urbanization is breeding enormous concentrated demand for natural resources, fresh water supplies, sanitation, energy, and infrastructure. Cities have complex metabolisms, mobilize huge flows of people, resources, and energy, and generate incredible amounts of waste and emissions. But the high density and the concentrated collective ingenuity of cities can bring efficiency gains and breed multibeneficial innovations, each one of which can bring a cascade of possible improvements.

The more cities expand or change, especially in times clouded with uncertainty, the more forward-looking perspectives matter. Humanity stands at a critical juncture and a redefining point for urban futures. It has been argued that the "death of distance," especially after the dramatic decline of transport and communications costs, would lead to the "end of cities." The entire world could become a frictionless field on which any activity could be located anywhere. This proved wrong because human beings prefer social interactions. The significance of face-to-face contact in building social capital and the importance of agglomeration did not erode. Economists suggest that cities will continue to grow as far as additional benefits outweigh incremental problems and advantages offset disadvantages (O'Flaherty 2005).

The links to sustainability are crucial. Sustainability is a global balance-seeking process that has to maximize and optimize investments in capital, labor, skills, and

opportunities. It has to impregnate all strategies and policies, bridge generations, and open new prospects. Cities promise many efficiency gains due to high proximity of activities that decrease the flows of movement for people and goods. Furthermore, cities are bedrocks of innovations, able to make smarter use of their assets and resources. Innovation does not happen in a vacuum, but in an economic, social, and cultural context, which is shaped by empowered citizens and enlightened decision makers, increasingly involved in global partnerships for a more egalitarian and harmonious world.

In a world that R. Koolhas symbolically describes as ¥E$, the UN summits and reports raised awareness that the urgent global challenges of sustainability and equity must be addressed simultaneously and that policies should spur progress towards equitable globalization. Cities are the places where the pressures of migration, globalization, economic development, social inequality, environmental deterioration, and climate change, often reinforcing each other, are most directly felt. Disadvantaged citizens attracted by the promises of cities for wealth and well-being are more vulnerable to the wider effects of environmental degradation in urban peripheries. They must also deal with threats to their immediate environment from indoor air pollution, dirty water, and inadequate sanitation.

Providing opportunities and choices for all, everywhere, current and future generations, is at the very heart of human development. Cities generally have higher Human Development Indexes (HDI), composed of life expectancy, literacy, education, and standards of living. Education and health services can more easily reach concentrated populations that, however, pose new challenges of providing urban jobs, housing, energy, and infrastructure to support collective quality of life. The Human Development Index shifted the development focus from income to well-being and people-centered policies. The 2011 Human Development Report suggests that the remarkable progress in human development during the last decades is under threat. Although living standards in most countries have been rising and converging for several decades, a disturbing potential reversal of those trends appears on the horizon. Failure to reduce the environmental risks and social inequalities could annihilate sustained progress and even reverse the global convergence in human development. Bold action is needed at all levels if the human development progress achieved for most of the world's poor is to be sustained, for the benefit of present and future generations (UNDP 2011).

Growing inequality is one of the biggest social, economic, and political challenges, and its significance has been amplified by the prolonged crisis, declining public confidence, and mounting pessimism on the pace of recovery. An historic overview of inequalities in the world in a nutshell indicates that before the industrial revolution, wealth gaps between countries were modest and income per person in the world's 10 richest countries was only six times higher than that in the 10 poorest. The industrial revolution widened the gaps both between countries and within them. The growth of the industrial workforce brought increasing political pressure for better redistribution of the created wealth. In response to the formation of trade unions, the rise of socialist parties, and also to crises, policy makers

introduced progressive taxes, government regulation, and social protection. Some governments were more interested in equality of opportunity than of income and mass education brought the most transformative shift (The Economist 2012).

Globally, poorer countries began to catch up with richer ones in the 1980s, even if new divides appeared within countries. By the turn of the century, most emerging economies were growing consistently faster than rich countries and global inequality started to fall. The huge transformation of the world economy since 1980, globalization, deregulation, the explosion of information and communications technology (ICT), and the associated expansion of trade, capital flows, and global chains narrowed income gaps between countries and widened them within them at the same time. Globalization hugely increased the size of markets and technologies pushed up demand for better-skilled workers. Technology accelerated globalization, and globalization accelerated technological progress. But inequality is not inevitable. The policy mix of tax reforms, welfare programs, and regulatory interventions could still contribute to reduce inequality. Inclusive urban policies could be decisive for improving income and opportunity equality and preserving the social capital of cities.

The natural and physical capital of cities is being increasingly affected by the accumulating stress on ecological systems, massive loss of biodiversity and vulnerability to natural disasters, soil erosion, water stress, and desertification. Tensions over scarce resources and raw materials could also cause conflict and require new forms of crisis management. State fragility due to inequality and instability and a massive increase in the urban population are expected to reinforce megacities and metropolitan areas, both in relation to their regions and as interconnected partners in a more polycentric world.

"The aim of a good city is to lead citizens towards a happy life," (Plato). Cities could be inspired to rate their degree of happiness by the Happy Planet Index which takes into account the natural and physical capital and reveals the performance of nations in supporting their inhabitants to live long lives and experience good well-being, while ensuring that their ecological footprint does not prevent others to do the same in the future. The third global report reveals that the planet Earth is largely still an unhappy planet but it also demonstrates that good lives do not have to cost the Earth. The countries where well-being is highest are not always the ones that have the biggest environmental impact.

The Happy Planet Index provides a tool to ensure that some fundamental issues are taken into account in crucial policy decisions. It is a measure of efficiency and provides an overall picture, but countries that seem to do well can still suffer many problems. The 2012 results confirm that no country achieves high and sustainable well-being and highlight that only nine countries are close to doing so. Eight of those nine are in Latin America and the Caribbean. The scores of high-income countries are brought down considerably by their large ecological footprints (new economics Foundation 2012).

In cities, human beings search for satisfaction of basic needs and access to essential public goods, but they also seek fulfillment and happiness. They are the places where the prospects of prosperity and individual and collective well-being can be

increased. The latest edition of State of the World's Cities highlights that prosperity for all has been compromised by a narrow focus on economic growth. A fresh approach to prosperity, including other vital dimensions such as quality of life, adequate infrastructure, equity, and environmental sustainability has been proposed by the UN/HABITAT. It also suggested another yardstick, the City Prosperity Index, together with a conceptual matrix, the Wheel of Prosperity, to assist decision makers in designing comprehensive policy interventions. The report advocates for the need of cities to enhance the public realm, combat enclaves of wealth for the few, and expand access to public goods and consolidate rights to the "commons" for all (UN/HABITAT 2012).

In cities, the UN Millennium Development Goals (MDG) can find spaces and coalitions for transformational positive change. In general, cities can boost human capital and offer more opportunities for better education, information, awareness, health, and well-being. It is in great part due to cities and the array of urban health and education infrastructure and services that the world literacy or life expectancy rates progressed considerably. Cities have also done much for the planet on track to achieve the MDG 7, target 11, improving the lives of at least 100 million slumdwellers by 2020.

In developing regions, slumdwellers account for more than 40 % of the urban population. The vast majority of slumdwellers live in extreme poverty and represent more than one third of the target population of the MDGs who have little or no access to decent shelter, education, health, reproductive health, and sound nutrition. This multifactorial context, together with their predominant youth, makes slumdwellers one of the most vulnerable groups in terms of HIV/AIDS, malaria, and tuberculosis. The right to the city allows slumdwellers to transform a tenuous stake into a tangible asset, which can be insured, facilitate access to credit, and enable the poor to create wealth and to improve their condition.

Cities were also decisive in ensuring access to drinking water which reached 89 % in 2010. Just after the Rio + 20, a UN report stressed the need for a true global partnership to achieve the remaining Millennium Development Goals. The Brazilian tenure regularization program for millions of slumdwellers, together with the Baan Mankong Program in Thailand that helped to upgrade slums in over 300 cities, were quoted as bright examples. Finally, water legislation introduced in South Africa to ensure that everyone has access to a daily minimum of fresh water can inspire others (UN 2012b).

Some initial estimates indicate that in 2010 the share of people living on <$1.25 US a day dropped to less than half of its 1990 value. The United Nations suggests that, for the first time since trends began to be monitored, both the number of people living in extreme poverty and the poverty rates have fallen in every developing region, including sub-Saharan Africa, where rates are the highest. The remaining MDGs on education, gender equality, child and maternal health, environmental stability, HIV/AIDS reduction, and a Global Partnership for Development could find in cities the necessary infrastructure and political will for significant progress. The UN report states that meeting the related challenging targets is possible, but only if governments do not waver from their commitments. A failure would mark an

extraordinary missed opportunity to transform global visions into deeds and impacts (UN 2012b).

Innovative projects such as the Millennium Cities Initiative by the Earth Institute, Columbia University, assist cities in their efforts to attain the Millennium Development Goals. The initiative suggests that urban transformation can curb extreme poverty and assists selected underresourced sub-Saharan urban centers to become sustainable "Millennium Cities," each one with distinct livelihood opportunities, improved access to public services, and links with the countryside and international markets. The progress report suggests many accomplishments, from comprehensive research to support for new investments and ground-breaking partnerships for improvements in public health, education, gender equality, water, sanitation, and urban design. Empowering the Millennium Cities and enabling them to implement lasting change is the next promising step (Millennium Cities Initiative 2012).

The 2012 "State of the Future Report" by the Global Millennium Project, the global futures research think tank founded in 1996 by the United Nations University, the Smithsonian Institution, and Futures Group International, provides an interesting picture of the global situation and the prospects for 10 years ahead. Most of the 15 global challenges, providing a framework to assess the prospects for the future of humanity, are critically affected by cities. Climate change, energy, water, resources, democracy, capacity to decide, status of women, and advancement of science and technology find in cities privileged partners and spaces for action (Millennium Project 2012).

The Millennium Project's State of the Future Index provides a score card on humanity's performance in addressing the grand societal challenges. The 2012 sixteenth global overview suggests that humanity wins in relation to the most important form of capital, human capital. Improvements are confirmed and further foreseen concerning life expectancy at birth, infant mortality, literacy rate, secondary school enrolment, GDP per capita, extreme poverty reduction, and women empowerment and participation in elected parliaments.

However, half the world is potentially unstable and only two ecological indicators, access to water and energy efficiency, mark progress at the global level. Food prices are rising, water tables are falling, corruption and organized crime are mounting, environmental capital for life support is diminishing and climate change is advancing, debt and economic insecurity get worse, unemployment persists and aggravates, and the gap between the rich and poor is widening dangerously. Uncertainty clouds global investments in R&D, electricity from renewables, and forest lands (Millennium Project 2012).

Global risks or megashocks involve significant and sudden, potentially high-impact, events, the timing and magnitude of which are very hard to predict. The oil and gas price spikes, the extreme climate change-related phenomena, pandemics, crimes, irreversible biodiversity loss, terrorism, nuclear disasters, and nanotechnology risks were among the shocks detected by world foresight organizations. The array of interrelated risks, economic, technological, environmental, geopolitical, and societal, and their perceived likelihood, impact, and interconnectivity are

subjects of many analyses, beyond conventional wisdom and sources of further insights (WEF 2012a).

1.1.2 iCities, Complexity, and Technology and Innovation Futures

The digital revolution demonstrated that information and communication technologies are key enablers of change and drivers of economic development. Cities should harness scientific and industrial capabilities and take advantage of transformations in manufacturing, infrastructure, services, and the digital economy. Many global foresight exercises try to shed light on possible science and technology developments that can have an impact on the future of cities and their ability to satisfy evolving citizen needs.

Science and technology are vital in the search for substitutes for scarce and exhaustible resources and the adoption of models of sustainable production and consumption. Mass production is being replaced by on-demand, custom manufacturing. The rapid access to specialists across the globe is improving and successful organizations connect answer seekers and problem solvers. Corporations become agile enough to maneuver in and out of countries very quickly. The quantity of information available to individuals, unprecedented in human history, continues to grow exponentially but it does not necessarily lead to illumination and wisdom. The sheer volume of information is in danger of creating more noise than value. Data may be collected faster than analyzed, resulting in "cyberdust," and knowledge becomes obsolete faster, resulting in "obsoledge" (WFF 2011).

The iCities become possible as everything in the natural world could have a digital counterpart. The global network of networks is being proposed as the guardian of a free society and the proliferation of Web features such as blogs have spurred demands for a redistribution of online earnings. Innovations in information structuring, mining, and processing hold the key to filtering out the noise and using the wealth of global information to address societal challenges.

The Internet has been a great transformer in the way people work, create, and communicate around the globe. In 2011, more than 25 % of the world's citizens were connected to the Internet versus 5 % in 2001. The Web could enter a new phase, with structuring online data and content, or introducing the Internet of things, with the connection of real-world objects that become embedded with sensors and gain the ability to communicate. The resulting IC networks hold promises for new and better business models and processes. In logistics, one of the key challenges is the synchronization of movement of freight and goods with the flow of digital information. The bottom-up development model of the Internet could be complemented by a greater top-down direction to enable greater infrastructure investment and regulation, promote transparency, increase efficiency, and, potentially, generate new applications and business models (Toffler ass. 2010; MGI 2010b, 2011b).

The natural world reflects the immense potential inherent in the genetic code of all living organisms. Progress in synthetic biology and metabolic engineering capitalizes on this potential in unprecedented ways, enabling the development of new biological processes and organisms to serve specific purposes and help produce new therapeutic drugs or methods. Personalized medicine, nutrition, and disease prevention advance rapidly. As life expectancy increases for all, traditional approaches to ageing become less sustainable, due to dwindling resources and increasing social costs. Scientific achievements in areas such as genomics and proteomics open up the extent of opportunities to tailor medicine, nutrition, and disease prevention to individual needs. These developments are laying the foundation for a revolution in health care to be less resource intensive and engender a more effective well-being. Systems biology and computational modeling and simulation are playing increasingly important roles in designing better therapeutics, materials, and processes.

Urban infrastructures in OECD countries are ageing and will require renewal to help address challenges, such as reducing greenhouse gas emissions, and to enable the deployment of smart distributed energy infrastructure. Widespread sensor networks are needed to help manage the new infrastructure, and give rise to a plethora of applications and opportunities. The growth of the personalized services sector might be followed by another wave of innovations aimed at tailoring and targeting services, from manufacturing to leisure.

The Green Revolution 2.0 is stimulated by the growing global demand for healthy environments and nutritious food and fresh water for all. Integrated progress across the biological and physical sciences and innovation holds the promise of further increasing crop production yields, minimizing the impact on biodiversity, reducing energy and water dependency, and decreasing the carbon and environmental footprints of the processes.

Urban possibilities to integrate innovations, including product, process, and service innovations, social and public, are attracting increasing attention from scientists in many areas researching the viability of humans as urban species. Synthetic biologists, for example, are exploring molecules that could clad skyscrapers and trap carbon dioxide. Knowledge is an inexhaustible resource enhanced by the density of urban networks and transactions. Cities can serve as the nexus for large-scale replicable cross-fertilisation and support global innovation ecosystems. Open innovations offer the possibility for each city to build on other cities' best achievements and capitalize on improvements as a global network partner.

Ecoefficiency gains have largely and often been offset by increasing demand on natural resources. Nanostructured materials with tailored properties, designed and engineered at the molecular scale, promise to reduce dependence on depleting natural resources, and increase atom-efficiency manufacturing and processing.

Research and development of new materials and energy sources and technologies are of particular interest for cities striving to achieve carbon emission reductions. Strong, light structural materials reducing energy costs of transport and in building promise to increase urban resilience. The energy transition is expected to stimulate technology developments in renewable energy generation, and new technologies

including fuel cells, the smart grid, and carbon capture and storage (CCS). Large-scale use of hydrogen as a fuel may complement the progressive electrification of everything.

Turning burdens into assets is more crucial than ever and the captured CO_2 after combustion can provide an important resource. Carbon is at the heart of all life on earth. Yet, managing carbon dioxide releases is one of the greatest current challenges. The captured and stored carbon dioxide, following combustion, could be transformed from a liability into a resource. Novel catalysts, based on nanostructured materials, can potentially transform carbon dioxide to high-value hydrocarbons and other carbon-containing molecules, to be used by the chemical industry as cleaner and more sustainable alternatives.

Wireless power advances. Society is still deeply reliant on electrically powered devices, significantly limited by the need to be attached to the electricity grid by wire, either permanently or through frequent battery recharging. Emerging approaches to wireless power transmission promise to free electrical devices and have a significant impact on electronics. A number of emerging technologies are coming together to provide the springboard for advanced electrical energy storage and use. These technologies are expected to provide the energy density and power needed for the next generation of clean energy technologies.

Innovative urban infrastructure is expected to involve a smart electricity grid built on requirements of renewables, microgeneration, and smart metering. New and flexible uses for existing infrastructure would allow increased efficiencies. Transport technologies become increasingly vital and efficient as life becomes more mobile. People are changing jobs and homes more frequently, commute farther to work and travel more. Mobile communication and telecommuting have demonstrated that there many more possibilities to extend the limits of space and time (CSIRO 2011).

Promoting an equitable and inclusive information society is very important for cities, and local and regional governments play an essential role in implementing strategies for eGovernment. The Cracow Declaration on the Local Agenda i2010, adopted by the European Information Society Conference of local and regional governments, focused on digital solidarity among the cities of the world as an effective response to the digital divide. It promoted the UN's Digital Solidarity Initiative and highlighted the need to fully acknowledge the role of local and regional governments in bridging the gap. Making full use of the potential offered by ICT requires political leadership, cooperation, and partnership.

From eGovernance and eBusiness to eLearning or eHealth, the most challenging goal is to build digital ecosystems where knowledge-sharing becomes an asset for local networks able to upgrade public services, as well as the local economy, and especially small and medium enterprises. Each eGovernment must advance from the simple reproduction in digital format of administrative procedures delivered in office hours to effective and efficient re-engineering of constant and uninterrupted provision of online services, 24 hours a day, 7 days a week. The participation of citizens in local public decisions through ICT can lead to the advent of a true eGovernance, increase transparency, and reduce corruption.

In the rapidly evolving and hyperconnected globalized society, personalized digital approaches to education and training could allow learner-centered education to thrive. Educating a growing young urban population but also integrating mentoring services by active elderly can benefit the urban knowledge economy. This also links to social innovation, ubiquitous access to the Internet, social networks, and "the world is my classroom, my neighbourhood or my home," developments (WFF 2011).

1.1.3 The Advent of Homo Urbanus *: The Rise of Empowered Cities and Citizens*

Governance is critical in shaping these patterns. Power imbalances and social inequalities interact with environmental distress and may result in even worrying outcomes. Global governance often weakened the voices of developing countries and excluded marginalized groups. Many organizations pleaded for inclusive governance, equity, and sustainability, especially in times of constrained growth (OECD 2007b, 2008b, 2010). Approaches emboldening people to bring about change in the socioeconomic and political arenas hold enormous promise.

Among the trends most detected and analyzed for the 2030 horizon, the empowerment of individuals could contribute to a growing sense of belonging to a single human community. The main drivers of this trend are, first and foremost, the global emergence of the middle class, particularly in Asia, near-universal access to education, the energizing effects of information and communications technology, and the improving status of women in most countries. The process towards gender political–economic equality seems irreversible (EUISS 2012).

Women are becoming empowered throughout the world and increasingly engaged in decision making. In 2012, they accounted for 19.8 % of the membership of national legislative bodies worldwide, and in 32 countries the figure was over 30 %. There are 20 women heads of state or government. Women represent 41 % of the world paid employment, but hold 20 % of senior manager positions. They account for about 70 % of people living in poverty and also for about 64 % of the 775 million adult illiterates. Meanwhile, violence against women is a huge plague (Millennium Project 2012).

The Global Gender Gap Report, introduced by the World Economic Forum in 2006, provides a framework for capturing the magnitude and scope of gender-based disparities in four key areas: access to health care, access to education, political participation, and economic equality. The report suggests that there is a strong correlation between those countries that are most successful at closing the gender gap, and those that are the most economically competitive. Six of the top 10 performing countries in this year's Global Competitiveness Index also feature in the top 20 of the Global Gender Gap Index (WEF 2012b).

The middle class is expected to increase in influence and become the protagonist of the universal spread of information societies. Citizens will be interconnected by

extensive networks and interpersonal transnational flows and this may lead to a new age of convergence of values but also risks of extremism. Greater informed citizen participation and growing expectations can lead to tensions, revolt, and conflict. The youth movements of 2011, expected to breed many members of the power elites of 2030, bear witness to the problems facing representative democracies and the potential contribution of social networks, blogs, and websites in forming and impacting public opinion.

Sustainable development issues, against a backdrop of greater resource scarcity and persistent poverty, compounded by the consequences of climate change, are likely to receive increasing attention. Despite the rise of the middle class, poverty and inequality remain a major burden for human development. By the third decade of the century, Africa is also likely to witness the rise of a growing middle class as millions are lifted out of poverty. Poverty and social exclusion will still affect a significant proportion of the world population.

Inequality, instability, and corruption are main hindrances to social inclusion and severely hamper sustainable development. Globalization should not only be equitable but also reinforce ethical principles. Without enhanced global ethics, the financial crisis of 2008 could have an enduring impact on living standards in Europe and the United States, creating a category of "new poor," shrinking the middle class and triggering new migratory flows, as well as a brain drain from poor regions towards OECD counties (OECD 2008b).

The world becomes much more polycentric and network dynamics, governance, and diplomacy gain importance. In the multipartner world of the next decades, the United States and China are expected to be the most influential players next to a plurality of actors. No single world power plays a hegemonic role. India will continue to rise, and Russia and Japan will lose the great power status that they have enjoyed in the past. Polycentrism will be accompanied by an economic power shift towards Chindia (China and India). The influence of all powers will also depend crucially on their ability to act as models for economic, political, and societal development. China is projected to be the largest economic power with almost a fifth of the world gross domestic product, and Brazil may become a successful example of sustainable development during the next two decades (EUISS 2012).

The evolving world order generates greater opportunities for middle powers. Traditional middle OECD counties such as Canada and Australia are expected to sustain their level of influence in global affairs. Europe's leading states may also be tempted to act as autonomous international players. If Pakistan, Nigeria, and Egypt consolidate their democracies, they could also become important middle-range players, with a significant regional influence.

Business and civil society actors and networks are expected to play a critical role in the coming decades. Their power and influence become greater than that of many states, and may lead to new forms of governance and civic action. The devolution of power to federated states and regional and local authorities seems to continue and even accelerate. By 2030, the 50 greatest megacities in the world will concentrate more resources than most small and middle-income states, and they will demand more autonomy and exert greater power, even taking on a more prominent

international role. Improving living conditions in the world's megacities will be a major challenge for some states but also at the global level. Affluent and dynamic cities worldwide emerge as both the main drivers and beneficiaries of a paradigm shift towards green growth.

Greater awareness of the global nature of the world's citizens' most important concerns may lead to a greater call for shared solutions. But this increased demand is unlikely to be matched by supply within the existing global governance frameworks. New constellations of actors emerge to address these challenges, but they still seem unable to provide many of the international public goods and services that citizens demand. This gap may become particularly evident and visible when addressing economic and financial crises, climate change, and resource scarcity.

The governance deficit may weaken the legitimacy of national governments and international organizations. No single power will be able to play a leading role in the search for shared solutions to global problems. The key to success will be strengthened links between local, regional, national, and global governance, and between state and nonstate actors to build a consensus among the different players in a multilayered global network. Multilateral institutions may need to redefine their roles and exercise new responsibilities being accountable to present and future generations.

Next to the world summits, the World Urban Forum, a biennial gathering established by the United Nations in 2002, examines rapid urbanization and its impact on communities, economies, and policies. In the space of 10 years, the Forum has turned into one of the most open and inclusive gatherings of its kind on the international stage. It brings together government leaders, ministers, mayors, diplomats, members of national, regional, and international associations of local governments, nongovernmental and community organizations, professionals, academics, women's organizations, youth, and slumdweller groups as partners working for better cities. It offers a common platform to discuss burning urban issues in formal and informal ways and come up with action-oriented proposals to create sustainable cities. The fifth forum (held in Rio Di Janeiro in 2010), focused on "The right to the city: Bridging the urban divide," a crucial flagship issue (UN/HABITAT 2011).

The Urban Future was the subject of the 6th Forum (held in Naples in September 2012), which introduced the "One Minute for Change" campaign. The Forum issued a Manifesto for Cities calling upon the international community, public, private, and social partners to commit to a Global Urban Agenda. The Manifesto is a collective act of committed partners, who wish to be "change makers," united by shared goals and a common vision of the city for the twenty-first century. It recognizes that the current models of urbanization are socially, economically, and environmentally unsustainable, but considers urbanization as a positive force to be harnessed in support of social equality, economic prosperity, ecological security, and cultural vitality. "The Urban Future We Want" manifesto advocates for a world where cities

generate justice, knowledge, and happiness. It sets key principles, establishes essential paths for realizing the Global Urban Agenda, and initiates a momentum towards the Habitat III Conference (UN/HABITAT 2012).

The first Monday in October every year, designated by the United Nations as World Habitat Day, reminds the world of its collective responsibility for the future of the human habitat and the importance of the recognition of exceptional action. The World Habitat Day is also the day of the attribution of each year's Habitat Scroll of Honor, the most prestigious human settlements award, launched by the UN Human Settlements Program in 1989. The scroll already acknowledged initiatives that have made outstanding contributions in fields such as shelter provision, improving human settlements, and the quality of urban life, care for the homeless, and leadership in postconflict reconstruction. Award winners can act as beacons for innovative and holistic approaches to twenty-first century cities.

A workshop on "Urbanization Nexus" organized by the Strategic Foresight Initiative and the U.S. National Intelligence Council discussed the urbanization trends and their significance for the world of 2030, especially regarding identity, citizenship, and ultimately, governance. The debate on megatrends concerning cities, including age and attraction of immigrants, and young adults, overrepresented in urban spaces, highlighted that it is in urban spaces that migrant populations have increased access to social, political, and economic conditions for the realization of their potential. The development of sustainable infrastructure in these areas would require partnerships among civil society, grassroots organizations, private sector, governments, and international institutions. Systemic approaches to development will ultimately help to scale up microsolutions to a macrourban environment (U.S. National Intelligence Council 2012).

Urbanization is intrinsically linked to challenges and opportunities for global governance in the next decades. The scale and speed of development and the sweeping extent of growth have profound implications for governance, inasmuch as the emerging profile of the future cities confronts national structures. Powerful local leaders play an increasing role in international politics, a rising strength of middleweight cities as opposed to current megacities, and important growth and innovation coming from cities at a faster pace than the ones occurring at the nation-state level. Furthermore, intense networking, alliances, and coalitions of cities can be much more agile, responsive, and effective than international established organizations.

Urbanization trends may pose stimulating questions to notions of citizenship and identity, not only among the urban poor but also wealthier populations. Migration concerns also the top, as talent goes in search of the best positions in cities around the world. The "right of the city" can be enjoyed by everybody, exactly as duties to cities apply to everyone. From asylum seekers to expats, and from freely chosen to compulsory itineraries, migration covers an increasingly diverse range of world citizens and is often proposed to be replaced by the term "mobility."

1.2 Cities, Wonderlands of Possibilities in the Era of Urban Geopolitics

Each city is a public good, both as a living organism and as technical construction. Cities are human nests and havens, places of social interactions, theaters of civilization, schools of abilities and values, and temples of culture and citizenship. Cities are the most complex and dynamic ecosystems, the only human ones. As biological species that concentrate in mutually supportive environments, humans come together to optimize their chances for prosperity. Proximity and concentration contribute to the generation of positive synergies which, when captured and enhanced, can bring about important additional benefits.

Cities have been shaped by human genius enhancing physical assets. C. Levi-Strauss called them the "human inventions par excellence." Synergies have always been a strong urban characteristic, closely linked to the density of diverse people and systems. Archaeological evidence suggests that large associated populations came together to boost very diverse activities, ranging from defense and religion to trade and politics. Mesopotamia can claim the earliest cities. The Indus Valley Civilization and ancient China had also major urban traditions. Ancient Greece saw the emergence of independent city-states, archetypes of the free city, the polis. Classical Athens is the recognized birthplace of the notion of citizenship but also the cradle of architecture, science, theater, and democracy. Hippodamus is considered the first city planner for his grid plan in Miletus and Alexander the Great commissioned Dinocrates of Rhodes to lay out Alexandria, the brightest example of urban planning in the ancient world.

Aristotle (fourth century BC) called the city "built politics." For L. Mumford, the main function of a city is to "convert power into form, energy into culture, dead matter into the living symbols of art, biological reproduction into social creativity." Cities are unique places where citizens constantly express preferences and wishes and where collective infrastructures and networks support the standard of living of all and everyone (Mumford 1961).

Ahead of the sustainability discourse, J. Jacobs stated that cities generate, in an ongoing way, their economic growth from their own resources and from the "disordered order" of human interactions. A sustainable city is, first and foremost, a city that carries the seeds of progress and sustains its ability to reinvent itself and grasp opportunities for a better future. Innovation is a sine qua non condition for continuously reinventing and enhancing precious urban assets and creating multiple benefits (Jacobs 1969).

Cities face some of the most acute problems but also hold the most promising seeds of progress. Beyond this duality, cities are places where people concentrate and interact to seize opportunities. Already in the seventh century BC, Alcaeus had suggested that "cities are not made from houses, stone walls, bridges, and canals, but from people able to enhance their chances and make the most out of them." For cities can generate synergies from the cross-fertilization of very diverse

people and resources. They constitute laboratories of the future, places where lifestyles are shaped before they are disseminated in the world (Mega 2010).

Finally, since ancient Athens, cities have been prominent political entities. They have always promoted open democracies. In the increasingly multipolar and interconnected world, urban leaders compete with national leaders in proposing innovative policies, supporting and scaling progress towards sustainability. Citizens are the political stakeholders and their participation is the common denominator of many transformative projects. Civic authorities have constantly to respond to citizen expectations.

Everywhere in the world, cities face complex, interlinked, and rapidly evolving challenges, such as climate change, global migration flows, transnational governance demands, financial volatility, expanding social inequalities, and environmental deterioration. And some of these problems have just been aggravated as many cities have been hit hard by the crisis, in particular by unemployment and notably youth unemployment. Cities are paying the ransom for the multiple opportunities they hold.

Addressing challenges and seizing opportunities requires ingenuity and innovation, whether in education and research, policy making, investment decisions, or everyday behaviors and lifestyles. An inherently interdisciplinary perspective and multifaceted approach should question established concepts, methods, and policies that responded to the challenges of bygone eras. Good understanding of the urban nexus is crucial for meaningful policies to be conceived and address the complex interrelated challenges of the urban age.

Local leadership increasingly gains global importance. New political leaders emerge around the globe, including an unprecedented number of female leaders, but also many religious groups push to get into government. “Philanthrocapitalists” may have more global influence. New social contracts gain ground and influence, together with the processes of democracy, emergence of more diverse cultural and religious values, social resilience, and social and virtual networks.

According to research by T. Chandler, Babylon was the first city to exceed 200,000 around 600 BC and Baghdad the first to reach a million, around 775 AD, as did also Beijing by 850, when it was superseded by London. In 1800, six of the world’s top cities were in China or Japan. Tokyo has been the top global megacity since 1900. The urban transitions led to various forms of agglomerations and conurbations, and administrative limits brought new complications to the delimitation of cities and new challenges for urban governance. In an era where cities become the material hubs of immaterial flows, global metropolises try to address their environmental problems and improve their competitiveness by strengthening triple helix cooperations, but also quality of life and urban attractiveness (OECD 2006).

The role of megacities and gigacities will probably have to be reinvented, as “trees cannot grow to the sky.” Megacities, hosting more than 10 million citizens, become increasingly significant global networks of networks and ecosystems. On the other side, global cities do not dominate world developments because of their magnitude, but due to their power, often diffused through interrelated networks and interactions and their ability to provide models. Combating poverty, especially affecting slum populations, is a prime concern for megacities which are the

destination of new inhabitants every week. The provision and management of expanding infrastructure, and the search of more inclusive, efficient, and effective metropolitan governance are important issues for sustainability and each metropolis gives its own responses (Metropolis 1996, 1999; Sassen 2001).

"A great city should not be confounded with a populous city" (Aristotle), but many of the most populous cities of the planet are undeniably great, with developing world cities starting the course to greatness. Metropolises should become again global matrices of civilization. Huge infrastructures, roadways, and rail structures, power grids, and telecommunications lines are technical systems that have to be strongly governed and managed. Optimizing these networks in order to achieve sustainable development is an immense task requiring leadership, effective citizen participation, and public and private cooperation.

The share of the OECD cities in the world group of megacities is decreasing. In 2025, the US megacities will still include New York and Los Angeles, and Latin America will have Mexico City, Rio de Janeiro, São Paulo, and Buenos Aires. The majority of megacities will be in Asia, starting with Istanbul and Moscow. China will feature four megacities, India three, Japan and Pakistan two, and the Philippines, Bangladesh, and Indonesia their capital cities. Last but not least, Africa will be represented in the megacities' league by Cairo, Lagos, and Kinshasa.

Increase in population and infrastructure development could force city borders to expand outward and engulf the surrounding areas. Convergence of two or more closely located cities could lead to the formation of huge urban regions, such as for instance, Johannesburg and Pretoria in South Africa. Another trend of urbanization seems to be the development of urban corridors at a regional scale. Infrastructure development, particularly transport interconnecting two or more megacities or regions, could lead to the expansion of long conglomerations like the Hong Kong–Shenzhen–Guangzhou corridor in China expected to house 120 million people by 2025.

Interconnected cities in a multipartner world can raise awareness among the world's citizenry that their aspirations and grievances are shared. This consciousness can result in a shared agenda for citizens of the world emphasizing fundamental freedoms, economic and social rights, and, irrevocably, environmental and ethical issues. Meeting the challenges of human development in a world characterized by the diffusion of power will depend increasingly on local nonstate actors, private companies, civil society nongovernmental organizations, and philanthropic organizations.

By 2030, the digital revolution is expected to have covered the entire planet. This revolution will empower citizens, including a large and growing global middle class, to participate more in decisions about their future than previous generations. If the twentieth century was marked by the rise of a middle class in developed countries, the twenty-first century is expected to see the rise of a middle class in many emerging countries. In 2025, low affordability income classes in the developing world may reach a threshold beyond which they have enough income to satisfy their basic needs and even to spend on other goods and services. This wave of one billion more middle class consumers is expected to boost competition for an array of products

and services. Market growth takes off at a rate that can substantially exceed income growth until reaching a saturation point.

Forming, maintaining, and breaking social bonds are increasingly independent from the urban context and take place instantly online, but the virtual relationships seem rather to complement the real world's personal and professional connections. It is a fundamental human conduct to seek identity and "connectedness" with other individuals or groups that share the same interests, beliefs, or ideals. At virtually zero marginal cost, citizens can interact with a much larger range of people across the globe but the direct eye-to-eye contact maintains its cardinal importance for social bonds (MGI 2012c).

By fully implementing social technologies, companies have an opportunity to raise the productivity of interaction workers by 20–25 %. The McKinsey Global Institute report suggests that the most powerful applications of social technologies in the global economy are largely untapped. Companies will go on developing ways to reach consumers through social technologies and gathering insights for product development, marketing, and customer service.

Research results suggest that the 600 cities making the largest contribution to a higher global GDP, the City 600, will generate nearly 65 % of world economic growth by 2025. However, the most dramatic development within the City 600 involves just over 440 cities in emerging economies. It seems that by 2025, the Emerging 440 will account for close to half of overall growth (MGI 2011a, 2012a).

1.3 The Journey to Strong Sustainability: Enhancing All Urban Capitals

Some years after the outbreak of the financial turmoil that plunged the global economy into a prolonged crisis, it seems that cities, regions, and nations are at a critical inflection point. The most challenging option is to take decisive and bold action and engage in strong and mutually reinforcing sustainability trajectories leading to smart *and* green *and* inclusive growth, in a coordinated way with meaningful structural impact. In order to lead a more decisive exit from the crisis and follow sustainable paths, cities have to reinforce their collective capacity to envision and shape the future and generate and distribute wealth, while propagating good governance models.

Cities have to address many scarcities, in energy, water, land, species, labor, and strategic natural resources, and also vulnerabilities and interdependent systemic risks, especially extreme poverty, new pandemics, and forms of organized crime, terrorism, and severe phenomena linked to climate change. These may be accompanied by tensions among the current methods of production and consumption and the future availability of nonrenewable resources, a general and simultaneous process of increasing global interdependence and differentiation, and of spatial proximity and cultural distance (EC 2009e).

Sustainability symbolizes a continuous efflorescence, resilience to threats, or a permanent aspiration for new and better opportunities. Innovations, qualitative leaps, and paradigm shifts are crucial to maximize and optimize investments in capital, labor, skills, and chance. Innovation and sustainability share a desire for permanent renaissance and enlightenment. In the context of global crisis, cities have to become smarter and regenerate their body, with its blood, its vital organs, and its nerves, but also their mind, with its concepts and its notions, and their soul, with its emotions and capacity to wonder.

The journey to sustainability demands multidimensional efforts at all levels, local, regional, national, and global, against the depletion of the capital stock, composed of human and social, natural and environmental resource capital, cultural and political and manmade, technical and financial, capital. The human capital includes health and well-being, personal skills, ethical values, and lifestyles, whereas social capital comprises community patterns, bonds, and institutions. Natural capital is described as the physical endowments, assets typically transacted in markets, and the environmental resource capital includes the life support systems, offering their services for free.

Financial capital is vital for investments, and, especially in times of crisis and scarcity, it needs innovative strategies to be enhanced, and the involvement of the private sector. Technical capital has to be enhanced, harnessing the evolving possibilities of new technologies to improve housing, water, energy, transport, and access to world networks. Cultural and leisure capital, including all cultural assets, is a potent instrument to maximize the visibility of a city's unique qualities and differentiate itself from its competitors on the world scene. Last but not least, democratic capital matters because city administrations need to improve accountability and transparency in order to achieve the commitment of the whole community on its journey into the future.

The progress of a given city into time can be estimated through the evaluation of the increase or decrease of the aggregate capital stock. A key question concerns the extent to which the various components of wealth can be substituted for each other. Strong sustainability implies that substitution of social and environmental capital is impossible and loss is irreversible. A bottom foundation of a "combined minimum" of environmental, social and economic capital has often been proposed as a nonnegotiable line. For weak sustainability the matter is not whether a particular natural resource will be available infinitely, but whether human ingenuity can preserve and increase the global capital (Mega 2005).

Agenda 21 and the Charter of European Cities and Towns Towards Sustainability, considered to be the European version of Local Agenda 21, plead for strong sustainability. They state that cities should base living standards on the carrying capacity of nature and advance towards social justice, prosperous economies, and environmental improvements. Social equity is considered to be a precondition to the achievement of sustainability, as the inequitable distribution of wealth causes both unsustainable behavior and resistance to cultural change (ICLEI 1995).

A global study on "cities of opportunity" offers an interesting understanding of urban dynamics and insights, communication with government officials, policy

makers, businesspeople, scholars, and citizens committed to the success of their cities. Senior figures from over 40 cities around the world were interviewed. The perceived key trends cut across the experience of all cities: globalization, individualism, merging, acceleration, hi-tech, hi-touch, demographics, urbanization, and migration. City leaders gave their views concerning the international and national, external and internal challenges that their cities face, their policy responses, and their plans for the future (PricewaterhouseCoopers 2011).

Building on the responses of the city leaders, the study explores perspectives on cities, their strengths and weaknesses, knowledge and creativity, in order to find new ways to develop strategic city management. Most challenges can be regrouped to reflect the six constituent groups of assets. Managing effectively these coevolving dynamic capitals ask for a holistic approach, because all forms of urban capital are interconnected. The necessity of taking a holistic approach is one of the themes that emerged particularly strong from the interviews with city leaders wishing to devise policies and strategies well adapted to the dynamic social, economic, and political urban environments.

Advancing towards strong sustainability through the simultaneous reinforcement of all urban capitals requires robust leadership to inspire and fulfill the dreams and visions for the future shared with the people and organizations of a city. Beyond converging bottom-up and top-down approaches, mutual trust dynamics are essential for enduring change. Values are a critical element of good leadership. Leadership usually operates on the basis of a number of collective and shared values that are communicated clearly and used by the leaders to guide daily thoughts and actions and mobilize citizens.

One of the key drivers of a city's attractiveness is also the extent to which people feel connected, the degree of social bond, in other words, the social capital that involves the quality of informal and formal relationships that characterize a city. It is closely linked to low levels of crime, educational achievement, and physical and mental health. Engaging all citizens is crucial for cities that wish to prevent divisions, segregation, and exclusion.

City governments are highly complex organizations. They need to respond to the demands of many different groups and manage the allocation of resources between various, and often competing, claims. Developing the capabilities to ensure that cities manage their capital effectively is essential for cities to achieve their goals. Cities need to make sure they can measure the performance at all policy fronts and create a culture of continuous improvement. As with any program of substantial change, effective risk management is an essential tool. City governments have to identify and understand the risks, gauge their capacity to respond, and link their policies to integrated frameworks of governance and compliance.

Cities have to devise the appropriate instruments and manage the different assets they possess to address the specific challenges linked to each type of capital, without losing the overall sustainability perspective. Human and intellectual capital is identified by the city leaders as the most important asset that their cities possess, which can make a critical difference to their ability to compete successfully for investment. Measuring this capital is very difficult and evidence suggests that few

cities have developed initiatives to do so. However, city leaders stated that they are trying to develop policies to attract skilled and entrepreneurial people, a key factor for success in the twenty-first century.

City leaders stress the central themes of collaboration and participation. In many countries, city governments are faced with the challenge of declining participation in the democratic process and want to renew the bond between cities and citizens. They need to reattract citizens in civic activities and develop ways to make themselves more accountable, increase the transparency of decision making, and engage citizens directly in the conception, implementation, and evaluation of policies.

Cities need to conceive and forge new partnerships with their multiple and diverse stakeholders, far beyond the exchange of information and views. Developing a common vision and implementing actions to make the vision come true are a vital part of this. Citizens should become more than voters or customers: they should be engaged as codesigners and codeciders in the policy-making process.

Effective communication with citizens is at the heart of political capital. Channels for interaction are expanding and the Internet is providing a forum and platform for dialogue between cities and citizens. Developing accountability is a key responsibility for cities wishing to engage their citizens. They are doing this by involving citizens in fixing their targets together and by disclosing their true performance against them, by creating collaborative committees and forums with stakeholders and specific interest groups, and by organizing public services responding to the needs of their citizens.

In addition to the political capital, the cultural and leisure capital depends on a complex array of attributes linked to the unique identity of a city. Cities that have succeeded in attracting visitors, residents, and businesses do so by creating a city brand that encapsulates the exceptional qualities of a city and generates powerful and memorable positive associations. Strategies designed to develop cultural capital need to understand the public perception of cities by citizens and visitors and develop the steps to project cities forward into the experience that they wish to offer.

The "experience economy" is an increasingly important concept in capturing what makes one city different from another. It consists in enhancing all possible activities to be lived in a given place in the future and links to the concept of "destination management." A city wishing to compete for attention in the global marketplace needs to undertake a wide-ranging audit of all the assets that differentiate it from others. Once these assets are understood and shared, they need to be developed and promoted to the type of people that the city wishes to attract (PricewaterhouseCoopers 2011).

The "experience capital" of many European cities is unparalleled and a key factor in making them the world's prime tourist destination. The most-visited cities are also leading advocates for halting the depletion of natural resources and improving quality of life. They can provide lessons for preserving and enhancing urban capital, with its tangible and intangible aspects, with its human, social, natural, and physical, and manmade dimensions, built and open spaces, public spaces, and financial capital (Beatley 2000).

Stimulating the flow of urban energy for simultaneous action on the various aspects of urban capital asks for integrated innovations exploiting new and different paths and destroying old and outdated patterns. From the initial invention to the final transformation, a chain of interactive processes could bring a thorough change that opens up the range of opportunities. Trial and error are important and failures carry the seeds of future successes. Efficient but noncreative use of human or financial capital or technology in cities can lead to the chronic import of innovations and annihilate the creative seeds.

1.4 The Promise of Cities: A Better Life for All is Possible

All cities and citizens desire a better life. However, not all cities enjoy the same assets or confront the same sustainability challenges. Some cities can capitalize on expanding populations and create the right framework conditions to make them competitive and harmonious in order to attract investments and achieve a higher quality of life. The challenge for urban policy makers differs in the developing and the developed world. In a nutshell, the task for the former is to manage growth in a way that avoids diseconomies of scale and builds a basis for sustainable performance. For the latter, there is urgency to deal with ageing and declining populations and outdated infrastructure and maintaining a healthy rate of growth.

One of the most interesting world "Visions for 2050", conceived by the World Business Council for Sustainable Development (WBCSD), based on country dialogues with several hundred companies and experts, highlights that humankind can overall progress to a low-carbon and zero-carbon society but all stakeholders have to change radically their eco-behavior, their interactions with economic and ecological processes.

Let's envision the results of this vision: in 2050, nine billion people live well and within the limits of the planet. More than two thirds of humanity live in cities. Education, cooperation, and empowerment of women bring more awareness about the socioeconomic challenges. Conflicts and disasters may have not disappeared but societies are resilient, able to withstand disruption and quickly recover.

A redefinition of notions and values is a precondition for the success of Vision 2050. Its implementation asks for society to redefine the notion of prosperity and well-being and economic growth to be decoupled from energy and material use and ecosystem destruction. Markets have to redefine values, costs, and benefits. In a complex, yet efficiently connected world, nations may have to pool sovereignty when necessary to manage international systems or resources, such as climate, water, or the space.

Humankind can progress to a low-carbon society with a secure and sufficient supply of low-carbon energy and transport. It can achieve zero particles of waste, and turn everything into a resource. Leading businesses help society manage grand challenges. Despite (lower) increases in population, humanity will be using the

equivalent of just over one planet, as opposed to 2.3 planets according to the business as usual scenarios (WBCSD 2010a).

Requirements for new or upgraded infrastructure may vary among regions and types of cities. Cities need to construct floor space and equipment for residential and commercial purposes. The capacity of ports to handle urban container traffic needs may have to rise considerably. China may hold a share of nearly 40 % of growth in global demand for urban building floor space to 2025. Africa and the Middle East will account for almost 14 % of the global rise in municipal water demand in large cities, almost twice their share of urban GDP growth.

The WBCSD's Urban Infrastructure Initiative brings together a diverse group of companies from key sectors including energy, buildings, materials, transport, water, equipment, and support services to help urban authorities develop realistic, practical, and cost-effective action plans for sustainable infrastructure. The case for action could be compelling both for cities and for companies. A sustainable city can be more competitive, use resources more efficiently, thrive economically, and create an inclusive community. For companies, the case for action is also compelling inasmuch as urban markets offer them the opportunity to provide system solutions, products, and services in support of sustainable buildings, energy, infrastructure, waste collection, and recycling. Working with local authorities, the initiative helps translate the identified needs into landscape solutions for sustainable urban development (WBCSD 2010b).

Urban infrastructure provides the "hardware", with increasingly incorporated "software" for a better life, which greatly depends on a city's distinctive character, history, and culture. Although a unique city, Shanghai is emblematic of the progress marked by a colonial town to become a metamodern metropolis within less than 20 years. The history of Shanghai is still reflected in its urban form and architecture, and revealed by traditional temples and Chinese gardens. Founded in the thirteenth century as an administrative center, a traditional circular city with canals and narrow streets, Shanghai has always been open to international movements of architecture and city planning, integrating classical European with local and national models.

As a major port on the east coast of China, with a unique geostrategic location, Shanghai grew into a modern metropolis in the 1920s and 1930s with the addition of "European" urban areas to satisfy the evolving economic and housing needs of its population. The city was divided into four international sectors (*concessions*), each with its distinct character and administrative systems. During the 1930s, a master plan, based on modern principles of urban planning but with traditional architecture forms, promoted a new center in the northern fringe of the city, away from the influences of the International Settlements and French Concession areas.

From the early 1950s to the 1990s, political circumstances on the world chessboard dethroned Shanghai as a major center of growth and development. Following the Soviet model of urban growth, satellite cities, heavy industry, and harbor zones and residential quarters were designed and built. Public buildings respected Chinese architectural forms of monumentality and dignity. Social realism has been the prevailing form in architecture and urban development.

In the 1980s, Shanghai was one of the first Chinese cities to achieve universal primary and junior secondary education. The Chinese government's decision to embrace a more open policy in the early 1990s gave the city an opportunity to build a new future and become, once again, a world class center of finance, commerce, trade, and shipping. After channeling industrial growth in different directions, the city chose to move eastwards in the 1990s, across the Huangpu River. The restructuring of the Pudong area has led to a new urban front with amazing new buildings for housing, offices, and other activities. Shanghai became again an open city, ready to seize opportunities and continue a competitive tradition underlying its dynamic nature and its entrepreneurial spirit (LSE 2008).

In 2010, Shanghai seemed a city-state hosting more than 18 million inhabitants. The highly populated area within its traditional city boundaries hosts 6.5 million people. Shanghai's overall increasingly urbanizing territory reaches an average density of 2,631 people per km^2, including residential, industrial, and tertiary land uses. Since 1992, the Shanghai economy has shown rapid growth, and it is expected to continue, expanding by more than 10 % annually. The riverscape has been given much attention, with factories, shipyards, and old warehouses being gradually replaced by public open spaces and cultural and recreational services. The transformation of the waterfront closer to the city center along the river banks was cardinal for the choice of Shanghai for the World Expo 2010, the first universal exhibition hosted by a metropolis of the emerging world.

"Better City, Better Life" was the theme of the 2010 Expo, which, for 184 days, explored, envisioned, and simulated possible mosaics of urban life through wonderful showcases of urban best practices and intercultural exchanges. The Shanghai declaration highlights that people's understanding and pursuit of a better life are both the foundations and the engines of urban development. It suggests that it is necessary to re-examine the relationships among people, cities, and our planet and advance towards "Cities of Harmony". Two years later, hundreds of urban demonstrators in a coastal town just north of Shanghai clashed with police, forcing authorities to drop plans for a water-discharge project, part of a paper-making factory. The protesters occupied a government office, in a violent protest against the industrial waste pipeline that could poison coastal waters. The crowds dispersed after local authorities committed to permanently abandon the waste water pipeline project.

The oriental wisdom concept could help re-establish broken harmonious relationships. The concept enhances local wisdom and scientific knowledge and advocates harmonious coexistence with nature through mindfulness and awareness in facing the endless need to consume. The "tragedy of the commons," the state of overexploitation of common environmental resources, could be prevented in extremis by global awareness and cities could lead by example. Local short-term profits should not sabotage global collective long-term oriented efforts. The joint consequences could be highlighted through the well-known metaphor of the "prisoner's dilemma." Because, as M. Gandhi put it, "The world has enough for everyone's need but not enough for everyone's greed."

Attaining contentment and happiness without necessarily continuous material accumulation could be as true for cities and communities as it is for individuals.

The fundamental qualities include public honesty, moderation, human compassion, and social solidarity, in order for communities to develop trust and work together for sustainable development. Enhancing local wisdom and driving for intergenerational equity and accountability are increasingly shared by world citizens (Sathirathai et al. 2011, 2012).

Watercolour 2
Shanghai Competing in the World of Gigapolises

Chapter 2
Human Ecosystems in Harmony with a Resource-Scarce World

Abstract The Rio + 20 conference insisted on the ecoresponsibility of cities, which have to become more resource-conscious and reduce their ecological debts. Sustainable cities, one of the seven priority areas of the conference, can also do much for other priorities, promoting decent jobs and preventing disasters and tensions over energy, food, and water. To thrive in harmony with the planet, cities need ecological and environmentally friendly cells and neurons. Urban organs and functions have to boost the resilience of urban areas and assist in the transition to the civilization of sustainability.

This chapter focuses on cities as vital ecosystems able to manage crucial amounts of scarce resources and materials and reduce emissions and waste. Urbanization affects land use and cover, biodiversity, the hydrologic cycle locally and regionally, air quality, and global climate. Cities should invent new resources if they wish to continue to prosper, while improving efficiency and reducing poverty, emissions, and pollution. Industry suggests that it is possible to live well, with not one particle of waste, and in ecological balance by 2050. Urban concepts such as the SymbioCity actively strive for this.

2.1 Bio-Diver-Cities in Ecological Unbalance

In 2012, humanity was using the equivalent of just over 1.5 Earth's worth of ecological resources and services. If current trends continue uncurbed, the biocapacity of two planets will be needed for the survival of humankind before 2050. Earlier and earlier every year, the Ecological Footprint Network, tracking global demand for, and supply of, natural resources and ecological services, breaks some threatening news. In 2012, the Earth Overshoot Day was on August 22. In just eight months, humankind had already consumed the renewable natural resources that the planet can sustainably provide and exhausted its ecological budget for this year. The ecological deficit conceptualizing the gap between supply and demand of resources is

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already eroding the planet's ecological assets and the depletion of the global capital becomes less and less irreversible (Ecological Footprint Network 2012).

Ecological overspending has entered a vicious cycle that can have equally devastating impacts as financial overspending. As resource deficits get larger, and resource prices remain high, pressures become unbearable and the accumulation of the debt weakens global ability to initiate virtual cycles. Already in the 1970s, humankind crossed a critical threshold as demand began outstripping the planet's biocapacity, and went into ecological overshoot. From soaring fossil fuel prices to crippling national debts, nations, regions, and cities are confronting the reality of years of consumption beyond their means.

Cities have to offer citizens the possibility to lead happy and fulfilling lives in balance with the planet. They need fresh air and water, healthy food, shelter, energy and transport, materials, services, and opportunities for education, work, and leisure. For this, cities interact with the surrounding land and affect a broader environment than in their "administrative" borders. They have enormous ecological footprints reflecting their resource consumption over the whole value chain.

In industrialized countries, an ageing urban population and decreasing household sizes gave rise to higher environmental pressures. Land use planning and urban sprawl resulted in increased consumption of land, energy and resources, air and noise pollution, and greenhouse gas emissions. New principles and models have to liberate cities from the unbearable weight of outmoded past urban planning practices and help reduce consumption while at the same time generate well-being and happiness (EEA 2010b).

Summits and high-level conferences could give cities a golden opportunity for reassessing sustainable development goals and the various strands of urban policies, evaluating success and failure and engaging in common actions. The UN Conference on Environment and Development (Rio de Janeiro 1992) and Agenda 21 underlined the role of cities and local governments. In 2012, cities were among the seven critical issues selected for Rio + 20. They had further increased their footprints. Earlier research had already highlighted that, on average, the annual growth rate of urban land cover was double the annual growth rate of the urban population between 1990 and 2000 (Angel et al. 2011).

The conference Rio + 20 solemnly reminded the world of the fundamental changes needed to preserve the planet. The declaration "The Future We Want" tried to encourage countries to introduce green economy policies and eliminate poverty but has been criticized for including few firm or specific new commitments. Earlier efforts by some countries to phase out fossil-fuel subsidies or define specific sustainable development targets did not bring the wished effects. The lack of pledges on concrete actions has been worrying for many international communities.

More than 700 voluntary commitments for sustainable development were registered by governments, business, civil society organizations and universities by the end of Rio + 20. Some interesting initiatives include a pledge by the eight largest multilateral development banks to spend $175 billion US to finance sustainable transport systems over the next decade. More than 80 companies and 50 countries also committed to boost natural capital accounting, after a proposal by the World

Bank to factor the value of assets such as clean water and forests into business decisions and governments' national accounting systems. The World Business Council on Sustainable Development suggested seven keys for businesses to drive progress through the market, which can thrive in cities: Innovate, practice ecoefficiency, advance from stakeholder dialogues to partnerships for progress, inform and influence consumer choice, improve market framework conditions, establish the worth of Earth, and make the market work for everyone (WBCSD 2012).

The review report "Only One Earth: The Long Road via Rio to Sustainable Development," launched in Rio + 20, helped to assess the progress and disappointments in environment and development. It looked into the challenges 40 years from Habitat I (Stockholm 1972), in particular in the areas of economics and governance, and the role of stakeholders, and proposed a "survival agenda," a bare minimum of absolute policy changes to advance towards sustainable development (Dodds et al. 2012).

Many organizations suggested that the moment had come to overcome the paralysis of indecision. Rio + 20 intended to give a new impetus and turn sustainable development from aspiration and patchy implementation into a genuine path to progress and prosperity for the present and the next generations. The Global Environmental Outlook warns that the world continues to speed down an unsustainable path in spite of hundreds of internationally agreed goals to protect the planet and stressed that drastic actions on a large scale are needed to reverse this pattern. The four goals crowned with success include eliminating the production and use of substances that deplete the ozone layer, the removal of lead from fuel, increasing access to improved water supplies, and boosting research to reduce pollution of the marine environment. The assessment emphasized that countries can still meet sustainability targets if current policies are drastically changed and provides examples of successful policy initiatives (UNEP 2012b).

Crucial ecological debtors on an ecologically indebted planet, cities declared their will and readiness to act. The ecological footprint of cities depends on the form and pattern of urbanization, consumption patterns, and policies. Many of them conducted precise assessments of their ecological footprints and identified ways to influence and reduce them. The San Francisco Planning and Urban Research Association, together with the Ecological Footprint Network, tried to calculate the ecological footprint of the metropolitan area. The project expanded the thinking and knowledge regarding urban design and infrastructure. The study concluded that the average San Franciscan's overall footprint was about 6 % higher than the average American and underlined the footprint trends in sprawling cities. Although density and public transport significantly reduce per capita footprint, the increased affluence of city residents may even increase final consumption (Ecological Footprint Network 2011).

Cities can collectively influence over 70 % of the global ecological footprint. In Canada, Calgary was the first city to develop concrete footprint reduction targets. The mayor and the council of Calgary have promoted the ecological footprint concept to engage the community and municipal government in advancing the goals of their 100-year sustainability vision. In 2005, Calgary participated in an ecological

footprint study, which found that the city's footprint of 9.86 global hectares per capita had exceeded the Canadian average by over 30 %. Calgary plans to reduce its footprint to the national average of 7.25 global hectares per capita by 2036. Accomplishments include a personal ecofootprint calculator specific to Calgary residents and the annual Mayor's Environment Expo to engage school-age children in sustainability projects (City of Calgary 2007).

Cities are among the highest concern ecosystems highlighted by all international organizations and foresight processes such as the UNEP participative foresight, introduced in 2010 to identify and prioritize emerging environmental issues. The process included a canvass of ideas from the UNEP community, the foresight panel that debated and ranked the issues in a structured and systematic way, and an extensive electronic Delphi consultation of more than 400 scientists worldwide. It shed light on cities as an "emerging issue," defined as the ones recognized as very important by the scientific community, but not yet receiving adequate attention from the policy community, including the research and innovation policy community. Cities were recognized as critical to the global environment, of almost universal spatial scale, and subjects of new developments, scientific knowledge, scales, or impact (UNEP 2012a).

The resulting ranking of 21 emerging issues stresses the importance of food production and security, cities and land use, biodiversity, freshwater and marine, climate change and energy, technology, and waste issues. Another cluster essentially cutting across sectors and themes includes issues such as the governance to effectively tackle twenty-first century sustainability challenges, the urgency to bridge the gap between the scientific and policy communities, and social sustainable consumption. The issue "Boosting Urban Sustainability and Resilience" ranked eleventh, and "Broken Bridges: Reconnecting Science and Policy" ranked fourth. The process suggests that the linkage between the policy and science communities is inadequate or even deteriorating, and this broken bridge is hindering the development of solutions to global environmental change (UNEP 2012a).

The sustainable management of natural resources and ecosystem services in an increasingly urbanized world is a major challenge for cities wishing to contribute to the UN Convention on Biological Diversity (CBD). However, the European Environment Agency suggested that cities can be an opportunity or a threat for biodiversity. Seizing the opportunity asks for a mix of high-quality green commons with dense and compact built-up areas (EEA 2010b).

The first global assessment and outlook, presented by the UN Convention on Biological Diversity and the Stockholm Resilience Center at the 11th meeting of the Conference of the Parties to the Convention on Biological Diversity, analyzed the negative impacts of urbanization on biodiversity and ecosystems, but also underlined the potential benefits from taking into full account terrestrial, freshwater, and marine ecosystem dynamics in urban planning and policy. Contributions from leading world scientists, policy makers, planners, and practitioners suggest that over 60 % of the land projected to become urban by 2030 has yet to be developed. This should rather be seen as a major opportunity to make giant leaps for the reduction of biodiversity loss and the improvement of urban quality of life. The Cities in Biodiversity

Hotspots Program is a 10-year global initiative providing over 250 cities located in and around the 35 biodiversity hotspots of the world with a platform for action on biodiversity and mutual learning (UN Convention on Biological Diversity et al. 2012).

In 2008, Singapore committed to work on a City Biodiversity Index as a performance evaluation tool. The index could assist cities in the benchmarking of their biodiversity conservation efforts over time. Other initiatives to benchmark environmental stewardship include notably the most widely accepted 2005 Environmental Sustainability Index devised jointly by the Yale Center for Environmental Law and Policy, the Centre for International Earth Science Information Network, the World Economic Forum, and the Joint Research Centre of the European Commission. The framework of the City Biodiversity Index was developed through a chain of expert workshops held since 2009. After a preliminary assessment of data availability and feedback by several world cities, indicators and a scoring system were developed, tested, revised, and improved upon and a user's manual was prepared. Efforts continue towards a single index aggregating all the contributing indicators.

The Local Action for Biodiversity Initiative introduced by the International Council for Local Environmental Initiatives (ICLEI) highlighted the achievements of pioneering cities. In Curitiba, the BioCity enhances public and private initiatives in an effort to reduce the loss of biodiversity. The program aims to halt the rapid urbanization rate, which can affect natural areas, damage ecosystems, fragment natural spaces, and drive species to extinction. In Liverpool, the city council proposed various incentives to encourage conservation action and the protection and enhancement of its rich and threatened biodiversity. Examples include recognition and inducement prizes for the environmental volunteers and involvement in the BioBanking scheme.

Parks are among the most important urban commons. Although biodiversity and ecosystem services are global common goods, local and regional authorities most often have the legal power to designate conservation areas and to integrate biodiversity concerns into their urban and spatial planning. Public commitment is essential for sustainable communities that identify biodiversity as a precondition for resilient cities. In addition to protecting areas, developing green infrastructure presents an opportunity to integrate biodiversity into spatial planning at local and regional levels (EEA 2010b).

Many cities strive to provide citizens with easy access to high-quality green areas. Ensure that all New Yorkers live within a 10-minute walk of a park is one of the goals of plaNYC, the ambitious plan 2030 for New York. The plan is a comprehensive effort orchestrated by the New York City mayor in 2007 to prepare the city for one million more residents, strengthen the economy, combat climate change, and enhance the quality of life for all New Yorkers. The plan brought together over 25 city agencies to work toward the vision of a greener, greater New York. Public spaces and parks are among the PlaNYC areas of interest (New York City 2011).

Environmental problems are profoundly intertwined with education and social behavior. The urban quality of life depends on the existence of sufficient attractive

urban green areas for people and wildlife to thrive. All roofs could become candidates for microfarms and all walls could support vertical urban agriculture. Inventors already proposed self-regulated urban farms to the size of a parking place. Cities are equally interested in ecosystem services delivered by biodiversity in green areas outside their boundaries.

The "Cities Farming for the Future Programme" searched to make a contribution to improved urban environmental management, food security, poverty reduction, empowerment of urban farmers, and participatory governance in cities. Six regional Resource Centres on Urban Agriculture and Food Security have been set up and provide gender-sensitive information, training, and advisory services to local and national authorities, NGOs, farmers, and other stakeholders regarding policy formulation and action planning, implementation, and monitoring (van Veenhuizen 2006).

2.2 Climate-Friendly Cities in Action

The decade 2001–2010 was the warmest period ever recorded. The past few decades have been warmer than any other comparable period for at least the last 400 years. Limiting the global average warming to 2°C above preindustrial levels and ensuring the survival of humanity on Earth is likely to require emission reductions larger than 80 % below peak levels. If emissions continue to grow, large regions probably will individually exceed a 2°C increase in average annual temperatures by 2040 (Ecological Footprint Network, ESA and WWF 2012).

The magnitude of climate change and the severity of its impacts depend on the actions that humanity takes to respond to these risks. Political decisions involve value judgments, but scientific knowledge can play a key role in the response to climate change by, for example, projecting the beneficial and adverse effects of climate changes, and their likelihood, identifying and evaluating the likely consequences of different actions taken to respond to climate change, expanding the portfolio of possible options, and improving the effectiveness of policies.

Climate change partially results from millions of decisions made by the world's citizens within their immediate environments. There is a call for a new era of climate change science and policy with an emphasis on "use-inspired" research, which not only improves understanding of the causes and consequences of climate change but is useful to decision makers at the local, regional, national, and international levels acting to limit and adapt to climate change (NRC 2010b).

Global emissions have grown by almost 40 % since 1990. International cooperation has been intense and the Kyoto protocol, which came into force in 2005, brought its results. The European Union, Russia and United States managed to curb their greenhouse gas (GHG) emissions. In 2007, China overtook the United States as the biggest emitter of the world. Urgent action is needed everywhere, as the world is in front of a new investment cycle of capital renewal and expansion, mainly in and for cities. Cities have emerged as a leading force for global action on climate change. It seems that policy makers do not need to choose between averting climate change and promoting prosperity (Stern 2006).

Research shows that it is not urbanization per se, but rather higher levels of income and the related consumption patterns that drive the higher GHG emissions. Urban densities yield many opportunities for low-carbon lifestyles, such as the use of cycling paths or public transport. In most countries, energy use per capita of urban residents is lower than the national average. By contrast, in China, per capita energy use of city residents is double the national average due to higher average incomes and increased consumption.

Cities have a responsibility to create solutions to climate change. Acting both locally and in network, they can have a meaningful global impact. Each city is unique in its morphology, culture, infrastructure, municipal services, and potential impacts to and from climate change. However, the underlying drivers of emissions in cities are largely the same and include huge energy losses, heavy traffic congestion, unsustainable resource and waste management, water leaks, and irreversible biodiversity losses.

Energy industries are responsible for 35 % of CO_2 emissions in the European Union and transport comes just after with 30 % of CO_2 emissions. Heavy periurban industries participate in the EU Emissions Trading System (ETS), a cornerstone of the European Union's policy to combat climate change and a key tool for cost-effectively reducing industrial greenhouse gas emissions. Launched in 2005, the ETS is the first and largest international scheme for the trading of greenhouse gas emission allowances, covering some 11,000 power stations and industrial plants such as combustion plants, oil refineries, and iron and steel works, as well as factories of cement, glass, lime, bricks, ceramics, pulp, paper, and board in 30 countries, including the EU27, Iceland, Norway and Switzerland. In 2009, the industries participating in the scheme accounted for almost half of the EU's CO_2 emissions and 40 % of its total greenhouse gas emissions.

The EU system is founded on the "cap and trade" principle. For each industry in the system, there is a limit on the total amount of certain greenhouse gases that can be emitted. Within this cap, companies receive emission allowances they can trade among themselves. The limit on the total number of available allowances ensures that they have a value. At the end of every year, each company must yield enough allowances to cover all its emissions, otherwise it has to face heavy fines. A company reducing its emissions can keep the spare allowances to cover its future needs or sell them to other system players. The number of allowances is reduced over time so that total emissions fall. In 2020, emissions are expected to be 21 % lower than in 2005. At the end of 2011, carbon prices fell to around € 8 per tonne of CO_2.

The Emission Trading System has demonstrated that it is possible to trade in greenhouse gas emissions. Nitrous oxide emissions from certain processes are also covered and air industries are expected to join the system that would be further expanded to the petrochemicals, ammonia, and aluminum industries and to additional gases, during the third trading period in 2013. At the same time, a series of important changes, notably a progressive move towards auctioning of allowances, could further enhance the effectiveness of the system. The success of the scheme has inspired other countries and regions to launch cap and trade schemes. A global carbon market is gradually emerging.

In 2010, Tokyo, the most populated world city, introduced the first urban cap and trade program in order to reach its GHG emission reduction target of 25 % by 2020 compared to its 2000 emissions. It covers 1,400 installations, including 1,100 business facilities and 300 factories that are large CO_2 emitters. Although they account for only around 0.2 % of some 700,000 industrial and commercial facilities in Tokyo, their carbon dioxide emissions in 2007 stood at roughly 20 % of total metropolitan emissions.

The cap for the first compliance period (2010–2014) has been set at a level of 6–8 % below base emissions, and the cap for the second compliance period (2015–2019) is expected to be fixed at a level of approximately 17 % below base emissions. Monitoring is permanent and reporting takes place on an annual basis. Compliance assessment after completion of each phase can result in fines being imposed on noncompliance emitters.

The Tokyo program offers an ingenious approach that addresses the complex and fragmented value chain in the real estate and building sector. The lessons that can be drawn include the capacity of the program to bring together disparate stakeholders from developers, owners, and tenants to curb CO_2 emissions in buildings. The program shows how a significant consultation process can ensure that stakeholders are convinced of its fairness. Mandatory reporting of emissions is an important prerequisite and asks for the collaboration of all, in order that the municipal government has the exact figures to address rising emissions. The program is based on energy consumption, which allows different types of buildings, and their emissions, to be assessed on a similar basis.

The effects of climate change pose significant social, environmental, and economic threats and risks to the urban, national, and global communities. Cities are also vulnerable to climate change as 75 % of urban settlements are located in coastal areas. More frequent and extreme weather events, especially rains and floods, heat waves and droughts, reduced snowpack, increasing temperatures, and rising sea levels seriously affect livelihoods, food production, energy supply, infrastructure, ecosystems, and society and the economy as a whole.

Unshakeable commitments, confirmed by concerted action, monitoring, and reporting, can help build a strong case for local climate action. Most climate-conscious cities involve citizens and local stakeholders in declarations on climate change to mobilize action and provide guidelines for implementing local policies to reduce greenhouse gas emissions. Climate-aware cities, such as Amsterdam and London, have created dedicated agencies and offices to monitor progress towards their climate objectives and targets.

The national–local dialogue is crucial to reducing GHG emissions. The Local Government Climate Change Leadership Summit (June 2009) was a prime milestone in the process leading up to the climate change COP 15 in Copenhagen (December 2009). It advocated for a national–local dialogue and a partnership with cities to reduce GHG emissions. The City Climate Catalogue, an interactive instrument highlighting accomplishments versus objectives, was launched five months earlier to provide a substantial contribution for national governments in the

international climate negotiations. All cities were invited to contribute their greenhouse gas reduction targets and engage in concerted actions to achieve and overcome them.

Educational institutions, from primary schools to universities, have a particular dual purpose, to promote learning and lead by example. Harvard University tries to model sustainability through both research and campus activities and its specific goal of reducing Harvard's carbon emissions by 30 % over a decade. By devising unambiguous action plans and bringing Harvard's disparate schools together in this noble process, the university insists on small "painless" changes on the use of resources and energy that can make a marked difference.

Mitigation has to take place at the earliest possible stage and it is hugely beneficial to reducing the cost of adaptation actions (Stern 2006). Adaptation asks for anticipation of the adverse effects of climate change and appropriate action to prevent or minimize the possible damage. Cities also have to engage in adaptive actions to keep the impacts of climate change within manageable boundaries. The likely impact of extreme events linked to climate change depends on location, physical characteristics, and land uses, as has been witnessed with the urban heat island effect caused by differences in urban density and vegetation cover.

Cities investing early in adaptation are expected to have the best returns. Many cities have already adopted detailed adaptation plans. London's Climate Change Adaptation Strategy proposes action far beyond the Thames barriers and tidal mechanical defenses. The measures include management of the flood risk from tributaries to the Thames and heavy rainfall.

Tree and vegetative cover, green ecoroofs and ecowalls, and cool roofs and pavements, are increasingly used to reduce urban heat islands. The extent to which urban areas can benefit from heat island reduction measures depends on a number of factors, some of which can be influenced by local policies. Decision makers can select from a diverse array of ecomeasures to generate multiple benefits, including vegetation and land use design improvements, incentives for green roofs and walls, and green public procurement.

Although the 2009 Copenhagen Summit on Climate Change did not live up to expectations, Copenhagen promised to provide the world a valuable lesson in environmental urban planning and become an international gold standard for sustainable cities. The city council agreed in 2009 to make Copenhagen CO_2 neutral by 2025 as part of an ambitious climate change plan. Already labeled "eco-energy" city and selected European Green Capital for 2014, the Danish capital promotes the use of renewable energy, the construction of high-energy efficiency buildings, and sustainable mobility. A comprehensive adaptation strategy, adopted in 2011, takes a long-term view that allows flexibility and targets action where it can be most effective.

As do most coastal cities, Copenhagen has a close relationship with water, further strengthened and strongly demonstrated each time the city was the victim of heavy thunderstorms and exceptional rain levels. The effect of the torrential rain in August 2010, the worst in the last 100 years, stressed the vulnerability of the city and put enormous pressure on its drainage systems.

Already in the 1990s, Copenhagen undertook action to deal with the threat of floods. A network of temporary reservoirs was built to store excess rainfall and wastewater, preventing the overflow of sewage systems and the risk of flooding in the city. The reservoirs also improved the surrounding environment, with the water in the harbor clean enough for swimming. The predictions for Copenhagen suggest that climate change will result in warmer summers with torrential downpours and more wet winters. The city could face increasing periods of intense rain much more often than in the past, but also more extensive drought periods. The reservoirs may need to be further expanded in the future to maintain the achieved high standards, along with other measures that are being planned to increase Copenhagen's resilience to climate change.

Copenhagen's climate plan includes an adaptation plan with a range of interlinked environmental initiatives. To reduce the risk of flooding, vegetation throughout the city is expanded through green walls and roofs, as well as through the creation of a network of *pocket parks*, small green spaces artfully integrated in the urban fabric. Well-designed small green areas dotted throughout the city could help to manage the risk of excessive rainfall and flooding.

Green and blue areas will also help to cool down the city during summer months to cope with the expected higher temperatures as vegetation holds moisture and releases it into the air giving a cooling effect compared to the one by artificial surfaces that tend to absorb and retain heat. Furthermore, these areas will also increase recreation areas for residents and visitors and improve conditions for biodiversity.

In cities in the developing world, climate impacts may aggravate poverty conditions and social inequalities. Climate change will also exacerbate other existing knotty problems such as low air quality and poor water supply. Some cities already see adaptation as an opportunity for better urban planning and policy to develop the correct infrastructure, improve quality of life, and create new innovation trajectories and employment opportunities.

Access to reliable data on the likely impact of climate change, the associated socioeconomic aspects, and the costs and benefits of various options are essential for effective adaptation. The European Commission's 2009 White Paper on Adaptation emphasized that the lack of knowledge is a major obstacle to the development of successful climate change adaptation responses. Evidence of the economic benefits of adaptation action is mounting because, according to the EC-supported Climate Cost project, the annual economic damage for the European Union due to floods alone is about € 6.4 billion and is projected to increase many times by 2050. Adaptation measures could avoid such damages at only a small fraction of the estimated future costs (EC 2009b).

The European Climate Adaptation Platform (CLIMATE-ADAPT), an interactive tool on adaptation to climate change, was introduced online by the European Environment Agency in Copenhagen in 2012. It is a publicly accessible Web-based platform, designed to support policy makers at EU, national, regional, and local levels in the development of climate change adaptation measures and policies. This instrument was developed with the support of the European scientific and policy community to help users to access, disseminate, and integrate information on

expected climate change, the vulnerability of regions, countries, and sectors, regional and transnational adaptation activities and strategies, case studies of potential future options and adaptation planning.

Measuring and disclosing the amount of emissions of all actors are important elements for preventing global warming. The Carbon Disclosure Project (CDP) is an independent organization providing a transformative global system for companies and cities to measure, disclose, manage, and share climate change and water information. Recognized as a powerful green nongovernmental organization, the CDP brought together over 3,700 organizations across the world's largest economies to report their greenhouse gas emissions and assess climate change risk and opportunity, in order to set reduction targets and improve performance. Some leading companies have moved to become carbon neutral, and others to reduce greenhouse gas emissions by adopting energy-efficiency methods and business planning.

Transparent disclosure enables authorities to underline commitment, reduce risks and associated insurance costs, and helps demonstrate to investors and citizens the values and visions of their city in a competitive globalized world. The CDP operates in most major economies worldwide and channels information through five distinct programs, one of which focuses on cities. The CDP Public Procurement Program is designed to enable local and national governments to ascertain the impact of climate change on their supply chain. Government spending equates to trillions of dollars a year, which has the potential to make a dramatic impact on the market. This program is an effective way for local and national governments to ask their suppliers about energy use, greenhouse gas emissions, and any subsequent global warming implications. This also allows governments to understand the climate change risks better, which in turn can help work towards building a low-carbon government supply chain. The dynamics of network governance make local and national governments leading actors for change.

The CDP Cities provides standardized reporting of emissions data, analysis of climate risks and opportunities, and adaptation plans for cities around the world. An annual report, first released in June 2011, helps city leaders to identify peers addressing comparable risks and issues with innovative strategies for reducing carbon emissions and for mitigating risk. The global 2012 report suggests that 82 % of cities identify the potential for economic growth as a result of climate change mitigation and adaptation. More than half of the participating cities identify opportunities to create green jobs and new business initiatives. Despite the substantial prospects for green growth, just under a third of cities expect new sources of funding for tackling climate change. The report, based on the carbon and water strategies and actions disclosed to CDP by 73 cities across continents, includes a special focus on the C40 Cities Climate Leadership Group, the world's largest cities working to reduce urban carbon emissions and accelerate climate change adaptation. The report recognizes that there is a "network emulation effect" for cities of the C40 which outperform the average (CDP 2012a).

The reporting cities suggest a wide variety of financial drivers for climate change action, with nearly a third of them expecting improved energy efficiency and a fifth

recognizing the increased energy security that action on climate change can bring. Most cities anticipate the creation of green jobs and foresee new business from clean technology industries or the development of the low, zero, and postcarbon economy.

The 2012 European report suggested that European cities are leading the international chorus of cities in various areas of climate change management, including setting emissions targets. Among the reporting European cities, 86 % have set a citywide reduction target, compared to the global average of 70 %. Two thirds of reporting European cities engaged with their suppliers on climate change, compared to 47 % across all regional groupings of cities reporting to CDP in 2012 (CDP 2012b).

Climate change risk assessment is becoming a mainstream practice in Europe. Seventeen participating cities have completed or are in the process of completing risk assessments to understand the possible impacts of climate change on their local jurisdictions. These efforts reveal that 18 of the 22 European cities face significant risks arising from climate change and 54 % assess these risks to be severe or very severe. Furthermore, 16 of the 22 European cities report that they are facing risks related to frequent or intense rainfall and temperature rises or heat waves. Once the risks have been identified and assessed, cities can establish action plans. Fourteen cities report that they have an adaptation plan, and two additional cities are in the process of developing these plans.

2.3 Urban Ecosystems: Ecocells, Eco-Organs, Ecofunctions

The vision for the sustainable city of the future has embraced many interrelated concepts including the green city, the liveable city, the viable city, the affordable city, and the ecological city. Ecocities are increasingly seen as simultaneously ecological and economic cities. Urban planning and policy are of utmost importance for improving urban performance and reducing the ecological footprint of cities. Urban infrastructure is long-lasting and influences resource consumption for decades to come. Public decisions on the future of infrastructure can foster or break a city's prospects for years and decades ahead. Urban planning can create and maintain future resource traps or opportunities for resource-efficient lifestyles. The involvement of all actors at the earliest possible stage is most important.

The "ecological city" concept, promoted by the homonymous OECD project before the turn of the century, advocated for the integration of ecological concerns in all urban policies. The process could be described as an essential bridge between the macrolevel concept of sustainable development and the microlevel one of local performance (OECD 1996). The Tokyo government proposed the concept of an ecosociety towards a clean, sound, and citizen friendly metropolis. Comprehensive actions focused on resource management, water recycling, energy, transport demand management, and promotion of environmental education and awareness (UN/Tokyo Metropolitan Government 1998).

Symbolic events and awards may be very inspiring. In the 1990s, Leicester, the first "Environment City" in the United Kingdom, provided a plethora of ideas. The Business Sector Network, and Environ, a nonprofit company, helped local organizations with environmental audits and advice. The energy-efficiency center introduced an energy education package for teachers and invited students to contribute to the energy monitoring of their schools. The energy efficiency bus, equipped with solar panels and connected to the infant Internet, promoted awareness on renewable energy. Energy passes to optimize the energy conditions of houses became a common measure in the German Länder (Energie-Cités 2001).

Ecoresponsible cities cannot exist without their ecological units, the ecobuildings. Ecohabitat, beautifully crafted, modular and flexible, luminous and healthier, with limited and subtle use of materials and low/zero energy requirements, has already endowed many cities with attractive ecocells. Good integration into the landscape, the orientation and adaptation to climatic conditions, the recourse to ecological materials and renewable energies, and the sustainable management of water and resources, including waste, are critical for ecoperformance at all scales.

Bioclimatic architecture and design made great strides over the last years. Architects, designers, ecobuilders and ecocitizens are promoting green construction and more ecologically sound techniques all over the world. Design information about the latest low-impact materials and technologies, the best possible use of renewable energy, and best practices can help make a difference (Roaf 2007).

Public and privately owned buildings open to the public can act as pioneers and serve as models for intelligent resource-saving and performance-enhancing buildings. The display of energy performance certificates and recommended optimal climatic conditions, such as the most favorable indoor temperatures, in all public buildings, can promote awareness about the benefits of ecoperformance.

Buildings represent the field that holds the largest potential for cost-effective energy savings in the European Union. Higher levels of comfort and equipment for homes and offices led to rising energy consumption. Given the long lifetime of buildings in Europe, the largest potential for improving energy performance is in the existing building stock. Ecoretrofitting is, however, far more challenging, than the planning and realization of new ecobuildings.

Schools can be the most instrumental eco-organs of a city and great places for promoting environmental awareness but also for sowing the seeds of a smart and inclusive society. The international award program "Eco-Schools" created a movement of schools in the sustainability journey. It provides a framework to embed sustainability principles into school life and action. Children are the driving force behind the project. They lead the ecocommittee and help carry out an audit to assess and improve the environmental performance of their school. They also learn principles and practices to apply in other spaces including homes and public spaces.

Religions, like schools, offer a prime way to get into family life and approach citizens' values. They can also play an important role, as responsible for the management of property, land and buildings, schools and hospitals, and the exercise functions with a significant environmental impact. In 2009, most of the world religions came together in the interreligious conference "Many Heavens, One Earth," and

presented their plans for greening their activities. The Church of England has pledged to reduce carbon emissions by at least 42 % by 2020 and by 80 % by 2050. The Muslim seven-year plan foresees the holy city of Medina to become a model green city (Mega 2010).

Green Capitals have first been introduced in the European Union towards the end of the first decade of the millennium. Stockholm and Hamburg were selected, among 35 cities competing for the prestigious title of European Green Capital for 2010 and 2011, respectively. The candidate cities presented a wealth of strong proposals and high-caliber events. Hamburg sent an impulse throughout Europe encouraging urban efforts for sustainable development. The city had already proven its success as a green city including through investments in renewable energy and the creation of HafenCity (Harbor City), an innovative district on the harbor.

The European Green Capital ignited the debate about exemplary concepts and solutions for the future of European cities. Hamburg has set itself the goal to cut CO_2 emissions by 40 % by 2020, and by 80 % by 2050. In an effort to make the city emission-free, the city has proactively sought partnerships with a number of green companies. To enhance the exchange of ideas among European cities, Hamburg put on rail the "train of Ideas," an interactive exhibition on a moving train, with information about major projects such as the reintroduction of a tram system and the HafenCity.

The genesis of HafenCity enhanced the possibilities of the space abandoned by the former Hamburg harbor. At the beginning of the last century, Hamburg's bustling harbor, at the edge of the city center, included the infrastructure and warehouses of the shipping industry. But the advent of bigger ships led to the creation of a new harbor, leaving a vast empty space just outside downtown. In 1996, a first study for the redevelopment of the inner city harbor fringes already comprised the majority of the future HafenCity. By the time HafenCity is finished in 2025, it will stretch 1.5 km between the city center and the Elbe River.

This new district features high-quality high-tech residential and office space, a waterfront promenade, a five-star hotel, a university, and excellent public transportation. HafenCity aims to become a living breathing part of the city, a place where people want to both work and enjoy their leisure time. The jewel in the crown will be a new opera house. Present achievements include an Ecumenical Forum inaugurated in 2010, the first of its kind in Germany sponsored by 19 Christian churches in Hamburg and designed according to the strict sustainability standards of the HafenCity Eco-label. In 2011, the district welcomed "Osaka 9," the HafenCity sustainability pavilion with an exhibition space on ecological, sustainable urban development. The pavilion served as the central information point of Hamburg as Europe's Green Capital 2011.

Some HafenCity buildings have already won international architectural applause. In 2009, the Unilever building was selected as the world's best office building by the World Architecture Festival Awards, not just because of its aesthetic and ecological qualities, but also its public character. A freely accessible atrium guarantees its openness to the surrounding urban area. The same year, another building in the

district, the Marco Polo Tower, won the European Property Award, the highest praise in the high-rise development category.

Vitoria-Gasteiz selected as the 2012 European Green Capital, greatly differs from the previous capitals in size and location, but stands out above them for the involvement by its citizens who judge their city to be sustainable, compact, accessible, healthy, caring, committed, open, and green. The Basque capital is the first city in southern Europe and the first medium-sized city (260,000 inhabitants) to be awarded this prize. Accessible and dynamic, vibrant and modern, Vitoria-Gasteiz, is one of the cities in Europe with the largest surface area of green spaces per inhabitant (45 m^2).

The designation of Vitoria-Gasteiz as European Green Capital in 2012 is a recognition of the results achieved by over three decades of sustainable environmental policies by municipal governments under different political parties. It also acknowledges the commitment of citizens to recycling, sustainable mobility and water consumption, and the ambitious plans being pursued by the city against climate change, the improvement in air quality, reduction in water consumption, optimization of energy efficiency, and waste management. The city's philosophy is that citizens themselves are the ambassadors of green criteria (New European Economy 2012).

New neighborhoods offer ample opportunities for improved environmental management (Arene 2007). The Beddington Zero Energy Development, or BedZED, is the United Kingdom's best-known ecodistrict or ecovillage, an environmentally friendly housing development in the London Borough of Sutton. A multiaward-winning project, created in 2000–2002 by BioRegional, BedZED is owned and managed by Peabody, one of London's largest housing associations. The low-energy and emissions concept encourages public transport, cycling, and walking, and asks for limits to private cars and parking space in the district. The residents' car mileage is 65 % less than the UK average (Bioregional Solutions for Sustainability 2009).

Bioclimatic architecture has been the rule in BedZED and all houses face south to take advantage of solar gain, are triple glazed, and have high thermal insulation. Low-impact materials were used for the buildings, selected from renewable or recycled sources within 35 miles of the site, to minimize the energy required for transportation. The project is designed to use only energy from renewable sources generated on the site. Tree waste fuels the cogeneration plant providing district heating and electricity. Most rainwater is collected and reused. Appliances are chosen to be water-efficient and to use recycled water when possible.

Hammarby Sjöstad, in Stockholm, a new district on the former waterfront industrial land set aside for the ultimately unsuccessful 2004 Olympic bid, features bioclimatic design and ecologically sound surroundings. The "eco-cycle model of Hammarby" aims to make the district autonomous throughout its life cycle. In Hanover, the design and construction of the Kronsberg district, built for Expo 2000, incorporated state-of-the-art ecological material and methods. Construction waste was reduced by 80 % through sorting and recycling measures, but also social and educational models (Mega 2010).

SymbioCity is the Swedish trademarked term for sustainable urban development. Launched in 2008, the program aims at exporting Sweden's knowledge and experience with sustainable cities. SymbioCity involves a network of Swedish companies and organizations founded on the initiative of the Swedish government and Swedish industry and administrated by the Swedish Trade Council. It assists Swedish environmental technology companies with their international marketing to "get more for less," by integrating different technologies and city functions. According to the SymbioCity approach, environmental and economic gains result from unlocking synergies between urban systems. For example, the excessive heat from an industry can warm up a household or the waste from an industry can be useful material for a service. The seven building blocks of the SymbioCity concept include architecture, energy, landscape planning, transport, waste management, urban functions, industry and buildings, water supply, and sanitation. SymbioCity is scalable, and adaptable to any climate and context.

Masdar City, literally "Source City" in Arabic, is an ecocity in Abu Dhabi, which strives to become a sustainable, zero-carbon, zero-waste city. The city, specializing in clean high technologies and environmentally friendly products and processes, is surrounded by a wall, designed to keep out the hot desert winds. The Masdar Institute of Science and Technology, has been the first tenant since 2010. Developed in cooperation with the Massachusetts Institute of Technology, the Institute uses 70 % less electricity and fresh water than average buildings of similar size and is equipped with a smart metering system that constantly registers energy consumption.

Water management has been given great attention. A solar-powered desalinization plant provides the city's water supply, estimated to be 60 % lower than in comparable communities. Approximately 80 % of the water is planned to be recycled and wastewater will be reused for crop irrigation, cleaning, and other purposes. The city aims at reducing waste to zero. Biological waste will be used to create nutrient-rich soil and fertilizer, and some may also be utilized through waste incineration as an additional power source. Industrial waste, such as plastics and metals, will be recycled or repurposed for other uses.

Ecocities offer a fertile environment for ecoinnovation to thrive in an emerging hub and can serve as a magnet for talent, financial capital, and entrepreneurship. They provide a competitive environment to companies and ancillary services and serve as an open technology platform that gives partners an unmatched opportunity to develop, test, and validate their technologies in a large-scale, real-world environment and conditions and consumption patterns.

Ecoinnovation is crucial to delivering the Europe 2020 strategy for smart, sustainable, and inclusive growth. European ecoindustries are a significant economic sector with an annual turnover estimated at € 319 billion, or about 2.5 % of the GDP of the European union. The 2012 Eco-Innovation Action Plan aims at boosting innovation that reduces pressure on the environment, and bridge the gap between innovation and the market. Ecofriendly technologies are valuable for business and the environment and help create jobs; they therefore hold the potential for triple dividends. The plan expands the focus from green technologies to the broader concept

of ecoinnovation, targeting specific bottlenecks, challenges, and opportunities for achieving environmental objectives through innovation.

The plan includes actions both on the demand and supply side, on research and industry, and on policy and financial instruments. It stresses the importance of research and innovation to produce more innovative technologies and bring them to the market. The plan recognizes the key role of environmental regulation as a driver of ecoinnovation and foresees a review of EU environmental legislation. It also puts emphasis on the international aspect of ecoinnovation and on better coordination of policies with world partners.

The Action Plan is expected to accelerate ecoinnovation across all sectors of the economy and help create stronger and more stable market demand. Cities can be instrumental and take measures in the areas of regulatory incentives, private and public procurement, and standards. They can also support small and medium-sized enterprises to improve investment readiness and networking opportunities, promote environmental policy and legislation to boost ecoinnovation, host demonstration projects and partnering to bring promising, smart, and ambitious operational technologies to market, develop with industry new standards for ecoinnovation, engage in international cooperation on local ecoinnovation, and support the development of emerging skills and jobs and ecoinnovation training programs to match labor market needs.

2.4 The Frugal and Resilient City: From Cradle to Cradle

A city has to regenerate its body continuously, with its blood, its vital organs, and nerves, but also its mind, with its concepts and notions, and soul, with its emotions and capacity to wonder. Recent concepts of innovative cities include the Flexible and even Instantaneous City, a city that can adapt instantly, or even the Frugal or Lean City, which enhances frugal and lean innovations to minimize and optimize resource use. Resilient cities are, finally, the cities that are strong enough, economically, socially, and environmentally, to withstand and overcome crises, including advancing climate change, social riots, and economic and financial crises and unemployment.

Frugal ideas are highly adaptable and could inspire innovations for cutting urban costs to the bone, overcome fragmentation, and lead to flexible modular products and processes that can further combine and lead to new innovations. Frugal innovations result in radically simpler products and services by stripping them down to their bare essentials. Frugal urban innovations exploit new possibilities focusing on the minimal quintessential requirements with all the unnecessary embellishments stripped out and huge cost savings. From the initial invention to the final transformation, a chain of interactive processes brings a thorough change that opens up the array of opportunities far more. At each stage, the focus is placed on the highest possible resource efficiency (Haëntjens 2012).

Mainstream understanding of cities and their capacities to regenerate themselves often derive from rigid concepts, models, and practices about the urban environment,

inherited from the functionalist era and Le Corbusier's Charter of Athens (1933). A fundamentally interdisciplinary perspective and multifaceted approach are needed to question concepts, methods, and policies towards systemic urban change from the bare essentials in balance with nature and with active citizen participation. In all cases, cities and innovations are open to benefit from other world experiences, create bridges, and together invent new concepts or ways of collaboration.

Land, air, and water are the fundamental resources for all urban settlements. Urbanization increases pressure on ecosystems and results in soil, water, and air pollution. Forests are being changed to agricultural land or urban areas. Soil is a living medium that supports human life. It is a vital, natural, largely nonrenewable resource with variable characteristics, and a multifunctional nonrenewable resource that has to be sustainably managed. Soil sealing, the covering of the ground by an impermeable material, as when converted into urban land, is one of the main causes of soil degradation.

Soil sealing often affects fertile agricultural land, puts biodiversity at risk, increases the risk of flooding and water scarcity and contributes to global warming. In the European Union, since the mid-1950s, the total surface area of cities has increased by 78 %, whereas the population has only grown by 33 %. During the last decade of the twentieth century, an area five times that of Greater London has been consigned to urban sprawl in the European Union. This has primarily occurred on former agricultural land, resulting in the loss of important ecosystem services such as food production, flood protection, and biological diversity.

The United States also experienced large waves of urban sprawl and the surge of suburban homogeneous developments with nearly cloned spaces. From 1950 to 2000, Massachusetts consumed more than twice as much land for development as it had in the previous three centuries. A wave of jobs moved out from Boston and the older cities to the factories and offices on and near Routes 128 and 495. Most new jobs and residential choices were related to sprawl development, distant from public transit but cheap enough to afford an increased number of private cars. The vehicle miles driven rose five times faster than the population. Congestion started having a high cost and serious threats to the region's water supply emerged as sprawl expunged natural recharge areas.

According to the European Environment Agency, artificial land cover increased by 3.4 % in Europe between 2000 and 2006 and this is by far the largest proportional increase in all land use categories. Although artificial cover accounts for just 4 % of the EU's surface, its dispersion means more than a quarter of EU territory is directly affected. Comprehensive survey results for the years 1990–2000–2006, confirmed by more recent studies, suggest that discontinuous periurban areas grew four times faster than continuous urban areas (EEA 2006).

The extension of urban areas may allow citizens to enjoy more living space, single-family houses, gardens, and proximity to nature. But it can create serious negative environmental, social, and economic impacts for Europe's cities and countryside, in particular in the case of low-density and scattered urban sprawl. These include increasing travel flows and energy demand, human health problems, and declining biodiversity.

Air pollution critically affects human health and may also damage the natural and built environment. The primary source of air pollution is the combustion of fossil fuel in energy generation, industrial processes, and transport. The European Environment Agency informed that, despite substantial reductions in some urban air pollutants, data for the period 1997–2008 show that for any given year, up to 40–60 % of urban citizens were exposed to concentrations of either particulate matter or ozone above the EU limits.

In European cities, the dominant sources of atmospheric pollution are shifting from the combustion of high sulphur fuels linked to energy and industrial processes to the combustion of gaseous fuels for motorized transport. Nitrogen oxides, particularly nitrogen dioxide, are known to cause specific damage to lung tissues and to contribute to acidification, eutrophication, and photochemical smog. The great majority of NOx emissions (98 %) are produced by energy production and consumption. Despite cuts in nitrogen oxides and nonmethane volatile organic compounds, air pollution due to ozone has not improved and heat waves can boost ozone exposure. Particulate matter is also another polluter and its emitters mainly include transport and construction. In China, emerging and developing countries, air quality problems are serious and do need particular attention from the international research and policy community.

The EC-supported Megapoli project brought together leading European research groups, state-of-the-art scientific tools and key players from non-European countries to investigate the atmospheric impacts of cities or conglomerations with more than five million inhabitants. Megapoli included both basic and applied research, including feedback and mitigation, and bridged spatial and temporal scales connecting local emissions, air quality, and weather with global atmospheric chemistry and climate. The project explored the hypothesis that megacities have an impact on air quality not only locally, but also regionally and potentially globally.

The environmental impacts of megapolises have also been investigated through the CityZen (megaCITY – Zoom for the Environment) project which analyzed emission hot spots on local, regiona,l and global scales, with respect to air quality and climate change. Ground-based data, satellite observations, and model simulations were used to support the search of the right science and policy questions on regional urban hot spots in Athens, Cairo, Istanbul, Guangzhou, Hong Kong, Pearl River Delta region, Ruhr region, BeNeLux region, and London.

Preventing noise pollution is also a subject for ecoinnovation. Noise pollution can affect human health by increasing stress levels or disturbing sleep. Prolonged exposure can even trigger serious illness. Across Europe, at least 100 million people are exposed to damaging levels of noise just from road traffic. The World Health Organization estimates that each year Europeans lose at least one million healthy life years due to traffic-related noise. Giving people better access to tranquil places can, on the other hand, enhance mental and physical health and improve quality of life.

For the second year, in 2012 the European Environment Agency and the Noise Abatement Society organized the European Soundscape Award to shed light on innovations addressing the noise issue creatively. The winner of the European

Soundscape Award 2012 was the remodeling of the Nauener Platz, a city park in Berlin. The project involved local residents and workers in a highly participative process to target and solve the noise problems. Ideas for creating a new attractive park were collected through public discussions and workshops. "Sound walks" were organized to enhance the experience and knowledge of local people in the reconstruction of the park's soundscape.

The redesigned Nauener Platz offers a much more pleasant atmosphere. This was notably achieved by installing devices in sculptures and benches playing recorded sounds of birds and water and a 1.5 m sound barrier made of stone and plants at one side of the park close to the children's playground. Benches for parents were placed directly behind the wall to increase the noise reduction effect. The remodeling of the park also included more attractive playgrounds, sports areas, and green spaces that increased the lively sounds from human activities.

The educational project "Noise is not music" by the Estonian NGO Ökokratt won the runner-up prize for raising awareness of the adverse impacts of noise among children and young people. Approximately 30,000 children from 214 different schools and institutions participated in this project and 100 teachers were trained in noise-related issues and the impacts on human health. The teachers subsequently planned and implemented a "Silence Week" at their respective schools and institutions and many other activities involving schoolchildren, including a research project competition resulting in a play by a theater group. Several groups also created noise maps and monitored noise levels in their schools and classrooms.

Fresh water, the blue gold, is a vital and scarce natural resource, essential to the survival of all living organisms. Unlike oil, it cannot be replaced. Access to clean water is regarded as a fundamental human right. In Europe, many cities experience water shortages. Renovation of networks and surveillance systems in order to limit leakage, which often reaches 30 %, is under way or planned in many cities. Leakage and risk detection are increasingly parts of integrated management and early warning systems. The Tokyo system for identifying leaks is considered to be exemplary. Water is also fundamental to many forms of energy production and the water–energy nexus has key implications as water resources become increasingly stressed in some regions.

Stockholm is a pioneer city in matters of water protection, setting standards and plans for cleaner water. The Swedish capital stands out for its high quality of life, as is evident in its strong public health performance, high educational attainment, and low poverty levels. The municipality has done much to improve wastewater treatment and reduce the impact from stormwater. The wastewater is treated by advanced technology before discharged in the inner part of the sensitive Stockholm archipelago. The Stockholm Water Company has improved the water quality by radically cutting down the discharge of phosphorous and nitrogen since 1995.

Water supply and sanitation in Singapore is characterized by a number of achievements in the challenging environment of a densely populated island. In 2007, the Public Utilities Board, Singapore's water and sanitation utility, received the Stockholm Industry Water Award for its holistic approach to water resources

management. Access to water is universal, affordable, efficient, and of high quality. Innovative integrated water management approaches such as the reuse of reclaimed water, the establishment of protected areas in urban rainwater catchments and the use of estuaries as freshwater reservoirs have been introduced along with seawater desalinization to reduce the country's dependence on water imported from neighboring Malaysia. Singapore's approach does not only rely on physical infrastructure, but it also emphasizes proper legislation and enforcement, water pricing, public education and awareness raising, as well as research and development.

Water celebration has reached a summit in the Saragossa 2008 Expo, a once-in-a-lifetime event for the Spanish city at the crossroads of many cultures. Public spaces and promenades were created on the banks of Ebro, and emblematical buildings such as the tower of water, the bridge pavilion, a pedestrian viaduct, and the largest river aquarium of the world metamorphosed the urban landscape. Magic shows, puppets, and the circus of the four continents attracted many young visitors. The climate change was the principal topic of the "Iceberg: Poetic Symphony." And whereas the circus of the sun traveled the city every day at noon, children were taught the treasure of each drop of water. The river overflowed with enthusiasm to welcome the event, a source of wonder for visitors and citizens.

A US study examined a wide range of water recycling applications, including potable water, nonpotable urban and industrial uses, irrigation, groundwater recharge, and ecological enhancement. Many communities have already implemented water reuse projects, such as irrigating golf courses and parks or providing industrial cooling water in places near wastewater reclamation plants. Drinkable water projects account for only a small fraction of the water being recycled. However, many drinking water treatment plants draw water from a source that contains wastewater discharged by a community located upstream (NRC 2012a).

The study outlines wastewater treatment technologies for mitigating chemical and microbial contaminants, including both engineered and natural treatment systems. These processes can be used to tailor wastewater reclamation plants to meet the quality requirements of intended future applications in the water cycle. The concentrations of chemicals and microbial contaminants in reuse projects designed to augment drinking water supplies can be comparable to or lower than those commonly present in many drinking water supplies. There is need for process reliability and careful monitoring to ensure that all reclaimed water meets the appropriate quality objectives.

Costs of water reuse for potable and nonpotable applications vary widely, depending on context and site-specific factors. Water reuse projects tend to be more expensive than most water conservation options and less expensive than seawater desalinization and other alternatives. Although the costs of reclaimed water are often higher than current water sources, water authorities should consider other costs and benefits in addition to monetary expenditures when assessing reuse projects, for example, seasonal peak demands on the drinking water system. Depending on the specific designs and pumping requirements, recycling and reuse projects could also have a larger or smaller carbon footprint than existing supply alternatives or reduce water flows to downstream users and ecosystems (NRC 2012a).

Many cities are interested in green infrastructure to manage rainwater, preventing polluted stormwater from entering sewer systems and waterways in local communities. Effective stormwater management is one of the most widespread challenges to water quality. Green infrastructure captures and filters pollutants by passing stormwater through soils. The green alternative is often less expensive than structural solutions, and can help reduce costs of flooding. Green roofs; permeable materials; alternative designs for streets and buildings; trees, gardens, and parks; and rain harvesting systems are increasingly supplementing or substituting grey infrastructure investments (NRC 2008).

Urban landscaping, vegetation, trees, and green roofs can reduce heating and cooling energy use and associated air pollution and greenhouse gas emissions, capture and store carbon, help reduce the risk of heat-related illnesses and deaths, improve water management, reduce noise levels, create habitats, improve aesthetic qualities, and increase property values and social well-being. Cool roofs can lower energy use, air pollution and greenhouse gas emissions, heat-related incidents, and solid waste generation due to less frequent reroofing.

In addition to air, land, and water, cities affect an amazing array of resources originating from their hinterland and, increasingly, the rest of the world. Resource management is being given more serious attention in cities and productivity and efficiency have risen since 2000. Ecoefficiency could help decrease the heavy dependency of cities on their hinterland and other cities and regions to provide them with indispensable food, water, and energy. Ecosystem services from surrounding regions provide fresh air, and store or drain flood water as well as drinking water. Differences in urban design and management make cities vulnerable in different ways, even those situated in the same geographic region.

Sound waste management is inextricably linked to resource efficiency and the performance of the urban metabolism. Integrated resource policies shed light on the life cycle from the extraction of natural resources, through their design, manufacture, assembly, marketing, distribution, sale, and use to recycling and finally disposal. Business events and online exchange facilities encourage the sharing of resources in order to reduce costs and help the environment. Based on the concept that "One's waste could be another's resource," multiple-win schemes can be organized at all levels.

Waste generation in the European Union rose from 1995 to 2002 but has remained stable since. Municipal waste reached 502 kg per person in 2010 but its treatment, by recycling, composting, and incineration, rose remarkably and only 38 % of the waste went to landfills. Waste prevention insists on action before the waste is generated, even if investments still concentrate on the recycling end. Environmental regulation and ecoinnovation have led to a relative decoupling of resource use and pollution and waste generation. Absolute decoupling is a challenge but zero waste may not be a utopian vision (WBCSD 2010a). However, throughout Europe, many cities abandon conventional waste disposal policies and adopt integrated resource/waste management (EC 2012a, c; EEA 2010a).

The European Environment Agency provides many examples of lost gold mines. Electric household appliances, computers, lighting equipment, and telephones

contain hazardous substances, but also include valuable metals, estimated to contain 450,000 tonnes of copper and 7 tonnes of gold in 2005. At the London Metal Exchange, these metals would be worth € 2.8 billion and 328 million, respectively, in 2011. However, only a small part of such electronic equipment is collected and reused or recycled. Precious metals discarded as waste also have a global dimension. Germany exports some 100,000 used cars every year through Hamburg to outside the European Union, mainly to Africa and the Middle East. In 2005, these cars contained around 6.25 tonnes of platinum group metals. Unlike the European Union, most importing countries lack the necessary regulations and capacity to dismantle and recycle used cars (EEA 2012b).

The inevitable need for adaptation to climate change brought forward the notion of resilience. The third Resilient Cities Congress (held in Bonn in 2012) highlighted that cities face huge challenges for resilience and adaptation to climate change. According to a study conducted by the Massachusetts Institute of Technology and ICLEI, almost one fourth of cities are noticing changes in natural hazards, temperatures, precipitation, and sea level rise affecting their communities. The study found that 68 % of cities are engaging in adaptation planning, with 19 % having done a risk assessment and another 19 % planning such an assessment. Furthermore, cities need to build resilience, not only to climate impacts but to all kind of potential shocks, crises, and threats.

Extreme weather events resulting in hazards such as heat waves, floods, and droughts are expected to happen more frequently and affect quality of life for citizens and attraction of visitors. Urbanization, population ageing, and other socioeconomic trends interact with climate change and can compromise public health, reduce productivity, and constrain the functionality of the infrastructure. Urbanization also reduces the area available for natural flood management or increases the number of homes and businesses in flood-prone areas. An ageing population in OECD cities increases the share of people vulnerable to heat waves and asks for additional urban services.

These changes increase the vulnerability of people, the built environment, and ecosystems. Although urban areas generally experience the same exposures to climate change as surrounding regions, the urban setting can multiply potential local impacts. The replacement of natural vegetation with artificial surfaces and buildings creates unique microclimates altering temperature, moisture, wind direction, and rainfall patterns. Excessive amounts of rainwater cannot drain into the ground, especially in “sealed” urban areas and this can generate or worsen floods. Artificial surfaces store heat and cause raised temperatures in cities compared to the surrounding agricultural or forest land.

The challenges of climate change ask for drastic changes in city and regional management and innovative solutions are required alongside traditional measures. Strong spatial planning especially for riskprone areas can be an effective and sustainable way to deal with risks. Keeping public space and buildings cool by using green roofs or walls and providing more shade, rather than air conditioning, could help save energy and even make cities more attractive.

Adaptation to climate change offers the opportunity for developing new skills and jobs and promoting innovation, introducing a culture of change. This can lead the way towards a more sustainable and resilient future for people, the economy, and nature. Delaying adaptation action most probably increases costs at a later stage. Infrastructure, such as buildings, roads, railways, energy grids, and sewage systems, lasts for decades and is expensive to replace. Building infrastructure adapted for future climate conditions and not only in riskprone areas, such as floodplains, results in lower costs and increased effectiveness.

Emergency architecture and planning can inspire. In New Zealand, a new cathedral in Christchurch is replacing the city's magnificent Gothic revival cathedral irreparably damaged by an earthquake. Architect S. Ban urgently worked on a project for a cardboard cathedral with a lifespan estimate of 50 years, built from cardboard tubes coated with waterproof material and flame retardants. The cathedral has a simple A structure protected by a poly-carbon roof and filled with stained glass on one side. It can host 700 people and reminds us of a "paper church" in Kobé erected in just five weeks. This kind of solution already used in humanitarian emergencies provided temporary shelters for refugees.

Existing and future buildings and infrastructure need huge investments, alongside those for climate-proofing, in order to keep functioning and delivering their services. Climate change adaptation concerns have to be incorporated into building standards and ecoretrofitting activities, to ensure that sewage systems can cope with heavier precipitation, review building design and adapt the energy and transport systems to cope with higher temperatures, low water availability, or flooding. Adaptation also strongly relates to using and expanding green infrastructure such as parks, forests, wetlands, and green walls and roofs, wherever feasible and sustainable. Such infrastructure serves to provide a cooling effect on cities and help manage floods.

Social innovations can unlock multiple policy options and can often be implemented at low cost. Soft measures include behavioral changes, emergency systems, and the adequate provision of services to disadvantaged or vulnerable groups. They can reduce health impacts in the event of extreme events such as heat waves or flooding. Such measures are generally well-integrated in disaster risk management programs, however, they need to be better adapted to climate-change related governance. Investments in capacity building and planning processes are required to help develop the potential of these soft measures.

The interconnections of ecosystems and the absence of frontiers on environment make cooperation for adaptation absolutely crucial. Certain cities, for example, face flooding due to inappropriate land use and flood management in upstream regions. In water-scarce regions, cities compete for water with agriculture and other potential users. National and supranational policy frameworks can enable or speed up local adaptation and create emulation structures. Urban adaptation to climate change asks for integrated multigovernance approaches at the local, regional, national, and international levels (EEA 2012a).

Watercolour 3
Stockholm: The First European Green Capital 2010

Chapter 3
Cities ahead of the Energy Transition

Abstract Responsible cities have to ensure access for all to clean, secure, competitive, and affordable energy. The advent of local renewable energy *procumers*, producers and consumers, of green energy, can lead to energy-producing cities instead of energy- (over)consuming cities. This chapter offers an insight into the components and vectors of sustainable energy production and consumption in cities and the efforts made at the local level to overcome national and supranational energy policy targets. Green electricity and hydrogen seem to be the energy vectors of the future and there is great potential for achieving energy efficiency in conjunction with cleaner energy options and technologies and behavioral improvements.

Sustainable energy is at the heart of the EU Europe 2020 Strategy for smart, sustainable, and inclusive growth. Renewables are becoming a major and competitive player in the European energy market and a significant generator of employment. European leaders recognized that sustainable and renewable energy sources and smart systems will make the difference in safely reaching the ambitious EU 2050 goal of decarbonization and cities prepared action plans to surpass the European targets. In the United States, cities choose to invest in efficient lighting, better building materials, and solar energy for electricity.

3.1 Smart, Green, and Responsible Energy: Addressing the Challenges

3.1.1 Towards a Balance among Security, Growth, Inclusion, and the Environment

Energy issues have always been high on the national and international policy agendas. The 2011 Fukushima disaster in Japan and instability in some oil-producing countries reminded the world of the crucial importance of energy. The 2012 UN

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International Year of Sustainable Energy for All tried to raise awareness of the world's 1.3 billion energy poor and generate action for eliminating energy poverty by 2030.

In the European Union, the strategy Europe 2020 had already integrated the headline indicators and targets of the energy policy (EC 2007a). The three objectives include a reduction in EU greenhouse gas emissions of at least 20 % below 1990 levels, 20 % of EU energy consumption from renewable resources, and a 20 % reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency. All objectives are flanked by a series of supporting policies that are expected to come to fruition for the two binding targets of emission reductions and the share of renewable energies by 2020. Estimates suggest that the indicative efficiency target will be very difficult to achieve. Cities hold a huge potential and often a political engagement in achieving even more ambitious targets.

Citizens and businesses need access to stable and affordable energy with the least impact on the environment. Sustainable energy policies aim at achieving a meaningful balance at all levels between the security of energy supply, intelligent and environment-friendly energy services, and reasonable prices. Responsible cities and governments have to ensure access for all to secure clean energy and respond, quickly and effectively, to needs and contingencies, such as disruption of electricity or oil supply. Public policy has to establish the framework conditions and optimize the energy supply, monitor evolving energy infrastructure and systems, establish targets, evaluate progress, and adjust policy measures in full accountability with citizens (IEA 2008a).

Energy policy options depend on geopolitics, international trade, market dynamics, citizen preferences, environmental concerns, and concerted actions against climate change. In the European Union, energy demand increasingly outstripped indigenous production. Since 2004, the Union imports more than half of the energy it uses. It produced 48 % of its energy needs in 2009. Dependency on imports increased for all fossil fuels and reached 83.5 % for oil and 64.2 % for gas in 2009 (EC 2011f). One third of the EU energy imports come from Russia and the rest from a small number of suppliers, including Norway and the OPEC countries. Energy dependency can have serious consequences, such as supply uncertainty, higher and unpredictable energy prices, and exposure to political instability of exporting world regions. The diversification of sustainable sources and suppliers is a must.

Almost all EU member states rely on energy imports to satisfy their gross inland demand. Denmark is the only energy net-exporter, whereas some countries, including Romania, Estonia, United Kingdom, Czech Republic, and Poland, have low import-dependency rates. Small countries such as Luxembourg, Cyprus, and Malta are completely energy-dependent, whereas Spain, Portugal, Ireland, and Italy have high import-dependency. The structural weakness of the European Union to balance its energy system affects all sectors of the economy. Transport and the residential sector largely depend on oil and gas and are at the mercy of unstable economies and markets (EC 2011f).

Promoting sustainable and competitive energy and creating new employment and business opportunities in the related industries and services constitute prime EU policy objectives. Government involvement in energy was traditionally seen as a national security issue. Over the past years, EU member states have introduced competition in the electricity and gas markets and citizens are offered an array of options and services. Cities, concentrated energy centers, have to participate in all decisions on the future of energy, together with the other levels of governance.

Cities should discuss with citizens the dimensions of a reliable, flexible, and diverse energy supply to satisfy their needs. No single energy option has the capacity to fulfill all energy needs in the immediate and near future. Diversification is necessary and has to be reflected in the political priorities. Science and innovation have an essential role to play in improving energy efficiency and in exploring and capitalizing on the potential of all energy options. Industrial production patterns have largely been adapted to environmental requirements. They are more concentrated in space and easier to target and change. A real change in consumer and society behavior is still to be accomplished. Taxation measures can steer demand towards energy options that are more environment-friendly and generate revenues to be invested in sustainable development policies.

Cities have to ensure that energy systems are economically robust, socially inclusive, and environmentally sound and that energy services respond to the evolving needs of aware citizens. Local governments play an important role in leading communities into the postcarbon age with renewable energy, and energy savings as major cornerstones. A bold vision for cities could be to become net producers instead of net consumers of energy. Urban buildings and districts could be converted into active energy generators to satisfy their own needs and provide energy to others.

3.1.2 Energy Production Patterns: Harnessing Local Resources

Energy consumption has almost stabilized in industrialized countries over the two last decades. In the European Union, it only increased by 2 % between 1990 and 2009 and is mainly fueled by fossil fuels which still form the backbone of the world energy primary sources. This quasi-stability hides a strong decline in coal consumption (–41 %), whereas the consumption of renewables and gas increased by 116 % and 41 %, respectively (EC 2011f).

The reserves of fossil fuels are finite, and their use has serious consequences for the environment and climate change. Experts and politicians suggest that, as the Stone Age did not come to an end because the world ran out of stones, the fossil-fuels age will not come to an end with the depletion of the resource stocks, but with the human ability to invent better resources and move up the value stair (Mega 2005).

Coal was regarded as a cornerstone of the economies in the early years of European construction. The primary objective of the European Coal and Steel Community Treaty in 1951 was to establish a common market in coal and steel and

to energize economic growth and employment generation. Demand soon outstripped supply and greater production has been encouraged. Coal mining, a labor-intensive industry, contributed considerably to the full employment economy of coal regions. However, since the 1960s, coal mining went into rapid decline due to international competition and the demand for cleaner energy sources. Since 1990, imports, mainly from the United States, Australia, South Africa, and Columbia, have exceeded indigenous production. In 2000, the European Union produced around 5 % of the world output.

Local coal communities were seriously hit by the decline of the coal industry which became the epicenter of political turmoil in some countries, in particular, Germany. The 1997 coal compromise between the German Federal Government, the Länder, and the private sector led to a considerable reduction in state aid, production, and employment. Some EU member states, such as Portugal, Belgium, and France, ceased all activities. Germany and Spain opted for restructuring the industry and the United Kingdom decided to make production competitive with that of imported coal. Ensuring access to certain reserves and minimal capacity of production in realistic economic conditions could be instrumental for the European Union to keep its leading position in clean coal technology. Coal satisfied 16 % of the EU gross demand in 2009. The world's first "clean coal" power plant was launched in Germany in 2008. China accounted in 2011 for half of the global coal consumption and became the world's largest coal importer (Eurocoal 2012).

Oil has still the lion's share (37 % in 2009) in the primary energy mix consumed in the European Union. Oil reserves are very unevenly distributed around the globe. The European Union produces <5 % of the world output. Its resources are mainly located in the North Sea and belong primarily to the United Kingdom. Transport is the economic sector most notoriously dependent on oil, but electricity generation in Malta and Cyprus is nearly exclusively dependent on oil as well.

Natural gas, discovered in the 1950s and considered initially a secondary by-product of oil exploitation, became a polyvalent source of energy. Cleaner and easy to use, with dedicated distribution network, it gained ground in all sectors, including power generation, heat, and transport. Most of the EU reserves are located in the Netherlands, the second net exporter after Denmark, and the United Kingdom. Import dependency increased more rapidly than for any other fuel. The IEA analyzed some rules to support a potential "Golden Age of Gas" which could transform energy markets (IEA 2012).

The management of energy resources throughout the value chain has crucial environmental implications. During the extraction phase, methane and carbon dioxide could be released, for example, when natural gas is flared from oil wells. Oil and natural gas usually occur together in deposits and oil drillers may burn off the gas or release it straight into the atmosphere. Natural gas can also be released during the extraction and processing of coal.

The safe transport, handling, and use of energy resources are of utmost importance for public health and the environment. The release of fuels during transportation is extremely hazardous and strict measures must be taken for their prevention. Oil spills are particularly dangerous. Accidents occurring to oil tankers, which may

release devastating hydrocarbons into the oceans, are disastrous and should absolutely be prevented. During the combustion phase of fossil fuels, in addition to energy production, a high number of by-products are also generated, including carbon dioxide (CO_2), carbon monoxide (CO), methane (CH_4) and other hydrocarbons, nitrous oxide (N_2O), and various nitrogen oxides (NO_x), particulate matter, and certain metals and radionuclides. The carbon content varies between the types of fossil fuels. Coal emits around 1.7 and 1.25 times as much carbon per unit of energy as natural gas and oil, respectively (Mega 2005).

The European Union possesses barely 2 % of the global known reserves of uranium, the heaviest element in nature, which is radioactive and occurs naturally in low concentrations. Fissionable nuclear fuels are remarkable sources of energy. The fission process utilizes only a small part of nuclear fuel. Once separated from the waste, amounting to around 4 %, recovered uranium and plutonium can both be used again to generate more electricity.

The European Union has excellent and diverse renewable energy sources. Starting from a rather marginal role at the turn of the century, renewable energy spectacularly increased its contribution. Enthusiasm about renewable energy is escalating, barriers are being removed, and infrastructure is being developed. Many trajectories of renewable energy growth went above the initial plans and it is expected that these trends will continue.

Decentralized energy from renewable energy sources (RES) is gaining ground. Hydropower, solar, wind, biomass and biofuels, geothermal, ocean, and tidal energy are fundamental vectors towards a sustainable energy future. They offer special opportunities for cities, key partners in moving towards decentralized energy production able to fuel homes, offices, shops, factories, public and private activities, and transport.

Microgeneration implies that every home and district can become a mini power station and complement the grid. The integration of decentralized energy resources and renewable energy into the main electrical grid is expected to change the energy paradigm of urban societies, with electricity generated in large power plants and delivered to consumers through a passive distribution infrastructure. The benefits can be impressive and their optimization asks for the collaboration of all stakeholders, including utilities, independent power producers, central and local governments, regulators, industry, and consumers.

In 2009, renewable energy sources contributed 18 % of electricity generation in the European Union. Countries that use renewable energy to a significant extent include Austria, Latvia, Sweden, Portugal, and Finland. In Austria, 68 % of electricity generation was provided by RES and in Latvia and Sweden this share was more than 50 %. Solar, wind, and biomass are the most rapidly progressing technologies. Solar and wind develop for electricity generation. Renewable energies such as biomass, solar, and geothermal energy have a huge potential in the heating and cooling sector. Biomass accounted for 69 % of all RES in 2010, hydropower for 18 %, wind for 8 %, geothermal for 3 %, and solar for 2 %. In 2009, investment in renewable energy fell in the European Union by 10 % in the context of the economic crisis, however, it increased most rapidly in other parts of the world and especially 50 % in China (EC 2012c).

Photovoltaic systems and onshore wind production are expected to be competitive in several markets by 2020. Onshore wind investment costs fell by 10 % between 2008 and 2012. Conflicts with neighboring local communities led to a lower allocation of permits. The best EU wind resources are offshore and are largely undeveloped. Offshore wind farms are very costly, but they cause near-zero scenic and acoustic impact and this could allow the construction of large wind farms without friction with local communities.

Solar energy has the highest theoretical potential for energy production. The sun is the universal primary source of energy. Solar energy systems can harness solar rays and produce electricity and heat. Solar radiation reaches the earth with a density adequate for heating but not for electricity. Solar energy represents a real chance for distributed energy in sunny countries and cities, also in the developing world, where micropower is often cheaper than extending the grid. Photovoltaics (PVs) use solar cells to convert light directly into electricity. The produced energy goes directly to the grid or gets stored in batteries. PVs enjoy high reliability, long lifetime, modularity, and low maintenance costs.

Bioenergy sources of energy include residential organic, agricultural, forest residues, and algae. Biomass is versatile and can generate electricity, heat, and/or transport fuel. Furthermore, it can transform waste into an energy asset. At the world level, biomass is the fourth largest energy source. However, only a small percentage of the biomass resource is used in modern processes.

The price difference with fossil fuels is still the principal obstacle for the small share of biofuels in the energy mix of the European Union. Biofuels can be primarily divided into biodiesels, extracted mainly from organic oils and sunflower, and alcohols extracted from beetroot, wheat, and so on. Biodiesel could be used without any major technical problems to replace diesel.

Biogas sources include recovered gases from sewage, landfill sites, and agricultural waste. Their use could lead to the reduction of methane emissions. Second-generation biofuels, made out of agricultural and forestry waste, offer a promising avenue for a beneficial asset for the bioeconomy. Recent crises reminded the world that biofuels should not be in conflict with food safety. The rapid rise in global food prices in 2007–2008 and more recent price volatility highlighted the continued importance of having sufficient nutritionally adequate food supplies that are affordable, and predictably available and accessible. It is generally agreed that in the next decades, growing populations and economic expansion will inevitably create supply disruptions and put upward pressure on prices. Policies have to reduce the effect on food crops, for example, those promoting the processing of food crops into biofuels (NRC 2012b).

The EU target of 10 % of road transport fuel by 2020 to be fuels from renewable energy sources (biofuels, hydrogen, renewable electricity), providing that they can be certified as sustainable, could provide a decisive boost to the development of second-generation biofuels. For some years already, Amsterdam is using biomass from municipal waste and sewage sludge to generate green electricity and heat. The subway and trams operate on green electricity. Producing energy from waste could be the most multibeneficial generation. The Waste and Energy Company is the

largest producer of sustainable energy in the Dutch cosmopolitan city. More than half the incinerated waste of nonfossil origin is used as biomass (Amsterdam Climate Office 2008).

Fuel cells constitute a promising technology of the future. They produce energy from hydrogen and oxygen in a much cleaner and more efficient way than conventional combustion engines. Unlike batteries, they do not store energy, but support a continuous flow process. It is expected that fuel cells will replace, in the medium and long term, a large part of the current combustion systems in industry, buildings, and road transport. In the long term, fuel cells and hydrogen are expected to form an integral part of the renewable energy supply and lead to a significant international market for fuel cells in transport and industry.

Energy generation in fuel cells is intrinsically clean. The choice of the fuel is an important issue. In the long term, hydrogen from renewable sources is the ideal fuel. Hydrogen is a key energy carrier for a future sustainable energy economy. It is abundant and perfectly clean. It provides a unique pathway for gradually reducing dependency on fossil fuels and increasing the contribution of renewable energy sources. Hydrogen can be used in fuel cells for all final, stationary, and mobile, applications.

Hydrogen can also be produced from water by electrolysis. Nuclear power is investigated as a possible source of hydrogen production, either as a provider of electricity for water electrolysis or as a supplier of high-temperature heat for the thermochemical decomposition of the water. Cost-effective transport, distribution, and storage of hydrogen are major issues, together with the creation of an appropriate infrastructure. Many cities chose hydrogen as the privileged fuel for their public transport. Amsterdam is one of the leaders of hydrogen-fueled public transport including buses and boats. In cooperation with other urban regions, the city provides a test site for large-scale transport operations (Amsterdam Climate Office 2008).

Renewable energy sources also include geothermal, ocean, and tidal energy. Geothermal energy flows from the hot interior of the earth to the surface and can be recovered before being lost by radiation. Global geothermal resources contribute 1.6 % to global electricity production. Italy is the EU country with the highest share of electricity generation from geothermal resources, accounting for 1.7 % of the total production. Ocean, wave, and tidal energies represent some of the most plentiful sources, but they are expensive to harness and subject to storm damage.

Energy transmission and storage are the key bottlenecks for the revolution of energy systems. Market failures also abound. The playing field for the various energy options is notoriously uneven. The noninternalization of external costs, such as the damage of air pollution on human health and in energy prices prevented renewable energy options from competing with fossil fuels on equal terms. The EC-supported ExternE project highlighted that, if all costs were taken into consideration, coal should be 2–15 times more expensive, oil 3–11 times its price, and gas 1–3 times more expensive. At the other end of the spectrum, photovoltaics could be 0.6 times their price and wind energy 0.05–0.25 times less expensive (Mega 2005).

In the United States, research by the National Academies on the hidden costs of energy also suggests that the life-cycle damages of wind, biomass, solar, and nuclear

power appear to be negligible when compared with those from coal and natural gas. The quantified harms reached an estimated $120 billion US in 2005, a cost primarily reflecting health damages from air pollution associated with electricity generation and motor vehicle transport. The figure does not include damages from climate change, harm to ecosystems, effects of some air pollutants such as mercury, and risks to national security. The damages associated with the operation of the 104 nuclear reactors, which provide almost 20 % of US electricity, are also low. The potential risks from a long-term facility for storing high-level radioactive waste need further evaluation.

The production of heat for buildings or industrial processes accounts for about 30 % of American energy demand. Most of this heat energy comes from natural gas or, to a lesser extent, the use of electricity. The total damages from burning natural gas for heat were estimated about $1.4 billion US in 2005. The median damages in residential and commercial buildings were about 11 cents per thousand cubic feet, and the proportional harm did not vary much across regions. Damages from heat in 2030 are likely to be about the same, under the assumption that the effects of additional sources to meet demand are offset by lower-emitting sources (NRC 2010a).

3.1.3 Cities: From Passive Consumers to Active Energy Procumers (Producers + Consumers)

According to the EC Market Observatory for Energy, in 2009, the overall energy consumption in the European Union was covered by coal (16 %), oil (37 %), gas (24 %), nuclear (14 %), and renewable energy sources (9 %). Primary energy sources are finally transformed into electricity, heat, and motion. For 2010, the primary energy consumption was 1,759 Mtoe (million ton oil equivalents) and the final energy consumption 1,153 Mtoe. It should be noted that the primary energy consumption is 50 % higher than the final energy consumption, the energy actually spent by consumers, as the conversion and distribution involve an array of critical losses (EC 2011f).

Energy consumption patterns in countries and cities present key differences but also many common points. Oil and oil products are the main source of energy in all EU countries except Sweden, France (nuclear energy), and the Netherlands (gas). Gas is the second most commonly used fuel, although it represents a small percentage of the total energy mix in Sweden, Greece, and Portugal. Great differences among member states seem to reflect the stage of socioeconomic development. Luxembourg presents the highest level of consumption, followed by Finland, Belgium, and Sweden.

Energy consumption per capita is linked to socioeconomic conditions, climatic and cultural features, population density, and the structure of human settlements. Northern countries with colder climates and low population density, such as Sweden and Finland, are huge energy consumers. Countries with a warmer climate are installing a growing number of cooling systems and the seasonal distribution of

energy consumption is changing. The severity of winters is also reflected on energy consumption peaks, and advancing climate change increases uncertainty.

Industrial energy consumption is being stabilized, mainly as a result of the transition to a digital, knowledge-based and service-oriented economy. Industry accounted for 24 % of total energy consumption in 2009. Investment in technology and innovation has enabled industry to become more ecoefficient. All energy-intensive industrial sectors demonstrated significant reductions in energy consumption during recent years. Environmental regulation and enforcement have been key driving forces for the development of ecoinnovations in energy.

Final energy consumption shares by the residential and services sector grew at a moderate rate to 27 % and 13 %, respectively, in 2009. Improvements in energy efficiency were partly offset by a systematic rise in levels of material comfort and increase in the number of (smaller) households. The result has been higher per capita consumption, with energy used for space heating falling slightly and electricity rising (EC 2011f). More than half the total household electricity demand comes from appliances and their share is growing (IEA 2003).

Energy consumption by the transport sector, depending almost entirely upon oil has increased steeply in the last two decades (+31 %), even though the economic crisis has slightly reversed the curb in 2009. The transport sector accounted for 33 % of total final consumption in 2009 and it is the fastest-growing energy consumer in the European Union. This is mainly due to the continuing growth of the road transport, passenger and freight. Air transport is also increasing dramatically, due to the rise of leisure trips.

In 2009, electricity in the European Union was generated from nuclear (28 %), coal (26 %), oil (3 %), natural gas (23 %), and renewable energy sources (18 %). Electricity production is still predominantly centralized and characterized by dramatic losses. In 2009, 15 member states of the European Union produced electricity from nuclear energy with France as the frontrunner (76 %). Luxembourg, the Netherlands, Ireland, and Italy produced more than 50 % of their electricity from gas. Electricity generation from coal remained particularly high in Poland and Estonia (EC 2011f).

Electricity was the lifeblood of industrial societies of the twentieth century. Electricity consumption by households increased by about 40 % over the past 20 years. Infrastructure and systems are considered largely outdated and inadequate for the twenty-first century. The capacity to be installed over the next years, both in developed countries to replace ageing power systems and in developing countries to facilitate access to modern energy services, holds many opportunities for radically improving electricity generation.

An essential change in electricity supply is the transition towards networks of smaller decentralized power plants nearer the consumers. Decentralized energy can be much more efficient, as it allows the financial costs and energy losses associated with the long-distance national transmission systems to be radically reduced. Micropower generation is expected to continue developing gradually alongside the grids, and increasingly incorporate renewable energies (Greenpeace 2005).

Unlike electricity, heat production is predominantly decentralized, and includes individual heating systems and/or of dedicated heat stations with their associated local networks. Needs range from office and household heating and cooling, including hot water, to steam production for industrial uses.

Combined heat and power (CHP) generation can substantially increase energy efficiency. The cogeneration process uses waste energy from electricity production for heating and, at the same time, helps to avoid the environmental impacts from additional heat generation. The overall system can reach very high efficiencies due to the inherent characteristics of the process. The produced heat can be used locally for residential district heating and industrial processes. Trigeneration, combined heat and power with the additional production of cooling, holds greater potential. The share of CHP in gross electricity generation in the European Union (11.4 % in 2009) is considered to be low and hold much potential for improvement (EC 2012c).

Combined heat and electricity generation and decentralized district heating are not a novelty for European cities. Saarbrücken installed its first district heating system in 1964. It uses cogeneration plants for almost all its electricity production. Danish and Dutch cities produce most of the energy they need through CHP systems.

The liberalization of the energy market can lower prices and boost green electricity. As new actors enter the market, such as small and medium-sized renewable schemes, suppliers are forced to cut costs. However, market liberalization could make energy companies reluctant to invest in new, often more expensive and risky technologies such as cogeneration. In Germany, liberalization is deemed to have discouraged the shift to capital-intensive CHP systems.

Until the second half of the twenty-first century and the era of the nuclear fusion which promises to bring to the Earth the virtually unlimited energy from the stars, distributed systems and renewable sources are the avenues to a sustainable energy future. Renewable energy applications for electricity generation, heating, cooling, and as biofuels for transport involve different processes and technologies maturing at different rates. Some have already penetrated the market and other technologies are at the deployment stage, whereas others are just demonstrating their potential.

To achieve the 20 % target, the EU Renewable Energy Directive set mandatory national targets. Building on the national renewable energy action plans, the support systems put in place by member states and the continuous investment in R&D, Europe's renewable energy sector has developed fast. Strong growth in renewable energy markets suggests that significant maturing of technologies is occurring. During the period 2005–2010, average photovoltaic system costs have declined by 48 % and module costs by 41 %. Industry expects costs to fall further driven by current government support policies, structural reforms, and removal of market barriers (EC 2012a).

The cost of renewable energy is not determined solely by available wind, solar, biomass, or water resources but also depends on capital and administrative costs. Complicated authorization and registration procedures, the lack of one-stop shops, and inefficient planning processes result in very high costs and undermine the competitiveness of the sector. Simpler administrative regimes, more stable and

reliable support schemes, and easier access to capital can greatly contribute to the attractiveness of renewable energy. Policies that hinder investment in renewables, and a fortiori those promoting fossil fuels, should be revised.

Renewable energy technologies operating in competitive environments, with a well-functioning carbon market should ultimately no longer need support. However, some form of financial or administrative support may continue to be needed for more innovative, less mature technologies. Some cost-effective and well-targeted support schemes will still be necessary beyond 2020.

Empowering producers and consumers and increasing confidence in the RES sector is fundamental. In some member states, changes to support schemes have lacked transparency, have been introduced suddenly, and at times have even been imposed retroactively. Moreover, diverging national support schemes and local approaches based on differing incentives may create barriers and prevent market operators from deploying cross-border models, possibly impeding business opportunities.

Historically, EU member states have developed their own renewable energy resources, contributing to their own emissions reductions, reducing fossil fuel imports, and generating jobs on their territory. The Renewable Energy Directive introduced cooperation mechanisms to enable renewable energy produced in one member state to count towards the target of another. Projects under development that could use cooperation mechanisms include the "Helios" solar power project of Greece, common projects or support schemes in the Northern Seas, the Southern Mediterranean, and in the European Neighbourhood Policy area (EC 2012a).

Local authorities can boost green electricity through public procurement and high local standards, innovative partnerships with citizens and associations, facilitation of infrastructure, and awareness raising. They can remove constraints in the value chain and boost efficiency of and accessibility to renewable energy sources. All municipal buildings should be showcases of energy-efficient spaces thoroughly fueled by local distributive schemes. Modest public acceptance of certain renewable energy projects may delay development and undermine policy goals.

Consumer choice and competition in energy varies across sectors. In transport, there is a degree of choice of fuel supplier, but not yet an EU-wide market for alternative fuels. In the heating sector, consumers are able to enjoy some independence by using solar, thermal, or local geothermal energy sources. Despite the market opening in both the gas and electricity sectors, limited supplier choices and regulated prices are still quite common.

Photovoltaic, wind, biomass, geothermal power, and combined heat and power systems can significantly reduce the need for power from the grid, for households, offices, and industrial buildings. As consumers become *procumers* (producers–consumers), they also gain a stronger sense of ownership and control over their energy use. Emboldening consumers as microproducers and improving planning processes are an important way to tackle a significant barrier to renewable energy growth.

The greatest benefits are expected to come from the combination of microgeneration and smart electronics. Smart meters can show consumers the price of

electricity services in realtime and encourage them to reduce their consumption. Related developments in "smart products" responding to price signals sent electronically could further induce consumers to alter their consumption. In addition, individual demand response can be aggregated by new market players offering significant consumption savings.

Cities could play a greater role in simplifying procedures on the ground and drive the integration of renewable energies forward, and prepare guidance on best practices and experience gained on support schemes to encourage greater predictability, cost-effectiveness, and technological improvements. They should also prepare to address sustainability concerns linked to the increased use of renewables regarding both generation and use and their direct or indirect impacts on biodiversity and the environment.

The 2012 seventh edition of the EU Sustainable Energy Week, the core annual event of the Sustainable Energy Europe Campaign, featured activities dedicated to energy efficiency and renewable energy. It aimed at demonstrating to businesses, decision makers, and the wider public that sustainable energy technologies are viable, cost-effective, and beneficial for the environment and the economy. The involved associations, companies, public authorities, and schools as well as national, regional, or local actors held their own Energy Days, 950 bottom-up happenings throughout Europe bringing together around 150,000 participants. The events embraced an array of issues, including energy efficiency, renewable energy, reductions of greenhouse emissions, employment in the energy sector, EU international cooperation, new technologies, and energy efficiency in buildings.

The Sustainable Energy Week suggested that it is imperative to invest in sustainable energy solutions, energy efficiency, and renewable technologies. Energy savings represent the most cost-effective way to enhance the security of the energy supply and to reduce GHG emissions. The EU GreenBuilding and GreenLight Awards, launched by the European Commission in 2005 and 2000, respectively, promote the reduction of energy consumption by public and private organizations on a voluntary basis. GreenLight encourages partners to install energy-efficient lighting, whereas the GreenBuilding initiative promotes improved energy efficiency in buildings through several measures such as PV panels, thermal insulation, efficient heating and cooling, and intelligent control systems. GreenLight counted 710 partners and total energy savings of 304,000 MWh in 2011 by replacing old-fashioned lighting with modern, low-energy lamps, and by controlling the use of lighting. GreenBuilding counted 364 partners and 616 buildings, and energy savings of 514,000 MWh in 2011.

Renewable energy markets have been growing strongly over the last years, as renewable energy technologies are maturing and investment costs are declining. Onshore wind and photovoltaic systems are moving steadily towards competitiveness. Regulatory policies could further support industrial policy, technology development, and elimination of market distortions. The EU strategy on renewables states that renewable energy should be gradually integrated into the market with reduced or no support, and should over time contribute to the stability and security of the grid on a level footing with conventional electricity generators.

The sectors that hold the highest potential for improvements and deserve the most attention are the residential, transport, and tertiary sectors, whereas industry holds more limited possibilities. Cities can play a major role in increasing awareness through appropriate regulation, public procurement policies, and economic signals. The combined effects of coordinated full implementation of the existing and new measures included in the energy policies has the potential to generate financial savings of up to € 1,000 per household each year, improve Europe's industrial competitiveness, and create up to two million jobs by 2020.

3.2 The EU long-term Vision for Secure, Competitive and Low/Zero-Carbon Energy

The EU Energy Roadmap 2050, adopted at the end of 2011, proposes a long-term vision and possible directions for the European Union to achieve the goal of full decarbonization, for example, reducing greenhouse gas emissions to 80–95 % below 1990 levels by 2050. Based on the analysis of a set of scenarios and different pathways, the Roadmap indicates the implications of a carbon-free energy system to help policy makers and industrial actors to make the appropriate energy choices and create a stable climate for longer-term private investments (EC 2011d).

The EU policies and measures to achieve the energy goals and the Europe 2020 strategy are ambitious and are expected to continue to bring results beyond 2020 and help to reduce emissions by about 40 % by 2050. This is, however, only less than half of the aimed reduction by 2050. The energy transition would demand more radical change, both structural and social, to achieve the objectives, while keeping a competitive and secure energy sector.

Developing post-2020 strategies is urgent. Energy infrastructures are long-lived and energy investments take time to produce results. Current decisions already affect the energy reality of 2050. The beginning of a new investment cycle should support the energy transition. The Roadmap suggests that postponement of investments would result in more costly solutions and greater disruption in the longer term. The Technology Innovation project at the Harvard Kennedy School of Government concluded with the same recommendation on the urgency to act (HKS 2011).

The analysis conducted by the European Commission, member states, and stakeholders highlighted clear trends, challenges, and opportunities to design the policy framework. Four main decarbonization routes for the energy sector have been identified, including energy efficiency mostly affecting the demand side and, on the supply side, renewable, nuclear, and carbon capture and storage. The scenarios proposed different combinations of these four interacting decarbonization paths, including two current trend scenarios, the reference scenario and an updated version taking into account current policy initiatives. This latter scenario is proposed as the basis of all decarbonization scenarios. Based on this analysis, this Energy Roadmap identifies key conclusions on "no regrets" options, beneficial in all cases, for a transition to a low-carbon energy system.

All scenarios entail major changes in policy, technology, systems, and markets. They all allow at least 80 % reduction in greenhouse gas emissions implying some 85 % decline of energy-related CO_2 emissions including from transport. Given the long time horizon, there is much uncertainty associated with these developments, given the fact that assumptions are also uncertain. It is, for instance, extremely difficult to anticipate whether or when an oil peak will happen, inasmuch as new discoveries have occurred repeatedly, whether and when carbon capture and storage will become commercial, and what future member states will seek for nuclear power. Last but not least, social and behavioral changes will also have a significant impact on the energy system (EC 2011d).

The reference scenario with long-term projections on economic development (gross domestic product growth of 1.7 % per annum) considers policies adopted by March 2010, including the 2020 targets as well as the Emissions Trading Scheme Directive. For the analysis, several sensitivities with lower and higher GDP growth rates and lower and higher energy import prices were analyzed. The Current Policy Initiatives takes into consideration the results of adopted measures, for example, after the Fukushima disaster in Japan, and being proposed in the Energy 2020 strategy.

A third possible path is indicated by the High Energy Efficiency scenario which requires political commitment to very high energy savings. It includes, for example, more stringent minimum requirements for appliances and new buildings, high renovation rates of existing buildings, and the establishment of energy savings obligations on energy utilities. This could lead to a decrease in energy demand of 41 % by 2050 as compared to the peaks in 2005–2006. The fourth High Renewable Energy scenario considers strong support measures for RES leading to a very high share of RES in gross final energy consumption (75 % in 2050) and a share of RES in electricity consumption reaching 97 %.

The Diversified Supply Technologies scenario indicates no preferred technology and considers all energy sources competing in the market with no specific support measures. Decarbonization is driven by carbon pricing assuming public acceptance of both nuclear and carbon capture and storage. Other scenarios include the delayed CCS which is similar to the latter but assumes that CCS is delayed, leading to higher shares for nuclear energy with decarbonization driven by carbon prices rather than technology push. The Low Nuclear is also similar to Diversified Supply Technologies scenario but it assumes that no new nuclear reactors are built apart from those currently under construction.

Decarbonization of the energy system is possible. The scenarios allow some conclusions that can help shape decarbonization strategies. The costs of transforming the energy system do not differ substantially from the Current Policy Initiatives scenario. The total energy system cost, including fuel, electricity, and capital costs, investment in equipment and energy-efficient products, could represent slightly less than the 14.6 % of European GDP in 2050 in the previous scenario, compared to the level of 10.5 % in 2005. Decarbonization scenarios suggest an import dependency around 35–45 % in 2050, compared to 58 % under current policies.

All decarbonization scenarios show a transition from the current model, with high fuel and operational costs, to an energy system based on higher capital expenditure and lower fuel costs. This is also due to the fact that large shares of current energy supply capacities come to an end. The analysis also shows that cumulative grid investment costs could be € 1.5–2.2 trillion between 2011 and 2050, with the higher range reflecting greater investment in support of renewable energy.

The average capital costs of the energy system, investments in power plants and grids, industrial energy equipment, heating and cooling systems, including district heating and cooling, smart metering, insulation, more efficient and low carbon vehicles, and devices for exploiting local renewable energy sources, such as solar heat and photovoltaics, may increase significantly. This has a widespread impact on the economy and jobs in manufacturing, services, construction, transport, and agriculture. It would create major opportunities for European industry and service providers.

All scenarios show that electricity plays a much greater role in the future, almost doubling its share in final energy demand to 36–39 % in 2050. Final electricity demand increases even in the High Energy Efficiency scenario. Electricity could provide around 65 % of energy demand by passenger cars and light-duty vehicles. The power generation system would have to undergo structural change and achieve a significant level of decarbonization (57–65 %) by 2030 in order to reach 96–99 % in 2050. This highlights the magnitude of the transition and the necessity of signals to minimize investments in carbon-intensive assets.

Energy efficiency should increase substantially in all decarbonization scenarios. Primary energy demand drops to 16–20 % by 2030 and 32–41 % by 2050 as compared to peaks in 2005–2006. Achieving significant energy savings will require a stronger decoupling of economic growth and energy consumption as well as strengthened measures in all member states and in all economic sectors.

The share of renewable energy rises substantially in all scenarios, achieving at least 55 % in gross final energy consumption in 2050. The share of RES in electricity consumption reaches 64 % in a High Energy Efficiency scenario and 97 % in a High Renewables scenario that includes significant electricity storage to accommodate varying RES supply even at times of low demand.

Carbon capture and storage has to play a pivotal role in system transformation. If commercialized, its contribution is significant in most scenarios with a particularly strong role of up to 32 % in power generation in the case of constrained nuclear production and shares between 19 % and 24 % in other scenarios with the exception of the High RES scenario.

Nuclear energy will need to provide a significant contribution in the energy transformation process in those EU member states where it is produced. It remains a key source of low carbon electricity generation. The highest penetration of nuclear comes in Delayed CCS and Diversified Supply Technologies scenarios, reaching 18 and 15 % in primary energy respectively.

Decentralization of the power system and heat generation increases due to more renewable generation. However, the scenarios show that centralized large-scale systems such as nuclear and gas power plants, and decentralized systems will

increasingly have to work together. In the future energy system, a new configuration of decentralized and centralized large-scale systems needs to build on the complementary advantages of both.

All decarbonization scenarios assume that global climate action is taken and this demands high levels of energy investments in the European Union even in the absence of ambitious decarbonization efforts. Decarbonization can be an advantage for early movers in the growing global market for energy-related goods and services. It contributes to the reduction of import dependency and exposure to the volatility of fossil fuel prices and brings significant benefits for public health.

As Europe pursues the direction towards greater decarbonization, there will be a growing need for closer integration with neighboring countries and regions and building energy interconnections and complementarities. The opportunities for trade and cooperation will require a level playing field beyond the borders. The overall cost of investment depends strongly on the socioeconomic situation and the policy framework locally and globally.

Energy saving and managing demand is a responsibility for all. The prime focus should remain on energy efficiency. Improving energy efficiency is a priority in all decarbonization scenarios. Current initiatives need to be implemented swiftly to achieve change. Implementing them in the wider context of overall resource efficiency will let cost-efficient results occur even faster.

Higher energy efficiency in new and existing buildings is vital and feasible. Buildings that are nearly zero-energy should become the norm. Buildings, including homes, could produce more energy than they use. Products and appliances will have to fulfill the highest energy-efficiency standards. In transport, efficient vehicles and incentives for behavioral change are required. Consumers will gain with more predictable energy bills. With smart meters and technologies such as home automation, consumers will be better equipped to transform their consumption patterns. Significant efficiency can be achieved with action on recycling, lean manufacturing, and longer product life.

Households and companies will have to invest in the transformation of the energy system. Greater access to capital for consumers and innovative business models are crucial as monetary signals provided by energy prices reflect the external costs. Energy efficiency has to be integrated in a wide range of economic activities from, for example, IT systems development to standards for consumer appliances. The role of cities and local organizations is expected to be much greater in the energy systems of the future.

Urban and spatial planning can contribute to saving energy in the medium and long term with all land uses having a complementary contribution. Local authorities should train advisers to help citizens find the cost-optimal policy choice between insulating buildings to less heating and cooling and the necessary infrastructure and networks to use the waste heat of electricity generation systematically in combined heat and power plants.

The analysis of all EU scenarios shows that the biggest share of energy in 2050 comes from renewables. Thus, the second major prerequisite for a more sustainable and secure energy system is a higher share of renewable energy beyond 2020. In

2030, all the decarbonization scenarios suggest growing shares of renewables of around 30 % in gross final energy consumption. The challenge for Europe is to enable market actors to bring down the costs of renewable energy through technological development and more efficient innovation policies and support schemes.

Renewables are moving to the center of the energy portfolio in Europe, from technology development to mass production and deployment, from small scale to larger scale, integrating local and more remote sources, from subsidized to competitive. This changing energy landscape requires parallel measures for the further development of renewables and incentives to favor economies of scale.

Many renewable technologies need further development to become competitive and penetrate the market. There is a need to invest in new renewable technologies, such as ocean energy and concentrated solar power and second- and third-generation biofuels. There is also a need to improve existing ones, such as by increasing the size of offshore wind turbines and blades to capture more wind and to improve photovoltaic panels to harvest more solar power. Storage technologies remain critical. Storage is currently often more expensive than additional transmission capacity. Greater efficiencies of RES and competitive costs require improved infrastructure for integration across Europe. Sufficient interconnection capacity and a smarter grid could help manage the variations of wind and solar power in some local areas.

In the near future, wind energy from the Northern Seas and the Atlantic can supply substantial quantities of electricity with declining costs. By 2050 wind power provides more electricity than any other technology in the High Renewables scenario. In the medium term, the contribution of ocean energy can provide an important contribution to the electricity supply. Similarly, wind and solar power from the Mediterranean countries could deliver a substantial part of the electricity.

Heating and cooling from renewable energy sources are vital to decarbonization. A shift in energy consumption towards low carbon and locally produced energy, including through district heating systems, is needed. Decarbonization will require a large quantity of biomass for heat, electricity, and transport. In transport, a mix of several alternative fuels will be needed to replace oil, with specific requirements of the different modes. Biofuels will probably be a main option for aviation, long-distance road transport, and rail. The market uptake of bioenergy, for example, biofuels based on waste, algae, and/or forest residues, should continue to be promoted.

Gas will be critical for the transition. It is expected to substitute coal and oil in the short to medium term and help reduce emissions with existing technologies until at least 2030. Although gas demand in the residential sector, for example, could drop by a quarter by 2030 due to several energy-efficiency measures, it is likely that it will stay high in other sectors, such as the power sector, over a longer period. For gas to maintain its competitive advantages as a fuel for electricity generation, the gas market needs more integration, liquidity, diversity of supply sources, and storage capacity. Long-term gas supply contracts may continue to be necessary to underwrite investments in gas production and transmission infrastructures as well as greater flexibility in pricing and dissociation from simple oil indexation.

Global gas markets are going under profound change, notably because of developments with shale gas in North America. With liquefied natural gas (LNG),

markets have become increasingly global because transport has become more independent of pipelines. Shale gas and other unconventional gas sources are seen as potentially great new sources of supply. However, due to the early stage of exploration, uncertainties abound, especially on the horizon that unconventional resources might become significant. As conventional gas production declines, Europe relies on substantial gas imports in addition to domestic natural gas production and potential indigenous shale gas exploitation.

The EU Roadmap scenarios are rather conservative with respect to the role of gas. The economic advantages of gas provide a reasonable certainty of returns to investors. Gas-fired power stations have lower upfront investment costs, are rather quickly built and relatively flexible in use. However, operational costs in the future may be higher than for carbon-free options and gas-fired power stations become less efficient.

Large-scale application of carbon capture and storage could help gas become a low-carbon technology, otherwise the long-term role of gas may be limited to a flexible back-up for renewable energy supplies. For all fossil fuels, carbon capture and storage will have to be applied from around 2030 onwards in the power sector in order to reach the decarbonization targets. CCS is also an important option for decarbonization of several heavy industries and combined with biomass could induce "carbon negative" values. However, the future of CCS crucially depends on public acceptance and adequate carbon prices. It needs to be sufficiently demonstrated on a large scale by 2020, and then further deployed, in order to be feasible for widespread use by 2030 (EC 2011d).

Coal in the European Union adds to a diversified energy portfolio and contributes to security of supply. With the development of emerging clean technologies, coal could continue to play an important role in a sustainable and secure supply. Oil is likely to remain in the energy mix even in 2050 for long-distance passenger and freight transport. The challenge for the oil sector is to adapt to changes in demand resulting from the switch to renewable and alternative fuels and uncertainties surrounding future supplies and prices.

As a large-scale low-carbon option, nuclear energy will remain in the EU power generation mix and contribute to lower system costs and electricity prices. Nuclear energy is a decarbonization option providing most of the low-carbon electricity consumed in the European Union in 2012. Some member states consider the risks related to nuclear energy as unacceptable. Since the accident in Fukushima, public policy on nuclear energy has changed in some member states, and others continue to see nuclear energy as a secure, reliable, and affordable source of low-carbon electricity generation. Costs, including for safety and the decommissioning of existing plants and disposing of waste, are likely to increase.

Another area of special importance is the shift towards alternative fuels, including electric vehicles. This needs to be supported at the European level by regulatory developments, standardization, infrastructure policy, and further research and demonstration efforts, particularly on batteries, fuel cells, and hydrogen, which together with smart grids can multiply the benefits of electromobility both for decarbonization of transport and development of renewable energy. The other main

options of alternative fuels are biofuels, synthetic fuels, methane, and liquefied petroleum gas.

Information and communication technologies in energy and transport and for smart urban applications are expected to play a major role. The digital infrastructure is expected to make the grid smart and may require support at the EU level by standardization and research and development. Flexibility in the power system is an important challenge, as the contribution of intermittent renewable generation increases. The impact on wholesale market prices of this generation is another challenge.

Electricity from wind and solar has low or zero marginal costs and, as its penetration in the market increases, prices could decrease and remain low for longer time periods. Revenues would then be reduced for all generators, including those needed to ensure sufficient capacity to meet demand when wind or solar are not available. This leads to concerns about price volatility and the ability of investors to recover capital and fixed operating costs. Market measures have to be well designed and offer cost-effective solutions. Access to markets has to be assured for flexible supplies of all types.

Local energy production from renewable sources asks for a more intelligent grid to deal with variable generation from many distributed sources such as solar photovoltaic, but also increased demand. With more decentralized generation, smart grids, and new network users, such as electric vehicles, there is a greater need for a more integrated approach to transmission, distribution, and storage.

Carbon pricing can provide an incentive for the deployment of efficient, low-carbon technologies across Europe. The EU European Trading Scheme, the central pillar of European climate policy, is designed to be technology-neutral, cost-effective and fully compatible with the internal energy market. It will have to play an increased role. The scenarios show that carbon pricing can coexist with instruments designed to achieve increased energy efficiency and development of renewables.

A higher carbon price creates stronger incentives for investment in low-carbon technologies, but may increase the risk of carbon leakage. Such carbon leakage is a particular concern for industry sectors subject to global competition and price patterns. A well-functioning carbon pricing system should continue to include mechanisms such as incentivizing cost-effective emission reductions outside Europe and free allowances based on benchmarks to prevent significant risks of carbon leakage.

The EU roadmap also highlights that the role of utilities could change substantially in the future, notably as regards investments. In the past, utilities were responsible for many generation investments. In the future, the scale of investment and the needs for innovation may have to bring in long-term investors. Institutional investors could become greater players in the financing of energy investments. Procumers will also play a more important role, which requires access to capital at reasonable cost.

The social dimension of the energy roadmap is important. The transition will affect employment and jobs, requiring education and training and a vigorous social dialogue. In order to manage change efficiently, the involvement of social partners and producer and consumer representatives at all levels will be necessary in line with fair transition and decent work principles.

Local authorities should be able to explain the various options and fully involve citizens in the technological choices and inform them about the pricing mechanisms and incentives that have to remain transparent and understandable to final consumers. Citizens should be engaged in the decision-making process, and technological choices have to take the local environment into account. Energy poverty has to be addressed in all areas. Vulnerable customers may need specific support in the transitional period.

To drive decarbonization, European cities should deploy multiple efforts on all strands of urban policy. Improving energy efficiency and infrastructure has a most crucial local dimension as well as ripple-effect social implications. Good multilevel governance is vital for the overall EU objectives to be achieved on the ground. The EU's 20 % renewable energy target has proven an efficient driver in the development of renewable energy in cities and regions, and their experience on drivers and barriers should be invaluable for setting options for intermediate milestones.

The next step is the definition of the 2030 policy framework and milestones, reasonably foreseeable and the focus of most investors. The Energy Roadmap 2050 identifies a number of elements that have positive impacts in all circumstances, and thus define some key outcomes such as the decarbonization of the energy system, which is technically and economically feasible. All decarbonization scenarios allow achieving the emission reduction target and can be less costly than current policies in the long run.

Energy efficiency and renewable energy can only have positive impacts. Irrespective of the selected particular energy mix, higher energy efficiency and shares of renewables are necessary to meet the CO_2 targets in 2050. There is no path to decarbonization without investment in these two prominent policy options.

All scenarios suggest that electricity will play an incontestably greater role in the future. Electricity prices are bound to rise until 2030, but may fall thereafter due to lower cost of supply, saving policies and improved technologies. The costs will be outweighed by the high level of sustainable investment, the related local jobs, and the decreased import dependency. All scenarios get to decarbonization with no major differences in terms of overall costs or security of supply implications.

The share of renewables grows significantly. According to the scenarios the share will reach roughly 30 % in 2030. In electricity, renewables could reach 50 % of final energy consumption in the same year. Clarity, planning, and openness are needed in managing changes to renewable energy policy measures and support schemes. R&D programs and initiatives and process and social innovation are necessary to speed up developments and guarantee higher and better penetration of renewables in the energy market.

Twin cities schemes could support renewable energy developments and help ensure fair trade and open access to emerging technologies and international energy markets. International cooperation could be further enhanced through joint investments in renewable energy sources and the creation of new enterprises and jobs in this green growth sector that has already generated at least one million jobs in Europe.

Local authorities have to address the challenges of ageing energy infrastructure, a financial and social crisis often reflected in local unemployment, and energy prices that have shocked consumers. Meanwhile, energy demand grows worldwide and greenhouse gas emissions keep rising, despite efforts to bring them down. The risks include dependency on energy supplies from unstable regions and countries, environmental and safety concerns, energy disruptions, and increasingly loss of competitiveness.

Introduced in 2008, the SET-Plan is the technology pillar of the EU's energy and climate policy with the aim of accelerating knowledge development, technology transfer and up-take, maintaining EU industrial leadership on low-carbon energy technologies, fostering science for transforming energy technologies to achieve the 2020 goals, and contributing to the worldwide transition to a low carbon economy by 2050.

The implementation of the SET-Plan advances through the European Industrial Initiatives which bring together industry, the research community, the member states and the commission in risk-sharing, public–private partnerships aimed at the rapid development of key energy technologies. In parallel, the European Energy Research Alliance has been working to align research activities and the SET-Plan priorities, and to establish a joint programming framework at the EU level.

The SET-Plan aims not only to help achieve the ambitious 2020 and 2050 objectives, but transform the entire energy system. Low-carbon energy technologies such as wind, solar photovoltaics, and biofuels must be affordable and competitive to be fully integrated into the energy economy. To support the SET-Plan, the Strategic Energy Technologies Information System has the mission to establish an open-access information system on energy technologies and develop an integrated approach for information and data exchange on energy technologies and capacities for innovation.

In 2012, the European Commission launched the Smart Cities and Communities Innovation Partnership to make the best use of Europe's great capacity for research and innovation to enhance the urban environment. The partnership proposes to bring together resources to support the demonstration of advanced energy, transport and information, and communication technologies in urban areas. The energy, transport, and ICT industries are invited to work together with cities to better address their needs. This will enable innovative, integrated, and efficient technologies to roll out and enter the market more easily, while placing cities at the center of innovation (EC 2012b).

A smart city and community integrates very diverse technologies to increase the efficiency of its functions, a driving force in generating Europe's sustainable economic prosperity. However, cities are confronted with many obstacles when it comes to the use of smart technologies. Multiple market barriers, difficulties for the promotion of innovation in public procurement, or uncertainty about the future of investments prevent innovative technologies to be integrated in the urban environment and rapidly deploy, despite their potential for cost savings and longer-term emissions reductions.

The EU initiative promotes industrial technology tests in a given city/community to better assess developments on the ground, with reasonable costs, and advantages for citizens and the community. Many technologies need to be tested and validated in the real conditions of a city. Some selected high-impact lighthouse projects will bring competent industrial consortia together with cities to demonstrate the technologies. A High Level Group for Smart Cities and Communities works on a transformation agenda and advice on the strategic orientation of the initiative identifying bottlenecks, incentives, and action to be undertaken by the lighthouse projects. The replication of successful urban applications and the mainstreaming of innovations will be achieved through the Smart Cities and Communities Stakeholder Platform, bringing city authorities, industry, NGOs, and civil society organizations (CSOs) together, to capitalize on experiences and exchange results.

The initiative will promote smart buildings and neighborhood projects, integrating, for example, local and renewable energy sources and expanding the use of high-efficiency heating and cooling. The construction of nearly zero-energy buildings and positive-energy buildings and neighborhoods will be supported as a prelude to energy-producing cities. Smart supply and demand service projects could be available for schemes that provide data and information to citizens and end-users on energy consumption/production and multimodal transport and mobility services. They could also help smart metering and related services for energy, water, and waste.

Urban mobility projects could include electric public transport vehicles that are able to exchange surplus energy, braking and accelerating energy, with the energy system. They could be using ICT to manage energy flows or hydrogen as an energy carrier for storing energy and balancing demand for energy in the city. Sustainable digital infrastructure could help reduce the carbon footprint of the Internet, in particular data centers and equipment, including broadband and intelligent heating, and invent more and better cooling and lighting solutions. The possibilities are endless (EC 2012b).

3.3 Saving Energy and Resources, Building by Building

The countdown has started to achieve Europe's 20 % energy-efficiency target by 2020 and it seems that the European Union will only achieve half of the target. Estimates made by the European Commission, taking into account the indicative energy-efficiency targets for 2020 set by member states, show that the European Union is still far from being able to achieve its objective.

The European Commission first put forward, in 2011, an Energy Efficiency Plan with a range of measures to be implemented throughout all economic sectors and presented a legislative proposal for a directive transforming into binding measures many of the key actions of the Energy Efficiency Plan. It built upon the existing Directives for Cogeneration and Energy Services and merged them into one comprehensive legal instrument addressing energy efficiency in energy supply and

in final energy consumption. The Energy Efficiency Directive intends to step up member states' efforts to use energy more efficiently at all stages of the energy chain, from the production and transformation of energy to its distribution and final consumption (EC 2011h).

Energy distributors or retail energy sales companies could save 1.5 % every year of their energy sales, through the implementation of energy-efficiency measures by final energy customers, such as improving the efficiency of the heating system and/or installing double-glazed windows or insulating roofs. Alternatively, national, regional, and local authorities also have the possibility to propose other energy-saving mechanisms, for example, funding programs or voluntary agreements that lead to the same results.

Governments, at all levels, have to lead by example and purchase energy-efficient buildings, products, and services. They will further have to reduce progressively the energy consumed on their premises by carrying out the required renovation works every year covering at least 3 % of their total floor area and the necessary audits to monitor energy consumption continuously.

All companies should conduct audits of their energy consumption to help them identify the potential for reduced energy consumption. Individual easy access to data on real-time and historical energy consumption through more accurate individual metering intend to empower consumers to better manage their energy consumption and influence their bills.

Local authorities could help with the energy audits to increase energy efficiency in businesses and especially small and medium-sized enterprises. It is also crucial to introduce schemes for the effective recovery of heat loss from electricity and industrial production, and to enhance cogeneration.

Consuming less and better is an aim for industrial, commercial, and residential actors and buildings. Countries and cities set ambitious targets to ensure that all new buildings consume the least possible energy and that a high percentage of older buildings can be refurbished and transformed to be almost energy-autonomous buildings. Everywhere, public buildings have to show the way.

The great majority of the housing stock of European cities is old and its energy performance is poor, especially in Eastern Europe. In Amsterdam, almost half of the 385,000 housing units were built before the Second World War. In 2006, 34 % of the total emissions of CO_2 were caused by household use of electricity, gas, and heat, despite a decline of more than 1 % per year in the average household gas consumption. This reduction, due to the efforts of the housing associations investing for many years in better insulation and higher efficiency installations, and the much better energy performance of newly built houses, has been counteracted by an increase in the number of housing units and especially by an increase in electricity consumption of 2 % annually.

The Amsterdam Climate Office worked with stakeholders and private landlords and owner/residents, making decisions about insulation, double-glazing, efficient heating installations, good ventilation, or the use of renewable energy. Housing associations, owning more than 50 % of the housing units, are important players along with tenant organizations. If all housing associations undertake serious

renovation until 2018, a CO_2 reduction of 31 % is possible and this may reach 37 % if these efforts continue until 2025. The decrease will be partly achieved by selling units, tearing down old housing, and building new ones. Since February 2007, the city has headed the alliance of leaders in which the housing associations are challenged to participate in concrete initiatives and achieve the best performance. The municipality and the housing associations jointly created model houses to reduce emissions (Amsterdam Climate Office 2008).

In the United States, the Better Buildings Initiative was announced as part of the plan to ensure that America succeeds in out-innovating, out-educating, and out-building the competition. The president announced his vision for investing in innovative clean energy technologies and doubling the share of electricity from clean energy sources by 2035 in his State of the Union 2011. In parallel, the Better Buildings Initiative aims at making commercial and industrial buildings 20 % more energy-efficient by 2020 and accelerates private sector investment in energy efficiency. Through a variety of efficiency improvements, such as new lighting, greater insulation, more efficient heating and cooling, clear information. and access to financing, buildings can become more energy-efficient and better places to live and work, while creating jobs and fueling a stronger economy. The Political Economy Research Institute suggested that the entire Better Buildings Initiative could create up to 114,000 jobs.

The White House Better Buildings Challenge is inspiring public and private sector leaders to commit their organizations to saving energy and money, and demonstrate the results of the best strategies. Partners commit to an energy savings pledge, a showcase building, and the presentation of their achievements. They would enjoy public recognition, technical assistance, and best-practices sharing through a network of peers. Their leadership could provide real implementation models. In addition to supporting significant energy reduction, the Better Buildings Challenge is focused on finding solutions to persistent barriers to energy efficiency that have limited the possibilities of the market. Another inspiring initiative is the Better Buildings Neighborhood Program in which partners are training and expanding their local energy-efficiency professional workforce.

Nearly 70 % of electricity consumption in the United States occurs in buildings where many cost-effective efficiency investments are possible. For example, replacing appliances such as air conditioners, refrigerators, freezers, furnaces, and hot water heaters with more efficient models could reduce energy use by 30 %. The energy savings from attaining full deployment of cost-effective, energy-efficient technologies in buildings could eliminate the need to add new electricity generation capacity through 2030. New power facilities would be needed only to replace obsolete facilities, or to introduce more environment-friendly norms.

Although there is great potential, many barriers exist to widespread adoption of energy-efficiency technologies. The upfront costs can be high, which can deter investment despite the promise of long-term cost savings. Volatile energy prices can cause delays in the purchasing of more efficient technology due to a lack of confidence concerning the return on investments. There is also a shortage of readily available, trustworthy information for consumers wishing to learn about the

relative performance and costs of energy-efficient technology alternatives. The public authorities closest to the citizens must inform them on investments in energy-efficient infrastructure, as these can affe ct the patterns of energy use for decades. Driving change will require significant public and private support, and sustained effort.

Successful energy efficiency initiatives include the US Department of Energy and Environmental Protection Agency (EPA)'s Energy Star labeling scheme. EPA lists the US cities with the most Energy Star certified buildings that meet strict energy performance standards and produce limited greenhouse gasses. By the end of 2011, 16,500 buildings had earned an Energy Star, saving the United States an estimated $2.3 billion US in annual utility bills. The average Energy Star building uses 35 % less energy and produces 35 % less carbon dioxide emissions than typical buildings.

Fifteen types of commercial buildings can earn the Energy Star, including office buildings, schools, and retail stores. Energy used in commercial buildings accounts for nearly 20 % of greenhouse gas emissions. With 659 Energy Star buildings, Los Angeles had, by far, the most energy-efficient buildings in 2011. The EPA estimates the city saved $149 million US in energy bills in 2011. Washington DC ranks second with 404 Energy Star buildings, and Atlanta, San Francisco, New York, Chicago, and Boston also feature in the top tenth.

New York City introduced the Greener, Greater Buildings Plan (GGBP), within the city's plan for 2030. It is projected to reduce greenhouse gas emissions by nearly 5 %, have a net savings of $7 billion US, and create roughly 17,800 construction-related jobs by 2030. The GGBP consists of four regulatory pieces supported by extensive jobs training and a financing entity. It includes a requirement that large buildings annually benchmark their energy performance, that a local energy code be adopted, that every 10 years these buildings conduct an energy audit and a retrocommissioning and that by 2025, the lighting in the nonresidential space be upgraded. The first benchmarking report on private buildings adds to the body of knowledge released with the benchmarking results for the City's municipal buildings in 2011, which is already helping to guide cost-effective energy retrofit projects.

Improving the energy efficiency of existing large buildings is crucial for achieving New York's goal of reducing greenhouse gas emissions 30 % by 2030 compared to 2005 levels. The emphasis on large existing buildings is driven by three facts. First, 75 % of GHG emissions in New York City come from energy used in buildings. This is almost double the proportion in the United States as a whole. Second, almost half of New York City's GHG emissions are generated by the city's largest buildings, which constitute only 2 % of the city's properties but half of the built space in the city. Third, 85 % of the buildings that will exist in 2030 are already built.

New York City's largest buildings have a huge potential for energy savings. It is crucial to realize this potential through increasing energy efficiency in large buildings, which are responsible for almost half of the city's total greenhouse gas emissions. On the cusp of an information revolution about the energy use in the building stock, Local Law 84 of 2009 mandates that all privately owned properties with individual

buildings over 50,000 square feet or multiple buildings with a combined surface of over 100,000 square feet annually measure and report their energy and water use (NYC Mayor's Office of Long-Term Planning and Sustainability 2012).

The first benchmarking report analyzing a year of energy and water use marks a first step in increasing knowledge about buildings' energy use and highlights opportunities for property owners to save energy by making their buildings more efficient. The report documents the current state of energy consumption and performance in large buildings in New York City. Using the US Environmental Protection Agency's Energy Star Portfolio Manager, an interactive energy management tool that allows tracking and assessing energy and water consumption across the entire portfolio of buildings, nearly 1.8 billion square feet of built space was benchmarked. This is the largest collection of benchmarking data gathered for a single jurisdiction and can help identify opportunities for further efficiencies.

Although New York City's buildings are generally less energy intensive than the national average, there is a significant opportunity to improve the energy performance of large buildings, which is essential to achieving the City's greenhouse gas reduction goal established in the comprehensive sustainability plan, PlaNYC. The benchmarking report shows that energy use varies greatly among property types, uses, and locations, with some properties using three to five times more energy per square foot than buildings with similar uses. Although many factors are at play, newer office buildings in New York City tend to use more energy per square foot than older ones.

Toronto's Better Buildings Partnership (BBP) is an innovative program that provides resources for energy-efficient retrofits and construction of new buildings. The program includes three segments, targeting multifamily buildings, all municipal, academic, social, and health care buildings and new constructions and commercial developments. The BBP's primary goal is to achieve energy-efficient buildings and reduce carbon dioxide emissions from the energy used to heat, light, and cool buildings. The disclosed results by April 2012 include 1,896 completed projects with an annual cost savings of $56.2 million Canadian, and 0.45 million tonnes in CO_2 reduction.

Sustainability ethics are also increasingly reflected in the EU building regulations. In the European Union, the Energy Performance of Buildings Directive (EPBD), issued in 2002, suggested a common framework of harmonized measures for the development of integrated energy performance standards, to be applied to new and existing buildings when renovated. An integrated method addressing all energy aspects facilitates the most effective and efficient combination of measures and offers a basis for designers and builders to recognize and promote high standards.

The 2010 Energy Performance of Buildings Directive (Recast) requires that all new buildings must be nearly zero-energy buildings by 2020 and member states shall set intermediate targets for 2015. A nearly Zero-Energy Building (nZEB) is a building that has a very high energy performance. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources. Member states must provide a definition for nearly

Zero-Energy Buildings adapted to their national conditions and submit plans for increasing the number of nZEBs including specific targets for the building typology. These national action plans shall also include measures to stimulate the transformation of buildings that are refurbished into nearly zero-energy buildings.

The public sector must play a leading role. By 2018, all new public buildings shall be nearly Zero-Energy Buildings. Energy Performance Certificates will be displayed in the majority of public buildings providing information and increasing public awareness of the energy conditions and objectives. Public authorities will be encouraged to implement the recommendations included in the certificate and communicate their results to citizens.

Public lighting has often been a subject of controversy, as it has been perceived both as a factor of public security and local identity and as a driver of high electricity consumption. Ample lighting has a beneficial effect on the atmosphere of a city. It has proved to help reduce both road accidents and security incidents, and the illumination of monuments and public buildings can make a city beautiful. Light designers were frontrunners in a contest to brighten up the city of Montreal dramatically. An iceberg show consisting of illuminated arcs and the day of Eight Suns with projections on the façades of the buildings were some of the innovations.

Lighting can also result in high energy budgets. Lighting typically accounts for about 20 % of a city's total electricity consumption. Intelligent lighting can optimize illumination, increase comfort and urban safety, and reduce costs. The latest generation street lighting is robust, weatherproof, and economical, often lasting three to five times longer than traditional street lamps. In a report by Siemens focusing on New York, named as "the city where the future comes to rehearse," performance contracting is evaluated to be one of the best ways for accelerating sustainability (Siemens 2012).

Responsible public lighting would benefit from lighting adapted to the degree of darkness. The municipality of Amsterdam replaced older lamps with more efficient ones and is entirely switching to electronic components. In 2007, the City Hall of Amsterdam was already fully equipped with energy-efficient lamps, achieving 45 % energy savings. The project earned the 2008 European Light Award. Furthermore, new-generation streetlights were tested and can provide huge energy savings (Amsterdam Climate Office 2008).

European cities join their efforts to improve their energy performance radically through EC-supported projects. The CONCERTO initiative brought together dozens of cities from across the European Union to improve their energy efficiency together. Most efforts focused on the integration of renewable energy sources with effective energy-efficiency measures. CONCERTO members worked on areas as diverse as ecobuildings, distributed energy from renewable sources, energy-efficient building design and management, cogeneration of heat and power, and clean district heating. Cities and observers shared experiences on the internationally most advanced concepts and technologies, assessed the potential of different policy measures, and issued policy recommendations.

The Polycity project, part of the same initiative, focused on energy optimization and the use of renewable energies in three large urban areas in Germany, Spain, and

Italy. The German project in Scharnhauser Park, a recently redeveloped former military area, is designed as an exemplary ecological community development, with low-energy buildings and a biomass cogeneration plant. Low energy standards have been prescribed for all new construction and connection to the heating network of the biomass cogeneration plant is obligatory. Furthermore, all buildings will be equipped with optimal heat insulation to minimize loss in winter and residual heat will be used to cool the office buildings during warmer seasons.

After tough negotiations among the European Parliament, the Council, and the European Commission, an agreement on the Energy Efficiency Directive was reached in June 2012. In its passage through the European Parliament, the Industry, Research, and Energy Committee had proposed to strengthen the provisions of the directive by making binding, the nonbinding national energy-saving targets. The deal sets out a number of binding measures, but also reflects the EU governments' desire for more flexibility, preferring to achieve targets via long-term national strategies.

The directive has abandoned the proposal on public building renovation requirements, which asked for 3 % renovation of the total floor area (over 250 m^2) of buildings owned by public bodies each year. Instead, the new directive requires member states to renovate 3 % of the total floor area of heated and/or cooled buildings owned and occupied by their central government and it would only apply to buildings with a total usable floor area of more than 500 m^2. As a consequence, the provision will only affect a small percentage of all public buildings (10 %). Nevertheless, the European Parliament introduced a promising measure, requesting EU member states to draw up a roadmap to make the entire building sector more energy efficient by 2050.

3.4 Urban Leadership and Action to Surpass National Targets

The Covenant of Mayors was launched by the European Commission, with the support of the Committee of the Regions and the European Parliament, during the 2008 European Sustainable Energy Week. City leaders introduced an ambitious initiative associating cities and citizens in the energy future. The Covenant of Mayors is a voluntary commitment by signatories to meet and exceed the EU 20 % CO_2 reduction objective through increased energy efficiency and the development of renewable energy sources. With more than 4,000 signatories in 2012, this prime commitment to surpass the EU targets brings together the most pioneering European cities to exchange good practices on energy efficiency and promote low-carbon socioeconomic development.

The Covenant of Mayors is the mainstream European initiative involving local and regional authorities in the fight against climate change and developing a more sustainable energy future for cities. Signatories represent cities with different sizes from small villages to major metropolitan areas such as London or Paris.

The Covenant aims to support the efforts made by local authorities to implement sustainable energy policies, and is open to cities of all size, including those outside the European Union. When local and regional authorities make the commitment to join the Covenant, they engage to establish a Baseline Emission Inventory and a Sustainable Energy Action Plan and submit them to the European Commission within the year after they sign the Covenant. The Action Plan is the key document in which the Covenant signatory outlines plans to reach the intended CO_2 reduction objectives by 2020, it defines the activities and measures set up to achieve the targets, together with timeframes and assigned responsibilities. Regions also play a key role as territorial coordinators and coinvestors in the energy future.

Symbols matter. On October 5, 2010, at its plenary session, the Committee of the Regions led the Covenant to a milestone signature with the joining of the 2,500th municipality, the 100th region and the 25th capital city in the EU, as well as the alliance with over 1,000 American cities working within the US Mayor Climate Protection Agreement, via a memorandum for cooperation between the CoR and the US Conference of Mayors bringing together all 1,200 cities with a population of at least 30,000 inhabitants.

Along with a pledge for increased political ownership of the initiative, the Committee of the Regions also proposes to widen the scope and broaden the geographical coverage of the Covenant. Local and regional authorities are committed to investing in smart energy and moving towards greater resource efficiency. It is very important that the Covenant of Mayors be expanded beyond energy issues to include the full spectrum of resources. A more resource-efficient lifestyle could boost green employment, increase EU competitiveness, generate financial savings, and create innovation opportunities.

The fact that more than 4,000 mayors, local authorities, and regions have signed up to go beyond EU targets for cutting emissions is underlined as a clear sign that the real impetus is at the subnational level. This momentum could also benefit resource efficiency. The targets for improving and reducing energy use could inspire, for instance, targets for other key areas, such as biodiversity and land use, waste and water management, or air pollution. The CoR suggested, ahead of the EC's Blueprint to Safeguard Europe's Waters in 2012, to extend the Covenant to include 20–20–20 targets for integrated water management, with a 20 % increase in water savings in all sectors, a 20 % increase in the number of water courses being renaturalized in order to reduce flood risk, and a 20 % increase in the volume of water reused and/or recycled in farming and industry.

In the United States, a survey of Clean Energy Solutions for cities demonstrates the leadership of more than 1,050 mayors who signed the conference of Mayors' Climate Protection Agreement and promoted strong local action to confront global challenges successfully (US Conference of Mayors 2011). In signing the agreement, the mayors committed themselves to initiatives that accelerate local efforts, including energy efficiency and conservation block grants.

The interest of mayors in clean energy is indicated by the sheer number of 396 mayors in all 50 states who responded to the survey. Among them, 75 % expect the deployment of clean energy technologies to increase over the next five years despite

the unfavorable economic conditions. Their top choices include efficient lighting (76 %), low-energy building technologies (68 %), and solar systems to generate electricity (46 %). Improvements in public buildings are seen as a priority for improving the energy efficiency of cities. Nearly half of the cities took action to improve the efficiency of outdoor lighting and 20 % of them especially promoted the energy efficiency of water treatment plants.

Cities expect to have economic benefits through energy efficiency. Of these cities, 70 % wish to develop a greener economy and 83 % deployed new energy technologies with the support of the Energy Efficiency and Conservation Block Grants Program offering grants for energy technology investments. The main technologies funded include energy-efficient lighting, new building technologies, and photovoltaics. Beyond getting additional funds, mayors see the potential for greater nongovernmental collaboration on clean energy and public–private partnerships.

Financial constraints are highlighted as the most important problem for the adoption of the low/zero carbon technologies. Adaptation to climate change is already integrated in the policies of one third of the cities surveyed and one quarter of them have set targets for the use of renewable energy (US Conference of Mayors 2011).

And from the European Union and the United States of America, the movement expanded to the world. In 2010, more than 138 mayors adopted the Global Cities Covenant on Climate, the Mexico City Pact, which aims to ensure transparency, accountability, and comparability of local climate action. The initiative encouraged signatories to report commitments, together with GHG inventories and relevant actions to the carbon Cities Climate Registry (cCCR). Cities that announce commitments are invited to report their baseline and latest available GHG inventory in order to monitor their progress in meeting their targets. As of May 2012, 164 local governments from 21 countries report their climate information to cCCR, including 319 commitments up to the year 2050. The cCCR, operated by the International Council for Local Environmental Initiatives, acts as a global online platform for local governments to report climate and energy commitments and accomplishments.

Watercolour 4
Copenhagen, the First Post-Carbon European Capital City?

Chapter 4
Reinventing Smart, Green, and Inclusive Mobility in Cities

Abstract Sustainable mobility and accessibility are fundamental to urban societies and economies, and vital for balanced growth and quality job creation. The quality of transport services has a crucial impact on citizens' quality of life. The transport sector is highly energy-intensive and a major intractable contributor to global warming. Its performance has to be radically improved.

This chapter sheds light on the challenges for the future of transport services and infrastructure and the patterns and models in search of cleaner and better transport options. It discusses alternative mobility actions and focuses on sustainable public transport and social innovations for moving differently and better around the city. A bouquet of examples from events celebrating improved mobility demonstrate how cities can be made accessible to all.

4.1 Optimizing Urban Transport: Challenges of the Future

The transport system of 2030, and perhaps of 2050, may still be based on two-wheelers, cars, trucks, trains, planes, and ships, much more efficient and better designed than at present. Electric city cars could be foldable or adapted to the space requirements as the grocery carts at the supermarkets. Private car ownership reached a saturation point in most industrialized counties but robust growth is expected to continue in emerging and developing countries. Very high levels, as in the United States, seem unlikely but EU and Japanese car ownership levels could be reached in rapidly developing countries if not tempered by air pollution, congestion, and lack of adequate parking space in large metropolises (ITF 2011).

According to the projections of the International Transport Forum, global passenger transport volumes in 2050 could be up to 2.5 times as large as in 2010, and freight volumes could grow by a factor of four. In 2000, half of global passenger-kms were driven in OECD countries but this share could decline to 20 % in 2050. Most fundamental changes are likely to have occurred in the organization of

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transport, with the modes interacting much more intensely with each other and innovative new transport services could allow more seamless intermodal mobility in urban areas (Transportation Research Board 2009a; ITF 2012).

Mobility projections for cities are much more difficult and depend on topography, culture and lifestyles, economy, and governance. A new culture of urban mobility demands less car-oriented lifestyles and alternative forms of mobility, for example, in the form of walking, cycling, car-sharing, car-pooling, bike-sharing, and taxi-sharing. Optimal urban policy portfolios include legislation, the promotion of lower-consumption vehicles and innovative fuels and propulsion technologies, demand-management schemes, such as parking and access restrictions, fair and efficient pricing regimes, and land use and planning. A mix of compatible land uses is highly important, inasmuch as it can lead to mutually enriching functions and decreased travel demand and energy consumption (OECD-ECMT 1994; ITF 2012).

Car-sharing is expected to have an increasing role in some urban areas and this may slow the growth of vehicular travel and even reduce urban vehicle stocks. Zen cars in Brussels, the electric car fleets for car-sharing try to fulfill a need that may create certain urban niches. In 2030, the car fleet may still be dominated by internal combustion engine technology but it is expected to display higher levels of hybridization and electric vehicles. Freight logistics could be optimized thanks to much more nimble technological applications.

Delivering seamless passenger travel in urban areas will require that local and regional authorities reassess the limits and boundaries of geographical and administrative structures. These will have to be more flexible and less mode- and jurisdiction-bound to allow for imaginative new mobility services. Infrastructure investment across all modes and innovative funding arrangements are very important. Business processes must be much more open to mode-neutral mobility and common standards are crucial for interoperability.

Sharing risk and liability with public–private partnerships may play an important role as well as greater uptake of road pricing. Transparent and clear pricing rules fully aligned with sustainability objectives are fundamental preconditions. Public acceptance is higher when projects invite stakeholder involvement and the revenues from pricing schemes are clearly directly allocated to sustainability projects.

Congestion is a huge burden on transport. In the United States, the 2011 Urban Mobility Report highlighted congested conditions on a number of levels, including the delay endured by the average commuter (34 h in 2010 against 14 h in 1982), the cost of congestion (more than $100 billion US, nearly $750 US for every American commuter), and the breadth of congestion, with about 40 % of the delay occurring during midday and overnight hours, creating an increasingly serious problem for businesses. The individual commuter feels the impact of congestion in the form of stress and wasted time. The study suggests that when economic growth returns, the average commuter could see an additional 3 h of delay by 2015 and 7 h by 2020 (Texas A&M Transportation Institute 2011).

Congestion costs the European Union about 1 % of GDP every year and most of it happens in extended urban areas. The economic recession seems to have caused a temporary respite from congestion. The most economical and effective congestion

solutions involve traditional road construction and public transport, combined with traffic and demand management strategies such as signal coordination, telecommuting, and flexible work hours. Planning and land use patterns can also play a vital role.

Seamless transport is being promoted as a smart investment in advanced transport systems that minimize obstacles to interconnection and barriers to access to information and services (ITF 2012). Safe, clean, fast, and efficient transport systems constitute key requirements in the European Union. The industry directly employs around 10 million people and accounts for about 5 % of GDP. Effective transport systems are vital for European companies wishing to compete in the world economy.

The transport sector, principally road vehicles, accounted for 33 % of the European Union's CO_2 emissions in 2009. Transport is producing more GHG (greenhouse gas) emissions than in 1990 and is the fastest growing source of these emissions. The sector presents the greatest problems for decoupling economic prosperity from pollutant release. Despite the important technological improvements that the transport sector witnessed over the last years, the increasing demand outweighed the ecoefficiency gains. By 2050, the European Union needs to achieve a 60 % cut in emissions for the transport sector compared with 1990 levels in order to limit global warming to an increase of just 2°C.

Road transport is largely oil-dependent and the source of the great majority of transport emissions. At the global level, road transport has become the largest single most intractable anthropogenic source of CO_2 emissions. Addressing transport greenhouse gas emissions requires a fundamentally novel approach with the public engaged in policy development and debate. Technological, social, and political innovation should be promoted, together with demand-side management and governance.

Higher-quality mobility with less environmental impact is a major challenge for cities. More mobility has long been regarded as part of an unquestionable urban lifestyle and the private car as a supreme symbol of freedom. Patterns depend on both the supply of transport infrastructure and the increasingly complex and unsystematic mobility demand, highly affected by the location decisions of public administrations, firms, developers, and households. The expansion of cities has always been inextricably linked to transport infrastructure (EEA 2006).

Urban transport is responsible for around 40 % of total road transport CO_2 emissions. The car is by far the dominant urban transport mode, contributing about 75 % of kilometers traveled in EU conurbations. Congestion in European cities often makes average traffic speeds at peak times lower than in the days of the horse-drawn carriage. Increased car use has not only been the cause of environmental problems, but also underinvestment in public transport. One third of fatal road accidents happen in cities (EC 2007c).

Transport infrastructure, the arteries for the circulation of socioeconomic vitality, cover 10–15 % of the urban space in the European Union. Despite the reduction of CO_2 emissions from passenger cars by 22 % since 1995, transport is the source of many concerns and worries. According to a 2007 EU poll, 90 % of Europeans suggest that local transport should be improved. Household spending for transport amounts

to 13 % of the total budget. On average, a European citizen makes 1,000 trips per year and half of these are less than 5 km long (EC 2007c).

Freight transport is essential for the socioeconomic functioning of cities but the efficiency of the sector has a high potential for improvement. The sector accounts for about 10–12 % of vehicle traffic in cities and may increase far more intensively than passenger transport also due to e-commerce. It is also important to stress that the sector causes disproportionately higher impacts on congestion and the environment. Construction works and retail are responsible for much of freight transport. Many cities impose vehicle size or weight restrictions, or limit access in certain areas. A balance has to be struck between access requirements, essential to urban vitality, and transport and environmental objectives. Urban responses such as the "Cyclocargo" in Brussels can provide environment-friendly transport for freight.

In 2011 the European Commission adopted a comprehensive long-term strategy, the Transport 2050 Roadmap for a resource-conscious competitive transport system, which fosters growth and employment. At the same time, the purpose is dramatically to decrease Europe's dependency on imported oil and reduce carbon emissions by transport. The roadmap proposes 40 measures for different types of journeys, including within cities, between cities, and long distance (EC 2011d).

Some key goals of the transformation of Europe's transport system by 2050 especially target cities. They include a major commitment for no more conventionally fueled cars in cities and a 50 % shift of medium-distance intercity passenger and freight journeys from road to rail and waterborne transport. By 2050, the majority of medium-distance passenger transport, about 300 km and beyond, should go by rail and by 2030, 30 % of road freight over 300 km should shift to other modes such as rail or waterborne transport, and more than 50 % by 2050. Together with a 40 % use of sustainable low-carbon fuels in aviation and at least a 40 % cut in shipping emissions, these measures are expected to contribute to a reduction of transport emissions by 60 % by the middle of the century.

The EU transport 2050 Roadmap aims at achieving a competitive transport sector that increases mobility and decreases emissions. It aims at removing major barriers and bottlenecks in key fields across transport infrastructure and investment, innovation, and the internal market. The aim is to create a single European transport area with more competition and a fully integrated transport network that links the different modes and allows for a profound shift in transport patterns for passengers and freight.

The Council of European Municipalities and Regions (CEMR), bringing together over approximately 100,000 local and regional authorities throughout Europe, considers urban transport a key issue for local governments and citizens. In 2004, CEMR adopted a manifesto on sustainable mobility for Europe's regions, towns, and municipalities presenting seven areas for further reflection and action from the European Commission, national governments, and local and regional authorities. These include the identification of the barriers that limit the use of public transport, the promotion of public transport and alternatives to car use, the development of incentives to manage demand for road space, quality and safety issues, the review and improvement of the legal framework governing privatization, public

procurement, concessions, and public service obligations in public transport, the use of economic instruments, the development of better policy, and strategy links between urban planning and transport policy at all levels of governance (CEMR 2005).

Since 2002, the CIVITAS (CIty–VITAlity–Sustainability) EU initiative helps cities to achieve a more sustainable, clean, and energy-efficient urban transport system by introducing, implementing, demonstrating, and evaluating ambitious integrated strategies involving technology and policy measures. The initiative facilitated the sharing of best practice among more than 200 European cities forming a network forum, open to all cities committed to a sustainable modal shift in their urban transport systems. By signing the CIVITAS Declaration, a nonbinding voluntary agreement, members communicate and exchange extensively with the other members of the network in a joint effort to raise the bar of excellence in sustainable urban mobility.

4.2 Walking and Cycling, Eternally Sustainable Locomotion

The transformation of central urban districts into pedestrian areas with cycling paths and related infrastructure completed five decades of astonishing results. Despite difficult beginnings due to strong opposition from commercial lobbies, the schemes gained acceptance in many cities in the world. Copenhagen was a pioneer city in recognizing the social value and economic benefits of central pedestrian streets. The creation of pedestrian precincts started in the early 1960s and evolved in coordination with the parking policy and the elimination of 2–3 % of the parking spaces per year in the city center. The public transport system was improved and the bicycle network enlarged. More and more space was liberated from traffic and rendered to citizens, initiating a tide of return of residents from anonymous peripheries to the historic heart of the city. The pedestrian Stroget area attracted civic architecture, sculptures, fountains, musical and cultural events, and became the archetype of northern pedestrian precinct developments (EEA 2010b). Its 50th anniversary is celebrated enthusiastically.

Dignified pedestrian streets expanded throughout Europe and the world and became sociocultural features of many cities. Italian cities were pioneers in closing historic centers to private cars and introducing peripheral park-and-ride systems. Rome, Milan, Florence, Bologna, Perugia, and Bolzano were among the first to experiment with various scales of car restrictions. Many cities followed the example with enthusiasm, even in icy environments. Oulu, in Finland, is a good example of a city with a vibrant pedestrian zone, which is proving to be very successful, even with temperatures as low as –30°C.

The role of the street as a shared noble public space is highlighted in the European Urban Charter issued by the Council of Europe in 1992 and reinvigorated in 2008 (CE 2008, 1992). The “Code of the Street: Streets for All,” introduced in 2004 in Belgium, asks for more attention to be paid to the rights of pedestrians, cyclists, children, the elderly, and the handicapped. The code requires drivers to respect one

meter minimum distance from pedestrians crossing the streets. The concept of crossing curbs can promote urban safety and incite drivers to reduce speed.

Pedestrian vitality of main streets also gained in US cities including New York, Boston, and San Francisco with increasingly safe and inviting streets for pedestrians. The litmus test of pedestrian-friendly cities includes the high attraction of citizens outside office hours and round the clock, a continued expansion of public transit to support the movement of pedestrians on longer trips, restricted parking, and the ending of the hideous structures of the megagarages built during the 1950s and 1960s. Preserving tightly built Boston as a city for pedestrians, not cars, started with widening sidewalks and reorienting and broadening pedestrian walkways across downtown (Boston Foundation and The Citistates Group 2004).

Bicycles are the only other sustainable transport means, second only to walking. Policy measures and infrastructure to promote cycling activities are expanding in most cities. The modal split of cycling has grown significantly in European cities during recent years. Amsterdam and Copenhagen are the capital cities endowed with the most elaborate bicycle networks, complementing road and canal routes. Both cities developed successful public cycling plans. Copenhagen has been selected by the International Cycling Union as the world's first Bike City, registering the highest percentage of commuting trips by bicycle.

The necessary infrastructure and conditions, fundamental policy measures to support cycling, are expanding in most cities. Helsinki has a total of more than 1,500 km of bicycle paths; Stockholm and Hanover have about 750 km. Vienna and Munich seem successful in reporting high percentages of trips by bicycle for commuting. Smaller cities such as Turku, Aalborg, Tampere, and Aarhus, featuring a cycling network of about 300 km, managed to convince about 20 % of citizens to use the bicycle also for home-to-work trips.

Cities such as Basel can be thoroughly crossed and enjoyed by bicycle. Since the early 1990s, Zurich and La Rochelle started lending bicycles to residents and visitors. The "Velib" service, involving flexible bicycle sharing through an electronic network, has been successful in Lille and Paris, as has the equivalent "Villo!" service in Brussels. In 2012, central Brussels had 180 Villo! Stations, located every 450 m in order to satisfy the evolving needs of citizens and visitors.

Towards the last decades of the twentieth century, bicycles started being valued as components of everyday transport and recreation in many western cities. Velo-city events and conferences have been held in Copenhagen, Paris, Dublin, Brussels, Barcelona, Perth, Munich, and Montreal to promote pedal power in bicycle-friendly cities. Each event offers participants a chance to share best practices for cycling-friendly cities and participate in debates on health, economics, and the environment with experts and citizens.

"Recycling cities" was the focus of the fifteenth event of Velo-city held in Brussels, in 2009. The theme highlighted the importance of bicycle policy in reshaping better quality of life in cities. The event concluded with mayors of many cities signing a cycling charter at the European Parliament. Cycling is also promoted

with campaigns such as Friday Bikeday, mentoring schemes for cycling to work, and the annual bike festival DringDring, a cycling-promoting event for all and a night cycling occasion.

Bicycle-sharing has also made advances in China, which has experienced a steady decline in bicycle use over the last 20 years. Central and local governments created Public Transit Priority to encourage public and clean transport initiatives. As part of this effort, the city of Hangzhou launched Hangzhou Public Bicycle in 2008 which allows members to access a shared fleet of bicycles. As of March 2011, the system operated 60,600 bicycles with 2,416 fixed stations in eight core districts. An intercept survey in 2010 had tried to understand drivers and barriers to bike-sharing. More than 800 responses, including by 666 members, suggested that bike-sharing was capturing modal share from bus transit, walking, vehicles, and taxis. Almost one third of members had incorporated bike-sharing into their most common commute; they most frequently used a bike-sharing station closest to either home or work. The modal shifts indicated that bike-sharing acted both as a competitor and a complement to existing public transport. Recommendations for improving bike-sharing in Hangzhou included adding stations and realtime bike and parking availability technologies, improving bike maintenance and locking mechanisms, and extending operational hours.

Is the "car-free city" a utopia or a reality? Research by the European Commission at the beginning of the 1990s, suggested that the city could be reconceived to give priority to pedestrians. A car-free city would be a polycentric one, made up of small units on a human scale that would be connected by high-speed means of transport. It seems that the car-free city would be not only effective from an ecological angle, but also from an economic one inasmuch as it appeared to be two to five times less expensive, depending on density (Municipality of Amsterdam 1994).

Many cities had already initiated a dialogue with citizens to restrict the use of private cars. In 1985 Bologna was the first city to organize a referendum on the restriction of the private car in its city center. Amsterdam, which had also gone through a recent referendum on the restriction of the private car, in the early 1990s, organized the conference "Car-Free Cities?" in 1994. The question mark is significant, as it expresses negative reactions and inhibitions. On that occasion, cities committed to promoting policies discouraging the use of private cars launched a Car-Free Cities club (Municipality of Amsterdam 1994).

The promotion of walking and cycling has often been complemented with car restriction policies, such as road pricing. The experience of Oslo, Stockholm, and London, charging motorists entering their central districts offers many lessons on urban toll design, information provision, public consultation and acceptance, operating costs and pricing, technological aspects, and environmental impact. In London, the congestion charging scheme introduced in 2003 represented an investment of £100 million in electronic equipment. The annual revenues have been estimated to be 20 % higher than the annual cost of the system. Good communication with the citizens and potential users has been crucial for the effectiveness of the scheme.

4.3 Public Transport and Accessibility for All

There is no local authority that is not concerned by the provision of clean, intelligent, and efficient transport services (Council of European Municipalities and Regions 2005). Public transport can only be a worthy alternative to the car if safe, reliable, fast, frequent, noiseless, flexible, easily accessible, well-designed, environment friendly, and economically viable. It plays a major role in the bigger cities where it carries 2.5 to 3 times as many people as private transport. Public transport is also important for the not insignificant number of households who do not have a car, which reaches 40 % in the European Union.

Highly populated cities such as Tokyo, where only 1 % of commuters use their private car, can provide many inspiring lessons for upgrading public transport. In Europe, Swiss cities register the highest public transport use, around two trips per inhabitant by public transport per day. Zurich has developed a most efficient network, best dealing with traffic build-up at intersections. Preserving and upgrading the tram system and rearranging the bus lines were the key elements of the improvement of the surface network. The system allows each public transport vehicle to cross intersections without stopping and offers clean, quick, and reliable services.

Eco-ride gains ground on all public systems of the world obliged to become more efficient, smart, green, and inclusive. Many metropolitan underground systems, already more than 100-years old, go through transformational innovations. Driverless operations, high-tech information, ticketing and security devices, continuous mobile communication capability, loyalty schemes, and wireless connections are among the main innovations.

Since the 1980s, tramways returned in many European cities, where they had often been abolished in the 1960s. Since 1985, Nantes, Grenoble, and Strasbourg introduced three technological generations of tramway. Valencia advertised its new tramway as a tramway named Desire. The Valencia Metro has been developed out of the former regional narrow-gauge network El Trenet de València. A tunnel through the city center connecting two of the northern lines with the one in the south was opened in 1988, 100 years after the inauguration of the first narrow-gauge line, and gave birth to the Metro de Valencia. The tram, abolished in 1960 in Athens, returned to the city in summer 2004, just in time for the Olympic Games. Equipped with the latest technology, it offered citizens and visitors the possibility of a valuable silent alternative mobility.

Buses, including electric, bio-buses, and hydrogen buses, and intelligent transport management systems are being developed continuously. Smart transport passes often link transport to other public and cultural services and parking spaces. Lille developed a fleet of buses running on biogas, and in Graz all buses function on biodiesel. Heidelberg, Freiburg, and Basel have been among the first cities to introduce low-noise public vehicles in noise protection districts. Alternative and complementary bus services on call can be very useful. Perugia has been a pioneer in introducing a flexible telebus service in peripheral zones, serving additional routes upon request, for better adapting supply to the changing demand patterns.

In Evora, one of the World Heritage cities, the municipality introduced a park-and-ride system to deal with the excess traffic in the historic center, surrounded by an ancient wall, the chaotic parking situation, and the quality of life of citizens and tourists. The project includes the creation of large car parks outside the city walls, a high-quality public transport system, with mini- and microbuses adapted to the narrow medieval streets, and congenial pedestrian streets and cycle tracks. In Orvieto, the alternative mobility system included the revitalized funicular railway and a park-and-ride with the parking spaces at the foot of the Orvieto hills.

Sweden has experienced, since the end of the 1980s, a liberalization of its local and regional public transport system. However, local authorities have kept the right to choose between regulated competition and direct administration of public transport services. Most local authorities have chosen to contract out public transport services, through tendering processes that incorporate sustainability criteria in the public service obligations. With this system, Stockholm managed to achieve a bus fleet that uses 100 % renewable fuels. Moreover, the city of Stockholm promoted the use of clean vehicles running on biogas, ethanol, or hybrids among private companies through awareness campaigns and has created a clean driver's network. In addition, various incentives were offered to clean vehicles, including free residential parking and cost-free driving in the Congestion Charging zone (CEMR 2005).

California's Zero Emission Bus Rules were instrumental in the invention of better buses. Proterra is recognized by the California Air Resources Board as the first company to deliver a full-size transit vehicle meeting these rules. The Proterra EcoRide transit bus, a battery electric bus with fuel cell range extension, made a visit to Washington, DC in October 2009, to meet decision makers. Over the course of three days, two senators drove the bus and many more officials came aboard to check the system against clean, quiet, and efficient public transport criteria. Proterra's products help transit agencies deliver clean, user- and neighborhood-friendly vehicles that meet government regulations and local mandates. The community benefits of zero emissions and quiet operations can be spectacular and, depending on the fuel source generating the electricity used by the buses, achieve great reduction of GHG emissions. With electricity from solar, wind, nuclear, geothermal, or hydro power, EcoRide buses could provide a zero-emissions transit solution.

Many cities have adopted fast and clean, green lanes exclusively reserved for public transport. Priority lanes could also be used by private cars for a price. The Quality Bus Corridors introduced in Dublin in 1996 include special lanes restricted to all traffic except buses, taxis, emergency vehicles, and cyclists. Features of the system include direct high-frequency bus services operated by environment- and citizen-friendly buses; staff highly trained in customer service; high-quality shelters and furniture; improved lane markings, curb alignments and traffic signals; restrictions on parking and turning movements; and bus priority measures. The system facilitated the provision of a faster, more reliable, and cleaner bus service, providing adequate loading and parking facilities for businesses and improving safety for road users with pedestrians as a top priority. The aimed overall impact is a more equitable balance between competing road users and improved safety for all with pedestrians as the top priority. In the period from 1997 to 2003, average bus capacity has

increased by 35 % with 60 % during the morning peak period (07–10 h). In the same period there has been a 25 % reduction in the number of cars entering the city center (CEMR 2005).

Network design can reverse a vicious cycle in public transport, in which declining demand translates into poor service, into a virtuous cycle, in which higher demand leads to more seamless service. Smart ticketing with integrated tariff structures can improve user service, reduce fraud, increase gate throughput capacity, and bring considerable payoffs to providers and users. The London Oyster card illustrates a low-cost alternative to the urgency of expanding station entrance areas. Contactless smart cards can considerably speed up boarding on public transport (ITF 2012).

In 2012, after 4 years of intensive research, the International Association of Public Transport (UITP) presented the results of a European project on urban buses. The project, which started in the midst of the financial crisis in 2008, aimed to develop a new generation of urban bus systems adapted to the specificities of European cities as well as achieving key breakthroughs and innovations improving the perception of bus transport. Through addressing the bus system as a whole, rather than looking just at the vehicle, the project marked advances in the design of not only vehicles, but also infrastructure and operations. High-tech innovations, vehicle design, driver cabins, and bus stations were tested in real operational scenarios in eight European cities, including Bremerhaven, Brunoy, Budapest, Gothenburg, Madrid, Paris, Rome, and Rouen.

The main results included technological innovations, such as sharing data through open architecture for the better connection of buses, new modular internal and external bus layout increasing passenger capacity, breakthrough design speeding up boarding and reducing dwell time for passenger flows, dynamic passenger information including real-time multimodal information, accessibility for all users including seamless interaction between the bus and the platform, driver comfort, including ergonomically optimized and adjustable driver workspace, new telediagnostic systems to optimize preventive and predictive maintenance, and an interoperable automatic vehicle monitoring system (UITP 2012).

In November 2012, the UITP launched its "Grow with Public Transport" campaign to support its objective of doubling the global market share of public transport by 2025. The Union advocates for legislation supporting public transport, investment, and policies that actively promote sustainable mobility behavior.

Public art for public transport is a common trend in some cities and Stockholm offers an outstanding example. There is a long tradition of public art in Sweden and its capital city had an early focus on art in the underground and eventually elsewhere in the transport network. The art allows the stations to be perceived as more beautiful and safer and adds a cultural dimension to the trip which becomes something more than just a physical move between two places. Art is also important to give each station its own identity and visibility, and thereby facilitate orientation in the transport network. It is also claimed that art helps reduce criminal damage and vandalism.

4.4 Inspiring Initiatives from Alternative Mobility Movements

As land, water, raw materials, and energy resources are increasingly under strain, there is a growing awareness and will of cities to invest in alternative forms of transport that help reduce resource consumption, pollution, and greenhouse gas emissions. Many international awards and events offer cities and citizens the opportunity to learn about extraordinary urban mobility experiences. A broad and rich array of initiatives put together by organizations and local authorities in partnership with CSOs, NGOs, and businesses provide a spectrum of inspiring examples. Citizens are often invited to propose ideas and host events or actively participate in the experience of their neighborhoods and cities.

For several years, CEMR sponsored a European Public Transport Award, in order to promote innovation by European local and regional authorities for better and more sustainable public transport. The award recognized innovative local actions that promoted sustainable mobility, integrated approaches, and coherence between different policy fields in partnership with spheres of government as well as stakeholders. Selection criteria for the award included the transferability of the schemes to other local and regional authorities interested in drawing inspiration and lessons from successful experiences and to reproduce part of them or overall adapt them to their particular context (CEMR 2005).

"Citizens' support for unpopular policy choices" was the theme of CEMR's award in 2003. The objective was to help increase citizens' awareness for necessary mobility policy choices that are often perceived as constraining. In Bologna, thanks to a strong media campaign, the *liberiamo l'aria* project brought together nine provinces and 81 local authorities to close the city centers to private traffic. Other ideas aimed at reducing traffic congestion by encouraging the use of public transport, reducing gas emissions, and giving citizens adequate information about the measures. The regional project reinforced Bologna's earlier project "Vivi Bologna," launched in 2001 by the local public transport company and the municipality. The scheme included the closure of the city center to private traffic during the weekends, the promotion of parking facilities at interchange points just outside the city center, and incentives to use these car parks and change transport mode, new ecological buses, as well as social and cultural events, and a strong media campaign and public awareness actions of the public health related issues.

Since 2002, hundreds of European towns and cities participate, every early autumn, in the European Mobility Week, evolving into a global movement inviting citizens to a wide range of activities around sustainable mobility. Alternative mobility thematic foci aim to promote resource-efficient alternatives to private cars that still dominate urban transport. The week has always encouraged local authorities and citizens to think about new and better ways to travel and contribute to making cities more healthy, pleasant places to live. The car-free day is the highlight of the week, with the challenge of organizing "In town without my car on a working day!" Participating towns and cities set aside areas solely for pedestrians, cyclists, public

transport, and joyful community events. The European event is coordinated by three nongovernmental organiszations including Eurocities, Energie-Cités, and Climate Alliance and already exported its successful model to countries including Argentina, Canada, Ecuador, Japan, and Taiwan. Increasingly popular, Mobility Week has supported cities in creating a more pleasant and healthy environment for citizens by encouraging them to reduce traffic congestion and promote more sustainable modes of transport.

"Travel Smarter, Live Better" was the theme of European Mobility Week 2010. The heavy use of vehicles in cities, particularly private cars, creates many health challenges for citizens. Well-being is affected by injuries and fatalities due to road accidents, respiratory infections and diseases from air pollution, and chronic conditions such as obesity as well as cardiovascular diseases due to increasingly sedentary lifestyles. Other risk factors to physical and mental health include social isolation and community breakdown triggered by traffic congestion and reduced public space, and noise pollution and stress.

Mobility Week wished to change people's travel behavior by offering environmentally friendly alternatives to the car. Citizens got the chance to sample alternative forms of transport and local authorities had the opportunity to test-run new services and infrastructure. Lasting impact is particularly valued and participating cities are encouraged to launch at least one permanent practical measure in addition to the exceptional events.

London's Smithfield Market was the venue for the capital's first City Cycle Style event on September 17, 2012 celebrating cycling as a fashionable form of transport. Participants were invited to turn up in their best cycling outfit and meet cycle fashion designers, try on outfits, and sit on the saddles of some of the latest two-wheel designs. Part of the money raised from the event went to a charity that collects second-hand bikes and ships them to Africa.

Bologna has again been distinguished and won the 2011 European Mobility Week Award recognizing cities that provide the best policy responses to urban mobility. The award goes to cities that organized the most innovative campaigns in terms of quality of activities linked to the annual mobility week theme and the scope of the proposed permanent measures. Among the many events organized in Bologna was an auction of second-hand bicycles found abandoned around the city. The event is being managed by a university students' association in collaboration with the municipality of Bologna. Lucky bidders receive safety tools, brochures about road safety, and other promotional material.

In 2011, Bologna was recognized by an independent panel of mobility experts as the city that had done the best job in promoting clean alternatives to cars and involving citizens in activities to support sustainable urban mobility. The permanent measures included the introduction of charging points for electric cars and a plan to extend the city's network of cycling paths to 130 km. The municipal authorities invited citizens to contribute their views to the plan during the mobility week. Bologna also set up a large car-free zone at the heart of the city for the week. This pedestrian area attracted street performers, retailers, cultural and sports associations, and over 60,000 visitors. The city also organized numerous bike tours,

workshops, games, walks, and an exhibition of electric cars. Police officers participated in public sessions on safe cycling for families and in an information point for citizens to learn about new services offered to cyclists.

The runner-up city, Larnaka in Cyprus, involved a wide range of partners in the organization of events during European Mobility Week 2011. Its comprehensive promotional activities included a free bus day, a hybrid car exhibition, an Environmental Café, and awareness-raising events on sustainable mobility. The city showed its commitment to space reallocation by transforming one of the roads in the central business district into a pedestrian street. The city also created numerous bicycle parking spaces and set up a "bicycle bank" to facilitate maintenance and reuse of bicycles.

The Croatian capital Zagreb, also a runner-up, confirmed its commitment to sustainable urban mobility through an extensive set of urban planning measures demonstrated and discussed during the 2011 European Mobility Week. Zagreb used opinion polls to collect valuable information on possibilities to improve its sustainable transport infrastructure and the quality of the 2011 event. The broad array of activities organized by the municipality included educational workshops, public walks, open-air athletic events, conferences, ecomarkets, and electric vehicle exhibitions.

The European Commission's Sustainable Urban Mobility Campaign shed light on many innovative initiatives involving car-pooling and sharing and the promotion of a culture of "post-motorists." The "Utrecht shares" campaign aims at changing the travel behavior of citizens in cooperation with car-sharers and the target group of post-motorists represented by the consumer network Nudge. Road shows with shared cars and performances were used to attract the attention of potential car-sharers.

In the United Kingdom, the Salisbury Car Share is a first cutting-edge action encouraging car drivers to make better use of the capacity of their cars. By signing up with the system, users can either post an offer as a car driver or check the car-pooling offers posted by drivers. The identification of potential matches takes into account not only the desired and possible itineraries and travel time but also preferences in terms of trip atmosphere and even music.

Inspired by comparable campaigns in particular in Austria, Denmark, and Hungary, business and civil society organizations across the Czech Republic compete to increase the uptake of cycling towards 100 % of commuting trips. The campaign not only rewards the best performers, but tries to improve the image and popularity of cycling and encourage businesses to invest in upgrading infrastructure and equipment for cycling.

Ljubljana is investing in making cycling safer, easier, and more agreeable and is promoting the transition to two wheels. Citizens can contribute to the campaign website with photos and accounts of their favorite cycling routes. Other unique features include a cost-saving and a CO_2-saving calculator. Bucharest introduced the first "I like bike" march, Burgas a Musical Bike Parade, and Budapest the first Urban Bicycle Race to mobilize thousands of citizens in favor of sustainable mobility.

And last but not least, some most interesting cases were shed light on by the CIVITAS annual awards, which recognize every year, since 2002, the most ambitious and successful actions or policies for cleaner, more effective urban transport. The awards have become a well-known reference within the field of sustainable urban mobility. Chosen by a jury of five independent experts, winners are showcased as examples of excellence, inspiring other cities across Europe to develop efficient urban transport solutions that lead to cleaner air and safer, more pleasant streets. Donostia–San Sebastian obtained the 2012 prize of the City of the Year, and Reggio Emilia won in the Public Participation category and Porto in Technical Innovation.

Donostia–San Sebastian won the year's award for a comprehensive approach that covers everything from public transport to personalized travel choices. The jury recognized the city's approach to "selling controversial measures" and achieving results despite major budgetary cuts. The city succeeded in raising public awareness and "presenting urban mobility initiatives as part of an effort to improve urban life." The winner's achievements included an 11 % increase in cyclists per year over the last 3 years, and one of the highest rates of public transport use in Europe. Brighton and Hove was recognized as runner-up for its wide-ranging, innovative actions, from rolling out electric vehicle charging points to "talking" bus stops, as well as for involving stakeholders, from parents to businesses, in their design.

To stimulate public participation in urban mobility, Reggio Emilia issued and promoted a "Manifesto" for safe, sustainable, and independent mobility in home-to-school routes, supported by city districts, school boards, and managers, and a range of stakeholder organizations. The CIVITAS award praised the city for "its broad and systematic engagement with children that could really reduce car use," and for the creation of a network of primary school "mobility managers." Around 13,000 youngsters have signed up with the manifesto, enabling them to travel safely to school on their own. Nantes introduced an extensive public involvement process in drafting active mobility schemes and issuing citizens' feedback reports, "positively influencing the impact on the behavior and perception of the city's citizens."

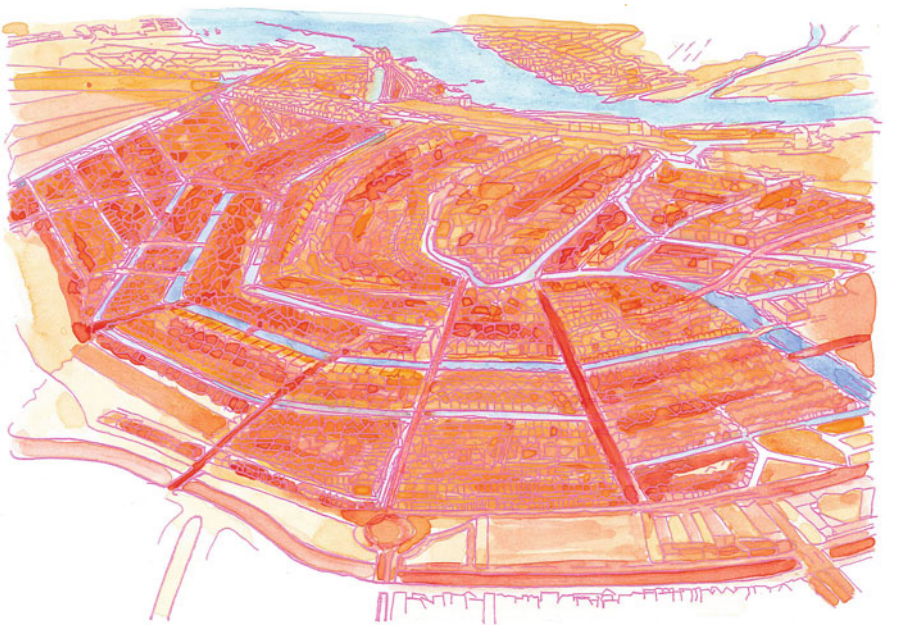
Porto won the technical innovation award for its cutting-edge mobile phone application MOVE-ME, which gives realtime travel information to public transport users. The system offers users a recommended travel route based on realtime data on the services by the various public transport providers and intermodal options. The system has already been extended in Portugal, and was praised for its replication potential. Runner-up Gdynia, Poland, was recognized for its commitment towards energy efficiency and "for doing something original, useful and cost-efficient" by converting old diesel engine buses into trolleybuses, and for producing a conversion guidebook to share information with other cities and enable them to transfer and implement the innovation.

The previous year's awards recognized Dutch city Utrecht for its "wide-ranging approach stretching from targeting behavioral change to investment in public transport." The city promoted everything from car-sharing and cleaner trams to efficient freight transport and park-and-ride. In relation to sustainable freight transport solutions, the city has put in place a comprehensive system that relies on its inland

waterways through the use of an electric “beer boat” and is using centrally coordinated solar-powered electric vehicle(s) called “Cargohoppers” for city-center freight deliveries.

In the Public Participation category, Ghent in Belgium was the winner for the sheer breadth of its actions to engage stakeholders in sustainable urban transport policy. From questionnaires and face-to-face interviews to hearings, letters, social media alerts, a weekly citizens working group, and dialogue cafes to public visits, the city managed to broaden and deepen public engagement.

Watercolour 5
Amsterdam, A Car-Free City?



Chapter 5
Pioneer Cities in the Creative Sustainable Economy

Abstract The future of cities depends largely on their capacity to innovate out of the crisis and generate and distribute sustainable wealth, while enhancing well-being in harmony with nature. As central scenes in national dramas and the global chessboard, cities generate agglomeration dynamics, enhanced by the mutual reinforcement of activities that cluster together. In times of uncertainty, the search for sustainable growth, in balance with the other components of sustainability, is critical. Multi-win innovations are essential for creating new assets, often out of liabilities, and ecoresponsible businesses have a key role to play in creating "value out of values."

This chapter examines the competitiveness of cities in the interconnected world of scarce resources. Competitive cities try to foster, attract, and retain talent and promote smart and green businesses to generate wealth and move up the urban value stair. Cities themselves are important direct and indirect sources of new green employment and can influence markets in line with sustainable development. Green growth and the bioeconomy have a great potential for a better and more profitable use of resources. Innovative partnerships with ecobusinesses are cardinal for reconciling short-term economic benefits with long-term sustainability goals. Quality of life and sustainable access to resources and knowledge are key features of urban attractiveness and power.

5.1 Cities, Powerful Players in the Symphony of the Nations

Cities are not only the stages of socioeconomic operations and environmental impacts, but genuine ecosystems that play key roles in the theater of nations and increasingly the world. Traditionally seen as centers of production and consumption and indisputable fulcrums of political power, cities evolved into cross-roads of exchanges between surrounding and broader world assets on a globalized chessboard. Cities are the places where economic flows can be decoded, condensed,

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converted, metabolized, and intensified to better satisfy the needs and the desiderata of citizens, businesses, and organizations.

Globalization brought an extraordinary storm of transformations with an important influence on local societies, lifestyles, and cultures. Cities may be seen as the brains of the global economy that provides many more actors the opportunity of becoming parts of a world conglomeration, but this may be an unequal process resulting in winners and losers. Strong urban infrastructure and institutions can greatly improve the comparative advantages and the relative position of cities in an equitable globalization. Deficiencies in urban hardware and software are important constraints, whose cumulative effects may drain the potential for sustainable development.

Cities have long been the world's economic turbines. The World Economic Forum 2008 highlighted that the collective GDP of world's top 10 cities exceeded the total GDP of 162 countries combined, with Tokyo alone generating a larger GDP than Canada. With more than $1 trillion US in economic output, Tokyo is the world's largest urban economy with New York coming close. Both would rank among the world's top 15 economies, larger than India, Mexico, and South Korea. As emerging and developing world cities enter the stage of intensive growth, their contribution to global wealth is impressive. Through a combination of investment in physical capital and consumption, raising cities could inject up to $30 trillion US a year into the world economy by 2025, also integrating and normalizing growing sectors of the world's informal markets (MGI 2011a).

Globalization leads to the modification of conditions for the adherence to a city and may affect the ability of cities to respond to citizen preferences (Sassen 2012). The multiple interactions between local and global flows and dynamics, which led to emergence of the term "glocalization", find in cities the best possible interfaces. Visions, ethics, and practices for sustainability may offer cities the opportunity to become new democratic spaces between the world macroregulations and the microregulations of the local communities in which economic prosperity, social cohesion, and citizenship can blossom (Mega 2010).

Cities have to be strong because they operate in a global marketplace, competing with other world players for investment and opportunities. The competitiveness of a city depends on a multitude of endogenous and exogenous factors, including the macroeconomic environment; openness to trade, markets, and investment; education; training and skills; ability to create and innovate; flexibility of the labor market; physical and digital infrastructure capacity; culture; and leadership. A city cannot compete if it cannot offer investors security, infrastructure, and quality of life. More and more cities and citizens recognize that competitiveness rewards cannot come from compromises in social well-being and environmental capital, even if the overall capital is preserved.

Liveable cities with high-quality infrastructure, green and public spaces, and healthy residential areas can attract foreign investors as well as highly qualified professionals and tourists. Effective governance depends on leadership at all levels, from the national government to encourage reform, a formal government at the metro-regional level, and lower-level local authorities and networks that include

nongovernmental actors, civil society, and businesses. To balance the financial needs of cities with those of the rest of the country, cities can diversify tax revenues and use public–private partnerships to raise money for public projects (OECD 2006).

Innovative urban partnerships bring together, often in forms of dynamic helices, universities, enterprises, and municipal institutions. Cities must be capable of defining long-term objectives, businesses have to inject vigor, and educational institutions to instill a culture of striving for excellence. P. Hall suggests that global data may be able to highlight some interesting trends but sound case studies can tell much more about the underlying changes. Understanding cities is also critical for companies trying to reach urban consumers and to address the demand for natural resources, such as water and energy, and for capital to invest in new housing, office buildings, and infrastructure (MGI 2012a).

Cities and universities, traditionally linked with the public good, have a much longer lifetime than enterprises. Antagonistic logic and ethos have long opposed cities and enterprises. Reconciling economic objectives with longer term political goals is at the heart of strong sustainability. As entrepreneurship creates value moving from low-yield to higher-yield resources, it can greatly contribute to urban sustainability which implies the constant climbing up the scale of values. Large enterprises may lead to the "edge city," and small and medium-sized enterprises have high potential for innovation and for revitalizing urban fabrics. Cities can act as enlightened mediators and establish free zones, specialized business areas, start-ups, capital risk companies, and microfinancing mechanisms.

The Bremen declaration "Business and Municipality: New Partnerships for the Twenty-First Century" adopted in 1997, focused on local, national, regional, and international framework conditions for the sustainable development of communities and economies. It suggested that businesses ask cities for favorable locations and fees, preferential treatment, and social recognition as a significant wealth and job generator. Municipalities seek from businesses employment for citizens, tax revenues, and investment in the city. At the cross-roads of these requirements, win–win investments can be beneficial for citizens and the local economy (Mega 2010).

The 2008 World Economic Forum shed light on cities in recognition of the rising leadership of mayors and governors in addressing global challenges. The concentration of people and activities present an opportunity for cities to become a powerful force for global change, as places where innovative solutions can be implemented and have a resounding and rapid impact. The SlimCity Initiative, launched in Davos during that Forum, is a perfect example of concerted action bringing together cities, regions, and businesses in a globalized context. A partnership between the World Economic Forum, the World Bank, the International Energy Agency, Arup, and ICLEI, was designed to explore the ways in which cities can improve their performance, save energy and resources, and produce less waste and emissions. It concluded with the Council of Future Cities and the Global Agenda.

Smart grids, sustainable buildings, and urban mobility were identified as the priority issues by mayors and private sector leaders and were the subjects of further analysis. The SlimCity Knowledge Cards, produced by the Foresight, Incubation and Innovation Group at Arup Associates, try to capture and assess global best

practice and policy across urban mobility, smart energy, and sustainable buildings. They offer practical solutions to many urban problems in both the developed and developing world and could help city administrations and the private sector to take mobilizing measures and effectively address complex environmental and resource challenges (WEF 2010).

Small and medium-sized enterprises, prolific in cities and urban areas, are considered to be propellants of innovation and job creation. Their incubation and growth are crucial for the local economy, as the decline of large factories brought difficulties to regions with traditional industries. At the same time, cities and citizens began to demonstrate environmental awareness while the digital world brought forward intelligent microenterprises. Global developments favored transformations in the production system and led to the provision of new environmental goods and services, often offered by smart and flexible new structures and networks. New high-tech start-ups have been created in many cities and provide ecoservices for various urban sectors.

A great city is often praised for its ability to grow, retain, and attract talent. Stockholm managed to do so with a strong educational system and Toronto through smart immigration policies. Boston tried to transform immigrants into knowledge workers. Political instability, regulatory uncertainty, and even the climate play against cities like Moscow. Successful cities are considered the ones that provide business and entrepreneurial dynamism, but also cultural and educational opportunity and quality of life.

Some cities have devised active policies to promote business generation. Turin adopted the Italian model "FaciliTO" to tackle the difficulties of small enterprises by providing access to advice or funding. Over 200 businesses have accessed FaciliTO and benefited from its support. The Barcelona Entrepreneurship Center, created in 2004, serves as a reference for existing and potential business managers, as well as a hub to promote entrepreneurship and innovation. The center provides advice and services, and a preincubation space, allowing potential entrepreneurs to design their projects, from their business ideas to the creation of their companies. Barcelona Activa, the local development agency of the municipality for employment, business, and the economy, is supporting enterprises in job creation. During the period 2004–2011, Barcelona Activa has assisted the creation of 6,214 new businesses and 11,800 new jobs.

San Francisco and Boston are among the undeniably most innovative world cities. San Francisco is a recognized major hub for start-ups and high-tech companies. Vibrant community networking events and conferences, held throughout the year, give new companies a chance to communicate and learn with the best. Boston also hosts countless incubators and resources for entrepreneurs. Many of them are created by alumni of the world's most reputed university institutions in Cambridge, Massachusetts. Despite the high cost of living, these two US cities are among the ones to attract most companies.

In Boston, promoted as the city of ideas, innovation and entrepreneurship are exploding (Boston Foundation 2012). The Harvard Innovation iLab, bursting with ideas and passion to improve the world through entrepreneurship, held in 2012 the

first Co-Founders Wanted workshop. The event aimed to pave the way for aspiring entrepreneurs searching for the right business partners to build a successful and effective business. The CoFoundersLab proposed the largest pool of entrepreneurs to choose from an online matching platform.

New ecosystems of start-ups and related services are emerging all over the world. The Start-up Genome, created in 2011 by three young entrepreneurs, tried to map and benchmark the constellations of start-ups. A comparative analysis of the top global entrepreneurial ecosystems suggests that, over the previous five years, digital technologies and the reduction of costs led to an explosion of software companies. The research proposed the "Start-up compass" benchmarking tool and a "Living, Breathing Map of Startupland" to allow founders to make more informed evidence-based decisions.

Fertile start-up ecosystems are essential for the overall health of the global economy, as they have the potential to become both regional and global engines of wealth and job creation. In the United States, for example, companies younger than five years old created 44 million jobs and accounted for almost all net new jobs over the last three decades. Valuable insights into the strengths and weaknesses of the world start-up ecosystems highlight that the three most active start-up hubs of the world include Silicon Valley, New York City, and London.

The Silicon Valley start-up ecosystem continues to lead the way, but the gap is constantly closing. On average, Silicon Valley start-ups raise two to three times more funds in the first stages of development. Concerning the perceived competitive advantage, compared to Silicon Valley entrepreneurs, New York City entrepreneurs are more than four times likely to consider content their primary competitive advantage, and London entrepreneurs are 58 % more likely to consider technology their primary advantage.

The Silicon Valley and New York City ecosystems have 35–46 % more mentors, respectively, than the London ecosystem. Silicon Valley companies have 46 % more mentors than companies in London. Companies in Silicon Valley work 35 % more than companies in New York City. In Silicon Valley teams work 9.5 h a day on average versus 8 h in London and 7 in New York City. Silicon Valley has 30 % more founders who want to change the world than London or New York. New York has 50 % more founders who want to make a good living than Silicon Valley or London.

5.2 The Green Growth Race and the Bioeconomy Prospects

Crises have the power to stimulate and cross-fertilize great ideas and generate growth. Developing new sources of wealth will depend on the intellectual assets needed to conceive, create, promote, diffuse, and adopt innovative initiatives. Policy makers should promote sources of growth compatible with sustainable development, and set the regulatory ground to allow new breakthroughs to emerge and overcome institutional or economic inertias. Investments in education and skills for sustainable development are most important.

Towards the end of the first decade of the millennium, the concept of green growth, as a short-term objective enshrined in the long-term paradigm of sustainable development, gained ground in international and European organizations. Promoted as a shortcut to sustainable development, green growth proposes a way to pursue growth and development that are sustainable both economically and environmentally and brings opportunities for new green industries and jobs, while managing the structural changes associated with the transition to sustainable development. The aim is to build a greener economy in which sustainable management of resources is key driver of growth (OECD 2010, 2011a).

The evidence is compelling. The current model is not just unsustainable, it is inefficient. Good economics asks for a paradigm shift to correct market failures, internalize externalities, assign property rights, improve governance, and influence lifestyles and behaviors. Concretizing green growth and ensuring it is inclusive also requires an acute understanding of political economy. The perception as a dilemma choice between preserving the environment and developing the economy proved to be misleading. In the long-term, economic and social development without sustainable management of natural resources is brittle.

Organizations suggest that green growth is necessary, efficient, and affordable. It is the only way to reconcile the rapid growth required to bring developing countries to the level of prosperity to which they aspire with the imperative of a better managed environment. There is no single green growth model. Green growth strategies will vary across countries and cities, reflecting local contexts and preferences, but all countries, rich and poor, have opportunities to make their growth greener and there is substantial scope for growing cleaner without growing slower. There is a growing consensus that green growth should focus on actions in the next five to ten years to prevent getting locked into unsustainable paths and to generate immediate, local benefits (OECD 2011a, UNEP 2008, World Bank 2012a).

Obstacles to greening growth mainly include social and political inertia and a lack of financing instruments. Some fear that greening growth may be too expensive or too ambitious at an early stage of development, or should concern only high-income countries. The World Bank suggests there is a clear case that greening growth is neither unaffordable nor technically out of reach; there are plenty of encouraging immediate benefits and poor countries can reap economic benefits from better environmental management. The way forward requires a blend of economics, political science, and social psychology; smart solutions to tackle constraints; overcome deeply entrenched behaviors and social norms; and develop the needed financing tools and indicators to monitor progress (World Bank 2012a).

These highlights add to the chorus started by the Organization for Economic Co-operation and Development (OECD) and the United Nations Environment Program which led the green economy initiative in 2008. The OECD strategy towards green growth includes specific tools and recommendations to help governments identify policies that can achieve the most efficient shift to greener growth. Already in 2009, the OECD had advised governments not to be distracted by signs of recovery but persist with green growth policies while looking after the long term (OECD 2010, 2011a).

Green growth strategies can help cities to become more resilient as they work to meet demands for food, water, housing, energy, and transport. Strategies can help mitigate the impacts of adverse shocks by reducing the intensity of resource consumption and environmental effects, while alleviating pressure on commodity prices. Green growth also offers competitive advantages to those cities that commit to policy innovations. The market for green goods and services is vast and fast-growing and can offer the dual benefit of environmental quality and job creation (World Bank 2012c).

Long-term sustainability demands dramatic changes in all domains of wealth creation, natural and physical capital, human, social, and cultural capital, as well as manmade and financial capital. The evaluation of the impacts on all distinct but interlinked capitals highlights the potential benefits from green growth. Investments in roads and factories may increase manufactured capital, part of the manmade capital, but can undermine overall wealth if they imply destroying forests, part of natural capital, or damaging public health, part of human capital (EEA 2012b).

Green growth means fostering economic growth and development while ensuring that natural assets are wisely managed to provide the resources and environmental services on which human well-being depends. To achieve this, a city must catalyze investment and innovation which underpin sustained growth and give rise to new economic opportunities. Energy and transport seem among the earliest drivers of greener growth. Green growth is seen by cities such as Copenhagen as an opportunity to empower, equip, and resource cities, offering a critical mass for innovative solutions.

Cities are ideal hotbeds for better green solutions trying out not only new technologies but new partnerships and governance models. Business as usual is unwise and ultimately unsustainable, involving risks that could impose constraints on further economic growth and development. Risks include increased resource bottlenecks, air, water and soil pollution, and irreversible climate change and biodiversity loss, accompanied by multiple ripple effects (New European Economy 2012).

More and more citizens want economic growth, but not at an unacceptable cost to the world and the planet. There is an increasing awareness of the equilibrium needed between resource extraction and resource preservation, be it in mining, managing fish stocks, or water exploitation. The acceptable balance is a fundamental challenge for the twenty-first century political process. Policy makers have to invest in innovative sources of growth, set the regulatory ground to allow new breakthroughs to emerge and overcome institutional or economic inertias.

Some countries have been pioneers. In 2009, Korea adopted a Five Year Green Growth Plan, committing 2 % of GDP to achieving a low-carbon society and moving away from labor-intensive quantity towards quality-oriented growth. In 2010 Korea created the Global Green Growth Institute to promote green growth and help reconcile developed and developing countries. A Green Card offers all citizens the possibility to green their actions.

In the United Kingdom, the Carbon Commission report on Haringey is a great plea for green growth. Haringey, the most unequal borough in London, was the first borough in the Unted Kingdom to sign the Friends of the Earth pledge to reduce its

emissions by 40 % by 2020. The pledge served as a strong economic platform to address core socioeconomic conditions and pave the way to prosperity for all. The Haringey 40:20 and the Carbon Commission were created to harness the energy of the community activists and search for collective answers to achieve simultaneously economic prosperity, reduce poverty, and radically curb emissions. Innovation has been a key way for a better future encapsulated in 43 policy recommendations to inspire everybody to participate actively in the collective journey.

The borough intends to stand as a beacon for communities facing the same problems and, through its countless twinning schemes around the world, to promote exchanges of efforts and results. The assets of the community include its young population, green spaces and conservation areas, and ethnic diversity with nearly 200 different spoken languages. Many of the residents come from countries already hit by climate change and this increases solidarity with the international community. The Carbon Commission identified practical steps to be taken under the existing resources and technology to improve housing, energy, and transport patterns, attract creative businesses, and invigorate the local economy, even under a new round of austerity cuts. The Council emphasizes the need for proactive action ensuring that the economic benefits for greening the borough are shared among the local population (Carbon Commission, nef 2012).

Green growth promises new sources of decent jobs for sustainable recovery (UNEP/ILO 2008, 2012). In Haringey, it was estimated that up to 11,000 jobs could be created in low carbon and renewable energy sectors. Providing local communities a stake in the efforts and responsibilities and a share in the benefits are sine qua non conditions for the transition and the reinvestment of the benefits to the local economy. It also increases the reach and impact of civil and voluntary organizations and the local social capital.

Green and smart policies could be best articulated to serve the transition to the low-carbon, zero-carbon, and post-carbon economy. In the United Kingdom, the decay of declining polluting industries has been the starting point for a number of blossoming green initiatives. A former coalfield in Ollerton, near Nottingham, won the 2005 Enterprising Britain award, which recognizes towns and cities that successfully drive forward enterprise. Sherwood Energy Village is an exemplary model for sustainable growth and development that celebrates progress based on industrial heritage. The former coal mine provided an opportunity for the development of renewable energies, seeking to integrate housing estates, industrial and commercial developments, cultural and leisure facilities, and educational resources, all the ingredients of a mixed city. The success of the company Ground Solutions, exploiting geothermal energy from the earth, as coal mining did in the bygone past, is the epitome of the progress.

Green growth creates propitious conditions for the development of lean innovative SMEs in cities. The essence of urbanization, the concentration of people and activities, offers a range of diverse resources needed by both green entrepreneurs and sustainability-conscious consumers. The features of a city favorable to green SMEs include access to precious human resources, the availability of other high-quality services, complementary producers, and a market for green products.

Cities can also provide the necessary knowledge basis and advanced services and support innovative green SMEs.

In the United States, the economic development strategy of Portland, Oregon, includes a focus on green growth in terms of clean-tech clusters and jobs and sustainable urban planning and management. It illustrates an urban governance approach to shift away from carbon-intensive economic activities towards clean-tech clusters, and services. An economic cabinet brought together leaders from all facets of the local economic clusters, including clean-tech, software, research and commercialization, athletic and outdoor industries, and advanced manufacturing in a panel advising the mayor. Portland's efforts have resulted in an estimated $355 to 960 million US in annual wages from the green building cluster in 2008. Fifteen new companies were attracted, 1,100 existing jobs were safeguarded, and more than 1,900 new jobs created through financial assistance to 132 local businesses (ICLEI 2012).

There is no "one-size-fits-all" for green growth strategies. Advanced, emerging, and developing countries and cities are facing different challenges and opportunities. However, there are common considerations that need to be addressed by all in a longer-term perspective. A green growth strategy incorporates a longer time horizon and takes into account the full value of natural capital. It focuses on cost-effective ways of attenuating environmental pressures to effect transition towards sustainable development. Because GDP as a measure of economic progress overlooks the contribution of natural assets to wealth, health, and well-being, a green growth strategy should involve better measures of progress.

Emerging cities will not become rich by following the same path that industrialized cities have embraced earlier. The environmental and social costs would be too high for similar wealth levels. Innovation and new technologies transfer and sharing are enabling developing countries to leap forward in their development. The Green Growth Knowledge Platform, a global network of researchers and development experts, which identifies and addresses scientific gaps, is an example of innovative structures to facilitate knowledge sharing. Through widespread consultation and world-class research, the platform provides practitioners and policy makers with better tools to foster economic growth and advance towards sustainable development (OECD 2011a).

On the occasion of Rio + 20, a world survey revealed that, overall, 95 % of city governments expect their green policies to have a positive economic impact, but only 20 % have a coordinated strategy for green growth. The three top policy aspirations of cities relate to economic development, transport improvements, and climate change. For most cities, green economic development is a key part of their overall political agenda, with 65 % of cities describing economic growth as a primary goal of their green policies. The majority of cities expect economic impacts from green policies to include growth, job creation, inward investment, innovation, entrepreneurship, and attraction of a highly qualified labor force. However, only 20 % of cities are aware of any economic impact assessment of their green policies (LSE and ICLEI 2012).

Next to green growth, bioeconomy offers many forward-looking opportunities for sustainable development. The biological sciences have demonstrated enormous

advances in recent years. As a result, economic activity fueled by research and innovation, the bioeconomy, is also growing rapidly, providing an expanding array of job opportunities. In addition to the societal benefits, these advances are beneficial for health, medicine, and agriculture, and generate, through the development of clean energy sources, a growing spectrum of bio-based products for industrial and chemical processes.

In early 2012, both the United States and the European Union presented their strategies for bioeconomy. In April 2012, the White House released a Bioeconomy Blueprint, as a comprehensive approach to harnessing innovations in biological research to address health, food, energy, and environment challenges. The aim is to enhance economic growth and job creation, improve the health of citizens, and move towards a clean-energy future through science and innovation. Food and sustainable agriculture have always been interlinked. Since the food riots of 2007–2008, the importance of nutritional composition and economic access to food moved to the top of global political agendas. Two months earlier than the US blueprint, in February 2012, the EC adopted its strategy and action plan for a sustainable bioeconomy to ensure smart green growth. The aim is a more innovative and low-emissions economy, reconciling demands for sustainable agriculture and fisheries, food security, and renewable biological resources for industrial purposes with biodiversity and environmental protection.

The bioeconomy encompasses the sustainable production of renewable biological resources and waste streams into food, feed, and bio-based products such as bioplastics, biofuels, and bioenergy. All bioeconomy sectors have a strong innovation potential spanning life and environmental sciences, food and agroalimentary and social sciences, enabling industrial technologies, biotechnology, nanotechnology, information and communication technologies, as well as local and tacit knowledge. The EU bioeconomy including agriculture, forestry, fisheries, food, and pulp and paper production, as well as parts of chemical, biotechnological, and energy industries, already has a turnover of nearly € 2 trillion and employs more than 22 million people, 9 % of total employment in the European Union.

If the European bio-based industry is to remain competitive, it needs to bring more products and services from the designing phase to the market. This will deliver direct benefits to citizens, such as food security; sustainable agriculture; secure, clean, and efficient energy; and the transition to a resource-efficient, low-carbon economy. The action plan aims at supporting research and innovation and building the knowledge base for cross-cutting policies. Developing standards and sustainability assessment methodologies for bio-based products and food production systems can help create new markets. Cities could do much to facilitate procurement for bio-based products by adopting specific standards and labels, training for public procurers, and incentives and mutual learning mechanisms for improved resource efficiency.

The creation of innovative urban markets can help accelerate the commercialization of bioinventions. The procurement of bio-based products could also create jobs in rural areas surrounding cities and help foster urban–rural partnerships. The future bioeconomy also demands education and training in the right skills. In the United

States, although significant investments in science, technology, engineering, and mathematics education have been made, agencies were asked to take further steps, and support, for example, employer–educator partnerships, and ensure that the future bioeconomy has a sustainable and well-trained labor force.

The public and private sectors should work together in partnership and precompetitive collaborations, where competitors pool resources, knowledge, and expertise to learn from successes and failures, to invent, deploy, and scale the cutting-edge technologies that will spark new breakthroughs. This offers the opportunity for cities to organize the conditions for new actors to get into an innovation chain and invest creativity and vigor in precompetitive collaborations among private entities to benefit the bioeconomy broadly.

Green tourism is another green economy sector in which many cities are interested, as it provides them an opportunity to enhance their natural and cultural assets and boost their local economy. Destination management is important for all cities wishing to attract visitors. There are multiple excellent examples. A growing green tourism in Boston is sparking interest in a heritage-oriented destination and is encouraging the tourism industry to improve its operations and services to visitors. Boston Green Tourism is helping to attract visitors who seek quality leisure linked to nature and demand environmentally friendly hospitality. A multifaceted program has been established after consultation with all stakeholders promoting Boston as a pre-eminent destination for ecotourists. The level of employment in the leisure and hospitality sector increased by 11 % during the period 2000–2008 (Boston Foundation 2009).

Tourism and mobility have been affected by the crisis. After a global fall in tourism services and revenues, 2010 witnessed an increase particularly due to emerging economies. Spain, France, and Italy, among the five first world destinations, have exceptional cities that serve as cultural gates for tourists to Europe. Green tourism could significantly add to the cultural attraction for potential visitors. A more complete experience offer could encompass enhanced local and regional physical, natural, and cultural assets. Bordeaux, a city attracting many visitors interested in wine, has elaborated cultural green tourism itineraries to allow experiencing the care of vineyards, nature's work to wine, and the cultural energy of the city and its rehabilitated waterscape.

5.3 Business-Friendly Cities, Incubators of Ecoemployment

The search for equilibrium along the two axes of economic growth and resource conservation is complex because the time dimensions are different. The need for economic growth is pressing and the desire for sustainability is more long-term oriented. They are very different and thus cannot be seen as opposite ends of a spectrum, progress should probably take place along these two orthogonal axes.

A more resource-conscious economy advocates for a new way of designing business, responding to the fundamental needs of all and respecting the availability of

resources. Scarcity can be turned into plenty when the waste of one product or service becomes the resource providing the input to a new cash flow. Cascading nutrients and energy can become a profitable process that generates jobs, builds social capital, and increases income for all.

Among various converging models for the economy of the future, the concept of the Blue Economy, merits attention. It has been promoted by an international alliance of companies, innovators, scientists, and enlightened citizens. The alliance provides open source access to develop, share, and implement prosperous business models that strive to improve natural ecosystems and the quality of life for all. "10 Years—100 Innovations—100 Million Jobs" seems like a slogan but it is the title of a report to the Club of Rome, expressing the ultimate wish that an innovative Blue Economy business model shifts society from scarcity to sufficiency.

The initiative highlights potential benefits in connecting and combining seemingly disparate environmental problems with open-source scientific solutions to create results that are environmentally, economically, and socially beneficial. The initiative aims to inspire entrepreneurs to demonstrate ways in which they can create economic benefits via job creation, reduced energy use, and more revenue streams from each step of the process. The Blue Economy offers a set of innovations for sustainable economies. Short- and long-term milestones include the Blue Economy Centers allowing visitors to experience blue reality, a pavilion for Milan Expo 2015, and the creation of 100 million jobs by 2020 (Pauli 2010).

Since 1996, with the support of the United Nations Development Program, the ZERI Foundation has tried to translate the blue economy model into pioneering experiences through a global network of creative people. The foundation declares that knowledge is the key driver of its activities. It tried to demystify science and introduced an extensive educational component using fairy tales. Starting from ideas based on science and public information, the network tries to find and improve sustainable solutions inspired by and based on locally available resources and responding to the needs of the community. Working with young adults and mobilizing their still "impossible dreams," the project seeks to go beyond traditional frontiers and help a present and future generation of sustainable livelihood on Earth emerge.

A recent analysis by the OECD suggests that green growth can reshape labor markets and the right labor and skill policies can help maximize the benefits of economic greening for workers. It argues that the impact of a transition towards a greener economy on labor markets will extend far beyond the generation of new green jobs, such as those related to renewable energy sources. The change will create new opportunities for workers, but also new risks. The challenge for the labor market and skill policies is to maximize the benefits for workers and help assure a fair sharing of adjustment costs. The suggested three main policy priorities include the smooth reallocation of workers to growing ecosectors, ecoinnovation, and the diffusion of green technologies by strengthening initial education and professional training, and reform of tax and benefit systems to make sure that cost pressures by environmental policies do not become a barrier to employment (OECD 2012c).

In the European Union, the Employment and Social Developments in Europe 2011 report highlights that the two sectors that have seen sustained high employment growth in the last decade are those commonly known as green and white jobs,

linked to the environment and health and social welfare, respectively. Green jobs cover a variety of jobs in ecological fields reducing environmental risk, pollution, and emissions but also the environmental upgrading of traditional fields, as for example, jobs related to ecoauditing. Growth in employment in ecoindustries was 3 % over the years 2000–2008 and continued to increase through the recession. One million green jobs could be created since 2006 and could have ripple effects in many other sectors (EC 2011h).

Green jobs could provide SMEs with the momentum lost because of the crisis. The results of a survey by the Committee of the Regions on SME-Friendly Regions and Cities of the European Union suggest that the financial and economic crisis is generally seen by local and regional authorities as having a negative impact on SMEs. Moreover, the nature of the impact is seen as quite diverse. The most pressing effect mentioned by the respondents was job losses. A decrease in investment or liquidity, falling consumer demand or orders, and declining performance, such as decrease in production or R&D, were some of the main effects.

Local and regional authorities have introduced a series of measures to help SMEs address the crisis. Key measures include support to entrepreneurs and new start-ups, provision of information, advice, and promotion of innovation. To respond adequately to the crisis, the majority of authorities claimed to have adjusted their existing regional policy making. With regard to policy integration from the European to the national level, the Small Business Act's "Think Small First" principle was integrated into many of the local and regional policies.

Most local and regional authorities are supporting SMEs in their region in multiple ways. including improving access to new markets and fostering international growth, easier access to financing for SMEs to help address the regional skills mismatch, promotion of entrepreneurship as a career path, improved Internet access and e-government services for SMEs, innovative activity, and marketing of its results. The most commonly mentioned forms of support were "ensuring easier access to financing for SMEs" and "promoting entrepreneurship as a career path."

The picture of whether regional or city legislation provides an SME-friendly environment is rather mixed. Although more than a third of respondents suggested that their legislation is conducive to setting up or developing SMEs, some argued that legislation has a rather restrictive character, for example, high taxes in general, or specifically on setting up new enterprises. Among the main aspects covered by legislation conducive to SMEs are the tax system and improved and simplified administration. Last but not least, there was a strong demand for simplification of procedures and improved administration at the European, national, and/or subnational level were also suggested (CoR 2012).

5.4 Ecoresponsible Enterprises and Social Urban Investment

Social responsibility of enterprises is essential for the transition to sustainable development. In search of sustainability, cities and enterprises have to embrace and support a new ethos, and make optimal use of resources and technologies.

They have to ensure that the best green products and services come to the market and ultimately improve citizens' and consumers' lives. Enterprises have to deploy their inventiveness and make available environmental technologies, products, and services with reasonable profits.

Improving company disclosure of social and environmental information is essential. Ethical citizens and vigilant consumers call for cities and companies to design and prove their contribution to sustainable development. Awareness campaigns can overcome information deficits and increase consumers' knowledge of the ecological impacts and the potential benefits of alternative consumption patterns. Citizen associations and the media tend to create a climate of trust, surrounding sustainable cities and businesses. Companies and municipalities without a declared commitment to and action for sustainable development may face consumer boycotts, attacks on fixed assets, failure to attract environmentally sensitive stakeholders, stockholders, and employees, restrictions on operations, and obstacles in raising finance. Proaction is a must, inasmuch as damaged reputation, impaired licenses, disillusioned shareholders, and disappointed citizens may impose a disproportionate burden.

A growing number of cities and companies make public their actions and results in preparing for the postcarbon age. Corporate codes of conduct gained momentum. Businesses adopted a broad range of approaches, from nonreporting to social reporting (SustainAbility/UNEP 1998). Assessment and public reporting have to be organically integrated components of the business process. The EU Strategy on Sustainable Development invited all publicly quoted companies with at least 50 staff members to publish a triple bottom-line report and present their performance against economic, social, and environmental criteria. The voluntary nonbinding nature of most codes is often related to the absence of any form of independent auditing, even if codes spell out the necessity for monitoring, assessment, and reporting.

Ecoresponsible businesses are instrumental in creating value out of values. In 2011, the European Commission published a new policy on corporate social responsibility (CSR). It states that to meet their social responsibility fully, enterprises should have in place a process to integrate social, environmental, ethical, and human rights concerns and principles into their business operations and core strategy in close collaboration with their stakeholders. The aim is both to enhance positive impacts, for example, through product and service innovations that are beneficial both to society and the economy, and to minimize and prevent negative impacts.

Social responsibility can be expressed or mobilized through many diverse schemes. The "Social Return on Investment" initiative in Amsterdam designed to include social obligations in public contracts, started as a pilot project in 2007 in Amsterdam's South-East District. Contractors are asked to use the money generated by the contract to offer employment opportunities to people usually excluded from the labor market, especially ethnic minorities. The project included the development of guidelines and monitoring instruments (Eurocities 2010).

The city of Leeds proposed a Socially Responsible Procurement Toolkit and Equality Assurance process. The toolkit is used by the city within the

preprocurement procedure to ensure that equality impacts have been taken into account at the tendering phase. The toolkit includes a matrix allowing procurement officers to identify services that have a high impact on migrant communities. These services are then subject to an internal Equality Assurance process, designed to insert diversity and equality requirements in the contract specifications and warrant the use of monitoring tools such as satisfaction surveys to ensure that the process contributes to the integration, versus assimilation, of migrants (Eurocities 2010).

Corporate engagement and enclosure are highly promoted by many investors, environmental and public interest organizations, and advocacy groups. In the United States the Coalition of Environmentally Responsible Economies and Societies (Ceres), a leading coalition with a lofty 20:20 vision, advocates for honest accounting, higher standards of business leadership, bold action to accelerate green innovation, and smarter policies that reward sustainability performance. The global reporting initiative, launched in 1997, had proposed a harmonized public disclosure to deliver a steady flow of consistent, comparable, and verifiable information. Ceres' sustainability reports enabled organizations to "walk the talk," and serve as a model for other organizations and small businesses looking to improve the transparent reporting of their actions and outcomes against commitments (CERES 2008).

In 2012, more than 500 business leaders, investors, environmentalists, and policy makers gathered at the Ceres' annual conference in Boston to discuss ways to accelerate the transition to a sustainable economy. Ceres and the research firm Sustainalytics announced a new assessment of 600 US companies on their progress on sustainability. The analysis of companies' responses to environmental and social challenges highlights examples of strong leadership, but also pinpoints significant needs for essential improvement.

The Ice Organization received the 2012 fourth award presented annually by Ceres and Trillium Asset Management to an inspiring leader working to move capital markets towards a system that balances economic prosperity with social and environmental concerns. The Ice is a new, flexible customer reward program, aiming at mitigating climate change via mass consumer purchase power.

Corporate social responsibility provides a prime occasion for international and public–private cooperation. Better aligning European and global approaches to CSR is important given the links to the OECD Guidelines for Multinational Enterprises, the UN Global Compact, and the International Labor Organization Tri-Partite Declaration of Principles on Multinational Enterprises and Social Policy. The UN Global Compact is a strategic policy initiative for businesses committed to aligning their operations and strategies with 10 universally accepted principles in the areas of human rights, labor, environment, and anticorruption. With over 8,700 corporate participants and other stakeholders from over 130 countries, the compass is the largest voluntary corporate responsibility initiative in the world.

Endorsed by chief executives, the Global Compact is a practical framework for the development, implementation, and disclosure of sustainability policies and practices. The Global Compact tries to mainstream ethical principles in business activities around the world and catalyze actions in support of broader UN goals,

including the Millennium Development Goals. The compact is global and local at the same time, private and public, voluntary yet accountable. It searches to combine the UN moral authority and convening power, with the private sector's vigor, and the expertise and contributions of a range of key stakeholders.

Most benefits include the establishment of a globally recognized policy framework and governance, the sharing of best and emerging practices and world linkages among business units and subsidiaries across the value chain with the Global Compact's local networks, including in developing and emerging markets. Access to the United Nations' extensive knowledge of and experience with sustainability and development issues and the UN Global Compact management tools and resources is essential.

The compact embraces the environmental, social, and governance realms, seeking to embed markets and societies with universal principles and values for the benefit of all. A commitment to transparency and disclosure is critical to the success of the initiative. The compact incorporates an accountability policy component, the Communication on Progress. The annual communication is an important demonstration of a participant's commitment to the UN Global Compact and its principles. Failure to communicate may result in a change in participant status and possible expulsion.

During the Rio+20 conference, the World Business Council for Sustainable Development promoted the Business Action for Sustainable Development (BASD) 2012, a temporary coalition of 13 international business organizations, and hosted more than 800 leaders of government, business, United Nations, NGOs, and other organizations at the BASD 2012 Business Day. Under the theme "Achieving Scale," the events featured interactive workshops and sessions and focused on identifying scalable business solutions on energy, water, natural resources, technology, and policy development. A session on "Eradicating poverty through inclusive business solutions" underlined the need to go beyond shareholder value, suggested that inclusive business can be a unique source of competitive advantage and called on governments to work as enablers in view of making the policy environment act as a tailwind, rather than headwind.

A session on "Business solutions to enable energy access for all: Achieving scale" underlined that, although the technology solutions exist to deliver access to energy, the key challenge is to build business models that deploy these technologies so that they deliver clean, reliable, and affordable energy solutions to customers while ensuring commercial sustainability for business. Well-designed and stable policy and regulation are critical for facilitating business participation in the energy sector and the expansion of access to energy. The discussions also highlighted the importance of designing public and development finance mechanisms to leverage additional private investment. Visits to businesses in the Rio de Janeiro's favelas and leading microcredit banks focused on the topic of access to finance for low-income communities.

5.5 Quality of Life and the Ability of Cities to Attract People and Capital

"What do citizens want from cities and how can best civic authorities respond?" Many local authorities ask this question and try to answer including through surveys, often supplemented by a series of in-depth interviews with city officials, architects, designers, and urban experts. *The Economist*'s surveys paint a broadly positive picture. Of those surveyed in 2010, 60 % believe that their quality of life is excellent or above average. Nearly three quarters rate their city excellent or above average as a place to work. Almost 60 % believe that life in their city is getting better. But when asked to consider the future, respondents recognized that the liveability of their city could be put at risk. They questioned the ability of public services and infrastructure to cope with the challenges of an ever-growing population, on top of existing financial and environmental pressures. In many cases, civic authorities do simply not have the resources to meet demands (*The Economist* Intelligence Unit 2010).

Urban liveability is cardinal for all citizens. *The Economist* Intelligence Unit's most recent global liveability report shows cities in Canada, Australia, Austria, Finland, and New Zealand as the best to live in, thanks to widespread availability and accessibility of goods and services. The ranking, which has been accused of being Anglo-centric, does not take into account the cost of living as a factor in liveability. The 2012 report placed Melbourne as the most liveable city in the world, with Vienna in the second place, followed by Vancouver, forming a list of top three that remained unchanged since the previous year. Other Canadian cities also ranked highly in the survey, with Toronto holding the fourth position, and Calgary with Adelaide at fifth. Helsinki is the only other EU city to be included in the first decade (*The Economist* Intelligence Unit 2012).

Liveability may be in the eyes of the beholder. The quality and cost of life surveys and the ranking of world cities, conducted annually by Mercer, an international consultancy in human resources, also offer multiple interesting insights. The surveys constitute important sources of information for governments and companies that have executives working in various cities of the world and have to take into account a series of factors when structuring their remuneration packages. Each survey is based on an array of assets and services reflecting the typical expenditure of the expatriated population. Mercer's Quality of Living index list includes more than 200 cities across five continents, ranked against New York as the base city.

European cities dominate the Mercer rankings according to the quality of life. Vienna, Zurich, and Geneva have been the constant winners of the last years for the overall quality of life. Vienna ranked highest for overall quality of living in 2011 and Luxemburg first for personal safety, Baghdad ranked the lowest for both. Zurich and Auckland occupy the second and third position, respectively, and Munich occupies the fourth place, with Düsseldorf and Vancouver sharing the fifth place.

Frankfurt is in seventh position, followed by Geneva in eighth, and Copenhagen and Bern share the ninth place. Globally, the cities with the lowest quality of living are Khartoum, Sudan, Port-au-Prince, Haiti, N'Djamena, Chad, Bangui, Central African Republic, and Baghdad, Iraq (Mercer 2011).

Next to the quality of living surveys, Mercer's cost of living surveys measure the comparative cost of over 200 items in each location, including transport, food, clothing, household goods, and entertainment. The cost of housing is also included and, as it is often the most important expense for expatriates, it plays an important part in determining the ranking of cities. New York is used as the base city and all cities are compared against it. Currency movements are measured against the US dollar. Recent world events, including economic and political upheavals, have affected the rankings for many regions through currency fluctuations, inflation, and volatility in real estate prices.

According to Mercer's cost of living 2012 survey, Tokyo is the world's most expensive city for expatriates, pushing Luanda, Angola, down to second position. Osaka is in third position, whereas Moscow and Geneva again rank fourth and fifth. Singapore and Zurich share the sixth place, up two and one places, respectively, since 2011. Hong Kong retains its ninth place. In the United Kingdom, London (25th) is the most expensive city for expatriates, down seven places from last year. Belfast (165th) is the United Kingdom's least expensive city. At the lowest end of the spectrum, Karachi is ranked as the world's least expensive city for expatriates, less than one third as expensive as Tokyo (Mercer 2012).

Most European cities have witnessed a comparative decline in the cost of living. Some exceptions exist where accommodation prices have increased or additional taxes have pushed up the cost of living. In North America, most cities have gone up in the ranking, as the dollar has strengthened against most of the world's other currencies. In Asia, more than six in ten cities moved up in the rankings, including all surveyed cities in China, Japan, and in Australia and New Zealand. At number four in the global ranking, Moscow remains the most expensive city in Europe for expatriates. Then follow the Swiss cities, Geneva in fifth position, Zurich in sixth, and Bern fourteenth, following the strengthening of the Swiss franc against the US dollar.

Despite dropping off the top spot on the global list, Luanda, Angola, remains the most expensive city in Africa, followed by Ndjamena in Chad, Libreville in Gabon, and Khartoum in Sudan. Tunis continues to be the least expensive city for expatriates on the African continent. São Paulo and Rio de Janeiro remain the most expensive cities for expatriates across both North and South America, and are closely trailed by Caracas. In South America, Brasilia is the fourth most expensive city.

New York City continues to be the most costly city in the United States with Los Angeles and San Francisco slowly catching up. Portland, Oregon and Winston-Salem, North Carolina, remain the least expensive surveyed cities for expatriates. Toronto remains the highest-ranking city in Canada, closely followed by Vancouver.

Another survey by the global property service provider Cushman and Wakefield sheds light on the European business environments since 1990. Each annual survey is based on the opinions of the senior management of 500 European companies and

the criteria considered important in location decisions. The key factors taken into account by the companies include accessibility to the markets, availability of qualified personnel, transport and communications, and cost of living and personnel.

London, Paris, and Frankfurt remained the top three cities for business in 2011. German cities occupy four out of the top 10 places. Brussels moves back into fourth place ahead of Barcelona. Vienna was the biggest mover in 2011, rising up the ranking by six places to the 22nd place, while Düsseldorf moves up by five places and breaks into the top 10 for the first time (Cushman and Wakefield 2011).

Another study of the "Main Streets Across the World 2012–2013" provides a global barometer of the retail sector, tracking rents in the world's top 326 shopping locations across 62 countries. The main league table, including the most expensive location in each of the countries, suggests that, despite a backdrop of a slower global economy and continued uncertainty about the future, prime retail markets have proved generally resilient. Rental growth was again driven by the robust performance in Asia Pacific and the Americas (Cushman and Wakefield 2012).

The state of a city has a strong impact on the state of the citizens' lives. The Veolia observatories of urban lifestyles revealed that cities are sources of intense feelings, much more positive than negative. City residents appreciate urban advantages, but also recognize that the price is often rather high. In 2008, 75 % of city residents declared living in the city of their choice and 36 % of them consider safety and the cost of acceptable living conditions to be the most important factors for quality of life, followed by the environment, infrastructure, public transport, and leisure (Veolia 2008, 2010).

The best to live in or most expensive cities are necessarily not the most powerful global cities, which are necessarily not the most competitive. The indexes that try to capture the economic power and competitiveness of cities include the Global Economic Power Index (by the Martin Prosperity Institute), the Global City Competitiveness Index (by *The Economist*), the Global Cities Index (by A.T. Kearney), the Global Financial Centres Index (by Long Finance, Toronto), and the Global Cities 2025 (by the McKinsey Global Institute). They lead to profiles, ratings, and rankings that share one main element: New York, London, or Tokyo occupy the first or second position.

R. Florida has ranked the world's most economically powerful cities by compiling the rankings according to the above-mentioned five major indexes on the relative economic strengths of global cities and metropolitan areas. New York stands on top of the global urban hierarchy and its position is proposed as secure, at least for the medium term. It is the world's most open and diverse large city, the only one to come first or second in each index. London is overall second and Tokyo third. Paris and Hong Kong follow, and Chicago, Singapore, Shanghai, Los Angeles, and Zurich round out the top 10.

The first Asian Ranking of Cities focused on the "Comprehensive Power" of world cities, defined as their ability to attract creative people and top companies from around the world. The Global Power City Indexes were first developed by the Institute for Urban Strategies at The Mori Memorial Foundation in Tokyo in 2008, and reviewed each year since then. The ranking is based on 69 indicators tracing the

six main urban functions, that is, economy, research and development, cultural interaction, liveability, ecology and natural environment, and accessibility. They compose the Comprehensive Power Index, developed for the 35 major world cities. Furthermore, evaluation is carried out from the angle of four global actors affecting urban activities, including managers, researchers, artists, and visitors, and one local actor, residents. A matrix bringing together city actors and city functions indicators helps make a multidimensional evaluation.

New York, London, Paris, and Tokyo appear to be the most powerful cities, whereas Singapore, Berlin, Vienna, Amsterdam, Zurich, and Hong Kong occupy the next six places. According to the ranking, one implication of the growth of intercity networks is the emergence of an urban geopolitics. Urban leadership, at the political, corporate, and economic level, is under more immediate pressure to act than national governments and has proved to be pragmatic and effective (The Mori Memorial Foundation 2008, 2009, 2010, 2011, 2012).

The Tokyo Metropolitan Area, composed of the capital city, Tokyo, and the surrounding three prefectures, is the largest metropolitan area in the world, with a population of 35 million. The historical cityscape was mostly demolished during World War II, however, the fundamental structure of Tokyo with its unique urban form surrounding the Imperial Palace, persists, often hidden behind or beneath heteroclite modern additions. Transport and telecommunications infrastructures and technology systems made this global metropolis a liveable place, where a huge number of people can live, move, and work. Tokyo enjoys one of the highest life expectancies at birth in the world and low levels of crime. The London School of Economics Urban Age program reminds us that, although Tokyo's level of well-being could be appraised as one of the highest in the world, the city had to strengthen its resilience to face severe disasters such as the Great Kanto earthquake, as well as more frequent typhoons and floods.

Risk management policies are essential in cities wishing to preserve and improve their quality of life. The complex disaster of March 11, 2011 caused by the earthquake in east Japan, and subsequently the tsunami and damage to the Fukushima nuclear plant, also had an effect on Tokyo, 400 km away from the epicenter. The gigacity offered some examples of well-designed risk-management policies that have been refined over the past two decades. The improvements brought to the seismic performance of buildings resulted in very few fatalities and limited damage. The city prevented fires, thanks to the "my-com-meter" system, introduced post-1995 and shutting down the residential gas supply at the first sensing of an earthquake. The transport infrastructure also resisted well after considerable reinforcement over the past years.

Watercolour 6
Tokyo, Most Populous City and Among the Top Global Powers

Chapter 6
Intergenerational Cities Embracing Diversity and Social Justice

Abstract Concentration and diversity of people and activities are invaluable assets for cities, colorful beehives and schools for respecting difference and learning how to live in society. This chapter sheds light on the evolving social capital of cities and their capacity for intergenerational and intracity equity, social justice, and solidarity. Urban social capital is of increasing importance in cities that face new forms of poverty and exclusion, where more than three generations coexist, and immigrants come looking for better living and working conditions.

Citizens can play a major role in shaping vital urban spaces and forging bonds out of degraded spaces and estranged relationships. Distressed urban areas, the backstage of urban dramas where underprivileged and excluded citizens come together, can be transformed into innovative neighborhoods and vibrant inclusive communities acting as extended families for the disadvantaged. The participation of youth and women in projects can further extend opportunities, and education is always the most decisive productive investment towards a skill-intensive economy.

6.1 Urban Diversity, Social Cohesion, and Intercultural Dialogue

The social dimensions of sustainability are of, at least, the same importance as the ecological and economic dimensions. Definitions for sustainability suggest that sustainability is a striving for eternal youth, for "equity extended into the future," a responsible resource-conscious journey to the well-being of all. It is a continuous invention of new opportunities, resembling youth itself, a capacity for innovation that is an inexhaustible resource, a permanent thirst for a better world.

Cities are the mirrors of societies. Social cohesion, a key feature of the EU social model, has an utmost value in cities, places of diversity, with its economic, gender, social, ethnic, racial, generational, and cultural dimensions. Diversity is not an obvious asset, inasmuch as otherness and difference often raise feelings of suspicion, which

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may generate incomprehension and engender violence. The citizen's duty concerning respect for the difference has a long way to go yet in cities and it is probably best learned at schools.

A strong human and social capital is a characteristic of the sustainable city, which has the capacity to withstand crises. Social justice is a precondition for the creation of sustainable wealth. The role of equity in shaping sustainability processes is unparalleled. Unequal distribution of wealth may result in revolt, unsustainable lifestyles, and obstacles to cultural change. D. Harvey argues that "There is nothing more unequal than the equal treatment of unequals."

Long before the "Occupy Wall Street" movement, modern cities had already become the central sites of revolutionary politics, where the deeper currents of social and political change rise to the surface. The city is a key arena within which class forces clash, given the strong relationship between urbanization and capital accumulation. The sharpening of these conflicts may transform movements for the right to the city into urban uprisings and revolutionary actions (Harvey 2012).

The main social challenges for cities include just distribution of wealth and solidarity, the harmonious coexistence of more than three generations, high-quality employment and home environments, the creation of a welcoming and friendly environment for newcomers and the most vulnerable and disadvantaged citizens, public well-being and security, and the enhancement of opportunities linked to urban diversity. Longer healthy lives are a great chance for citizens and cities wishing to address the expectations of an older population but also benefit from the experience and contribution of all and care about future generations.

Poverty is one extreme result of rising inequalities and deserves major attention by policy makers. Its multidimensional character makes it difficult to measure and monitor. Local services in everyday contact with people are probably the best placed to see the people behind the statistics. In the framework of the Europe 2020 strategy, a three-pronged approach to monitoring poverty and social exclusion is addressing the three main dimensions of poverty and exclusion, including income poverty, material deprivation, and exclusion from the labor market.

In 2010, 23 % of the European population was at risk of poverty and social exclusion. 80 million Europeans were at risk of one dimension of poverty, 28 at risk of two and 8 at risk of three dimensions of poverty. Lack of strong labor market attachment, youth or old age, particular family circumstances, including those caused by care obligations, as well as some other individual characteristics such as disability or a migrant or minority background are among the key risk factors (EC 2011h). Welfare systems reduced the risk of poverty by 38 % on average, and this impact varies from less than 10 % to nearly 60 % across the European Union (EC 2011h).

The reduction and eradication of poverty is a strong priority of all sustainable development policies. Poverty-trap conditions of low income and welfare-dependent economic structures can exacerbate exclusion. Increased financial pressures, in a complex and fragmented institutional environment, have to be addressed through the horizontal and vertical integration of decision-making systems and the optimization of the contribution and commitment of the public, private, and social economy sectors (Parkinson 1998).

Poverty often concentrates in particular urban spaces and is inextricably linked to phenomena of urban decay, which constitute a colossal obstacle to sustainable prosperity. A quartered city mirrors multiple divisions due to globalization and economic developments; competition between companies, cities, regions, and nations; and the restructuring of welfare states. The combination of these factors often results in the dichotomy between spaces and functions.

Urban decay indicates that the capacity of urban systems to innovate and drive or adapt to change is overstretched and the urban cell renewal slows down. Distressed areas suffer functional impoverishment, with destitute housing; failing schools and insufficient equipment and facilities; delinquency and crime; high unemployment; low mobility; little access to information, education, and training; and high levels of substance abuse. Very often, transport infrastructure, whether operating or disused, fragment the urban web and further isolate distressed spaces from vibrant urban areas. Comprehensive urban policies have to simultaneously address all these aspects and create a new momentum.

Each city has some areas more problematic than others, where problems concentrate and should be seen as a source of opportunity to rediscover the art of living together. In the deeply divided city of Belfast of the 1970s, Shankill road could easily win the award of the most "problematic" European urban area. It is a prime example of challenging resistance to change. The industrial decline and the civil conflict of 1968 led to Catholic and Protestant neighborhoods physically separated by demarcation walls. With the assistance of the initiative "Making Belfast Work," a local development agency was created and proposed a cooperation process that organized, in 1995, a community planning weekend entitled "Planning for the Real." The event led to a strategy, implemented through a first urban program of 14 million Euros, shared with a nearby Catholic area. The program focuses on the work of parents and especially women, considered to represent a new generation of possibilities.

Preventing and fighting social exclusion is a major issue for cities suffering from various forms of schizophrenia with multiple spatial patterns and dynamics. To preserve their social capital, cities must regenerate their spatial and social fabric. They must offer all citizens access to information, education and training; adequate housing; and noble public, green, and recreational spaces; social services; and the possibility to participate in codesigning the future of the city. Building social cohesion contributes to the creation of a "good" society, able to endure threats (Galbraith 1996).

Cultural diversity, a resource for the dynamism and energy of a city, can increase social cohesion. Developing a sense of belonging and identity is crucial for cities wishing to adapt to change and enhance their diverse resources to attract investment. If cities manage diversity properly, they can benefit hugely from the potential of all minorities for entrepreneurship and innovation. For this, they should review the array of policies, services, and instruments to create the appropriate conditions and governance structures.

Many European cities have adopted integration strategies and mainstream them in all their policy domains. In 2005, the Berlin senate adopted for the first time a

comprehensive policy defining the city's overall approach to integration and setting guidelines for common action for the various services. This includes the identification of common goals and instruments, as well as of agreed-upon indicators to assess the effectiveness of municipal action. In Amsterdam, incidentally the city with the highest number of physical bridges, the commitment to mainstreaming integration, diversity, and equality in the work of all departments was an integral part of the coalition agreement signed by the "red–green" coalition of winning parties for the period 2006–2010 (Eurocities 2010).

The human face of cities is composed of the plurality of otherness. According to Socrates, if a man has to know himself, he must look into another man. Similarly, each culture draws from its own roots, but fails to blossom if not crossing other cultures. It is crucial to promote dialogue between all cultures in order to avoid ghettoization and prevent identity abuses. Working together with civil society can create a climate that values diversity, accessibility, and freedom by offering everyone the opportunity to share knowledge, exchange ideas, and strengthen the elements that compose cultural identity.

The number of languages spoken in a given city is becoming an important indicator of cultural diversity. It is estimated that 233 languages are spoken in London, a number indicative of the ethnic communities living in the British capital. Schools are the roots of integration, experiencing cultural and religious diversity on a daily basis. The natural open-mindedness of children makes diversity more accessible and direct. The "Tiempo Joven" integration project in Madrid involved thousands of young people of 16 different backgrounds and used rap, video, and drama as tools to foster a sense of identity and belonging (Fundación Bertelsmann and Cities of Migration 2012).

Multicultural cities hosting diverse cultures have to create the conditions for people not simply to coexist peacefully but to engage in a dialogue that generates a new collective urban identity. The Intercultural City program, jointly launched by the Council of Europe and the European Commission during the year of intercultural dialogue 2008, tried to enable cities to pertinently address the challenge of cultural diversity. Through the intercultural innovation network, the project facilitated mutual mentoring among a learning community of cities, politicians, practitioners, academics, and civil society.

A unique aspect of the initiative is that it tapped into the knowledge and perspectives of a range of city peers, including teenagers. Each city sent a team of ambassadors to another city to exchange experiences and foster intercultural dialogue through specific policies and structures. The program searched an optimum model for dealing with cultural diversity in local communities and managing relations between different ethnic and cultural groups (Eurocities 2009).

In implementing its civic agenda, Boston wishes to strengthen its collaborative gene and aim for leadership that reflects the full diversity of the city in the public, nonprofit, and private sectors. In 2008, 87 % of 111 organizations reported that employees of color made up at least 10 % of their workforce. Health care organizations had the highest percentage of employees of color (44 %). In 2007, women accounted for 11.5 % of directors of the 100 largest public companies with women of color making up 1.2 % (Boston Foundation 2009).

6.2 Employment, Housing, and Active Inclusion in Cities

The strategy Europe 2020 gives new prominence to social issues through its objective of inclusive growth. It stresses the need for social inclusion and fighting poverty, as well as enriching labor market participation with more and better jobs. These are vital elements of the European socioeconomic model that pleads for social solidarity and justice, human rights, and democracy.

Active inclusion could start with bridging the gender gap. Gender gap indexes could inspire cities to assess their ability to close the gender gap in key areas such as access to health care, access to education, political empowerment, and economic equality. The seventh annual World Economic Forum Global Gender Gap Report 2012 ranks Nordic European countries in high positions, with Iceland holding on to the top spot, followed by Finland, Norway, Sweden, and Ireland, respectively, and Denmark and Switzerland rank also among the first 10. The global economic gender gap now stands at 60 %, but only 20 % of the political participation gap has been closed. The report suggests a strong correlation between closing the gender gap and economic competitiveness at the national level (WEF 2012b).

The financial and economic crisis that in the European Union turned into a sovereign debt crisis and extensive recovery packages, followed by a wave of austerity measures by most governments, has distinctly highlighted the need for more integrated economic, employment, and social policies. The social consequences of the economic crisis and the reduced spending on environment make more acute the need for efficient, well-designed, and well-targeted policies at all levels.

Increasing employment levels and enhancing labor productivity, together with capital investment and innovation, are two sources of growth. Employment growth in the European Union has followed the timid economic recovery and resulted in a gain of only 1.5 million jobs by mid-2011, much less than the 6 million jobs lost during the recession. The number of the unemployed reached 23 million people, corresponding to 10 % of the working age population. Youth unemployment is particularly alarming as young workers usually are the main victims of the recession. More than five million young Europeans, 20 % of the labor market, above 25 % in 10 member states, with a high of 48 % in Spain, are unemployed. The share of the long-term unemployed among those looking for work exceeds 40 % and is up one third compared to the level of 30 % registered 2 years ago, after a falling trend from 1994 to 2008 (EC 2011g).

The surge of protesting movements such as the Indignados in Madrid is indicative of citizen reactions as the prospects for sustained and job-rich economic recovery have again become uncertain (EC 2011h). A jobless protracted recovery has not only important economic and social costs but also signals structural deficiencies in the labor market that weaken the seeds of growth. Although unemployment does not show signs of improvement, coincident rise in job vacancies and unemployment indicate labor market mismatches, such as inadequate skills. Lifelong education and training policies are essential to equip citizens with the adequate skills for a sustainable recovery.

In 2010, 29 % of employed EU citizens had high-level qualifications, and 22 % had low qualifications, just the reverse of 2000. By 2020, 35 % of jobs are expected to require high qualifications and the demand for low skills will drop by 12 million jobs. However, educational attainment falls short of the growing skill-intensity of available jobs. One out of seven (14.41 %) youths aged 18–24 in the European Union leaves the education system definitely with no more than lower secondary education (early school leavers), whereas many have qualifications that do not correspond to the requirements of the labor market. Urban projects targeting young people who are neither in education and training nor in employment and offering them a rewarding first work experience, for example, in a renewable energy or recycling project, can have an invaluable impact.

A trend towards polarization of jobs already existed in the European Union before the crisis, as new jobs became concentrated in relatively high and low pay levels, notably in the service sector, with a predominance of better-paid jobs. The intensity of the recession and the implications on employment has further intensified this polarization by massively destroying medium-paid jobs in manufacturing and construction. At the same time, educational and skills profiles in the emerging employment structure tend to become more demanding, thus compromising the chances of re-employment and access to well-paid jobs for the lower-skilled unemployed.

Rising long-term unemployment, declining incomes, and signs of increasing poverty and material deprivation are significantly intensifying the risks of long-term exclusion from the labor market and local society. Cities traditionally play an important role in human capital creation and attract the most educated but also most of the unemployed. From a citizen perspective, choosing the right sorts of skills to develop is vital for a successful professional and social life. From the perspective of the urban economy, it is crucial to improve skills forecasting, labor market matching, adaptability of enterprises and workers to change, and to develop new sectors compatible with the search for sustainable development, for example, green growth with potential for sustainable job creation. The concept of *flexicurity*, flexibility within security, is regaining attention.

Despite the positive role that social systems played in preventing the collapse of household incomes during the crisis, and especially of those in the lower part of the income distribution scale, almost 116 million Europeans were at risk of poverty or social exclusion in 2010. And although employment is considered to be the first factor of social integration, over 8 % of the EU population in employment is estimated to be at risk of poverty and the trend in income inequalities remains a generally upward one (EC 2011h).

Employment still remains the best safeguard against poverty and social exclusion but it does not eliminate this risk. Six in ten working-age Europeans at risk of poverty or social exclusion have a job and may be qualified as "working poor." This exemplifies the need for an integrated approach addressing both social and employment situations. Working on a temporary contract, which is the case for 40 % of youths, is another important characteristic. Temporary contracts often carry a wage penalty, and this is a particular concern in countries where the percentages of obligatorily temporary work is high and future prospects are low. Emerging and potential

working poor must be understood from a household perspective, notably as regards the composition of the nucleus, the presence of children, and the involvement of all adult members in employment. Households working at only half of their potential face a risk of poverty of 20 %, against 5 % for those who realize their full potential, that is, with two adults working full time.

Four in ten working-age Europeans at risk of poverty or social exclusion are inactive. Labor underutilization is especially prevalent among groups such as single parents, people with disabilities, older citizens, and migrants. Europeans over 65 years of age represent 16 % of the overall population but 22 % of the population at risk of poverty or social exclusion and the risk further increases in the age group over 75. Being born outside the European Union also represents a significant risk factor. Better integration of these groups into the labor market would enhance inclusion and prevent marginalization. In general, labor utilization can be increased by training, improving the functioning of labor markets, reforming the tax and transfer system, and maintaining labor market flexibility. Beyond labor market policies, the multiplicity, and complexity of social inclusion issues ask for a comprehensive and integrated approach focusing on individual needs in the local context.

The promotion of green jobs is central in the transition to a zero/low-carbon economy and society. The creation of green jobs is considered by the World Bank to be the most human face of green solidarity. For the ILO (International Labor Organization), the notion of green jobs summarizes the transformation of economies, enterprises, workplaces, and labor markets into a sustainable, low-carbon economy providing decent work. But much-needed innovative strategies to promote green jobs can only succeed with the full involvement and participation of workers and enterprises (ILO 2012; World Bank 2012a).

Housing is considered to be, after employment, the second factor of social integration. In 2009, across the EU27, almost 6 % of Europeans suffered from severe housing deprivation and in Poland, Lithuania, Slovenia, Bulgaria, and Latvia this percentage reached more than 15 % of the population, rising to a high of 28.6 % in Romania. In 2009, 12.1 % of the EU27 population lived in households that spent 40 % or more of their disposable income on housing. Postwar housing developments for poor and working-class residents go through radical renewal schemes endowing them with systems that enhance ecological performance and are socially uplifting and architecturally compelling.

Homelessness is a serious challenge for cities (Eurocities 2009). In the United States, housing and the homelessness crisis has worsened over the past 2 years. By some estimates, more than 311,000 tenants nationwide have been evicted from homes the year preceding the crisis. As more people fall into homelessness, local service providers are facing an increase in the demand for services. In Denver, nearly 30 % of the homeless population are recently homeless. Of the 25 cities surveyed by the U.S. Conference of Mayors for its annual Hunger and Homelessness Report, 19 reported an increase in homelessness in 2010. On average, cities reported a 12 % increase. The lack of available shelter space leaves many homeless citizens with no choice but to struggle to survive on the urban streets and public spaces (U.S. Conference of Mayors 2010).

Even though most cities do not provide enough affordable housing, shelter space, and food to meet citizen needs, many cities use the criminal justice system to punish those trying to survive on the street. In response to the homelessness crisis, the U.S. National Law Center on Homelessness and Poverty and the National Coalition for the Homeless released the report "Homes Not Handcuffs," tracking the criminalization of homelessness, a dangerous growing trend in cities. The list of "meanest cities" has been proposed to name and shame cities that have even enacted food-sharing restrictions that punish groups and individuals for serving homeless people. Many of these measures appear to have the purpose of moving the homeless out of sight, if not out of the city.

European Union leaders have pledged to bring at least 20 million people out of poverty and exclusion by 2020 and created the European platform against poverty and social exclusion to work at all levels in order to help reach the agreed target. Key challenges include the eradication of child poverty, the active inclusion in society and the labor market of the most vulnerable groups, the provision of decent housing for everyone, the social integration of people with disabilities, ethnic minorities, and other vulnerable groups, including the Roma. In Poland, the Magic Mountain Foundation provides opportunities for each and every person to climb his or her own Everest.

In the European Union, children represent 26 % of the vulnerable population at risk of poverty or social exclusion. Single parents with dependent children face high risk, although they represent only 2 % of the total population. They constitute an obvious target group for focused action. Cities could complement and strengthen fragile family structures through social networks, services, and associations. Schools and urban institutions should strive together in order that vulnerable children understand the indivisible rights and duties to the city, and benefit from the opportunities that they are offered to learn and grow.

On the other end of the age spectrum, city policies may influence considerably the decision whether to retire or remain in the labor market. The working population in the European Union is projected to age significantly in the coming decades and the age-dependency ratio will increase sharply. In combination with falling fertility rates, living longer will pose a major risk to the sustainability of the European model.

Intergenerational cities are the ones in which every generation brings its best to the service of all. The rights of the elderly are enshrined in the Treaty for the Functioning of the European Union. Active ageing policies should not be limited to removing financial disincentives but should include supportive measures such as discouraging early retirement, stimulating learning and training to avoid skills obsolescence, adapting working conditions to the specific characteristics of older adults, valuing volunteer work, promoting good health of older workers, and providing care for the elderly, while making them useful to the community. Universities for the elderly expand their offer for sustainable development to include a great variety of courses of interest to older adults and cities can sponsor courses that have a special interest for communities.

Intergenerational solidarity is an essential dimension of sustainable cities. The generation project in Portugal emerged from the need to improve the prospects of

youths in the deprived community of Amadora, on the periphery of Lisbon. Activities range from work and play for the very young, enabling parents to stay in full-time employment, to a number of programs working with children to encourage them to stay in education. The "If You Keep Studying" project provides education and training in the fields of martial arts and a youth orchestra. This orchestra, based on the Orquestra Sinfónica Simón Bolívar of Venezuela, has incubated 10 orchestras in the Lisbon area over the last 2 years. And the journey continues (EC 2010a).

The 2012 European year for active ageing and solidarity between generations suggested that, instead of creating conflict over scarce resources, ageing could be turned into an opportunity and provide Europeans with the possibility to contribute to community life and keep a live contact with younger generations. In order to address this challenge, older people should be encouraged and assisted to remain active longer, not least in order to generate a desirable outcome in an efficient and equitable way. Older scientists have a precious capital to transfer to younger generations, as have older leaders and businessmen, artists, and simple citizens wishing to share and transmit. The noble cause of sustainable development could provide a shared value to adhere and make a transgenerational contribution.

Innovative partnerships involving the most key stakeholders can best address complex situations and groups in society, and stimulate bottom-up and mutual-trust approaches to help integrate the most excluded. Schemes empowering poor women, through microenterprise development and strategic initiatives of promoting gender-inclusive value chains, market linkages, and training in vocational and business skills in backward urban neighborhoods, are most promising. The Suikeroom project in Amsterdam is a fund for ethnic start-up companies financed by established companies. The fund was created in 2006 to help ethnic minority entrepreneurs, considered as potential profit makers to start a business successfully. Entrepreneurs receive guidance in preparing a solid business plan and are introduced to investors (Eurocities 2010).

The social economy enterprises demonstrated a better resilience to the financial crisis compared to conventional enterprises. This resilience is a good indicator of their capacity to sustain their economic activities and jobs even in hard times or to engage in markets with a growth potential. They can create and maintain sustainable enterprises and contribute to local development and social cohesion. Cities can increase awareness of the role of social economy and develop a favorable environment for social enterprises that incorporate sustainability and women and/or minorities empowerment values.

Innovation in urban social policies can have impressive results for the active inclusion of citizens. Eurocities presented a collection of innovative strategies of nine network members including Birmingham, Bologna, Brno, Copenhagen, Krakow, Lille Metropole-Roubaix, Rotterdam, Sofia, and Stockholm discussing their projects to promote social inclusion. The practices highlight that new social trends and challenges constantly prompt local governments to adapt and develop new ways to achieve active inclusion (Eurocities 2010).

In Rome, the *Consiglieri Aggiunti* (additional councillors) are elected representatives of migrant communities legally residing in Rome and registered on the voting

list. These councillors act as essential consultation contact points within their respective communities.

Four of them, representing migrants from the four continents (Africa, America, Asia, and Europe), sit on the city council and take part in all its activities, although not entitled to vote on the decisions of the council. In addition, there are 18 consiglieri aggiunti representing foreigners in the district councils.

6.3 Integration of Immigrants and Minorities in Cosmopolises

Migration is one of the defining global issues of the twenty-first century, with a high potential and impact. The United Nations defines migrants as citizens residing in a foreign country for more than 1 year. In the world of 7 billion people, at least 214 million are living outside their countries of birth. According to the International Organization of Migration, the movement of people has not been affected by the global crisis and is likely to become even more significant in the future, as a result of continued globalization, demographic challenges, and economic imbalances (IOM 2011).

One in 33 world citizens is a migrant. The total number of international migrants has increased over the first decade of the millennium and reached 3.1 % of the world population. If migrants were a country, it would rank fifth in the world according to the number of inhabitants. An estimated 64 million (or 9 % of the population) immigrants live in Europe. In North America and Oceania percentages are higher. Migration is a key feature of the increasingly interdependent world and enables the exchange of talents, services, skills, and experiences (IOM 2011).

The world population of migrants is expected to reach nearly 250 million migrants in 2025, of which 65 % are established in developed countries and especially in cities. Foresight studies emphasize that international migration will increase and counterbalance demographic dynamics. Without a significant influx of immigrants, the decline of the European population is irreversible (EC 2009e).

During 2009, about three million people immigrated into one of the EU member states, marking a substantial decline as compared with 2008. However, it is difficult to quantify exactly the magnitude of this decline and its possible relationships to the crisis as some countries, including Germany, Austria, and the Netherlands, have modified the underlying definitions of migration. The United Kingdom reported the largest number of immigrants, more than half a million in 2009, followed by Spain with half a million and Italy with a little less. These three countries recorded over half of all immigrants into EU member states. It should also be noted that these figures do not represent the migration flows to/from the European Union as a whole. However, more than half of the immigrants into the EU member states, an estimated 1.6 million people in 2009, were previously residing outside the European Union.

The motivations and the incentives, the opportunities and associated risks, and the potential for migration to benefit labor balances and development have been the subject of many analyses. Migrants are primarily driven by economic or political reasons. In the future migrants would probably also move more for educational, cultural, and ecological reasons, including ecological causes related to natural disasters due to climate change. From refugees and asylum seekers to expats, the spectrum of immigration is increasingly diversified and defies standardized mass approaches.

The immigrant population predominantly concentrates in large cities. Migrants expect cities to offer them exciting new beginnings. It is estimated that 16 % of immigrants in France live in the Paris agglomeration. Another characteristic trend in many cities is the formation of ethnic mosaics attracting immigrants from the same culture in particular neighbourhoods. Openness of these districts and interactions with the city are essential for the city to prevent ghettoization and exclusion.

Welcoming migrants is a challenge for many cities of the more developed countries. Cities often experience tensions between spatial proximity and cultural distance, linked to the coexistence of migrants with other very diverse established social groups. A more selective and better integrated immigration would be more beneficial. Education, housing, health, sports, culture, and local politics are the sectors with the highest potential for the integration of migrants in the city (EC 2008a).

Amsterdam, the European capital of tolerance, has been one of the best examples, since its golden age, of openness and willingness to accept and integrate foreigners considered to be a source of prosperity and progress for the city. Political emigrants, workers, and intellectuals of every race and belief have always lived side by side with the local population. Plurality, a key element in European civilization, has played an important role in the development of the city and the formation of its grassroots.

A politically sensitive issue, migration requires public authorities to clear up stereotypes and misunderstandings. Cities can play a role in changing the perception of migrants both in the societies of origin and destination and forge solidarity bonds among world communities. Social services and innovative projects involving young emigrants can have a great deal of impact. Interfaith cultural centers and events in many disadvantaged suburbs help minorities coexist harmoniously. The organization of exceptional events, such as interreligious open days, can stimulate dialogue among populations that do not usually communicate among themselves.

Lyon *intra muros*, promoted as a city of confluences, is an example of a city that has always been a welcome land for migrants from Mediterranean, Asian, European, and African countries. The “small Lyon” has its migrant neighborhoods, nine official districts, comprising vast housing areas on the western outskirts of the city and a fascinating inner quarter, the *Guillotière*, a lively, colorful, cosmopolitan neighborhood known as the gate of the city where newcomers traditionally arrive. Lyon was also the first city to sign in 2005 the Diversity Charter with 35 companies in the region, to promote active nondiscrimination in the professional world.

The knowledge-based green economy can create jobs for migrants and the disadvantaged. Dublin offers an interesting example of a city that did not know the sense

of immigration until the early 1990s. The phenomenon of the Celtic tiger, with a rapidly growing economy over the period 1995–2005, not only created jobs for the unemployed, but attracted many migrant workers in a country much more familiar with emigration. Once the Celtic tiger expired, many immigrants, mainly from Eastern Europe, chose to remain and form 10 % of the population of Dublin. And although the economic decline had slowed or even prevented new migration, the city could count on a more diverse and qualified labor force for the green economy.

If cities wish to attract talent in a competitive world, they should create a "welcoming culture," based on tolerance and understanding, solidarity, and equal opportunities. Cities play an essential role in the integration of newcomers. The settlement and integration of newcomers is a fundamentally local experience and the quality of the welcome has a huge influence on their future success and ultimately on the prosperity of the cities. With the support of the Maytree Foundation, cities started exchanging their experiences in welcoming migrants and contributed to over 100 good ideas in integration about cities that have been enriched by the energy and opportunity of immigration flows. Each good idea includes success steps, resources, and data to help practitioners and policy makers (Fundación Bertelsmann and Cities of Migration 2012).

Socioeconomic integration can start with music or dance, video, or soccer. The universal languages of art or sports can forge bonds among populations divided by mother tongue and tradition and help the integration of young migrants or refugees while fostering a sense of connection and belonging. Like music, sports have the power to overcome cultural and ethnic differences, and to rally a community. In Auckland, soccer has been used as a strategic tool to reduce the social isolation of young refugees and to help them feel a sense of a bond, both with each other and the wider community. The Refugees in Sport Initiative was started in 2006 by Refugees as Survivors, a nonprofit refugee mental health agency in order to enable refugee youth to achieve better access into mainstream sports and a safe place to meet with others sharing and understanding their experience. The program has also expanded to offer other sports such as cricket and martial arts and to encourage girls from refugee backgrounds also to participate in both team and individual sports.

TODOS is an annual festival hosted since 2009 by the city of Lisbon, designed to promote cultural diversity and social cohesion, and build links with the local immigrant community. The event is focused on the Mouraria-Martim Moniz neighborhood, home to immigrants mainly from Bangladesh, Brazil, China, India, and Pakistan. The area has a reputation for crime, prostitution, and drugs. Through the TODOS festival, Lisbon invites all citizens to explore the neighborhood, meet the locals, and experience their lifestyles and cultures. The success of the festival depends on the participation of the immigrants, hosting and participating in events and classes designed to highlight their cultural heritages. Participants are also invited to visit local businesses and shops and see people in their daily activities. Portuguese artists work with the immigrant community, the homeless, schoolchildren, and youths to create theatrical happenings and exhibitions (Fundación Bertelsmann and Cities of Migration 2012).

6.4 From "Cloned Cities" to Safe, Healthy, and Fulfilling Urban Spaces

The sustainable city cannot exist without a human face and the sense of community. Solidarity constitutes the ultimate ethos of the social architecture of any city that does not accept being a fragmented web of cloned spaces, without a particular identity or character. Dysfunctional "noncities" suffer from various forms of urban distress. Impacts are both invisible and visible. Environmental degradation, physical isolation, obsolete housing infrastructure, and neglect of public spaces go hand in hand with poor education, unemployment, weak health, and violence. Social innovations responding to social needs, addressing social challenges and improving social conditions are crucial for creating fulfilling neighborhoods.

The choice and promise neighborhoods in the United States can inspire (Obama 2009). People living in communities infected by poverty have a greater risk of being excluded. Policy interest in comprehensive community initiatives has surged with two federal comprehensive place-based programs, the Department of Education's Promise Neighborhoods, modeled on the acclaimed Harlem Children's Zone and the Department of Housing and Urban Development's Choice Neighborhoods program. They both intend to address vital local needs with the active participation of the targeted population.

Promise neighborhoods tried to foster a culture that creates a cradle-through-college-to-career continuum and promotes multiple positive effects across sectors. Neighborhood students have to be safe, healthy, and successful, and improve their life prospects through coordinated community efforts. Choice neighborhoods focus on communities dependent on social housing to be transformed into communities of opportunity with good-quality affordable housing and high-performing schools and services. Both programs intend to become self-sufficient and continue after the end of federal funding. The contextual dynamics of the local communities are crucial in shaping the transformation effort. Credible evaluations have to assess the overall benefits of the communities in addition to those directly participating in the programs (Urban Institute 2011).

Choice Neighborhoods includes an unprecedented focus on access to quality educational opportunities. The US Departments of Housing and Urban Development and of Education worked together to develop the program, requiring Choice applicants to have an education strategy that "expands access to high-quality early learning schools, and education that will improve key outcomes for children and youth in the neighborhoods." Many cities can get inspiration from various elements of the program to ascend the learning and performance curve.

The Chicago Choice proposal included plans to cooperate with the University of Chicago, which is making a number of major investments in the neighborhood including opening the doors of its high performing Laboratory High School to neighborhood residents. The plan also invests in the Woodlawn Children's Promise Community, a project for turning around poor performing schools and enriching children's academic experience.

The Choice Neighborhoods' planning grant application included a set-aside for organizations receiving a Promise Neighborhoods planning grant, and the 2011 Promise Neighborhoods' planning and implementation competitions include a competitive preference for neighborhoods that were the subject of an affordable housing transformation funded by Choice Neighborhoods. Additionally, the two programs share consistent requirements and outcome metrics.

Aligned Choice and Promise Neighborhoods investments are exemplified in Boston and Atlanta. In Boston's Choice implementation site, the housing redevelopment strategy is a key element of the city's Circle of Promise Initiative, a comprehensive integration plan to transform public education. Similarly, Boston Public Schools focus on improving instruction in schools within the Choice footprint through interventions such as extended learning, improved data integration, and community engagement. The Dudley Street Neighborhood Initiative received a Promise Neighborhoods planning grant for part of the same neighborhood and is expected to leverage the Choice funding to bring partners such as ReadBoston, and the City of Boston together to better coordinate student-focused literacy, health, and violence-prevention programs.

In Atlanta, organizations received both Choice and Promise Neighborhoods planning grants to focus on the same neighborhoods. The City of Atlanta's Choice planning grant helps revitalize its University Homes public housing development, and its Promise grant harnessing the talents of Atlanta's historically black colleges and universities aims at providing educational opportunities to children living in the University Center neighborhood.

Public well-being and security are also major challenges for governments, cities, and regions. Improving security through biological research becomes possible because a genome provides a definitive signature for an organism and can be used to distinguish an organism from all others. The US Department of Homeland is developing a genomics-based approach to microbial forensic analysis to allow identification and characterization of any microbial organism, including "unknown" organisms such as emerging, chimeric, or synthetic organisms. This involves development and refinement of several intersecting technologies, including bioinformatic analysis, the study of metagenomics, and comparative genomics.

Urban environments can play a decisive role in combating chronic disease development. Being overweight and obesity are strongly linked to diseases such as diabetes mellitus, hypertension, and some types of cancer. Since the late 1980s, many countries and cities have reported a growing epidemic of obesity. Studies in India and China and other developing countries around the world have also illustrated that obesity, diabetes, and hypertension seem to increase in tandem with rapid urbanization and pointed to "obesogenic" predominantly urban environments, as a risk factor. In fact, cities often focus on convenience and minimal-effort physical activity. The dense urban transport network, the handy services, and the absence of adequate recreational spaces, parks, and athletic facilities do not invite exercise and a healthy life (Institute of Medicine 2012).

Cities could play a major role in addressing the overweight and obesity epidemic that becomes a public health issue of monumental importance, both because of the

huge number of people it affects and the possible multiple ripple effects on the development of serious and chronic diseases. Obesity is a major contributor to health care costs in the United States which may increasingly become unaffordable. Individuals, families, and communities have to be empowered to work for change and cities can support in many ways their efforts to achieve and maintain a healthy weight. If a community has no safe places to walk or play, lacks outlets offering affordable healthy food, and is bombarded by advertisements for unhealthy foods and beverages, citizens have fewer propensities to engage in physical activity and adopt eating behaviors to achieve and maintain a healthy weight (Institute of Medicine 2012).

To make physical activity an integral part of everyday life, cities should make it a priority by substantially increasing access to places and opportunities for such activity. They could also make creative partnerships with the private sector and local businesses to create healthy food and beverage environments that ensure that healthy options are the routine easy choice. Cities could develop and support a sustained, targeted physical activity and nutrition social marketing program. And finally, they should partner with schools in which so many health and environmental projects begin. Pupils are perfect entry points to approach families but also teachers. Schools could be perfect focal points for obesity prevention, ensuring that all students have adequate opportunities to engage in physical activity and access to nutrition literacy, including skill development, and healthier food and beverage options at affordable competitive prices.

The Cork Environmental Forum worked with Green Schools and the SMILE program to improve schoolchildren's mobility and lifestyle patterns. Over the last 20 years car ownership in Ireland has grown hugely, resulting in children being driven to school. This dependence on the private car has resulted in traffic chaos outside school gates at morning and afternoon peaks, safety problems, and overweight or even obese children. The Cork city council decided to reverse these trends and promote alternative mobility modes that are healthier and more environmentally friendly. After the analysis of census data on travel modes, the city identified six schools, primary and secondary, with a potential for increased commuting in the forms of walking and cycling. Through collaboration with key stakeholders, especially children, parents, and teachers, school travel plans were designed to promote more sustainable transport to school. The measures included the development of walking, buses, the promotion of park-and-stride and installation and/or upgrading of infrastructure, such as pedestrian crossings, pavement improvements, bicycle racks at schools, disabled access, and speed control zones.

Public health is not merely the absence of epidemics or disease, but it is a state of complete public physical, mental, and social well-being. A healthy city is a committed city, promoting public health high on its political agenda. The European Healthy Cities movement includes cities that have developed and implemented a wide range of policies, including health profiles and city health plans and strategies through community initiatives and programs that address the needs of vulnerable groups, environmental health, cultural lifestyles, and Agenda 21.

Openness of global cities to movement of people may make them more fragile to the spread of infectious diseases. Singapore suffered from the two major epidemics of recent years, the severe acute respiratory syndrome (SARS) and the H1N1 virus (swine flu), both imported. Three months following its identification in Mexico in April 2009, the 2009 H1N1 influenza virus became a global pandemic affecting practically every country. In Singapore, researchers tracked the transmission of the virus by looking for antibodies, a type of immune response to infection. They found a rate of infection in the general population of 13 %, and identified public transport as a risk environment.

The Zagreb Declaration expresses the strong commitment of political leaders of cities to bolster and champion action on health, health equity, sustainable development, and social justice. It celebrates and builds on 20 years of knowledge, experience, and public health accomplishments of the European Healthy Cities movement. It reconfirms values and priorities and identifies new challenges and approaches for cities to address and adopt as they work to protect and enhance the health and well-being of all their citizens. The Healthy Cities network, initiated and supported by the World Health Organization (WHO), is already in its fifth 4-year phase (2009–2013) and promotes government policies at all levels supporting and benefiting from urban public health (WHO 2009).

Urban safety is a critical dimension of well-being in cities. Cities, democracy, and safety, together with the future of prevention are the main foci of work of the European Forum of Urban Safety. The "Cities' Manifesto for Safety and Democracy", adopted in Naples in 2000 by 250 cities, expressed the desideratum for quality cities, defined as safe vital places of harmonious development and immune to insecurity and fearfulness, violence, and fanaticism. Recurrent issues include violence against vulnerable social groups and sensitive places such as schools and streets. The exchange of experience and cooperation are judged essential for guaranteeing the legitimate right to safety (EFUS 2003, 2006).

In Boston, property and violent crime declined over the first decade of the millennium, extending a steady drop since the last peak in 2001. However, citywide averages obscure a sharp increase in youth violence and homicides in geographic hotspots for which new policing practices and a 5-year public–private initiative have launched the "StreetSafe" Boston, a partnership targeting youth and particularly gang-related violence, even in the face of tightening budgets (Boston Foundation 2011).

Art for all in the street has often been used as a weapon. Graffiti attacks have been a postmodern way of addressing public spaces and private property. An innovative integrated approach, developed in Maastricht, included enhanced means to identify the offenders, education programs to improve their potential skills, and an antigraffiti bus with formerly unemployed people specialized in removing graffiti. The city made a wall available to all citizens wishing to express themselves through the art of graffiti. The project proved very successful and led to the dramatic decrease of the graffiti in Maastricht. It also had a noticeable effect on preventing recidivism. Moreover, former offenders trained in graffiti techniques have become creative artists.

The well-being of children is a litmus test for future urban societies. Each local place can make a difference. In OECD countries, concern for children's well-being

has shifted away from communicable diseases to issues of broader well-being, abilities, and experiences to lead a successful and happy life. Children’s use of space and time has changed in the last few decades. Inhabiting a shrinking space, spending more time indoors, a feature also favored by the increasing availability of home entertainment, can have a high impact on future lives. The quality of the home environment and surrounding outdoor space is therefore of vital importance to children’s well-being (OECD 2009b).

Housing quality is important to children’s socioemotional and mental health, cognitive development, and respiratory health. Residential noise levels from street or air traffic seem to be particularly problematic for children’s physical and mental health. Children with attention deficit disorders seem to function better after activities in green playground areas. Other examples show that children living in high-rise blocks are more likely to suffer mental health problems than their counterparts in dense row housing. Context and culture are, however, very important inasmuch as high-rise living is the norm in many countries and there are very different expectations in terms of perceived and desired urban density.

Good neighborhood design could support children-friendly communities. Proximity and accessibility of green open spaces to residential areas is linked to increased overall levels of physical activity across age groups. Urban parks provide many opportunities for children and youths to play, exercise, explore nature, and interact with different people. Walking and cycling activity could be supported by built-environment attributes such as frequency of sidewalks, pedestrian crossings, and cycle tracks and the quality of recreation facilities. Safety and urban mix are also important factors in encouraging children’s physical activity.

Governments should be more proactive in providing and shaping the built environment to promote children’s well-being. Greenery is beneficial, whether experienced in the immediate residential environment, or even viewed through windows. Children’s contact with greenery and trees in the built environment seems to be linked to a range of physical, mental, developmental, and emotional benefits, including reduced aggression, alleviation of stress, stimulation of creative play, and social interactions.

Watercolour 7
New York, New York

Chapter 7
Cities of Education, Science and Innovation, Culture and the Arts

Abstract Cities are places of interactions and exchanges where people can greatly benefit from the experience of others to learn, interact and innovate. Their identity is defined by heritage and traditions, culture, science, and the arts. They also constitute forums of intercultural dialogue, places where patterns and lifestyles are collectively shaped before they are disseminated to the wider world. A sustainable city has to cultivate the seeds of freedom and offer a space to all for expressing their creativity and enhancing their abilities.

This chapter examines the role of intellectual and cultural resources as key assets for urban sustainability and presents a spectrum of inspiring actions to reinforce urban identity and make citizens proud of the places in which they live. Knowledge cities invest in education, and partnerships with universities and businesses provide valuable models for targeting investments towards world cities of excellence.

Cities are living heritages and legacies in which citizens project their hopes and desires for a better future. The urban cultural heritage is as important for humanity as exceptional rural natural sites. Arts in the city represent the ultimate expression of collective intelligence, imagination, and ingenuity. Many innovative actions focus on the cultural enhancement of urban spaces and the artistic creation that transforms everyday environments into unique experiences.

7.1 Cities of Knowledge and Ideas

Anthropologists, archaeologists, historians, geographers, and city planners have long argued that cities are propellers of knowledge and innovation. Cities host most of the world's top universities and the vast majority of its scientists. Most research activities are concentrated around major metropolitan areas. The Silicon Valley and European high-tech hubs such as Cambridge, Baden-Württemberg, and Catalonia demonstrate that places play a key catalytic role. They form the spatial horizon bringing together innovation actors to produce higher value. Knowledge-based

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growth poles, innovation clusters, science parks, and cities attract academic and research institutions, innovative enterprises and business incubators, local organizations, and support agencies that cooperate and mutually reinforce regional creativity through strong synergetic links.

The attractiveness of a city for researchers has already been investigated by some scientists. The factor most often quoted is the freedom of cities, inviting everybody to express ideas. The access to infrastructure and instruments is another factor related to the proximity of very diverse resources and facilities. Public funding is essential for work in science and innovation, but local private corporations and philanthropists endowing research chairs or specific grants can also play a great role. The third factor is the urban cultural lifestyle, offering the possibilities for very diverse experiences. R. Florida lists scientists among the "creative class" of mobile and talented thinkers that a city must attract (Florida 2005).

The number of scientists and researchers is by no means indicative of the economic robustness of a city or region. New Mexico probably has the highest number of physicists per capita in the United States, thanks to the Los Alamos and Sandia national laboratories, but the research done within its borders does not lead to market products and commercial processes. On the other hand, Boston and San Francisco have a strong science foundation that has attracted companies and institutes, which in turn have created wealth and attracted more top scientists.

Innovation and the generation of wealth from science and technology seem related to some necessary but insufficient urban conditions. Size does matter for synergetic effects. It seems that new patents are granted disproportionately to larger urban centers. Great metropolises such as London, Tokyo, and New York are bound to be science strongholds, even though their economic strength comes from other areas, such as financial assets. Many hold that, for applied research at least, being part of the urban mosaic benefits from the education–research–innovation interactions.

For cities seeking wealth through science, the anchoring presence of a large private research and development laboratory can bring huge benefits. The Dutch electronics corporation Philips in Eindhoven, with a population of 200,000, is an example of a private company working with a local university. However, all mono-economies risk collapse once the main driver falls.

Some cities pursue an active innovation policy. In 2007, Berlin bundled forces with the surrounding Brandenburg region and jointly searched the future of excellence. The most promising identified fields included biotechnologies and medical technologies, energy and transport system technologies, ICT and new media, and optical technologies. These are underpinned by four cross-sector priorities including new materials, production and automation technology, clean-tech, and security. Innovation support measures concentrate on strengthening private sector research and knowledge transfer, especially for small and medium-sized enterprises.

Cities often host and even develop the incubators for a sustainable future. The Rotterdam innovation dock is a good example of transformation of a former naval industry infrastructure into a campus for educational activities, innovation businesses, and research institutes. Founded in 1902, the Rotterdam Dry Dock Company

was once a booming shipyard, one of the largest in Europe. It closed down in 1983 affecting also the nearby garden village built for the employees. In 2007, the city of Rotterdam and the port authority decided to give the places a new life. Building on the ideas of the Rotterdam Climate Initiative, bringing together all stakeholders to achieve radical reduction in CO_2 emissions, the area was redeveloped into a low-carbon location and breeding-place for creative and innovative businesses. Educational institutions and companies work together on sustainable solutions in the areas of building, mobility, and energy.

In Japan, Tsukuba Science City represents one of the world's most ambitious efforts to upgrade the quality of scientific discovery. The city was designed freely inspired by other planned cities, including Brasilia. The city center, the University of Tsukuba and 46 public basic scientific research laboratories began being created in the 1970s and the city became fully operational in the 1980s. By the year 2000, the city's two universities and 60 national research institutes had been grouped into functional zones supporting higher education and training, physical science and engineering research, biological and agricultural research, and public facilities. The city has an international flair, with thousands of foreign students and researchers of as many as 90 nationalities. Tsukuba held the world Expo 1985, which was commemorated by a full-scale rocket in the city park also hosting the 85-m Techno cosmos.

Over the past several decades, nearly half of Japan's public research and development budget has been spent in Tsukuba. Important scientific breakthroughs by its researchers include the identification and specification of the molecular structure of superconducting materials, the development of organic optical films that alter their electrical conductivity in response to changing light, and the creation of extreme high-pressure vacuum chambers. Tsukuba has become one of the world's key sites for government–industry collaborations in fundamental research. Public–private partnerships have promoted very diverse fields from earthquake safety, and environment to microbiology and plant genetics.

The UK Science Cities, Newcastle, York, Bristol, Birmingham, Manchester, and Nottingham, have been designated to transform the best of British ideas and concepts into new products and services. Developing science cities requires a range of policies to address the specific needs of research and innovation, support university–business collaboration, and influence a wider spectrum of factors that contribute to the growth of knowledge-intensive industries, such as skills, finance, and infrastructure. By bringing these components together in a concentrated space, science cities can attract a critical mass of innovative businesses and become drivers of regional growth.

Science City Manchester, led by Manchester Knowledge Capital, a partnership bringing together expertise and resources from the public, private, academic, and health professional sectors, is founded on urban strengths and policies, including the city's sheer scale, its creative cooperative approach, and its focus on inclusion and social benefit. With 800 knowledge-based businesses in the city center alone, employing more people than the entire UK biotech sector, Manchester is building the success of its science city on strong foundations.

Urban communities have been active in the early schemes of the European Institute of Technology established in 2008 to embody the knowledge triangle and

attract the best of education, research, and innovation. In the framework of the Climate Knowledge and Innovation Community, EURBANLAB connects urban living labs and their stakeholders in Paris, London, Rotterdam, Utrecht, and Valencia and enables them to share, learn, and transfer ideas and experiences. The initiative aims at increasing the innovative capacity of the involved stakeholders towards the transition to low-carbon resilient cities. By linking experiments with capabilities for innovation on a European scale, the project supports this transition through the generation of new business models and value chains serving the needs of local populations.

The PIONEER Cities Initiative of the same Knowledge and Innovation Community focuses on the systemic transformation of cities through new place-based business models. The mission of the Knowledge and Innovation Community is to accelerate and stimulate the innovation required for this transformation, through new technologies, policies, businesses, and jobs. A strong community of world-class private companies, public institutions, researchers, students, and an ever-increasing alumni group of climate change entrepreneurs and change agents work together on European innovation for the global climate change market.

In the United States, the Boston area and Silicon Valley constitute exceptional places for the development of triple helix models, university–industry–government, conceptualized as cycles of knowledge, consensus, and innovation. The Silicon Valley ecosystem evolved into a planetary system with strong gravitational fields, pulling promising start-ups and niche organizations, planets, and satellites. The shadow of the Silicon Valley sun is long enough to stretch all the way across the continent, to the other leading high-tech region in Boston.

Boston's scientific distinction is the latest in a series of economic revivals, from being the largest city in early colonial America, to a center for global shipping and sailing in the nineteenth century, to its current position as a biotech and innovation hub. Similar tales of success for the San Francisco area relate to its attractive climate, culture of risky investment, and a context that favors creativity.

Harvard and the Massachusetts Institute of Technology, traditionally ranked as the first world universities, are the key resources in the Boston area, along with other universities that have developed specific technological expertise, such as Boston University in photonics. The Harvard innovation lab tries to foster team-based and entrepreneurial activities and deepens interaction among Harvard students, faculty, entrepreneurs, and members of the Greater Boston community. The Harvard ecosystem brought a stream of innovations, including the heart pacemaker, surgical anesthesia, Facebook, and even breathable chocolate. MIT is a leading institution for technology business creation.

Physical links matter. The construction of the Øresund Bridge connecting Copenhagen, Denmark, with Malmö, Sweden, in 2000, brought multiple benefits to both sides. Sweden got a physical connection to the rest of mainland Europe, socio-economic and cultural cooperation increased, and scientific synergies have also been forged. The bridge encouraged the establishment of the Øresund region, a loose confederation of nine universities, with 165,000 students and 12,000 researchers. Coauthorship between Copenhagen and the southernmost province of Sweden has more than doubled in 10 years.

The bridge also inspired the start of a research project to catalogue the growth and connections of geographical clusters of scientific productivity all over the world. A Danish research team ranked cities according to volumes of publications by authors living in urban conglomerations in a time distance of 40-min commute from a city center (Matthiessen et al. 2010).

A similar ranking has been proposed from an analysis provided for *Nature* by the publisher Elsevier, which maintains the Scopus database of journals using the simple method of assigning cities from the authors' addresses. Both analyses suggest that urban scientific production is growing, in particular in Tehran, Istanbul, Seoul, Singapore, and São Paulo. Beijing marked a significant increase, from 0.76 % of the global output in 1996 to 2.74 % in 2008.

Elsevier also tried to capture the quality of research being published by analysing the citations that publications from the various cities attract. Boston and Cambridge, MA, come out on top, attracting more than twice as many citations per paper as the global average. United States cities dominate the quality table, with only Cambridge, UK, breaking into the top 10. Cities with the most improved relative quality in the past decade include Austin, Texas and Singapore. Beijing's papers in the 5-year period ending in 2008 attracted 63 % of the global average-citation rate.

Science cities incorporate science in all their functions and promote public engagement in science not least in a festive way. In 2003 Genoa initiated a science festival to raise awareness of the role of science for a better world. Making science accessible to all citizens is the essence of the festival inviting all and everyone to the world of science, full of excitement and wonder. Educational and art exhibitions, visits to laboratories of the future, conferences and round tables and multimedia activities are organized to provide an enjoyable experience.

The second edition, in the framework of "Genoa: European Capital of Culture 2004" included initiatives specifically addressing schools. Besides taking part in hands-on exhibitions and workshops, schools had the opportunity to present their projects, adopt an exhibition or a lecture, and train their teachers. Each subsequent edition brought a unique contribution in extolling diversity, inciting discovery, and opening a wider window into the science world.

7.2 Open, Industrial, Social, and Public Innovations in Cities

Great progress in a specific sociospatial and temporal context requires the art and science of innovative interventions. Innovation involves a dramatic and thorough change that forces conventional frontiers and opens up the spectrum of possibilities. It also involves a catalytic architecture that allows a new concept or idea, product or service, process or order, to bring about the desired transformation. Invention is often identified with the research and development phase, whereas innovation is the process including all the politics of its implementation and all reiterations until the final transformation. The articulation of all phases needs foresight and strategic planning. Progress in technology opens up new horizons, and hypermedia create a

new global social fabric. In an increasingly digital world, innovations involve all scales of coalitions and transformations (EFILWC 1997d).

Innovation should be distinguished from pure evolutionary change and adaptive responses to new technologies, within the established rules and procedures. Innovation comprises a policy response, among various options, to the opportunities offered by invention, research, and technology. It implies a radical shift and the creation of something new at the expense of something conventional, discards old assumptions, and looks for new alliances. Its main sources are chance, necessity, and choice. Innovations originate from scarcity, accident, defense, crisis, creative conflict, and strategy. Many world innovations have come out of military defense projects. The Internet, described by J. Attali as the seventh continent, is one of them.

Cities can test, adapt, and integrate all kinds of innovation, including product, process, and service innovations and social, public, and open innovations. Urban innovation implies significant change in a city's functions and accomplishments. Innovators suggest that, the more complex and diverse an organization, the greater the number of innovations that are proposed, but the fewer the number of adopted innovations. The most challenging but potentially most effective innovation is not to create something new, but to halt an established practice. Finally, any innovation creates the conditions for its demise.

Cities are palettes of possibilities, untapped reservoirs of ideas, enthusiasm, commitment, and labor. The seeds of their growth lie within them. Cities do not grow as an enlargement of what is essentially already there, but by processes of gradual diversification and differentiation. "Adding new work to older work proceeds vigorously and creates possibilities for change" (Jacobs 1969). Cities, as very complex systems, are, by definition, organizations where many new ideas, concepts, and products are created, but where the difficulties of implementation also abound.

Innovation can be a highly political process and governments have a broad range of ways to influence this. Directly, they can promote innovation by supporting research activities and by adopting new ideas, products, and services. Even in decreasing budget environments, governments can influence innovation indirectly, through demand stimuli. Public procurement is a prime instrument to promote innovation. Each innovation constitutes a dynamic, which can be very powerful and open new creative trajectories.

The sustainability challenge is to manage change for the best and ensure an overall beneficial outcome for present and future generations (BURA 1997). Cities must harness the power of ICT to explore their "truly endless frontiers" and optimize their condensed knowledge and information. Discrimination is a major prohibitive factor. Very often, established administrative and financial structures nullify the possibility of innovations to extend the limits of the possible. Redressing the imbalances and addressing the inflexibility of structures represents a vast field for innovation and change.

Innovation might also be the result of a struggle for survival. Crises force people to take a hard look at reality and generate myriad new ideas to contribute to environmental and socioeconomic development simultaneously (ACE 2013). Complex problems that inhibit innovation often create a sharper need for it. This was one of

the conclusions by the global Urban Ingenuity Awards launched by the *Financial Times* and Citi in 2012, to recognize individuals or organizations with an outstanding contribution in addressing urban challenges. Endeavors were particularly recognized in four priority domains: energy, infrastructure, education, and health care.

A Kenyan Foundation was the overall 2012 winner with the "community cooker" project. It is an industrial-scale oven safely incinerating household waste while channeling the energy it produces to cooking, heating, and boiling water, helping cut reliance on traditional fuel sources such as wood and charcoal. The cooker is the central element of a communal meeting point in a slum of 54,000 people in a country that has long been blighted by ethnic tensions. In the midst of Kenya's most important flower-growing region, human ingenuity created resources out of rubbish and a social space to help flower farm workers to interact happily while cooking.

Innovations for the conversion of waterfront areas for activities of the future were prompted by previous waves of world crises. City-center harbors have disappeared, leaving behind the husk of an infrastructure in need of a new life. Disused dock buildings were offered a new life when turned into exhibition halls, shops, craft workshops, and centers for cultural activities. Changes in the built fabric transform the social fabric, as areas facing dramatic unemployment levels are creating many new jobs, directly in construction and indirectly through the attraction of businesses. Careful planning with citizen consultation can ensure that waterfront developments are not reserved for luxurious office and leisure areas but become organic parts of "normal" cities. Innovation combined with respect for past structures can result in emblematic buildings that are both beautiful and functional (EFILWC 1997a, b).

Many awards celebrate the role of cities as crucibles of ingenuity and invention. From cradle to career and adult life, and from structures to the soul of a city, the human and the built environment bear witness of many outstanding examples of excellence. Bright urban ideas are usually brought forward by individuals who try to extend the breadth of alternative futures. The Metropolis 2012 Guangzhou International Award for Urban Innovation recognized deserving initiatives enhancing sustainable urban development through inspiration and knowledge-sharing and rewarded innovations in improving social, economic, and environmental sustainability in cities and local governments worldwide. Exemplary models of innovative policies and practices can motivate cities and local authorities to emulate and further promote innovation and improve urban governance.

It is important to highlight the crucial role of stakeholder coalitions, the catalysts that make each step of the transformational process possible. They are of political, strategic, and tactical importance. They are significant because they contribute to the redirection of the flow of power, open urban chains to highly creative approaches, and change the city's political culture. They are strategic tools that help formulate a common vision, and tactical instruments, translating the innovative concepts into concrete actions.

Models of coalitions that place people at the center of a genuine, far-reaching development strategy seem to have an unparalleled potential to lead to what J.K. Galbraith calls a "good society" (1996), a society offering a fulfilling life to everybody. Charismatic leaders, scientists, or simply local citizens and workers are all

potential bearers, initiators, or adapters of innovations. A shared problem or perspective often prepares the common ground for the coalition.

The architecture of coalitions is very diverse and challenges general rules. Flexible but strong alliances are often needed to create the space and the conditions for the future. Alliances based on agreement, mediation, political maneuvering, and negotiation can best direct the wave of the future. Agreement is much more important than arbitration. Consensus and persistent commitment are a necessary front for long-gestation projects.

Innovations may bring impressive leaps out of value-creating activities, in a continuous flow to improve quality. They may also lead to a point of no return and affect the cultural equilibrium of a city. They may permanently change a city's sense of what is possible in the relevant timeframe. A strategy of moderation and cooperation is needed. Adaptation may be difficult. Citizen participation can act as a net, in communicating vision, in sharing the costs and fruits of change, and in ensuring that innovations respect traditions and social values. Business participation can act as a net to ensure that costs are kept to a minimum.

P. Hall suggests that "Innovative cities at their zenith (Athens, Florence, London, Weimar, Berlin) were cities in transition, out of the beaten track, into new and still unknown modes of organization" (ACDHRD 1995). Conventional urban administrations resist innovation. They are largely created to replace the uncertain and haphazard activities of voluntary, ad hoc endeavors with the standardization and stability of organized operating procedures and relationships. A broad citizen consensus is needed to overcome these obstacles and adopt new ways of thinking and acting. Sometimes, the most innovative element is the common front to the future established by various stakeholders with conflicting agendas.

Flagship renewal projects offer ample ground for innovations, including in the areas of planning and financing. Exploring all potential options and solutions is essential to the completion of such projects. Ensuring mixed financing from various public bodies and attracting the necessary private funds is crucial. In Germany, the IBA Emscher Park has been an important pole for urban development and ecological renewal within the northern Rühr district. The preservation and enhancement of industrial monuments, the landscaping of the Emscher area into a park, the ecological restructuring of the Emscher River, and the protection of the water environment led to the radical improvement of the local environment. New dwellings have been created on fallow land with new environment-friendly materials. High-quality locations for industry and services are under constant assessment. Contaminated areas are insulated and reused. "Working in the park" is possible through the enhancement of the quality and attractiveness of the area (EFILWC 1997a).

Innovation involves looking with new eyes, or in new ways. In Kemi, Finland, snow has been seen as a "new" resource leading to creativity and employment in one of the world's first and greatest snow castles. Important elements, which many traditional employment schemes had not considered, are the removal of disincentives to education, training, enterprise, quality, and the overall improvement of the quality of life for the long-term unemployed. Many schemes looked for new local response to long-term unemployment, guidance, training, and job creation. They include the regeneration of the economic web of the city through new professions, qualification

and requalification of the labor force, adaptation to demand, and prevention of social exclusion.

Each successful initiative is probably the result of various purposeful trials and constructive errors and a step on the innovation ladder. A city supporting and fulfilling innovations must also be willing to adjust or stop initiatives that are not on a trajectory likely to lead to positive outcomes. Sometimes, the purposeful and knowledgeable use of capital is impossible unless small investments have first seeded a multitude of new departures. The success of each innovation is an expression of the creativity invested in the chain of experiments (Jacobs 1969).

Place-based and human-centered innovations can be powerful and completely transform the status of a city. Efficient but noncreative use of capital or technology in cities can lead to the systematic imitation of innovations that are produced elsewhere, a chronic importing of ingenious solutions. Risk-taking and trial are limited in the search for the optimal and most efficient conditions for transplanting innovations. Continuous imitation kills the productive seeds and weakens the creative capacity of cities. No rapid mobilization of innovation can take place if there is no permanent environment for the peaceful incubation of genuinely new ideas and unproven goods and services.

In 2012, Portland, Oregon, joined the metropolitan areas stepping up to help achieve the Obama administration's goal of doubling exports. Portland is one of the nation's leading green economies, with an export sector that accounts for 18 % of the area's economic output, third among the 100 largest US metropolises. In 2011, the mayor and the Portland Development Commission, in partnership with regional business, economic development, and university leaders, conducted an analysis to better understand the region's economic strengths, global position, and opportunities for growth. The assessment revealed a strong computer and electronics sector, which accounts for more than half of regional exports, and vibrant but underexporting sectors including clean-tech and software.

In light of these findings, Greater Portland Inc., a regional economic development organization, coordinates the implementation of an export plan aligned with regional economic development strategies. A diverse coalition of government, business, and nonprofit leaders worked together to create a full-fledged Greater Portland Export Initiative Business Plan with the goal of doubling regional exports. The creation of a "We Build Green Cities" brand is expected to leverage regional clean economy exports to a rapidly urbanizing world. The Brookings Institution included this initiative in the Innovations to Watch in 2013.

Social innovations often begin with an understanding that support to a disadvantaged community is to be offered on helping people help themselves. Recognizing, for example, the independence and capabilities of homeless people at an initial stage engenders a sense of trust, easing the delivery of support services and counseling. Already in the 1990s, the *Big Issue* magazine in London represented an effort that both increased community awareness of the plight of homelessness and offered a step towards its alleviation. A low initial capital investment rapidly led to a self-financed magazine, London's fastest-growing publication with a circulation of 80,000 copies per issue and 1,000 committed vendors.

7.3 Cities, Breathing Legacies and Catalysts of Culture

The cultural capital of cities must also be transmitted enhanced or at least intact to future generations. Cities have always been shaped by the ebb and flow of unique historical, socioeconomic, and cultural dynamics. Culture is neither knowledge nor erudition; it generates joy, excitement, and wonder. Citizens project their hopes and desires into the urban reality and marvel. Each city is a unique civilization involving places, links, facts, notions, perceptions, smells, music, colors, emotions, and symbols. It also has its subconscious, its interwoven bonds and conflicts, convergences and divergences, conquests and dreams, and myths and legends (Calvet 1994).

Cultural spaces have high existence and bequest values. Cultural heritage and artistic activities bear witness to the ways that citizens and communities have dreamed about and transformed the environment they live in and etched this into the landscape. Urban monuments play a role of catalyst as vectors of common memory and can generate new dynamics for participation and citizenship. Functional mix and diversification can promote the continuity of a city and its projection into the future, as a live city versus a museum city. Monuments and sites of local, national, and international importance, unique and universal, are all witnesses of human civilization. It is the responsibility of all citizens to ensure their preservation.

Heritage is priceless and irreplaceable. Urban biographies suffer from the absence of detailed historical inventories, intelligent and imaginative projects, and illuminating public debates. The living past of many cities is in danger as projects ignoring the collective culture are often being carried out. The resistance by citizens is often powerful and effective, especially in cities with a strong democratic tradition. Examples of rejection and preservation abound.

The urban economy is also nurtured by the culture that made the city a space of belonging, pride, and attraction. It is estimated that the cultural sector contributes more than 3 % to the EU GDP and provides employment to 5 % of workers. Culture is the driving force of tourism which contributes to 5.5 % of GDP in Europe. Moreover, European cities constitute the gates of the first world destination attracting 55 % of tourists in the world. High-quality cultural tourism can find in cities landscapes of choice for discerning visitors.

Sustainable cultural tourism tries to bridge physical and cultural resource conservation and tourism and improve the quality of leisure for individual and cultural fulfillment. Cultural parks and itineraries are two components of cultural tourism that involve public heritage spaces and merit particular attention for sustainability. Linked to green tourism issues, the design of cultural parks has to take into account all historical assets of an area, and their integration in the urban environment.

Monuments and sites are concrete signs of the biography of a city, the essence of its constancy over time, the print of public events, and private dramas. The Organization of the World Heritage Cities (OWHC) hosting monuments and sites belonging to UNESCO's World Heritage list, involves more than 230 cities committed to actively preserving their sites. More than half of them are located in Europe, where Italy alone hosts more than 5 % of the world's listed monuments. Governments

must preserve the characteristics and qualities that justified the inscription of a cultural site on the World Heritage list. The OWHC's "City2City" program aims at strengthening all types of exchanges and dialogues on preservation among its World Heritage Cities.

Even in less impressive cities, devoid of incomparable architecture and sites, exceptional events such as heritage nights or light festivals reveal unexpected jewels and invite citizens and children to rediscover urban environments with new eyes. Carnival seasons disrupt everyday routine, help discover the ignored assets of neighborhoods, and bring local imagination and life to an apogee.

A continent of culture and continent of cities, Europe is full of urban spaces that C. Levi-Strauss called "objects of nature and subjects of culture," "something dreamed and lived, real and imaginary," and F. Braudel called "greenhouses of civilization." Cities are the undisputed epicenters of cultural Europe. Every city being absolutely unique, the urban archipelago contains only prototypes.

The cultural understanding and enjoyment of urban places is critical for collective well-being. Promoting art and culture can be a purposeful means of participation. Bringing opera to new spaces and audiences has been an interesting project for Barcelona. The 1994 fire that destroyed the Opera house Liceu has been an opportunity for the physical, structural, and managerial remodeling of the Opera set up anew as a foundation. Five years later, it opened its doors as "People's Liceu" to welcome everybody.

A counterculture-friendly city, Berlin has always welcomed alternative cultural currents. Counting three operas with the cult of the "total art," more than 50 public and private theatres, 170 museums and collections, and many other international institutions, Berlin has established itself as a cultural capital. Between the banks of the River Spree, and those of its channel, the Museum Island, a World Heritage site, involving five major museums, is a visionary unique project. Other museums include Checkpoint Charlie, the former crossing point between East Berlin and West Berlin, a testament to human ingenuity to pass "on the other side of the wall."

The city can serve as the mirror in which diverse cultures observe each other, discover their convergences and divergences, interpenetrate, and fecundate. Cities, strongholds of civilization, solidly anchored in local traditions but open to the world, can promote multicultural cooperation and intercultural understanding. Civilization is not frozen immutable capital. It must be reinvented and enriched every day. Cultural routes can serve as lightning rods of urban beauty, with its asymmetry, its paradoxes, contradictions, and extraordinary power of suggestion. Each city is a world and has its place in the global community, as it becomes a geoideological reference and a source of wonder (Sansot 1973).

Public heritage areas often are exceptional cultural spaces, closely linked to the identity of a city. They have the potential to stimulate the collective memory. They can be places of sharing and not just places of passage. They belong, by definition, equally to all and must be accessible to all. R. Koolhaas describes them as fortresses of freedom. They offer great opportunities as islands in the archipelago of the city. Streets, parks, and public spaces should be the object of special attention as the nerve centers of the city.

The first European Urban Charter, adopted by the Congress of Local and Regional Authorities of the Council of Europe in 1992, highlighted the role of the street as a social arena. According to the charter, cities must be designed so that all citizens have access to all places and participate in urban management (Council of Europe 1992; Abbott 1996).

The European Urban Charter II "Manifesto for a New Urbanity", adopted in 2008, pleads for a new culture of urban life and encourages progress towards the sustainable city. The manifesto released a set of principles and concepts enabling cities and their inhabitants to address contemporary urban challenges. It invites local actors, in all their diversity and shared values, to implement public policies upholding the principles of ethical governance and sustainable development (Council of Europe 2008).

New cultural public spaces expand. The development of the High Line in New York is a remarkable example. Stretching from the Gansevoort Street to West 34th Street, it has been built on an old railway raised to 7.5 m above the ground, which was used to transport goods from 1934 to 1980. At the heart of the west side of Manhattan, the cultural passage of the High Line alludes to the industrial past of a city in eternal transformation. The walk is designed as an urban choreography by performance artists, suspended in space and time. It hosts 220 species of plants and is designed to become a catalyst for a new social life.

Developing the cultural distinctiveness of cities and towns and better experiences of the central streets could greatly support sustainable well-being. Work by the UK new economics foundation invited citizens to resist creeping homogenization and the spread of clone towns and instead reimagin the high street. A survey distinguished clone, border, and home towns and followed the evolution of the towns in status over time. Of the 18 London villages that were resurveyed since 2005, three towns moved from border to clone status, one improved from a border to a home town, and one from a clone to a border town. By 2009, the recession had caused a reported 17,880 retailers to shut up shop. The towns most dependent on the largest retail chains have proven to be most vulnerable to the economic crisis (new economics foundation 2010).

The UK "Reimagining Your High Street" program, based on the successful US "Main Streets" encourages local people to improve their High Street environments. Over the past 30 years, the Main Street movement has transformed communities' approach to the revitalization and management of their main commercial districts. High Streets are places of shared memory and destiny. Particularly alive during festive seasons, downtowns and neighborhood commercial districts offer the perfect canvas for local revitalization and community well-being (new economics foundation 2010).

Citizen imagination could transform High Streets into places of civic engagement. Shopping could be just one small part of a rich mix of activities including working, communicating, sharing, playing, and learning new skills or appreciating cultural events. Attractive public spaces can build the framework of social exchange and promote democracy. Instead, deteriorated public places, victims of neglect or standardization, easily become places of confrontation and exclusion that generate violence. Many cities invest in the creation of public spaces that combine aesthetics

and functionality, such as the development of quality urban beaches during the summer and fountains at bus stops. The development of public spaces has no other limits apart from the collective imagination.

Distinctiveness, identity, and a sense of place matter to people. The current crisis offers a huge opportunity to reimagine High Streets and public places and their socioeconomic revival. The injection of cultural infrastructures in distressed urban spaces can lead to the regeneration of an area. The Opera of Detroit, constructed in the most dangerous urban district, is a prime example of the efforts for regeneration of the city that was once among the fastest growing US cities, the headquarters of General Motors and Ford.

Venice, the most emblematic European city, offers the epitome of lessons. Centuries of human activities have shaped a unique yet fragile anthropogenic ecosystem. The degradation of the quality of the lagoon is mainly due to urban, industrial, and agricultural activities. The process of subsidence is under relative control, but the rise in sea level due to climate change could be very serious because it is estimated that in the absence of drastic measures a 30-cm rise in sea level would flood St Mark's Square some 360 times a year. Although Venice's geographic isolation protects it from cars, it cannot shield it from tourism. The exceptional character of Venice makes it an unbeatable destination but tourist pressure has crowded out both population and economic activities other than tourism. The lessons can be valuable for cities reflecting on the balances between their activities and their prospects for the future.

Unlimited architecture, an art and a science, has long been celebrated in Venice, which offers an unrivaled stage for the most important architectural world exhibition. The sublime architecture of the city, reflected in the lagoon, indicates the infinite possibilities of architecture, as the manifestation of collective values and the scene for daily life. One of the world's greatest patrimonies of architecture and urbanism reminds us that the built environment is a testament to the continuous evolution of human ingenuity and critical to the understanding of the surrounding world.

Nonbuilt spaces are the most promising for the circulation of energy throughout a city. "The vacuum is not empty of significance," proposed D. Perrault at the Architecture Biennale Venice 2010, exploring perception gaps as "the place where everything is possible." Every city has its empty, noble, or uncertain places that offer ideas and opportunities to recognize the importance of emptiness at the heart of processes, practices, and experiences.

The 2012 biennale focused on the "Common Ground" and explored inspirations and influences that shape architectural expression. It also brought attention to the many stakeholders and participants in the process and art of building cities. The discipline of architecture involves diverse and often contradictory concepts, but also common values and shared visions. These selective affinities create a basis for dialogue and debate that are worth celebrating, especially at a time of prolonged crisis (ACE 2013). Resonances among architects, city planners, and citizens, individual and civic life, could prepare the breeding ground for some new and better artistic expressions.

7.4 Cities as Theatres and Masterpieces of Art

Art is the aesthetic expression of individual, collective, and universal ethics, the ultimate expression of the creative intelligence (Jimenez 2002). It enriches and heightens human and social capital but also influences the manmade environment of cities. Each city should be enjoyed as a collective masterpiece of art (Olsen 1987).

Urban dynamics contributed to the genesis of many arts but have also been reinforced by arts. The invention of the ancient Greek theater has been interlinked with the emergence of the polis. In Greek cities, restored ancient theaters bear witness as diachronic places serving the same art, the drama composed of tragedy and comedy, for more than two millennia. Theater, called by Nietzsche "the supreme art", is probably a most perfect and living form of art, at the convergence of all means of expression. "Art among arts, celebration among celebrations," wrote V. Rotas, whereby stressing the fact, that in the open air, the theater takes its most festive dimensions, in communion and communication with the public.

The dawn of the art of theater in Greece has been a prominent urban and cultural innovation of all times. Initially consisting of a choral group, part of a rural festival in the honor of the god Dionysus, drama gained importance when it came to Athens. In the city, a first actor, Thespis, was introduced and started a dialogue with the chorus. Tragedy, comedy, and the satyr play were the three dramatic genres to emerge. The spark of innovation was the injection of the critical word in the lyrical songs. The chorus became the voice of the citizens, a strong expression of public opinion. Athens exported theater to its numerous colonies and allies in order to promote a common cultural identity. Athenian drama has had a significant and sustained impact on world culture as a majestic anatomy of all human passions.

The city is the permanent theater of all expressions of human creativity. Arts and culture can also be catalysts of urban regeneration. Efforts to revitalize urban areas often focus on the city center as a cultural hub or an arts district, dear to R. Florida's concept of making the urban core friendly to the creative class (Florida 2008). Events such as First Friday art walks and overnight museum experiences can create magnets of attraction.

Radical forms often challenge a city's status quo. In Amsterdam, an immense bathtub, which could also perfectly be a space vessel, has been placed in front of the modern art Stedelijk museum to mark its extension. It was reoriented to face the museum square, the public spaces shared with the Van Gogh museum, the Rijksmuseum, and the Concertgebouw. Cultural clusters can play a major role in culture and the agglomeration of cultural economics.

In Bilbao, the creation of the Guggenheim Museum was a catalyst for urban transformation, infused a new breath, and projected a dynamic image of a city on the world stage. It is a temple dedicated to modern art that gave to the city a sense of permanent wonder. The Guggenheim Museum Bilbao is a radically new architecture that challenged the museographic approaches and changed assumptions about art, architecture, and collections.

The titanium vessel designed by Frank Gehry was instantly hailed as a most significant accomplishment. Its structure undulates smoothly and captures every ray of sunshine. The museum revolves around a broad atrium bathed in light. It gave the city of Bilbao a new life and the dynamic and modern image of a city ready to grasp future opportunities. In 2007, the museum has celebrated more than a decade of extraordinary success, with over 100 exhibitions and more than 10 million visitors. It also created more than 4,500 direct and indirect jobs.

As well as a religion spread by the construction of places of peace and worship, culture needs places that promote wonder. In globalized times, the Louvre can also be visited in virtual form. It also expands with the creation of a laboratory for the museums of the future in a distressed region in Lens and gets exported to Abu Dhabi. Every 10 years since 1977, the "Skulptur projekte" invades Munster and changes the face of the city. Temporary public art can add much beauty and zest to the urban fabric and change the flow of collective consciousness. And the Modern Arts Museum, in Bonn, always reminds us that buildings have five fronts and that special care has also to be taken of the frontage facing the stars.

Cities are full of hidden gems and treasures. In Brussels, the Kunstenfestivaldesarts is a festival of urban and cosmopolitan creation. Since 2004, hundreds of artists and dozens of art centers and theaters open their doors each May and invite dialogue with everyone. The festival brings together, around the same project, artists of the two main communities in the country, world artists and a curious public willing to expand fields of vision. The festival invests different places in the city and invites citizens to its rediscovery. Diverse views are highlighted and also put in perspective. The concepts of nation and culture are relativized and even transcended.

The European capitals of culture offer cities an outstanding opportunity to affirm their position on the European chessboard and to benefit from considerable returns in economic, cultural, tourist, and media terms. Launched on the initiative of the Greek Minister of Culture, M. Mercouri, in 1985, the European City of Culture is designed to "contribute to bringing the peoples of Europe." All designated European Capitals of Culture present programs artfully combining international artistic content with the wealth arising from local diversity and culture.

The array of the European capitals of culture has been very rich and diverse and sometimes acted as a catalyst of urban transformation and renaissance. Glasgow is often cited as the most outstanding example of a city that has used its year as cultural capital as an opportunity for urban regeneration. Sharing the title among EU cities and with cities from outside the European Union has led to precious exchanges. Norwegian Stavanger port, the European cultural capital in 2008, together with Liverpool, presented an ambitious program and displayed a willingness to involve the whole community in more than 100 events spanning from ancient Greek theater to opera and ballet and skiing amid rocky fjords.

In 2009, Vilnius and Linz shared the title of the European capitals of culture. Linz focused on the themes of "industry, culture, and nature". Greater emphasis was placed on the quality of cultural events as well as on the global dimension, seeking to make the city more international, open, and welcoming and deal comprehensively

with the legacy of Nazism, as the location proposed by Hitler for his "Führermuseum," which would display much of the art stolen by the Nazis from across Europe. There was also a strong emphasis on providing a complete "365-day offer". The program sought to address weak points in the city's cultural offer, such as activities for young people and children, neighborhood-level projects, and those dealing with the city's contemporary history.

The 2009 Vilnius European capital of culture tried to enhance the culture of the capital city of Lithuania, home to a variety of ethnic and religious groups. The city's long history is reflected in the diversity of architecture in its Old Town, which has been a UNESCO World Heritage site since 1994. The rapid transformations of the 1990s and 2000s were reflected in a growing contemporary and alternative cultural scene, featuring the many private and nongovernmental cultural operators that have come into existence since the beginning of a new era.

Essen and the Ruhr shared the title of the 2010 European capital of culture with Istanbul and Pécs. Under the name "Essen for the Ruhr," it is the whole urban area that was celebrated as the European cultural capital. Originally the industrial, coal, and steel center of Germany, the Ruhr was hit hard in the 1960s. Urban and regional revitalization enabled the development of new clean activities, rehabilitated damaged areas, and improved the quality of life. In a dense, largely wooded landscape, crossed by road and rail networks, inland waterways, and the three tributaries of the Rhine, the project embraced 50 cities all of which participated in the European capital of culture.

Essen, the largest city of the region, presented a rehabilitated coal mine and coking plant, the Zollverein World Heritage site. Dortmund created a cultural center in a former brewery to celebrate the creative and digital economy in the field of music. In Duisburg, the site of the largest European river port, the grain silos have been transformed into a museum of contemporary art. Other achievements include the Route of Industrial Culture, a 400-km loop connecting various memorable places such as lift boats, mines, foundries, and a textile museum.

Among the most prominent events during the year 2010, one could point to celebrations, one with hundreds of yellow balloons floating across the region in May, each signaling the site of an old mine, and one night in June with a perfectly illuminated industrial heritage on many sites. A day of song gathered hundreds of choirs and on September 12, 2010, exactly a century after its creation, the Symphony of a Thousand, Gustav Mahler's Symphony Number 8, reputed to sound as the music of suns, stars, and constellations, was performed. Six playwrights revisited the Odyssey, and the six new versions were presented at different locations during a weekend.

In 2011, Turku and Tallinn marked a strong Baltic presence as European capitals of culture. They offered the stage for an eventful year and multiple emotions. In Tallinn, Estonian culture was honored in all its diversity and richness, ranging from traditional to contemporary. Almost half of the events were open to all citizens and visitors. There have been many large-scale events such as the Tallinn Maritime Days, a song and dance festival, the concert "Song of Freedom," the "Happy End," during the last day of the European capital of culture and the Tallinn Marathon

bringing together many thousands of participants. One of the main objectives of Tallinn 2011 was to bring cultural life to a former industrial wasteland. An old mill was transformed into a cultural center.

The greatest ambition of the Foundation Tallinn 2011 was to give life to smart ideas and fascinating, unique, and original events that place culture at the heart of the city. Cultural startups, especially by local designers, were encouraged by a curious daring public embracing unexpected idea. Unique projects included "The silent film is going strong," "Cinema in the Urban Space: Roof Film and Guerrilla Cinema," and "Song of the Bells Tower." Tallinn 2011 has also initiated a sustained movement of 1,500 volunteers to become a more bike-friendly city, and presented a hospitality program and launched a project to attract young people and children from outside Tallinn to the cultural events.

Guimarães in Portugal and Maribor in Slovenia were the European capitals of culture for 2012. They both tried to showcase the best of their culture on the world stage and leave their citizens a lasting legacy. Both cities have developed ambitious cultural programs. Even in tough economic times, the title of European capital of culture is an extraordinary opportunity to move towards sustainable development through culture, boost tourism, create jobs, and raise a powerful creative energy. In Maribor, events especially targeting youth combined tradition and innovation, folklore, and contemporary dance. Guimarães unveiled a program on four themes: city, community, ideas, and arts.

The 2013 European capital of culture title is shared by Košice, in Slovakia, and Marseille Provence. Košice invested in restoring gems of the "Pearls of the Gothic Route." Marseille wished to encourage the expression of the creativity of the whole region and extend it to the Mediterranean. The metamorphosed old harbor has been at the crossroads of all events and the meeting point of the capital of culture. The "Silo," a new concert arena in a converted silo on the docks, and a huge hangar at the head of the old port are among the most exciting venues. Exceptional events include an exhibition at the crossroads of science, mathematics, and experimental art and a fictional journey around the Mediterranean Sea, tracing its real and mythological history through the eyes of contemporary inhabitants and artists. The newspaper *La Marseillaise* plans a serialized novel through the weekly installments of work produced by 12 authors in residence in symbolic locations. It is expected to conclude with a set of short stories creating a portrait of the region.

The permanent legacies of the annual celebrations are extremely important. Since it became European capital of culture in 2000, Brussels has been the object of numerous ideas and projects that generated important cross-fertilizations and dynamics and led to the Cultural Plan for Brussels. After 2 years of consultation, the cultural sector has formulated 34 proposals for a future-oriented cultural policy. It is part of a broad debate on the city and its challenges and insists on collaboration and concrete action. More than a list of events, the cultural plan is an exercise in democracy with the creation of two organizations, the Brussels Arts Network and the Kunstenoverleg which signed a cultural cooperation agreement in 2007 and the conclusions of the Citizens' Forum of Brussels, in the context of elections and institutional negotiations in 2009.

Heritage Days or sleepless nights dedicated to culture in Paris, Brussels, and Madrid, showcase the city from an unusual angle. The MuseumNightFever is a joint event organized by 23 museums in Brussels under the umbrella of the Brussels Museums Council. For its tenth anniversary, the sleepless night in Paris, on October , 2011, hosted meetings between artists from around the world, a discovery of contemporary art in its richness and diversity, and an unprecedented walking exploration of the city on the theme of time. An unusual program of activities, conferences, exhibitions, performances, and screenings made the night unforgettable under the stars of creativity and discovery.

Outsider art or unexpected artistic happenings can expand frontiers in an extraordinary way. Toulouse and Brussels organize marathons of words to stage thrilling stories. Toulouse gathered a public of 70,000 citizens in a marathon of whispering voices, and Brussels proposed the discovery of the European literary heritage, nights of poetry, readings, and meetings with writers in exceptional places. The "Spring of September" celebrated in Toulouse proves that the renaissance of a city can also take place in the fall and that creativity is an inexhaustible resource.

"Cities on Stage", initiated by the National Theatre in Brussels and supported by the Culture Program of the European Union, invites six European theaters to exchange and confront their art on the issue of "living together" in cities. The National Theatre of Brussels cooperated with Folkteatern in Gothenburg, Odéon-Théâtre de l'Europe in Paris, Radu Stanca National Teatrul in Sibiu, Teatro Stabile di Napoli and Teatro de la Abadia in Madrid. Since 2011 and until 2016, artists pose singular, critical, and poetic eyes on this urban world in transition through seven creations. Their questions resound in other countries and contexts. Initiating the circle, Brussels proposed "Exiles", and Gothenburg "Fragments".

The initiative also wishes to strengthen the link between artistic creativity and citizenship, closely associating the inhabitants of each city with the creative process. "Moving Cities" invites groups of citizens, young and old, to question the challenges of contemporary cities in the present and future world. Citizen workshops, accompanied by artists of multiple disciplines, follow the process of theatrical creation and explore themes such as migration, diversity, multiculturalism, and mixed urban character. In parallel, each theater invites a group of young actors of partner countries to work for a month with a director and associated citizens to support young artists in their discovery of the city.

The incisive beauty of art can transform many places and human destinies. Cities are the places where most artists live; the public is usually more demanding and freedom of expression reaches its apogee. The most revolutionary new forms of artistic expression, which often created innovative bridges between existing forms of arts, also took place in cities. In 2012, Brussels hosted for the first time "Kiss and Cry", a most innovative spectacle of nanodance, dance done on the fingers of the hand and not on the toes of the foot and combining many forms of expression.

Art 2.0 is also possible as the Web becomes a stage of, but also an instrument for, artistic cocreation. The social networks offer the artist or the performer a far larger audience than the real circles of enlightened public. The real and the virtual worlds seem to have an infinite potential for mutually shaping themselves.

The “Exquisite Forest” is an original online collaborative art project, introducing a new form of collaborative drawing for a global online community. It was presented by Tate Modern, in London, and Google, and enables people to create short animations that grow from each other’s contributions. Taking as the starting point a series of short animation sequences created by artists represented in the Tate’s collection, visitors of both the gallery and the website are invited to draw and animate new sequences and fertilize the seeds by the artists. As more sequences are added, the videos dynamically branch out and evolve, forming multiple new visual narratives.

Watercolour 8
San Francisco, A Gate to a Promising Startupland

Chapter 8
Sustainable Regeneration and Enlightenment

Abstract This chapter sheds light on the continuous process of urban renewal that is essential for sustainability. Land use planning and transport are fundamental instruments for the sustainable regeneration of the cities, of their physical parts, and of their extraordinary diversity. Brownfields and ageing infrastructures should be converted into smart, green, and welcoming spaces, well integrated into the urban fabric. Many cities demonstrate that the intensification and consolidation of the urban fabric can prevent uncontrolled urban sprawl and reduce the heavy burden of emissions and congestion.

Sustainable architecture in search of excellence can lead to new forms of urban expression and a better performance of buildings and neighborhoods. Public and cultural buildings and spaces can promote collective life and local democracy and bring more value to places. Symbolic and structural projects can become beacons of the urban future. Breaking down barriers, forging partnerships with citizens and sealing relationships with the surrounding regions and the world are cardinal values to be enhanced in "imagineering" the cities of the future. Collective imagination and engineering have to become mobilized and cross-fertilized for creating the fair cities of the next generations.

8.1 Ecological Renaissance of Urban Forms and Functions

The city is the only living organism that has the capacity to renew itself. It is not simply a concentration of people and activities, but a hive of intense relationships and synergies, in which the whole can far exceed the sum of the parts and enhance the conditions for renewal. Urban regeneration and renaissance help reinventing cities as *civitas*, a universal space on a local, increasingly diversified, territory. Harmony is an essential value in cities striving for dynamic balance among coevolving policy objectives.

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The art of urban planning has evolved much, and after the rigid segregation of urban functions in the twentieth century, it has embraced sustainability principles and holistic approaches. The New Charter of Athens, issued by the European Council of Town Planners in 1998, signaled a clear shift in prevailing planning principles and objectives. The 1933 Charter, under the leadership of Le Corbusier, had introduced functionalistic ethics in planning, bringing the separation of spaces for work, living, leisure, and communication. The new charter advocates sustainable human settlements for all, based on true involvement and planning that promotes socioeconomic progress and environmental enhancement, and safeguards traditional identity (ECTP 1998).

Progress towards sustainability demands greater intensity of land use and the conversion and reuse of abandoned and/or contaminated brownfields. Sustainable cities opt for consolidation and renewal rather than expansion and urbanization of greenfields, for strengthening of the urban fabric and improvement of the suburbs. Concentrated and intensified use of space in a well-defined urban territory provides multiple advantages for the integration of urban structures that minimize flows of resources and transport, extract higher value out of materials and lead to a drastic reduction of greenhouse emissions, preservation of biodiversity and enhancement of local social life.

Copenhagen went through decades of investment in urban renaissance. In 1989, the regional plan for Greater Copenhagen already promoted a "better city instead of a larger city." The organic integration of urban structures and life played a most important role. The ongoing urban renewal in Copenhagen, described as the largest recycling project in Denmark, is founded on principles of quality and equality and aims at ensuring sustainable development through the enhancement of natural, cultural, and human resources.

Berlin strives to become a cleaner, greener, and friendlier European and global metropolis. Its vibrant scene, built on the ashes of the city's troubled past and idiosyncratic character, demonstrates that urban renaissance not only concerns the physical spaces but creates anchors and symbols for the future. Once a divided city, it endeavors to create a new future out of an exceptional past. According to cinema director Wim Wenders, "The history is here physically and emotionally present." The 1-km long fragment of the wall, exhibited in the East Side Gallery, serves as a metaphor of the many mental walls that have still to be torn down. More than two decades after the fall of the Wall, the urban scars are healed and the remnants, potent symbols of war and arbitrary partition, have been restored. The symbol of the hollow tooth as a monument of memory is significant.

Since its reinstatement as the German capital, Berlin has been a hotbed of new ideas, concepts, and realizations. The urban core has been redesigned for people and flagship projects are enriching the urban fabric. Potsdamer Platz, once the hub of social life, the busiest crossroads of Europe, and later the broken heart of divided Berlin, claims a new central role. Neighborhoods such as Kreutzberg try to reinvent themselves. The Sony center has been conceived as a "city in the city," open to all those wishing to be part of a new and highly contemporary community vision. The success of the artist Christo's packing of the Reichstag, a building of conventional

aesthetics, prepared its ownership by the citizens as the seat of the German Parliament. The glass cupola, which overhangs the hemicycle, symbolically places the citizen above the elected representative (Berlin capitale 1992).

In Amsterdam, urban renaissance has been linked to the vision of a diverse and compact city optimizing scarce and fragile land and hydraulic resources. Until the Second World War, Amsterdam had developed in a series of concentric rings, embracing the harbor. The 1950 General Extension Plan added lobes like the fingers of an outspread hand. During the reign of the private car, concentric canals began to be filled in to provide more space for car traffic. The rise of the ecological movement led to the reopening of canal rings and the intensification of the land use. The water environment has been rediscovered and enhanced. Many Dutch cities created mixed-use and citizen-friendly environments, including pedestrian and bicycle bridges spanning urban ages and canals (Pistor et al. 1994).

Lisbon grasped the opportunity offered by the 1998 world exhibition on "The Oceans" to redevelop a significant stretch of decaying waterfront. An abandoned area that had played a role in the past life of the city was selected as the location for the Expo and was transformed into a site for innovation and modern creation. The project was not confined to the exhibition precinct of 50 ha but created a whole new resourceful city of 330 ha. Investments in bioclimatic architecture, quality design, and advanced energy management concepts have led to the aesthetic and functional metamorphosis of the area. An ecoefficient distribution network for thermal energy, heat, and cold air, was set up, together with an observation and monitoring system. The adopted standards were higher than those required by national regulations and the performance of the area has been exemplary.

8.2 Consolidating Cities and Limiting Urban Sprawl

Compact cities have the potential to manage resources at remarkably lower levels of material and energy consumption, and generation of waste, compared to diffuse settlements and dispersed populations. The interrelated questions of density and compactness are critical indicators of sustainability. Compact settlements imply a clear boundary between urban and rural spaces and encourage functional diversification of land uses at the neighborhood level and the environmental improvement of urban centers served by high-quality public transport. The Danish model of decentralized concentration highlights the importance of all these components, whereas the Dutch compact city policy is based on the principle of spatial multifunctionality.

Tentacle-shaped low-rise suburbs have very different consolidation needs compared to high-rise peripheries with social housing or high-density urban cores. High density should be distinguished from high rise. Architect C. Correa suggests that high density/low rise could be the ideal composition for mixed diverse cities. Various studies suggest that although high density may convey the illusion of chaos, it bestows the benefits of social and spatial stability. Creating multifunctional urban cells is a guiding principle for many city plans (World Bank 1995).

Sustainable cities must reflect a true urban and social intermixture. Many cities experience a need for urban mix, a community desire for a real neighborhood gene, an organic part of the city, everywhere in the city. The reintegration of urban functions should reinforce identity, but also improve communication and openness. The "open block" proposed by the architect Ch. de Portzamparc advocates urban blocks penetrable by the city and the world. The concept could favor the interactions and social life at the scale of each neighborhood in the world of the city (Mega 2010).

Cities such as Amsterdam consider a functional mix as a valuable attribute of the inner-city heritage and try to strike a balance among spaces for housing, offices, commerce, services, tourism, and leisure. The compact city policy, introduced in 1985, aimed at enhancing scarce space as efficiently as possible, creating multiple residential environments and curbing the overall ecological burden. Diversity and mixed land uses are linked to enhancing the city's unrivaled character as a cultural melting pot.

Sustainable regeneration and consolidation of urban areas in decaying city centers has been a key instrument by many cities in their efforts to limit sprawl and attract new business and residents. Revitalizing an urban area entails re-creating the economic diversification, social heterogeneity, and cultural diversity of the city. Sustainable renewal has to address the unrealized potential of distressed areas willing to reattract productive investment and social life in healthy environments. Successful schemes address both the hardware and software of the areas and try to reconcile the environmentally sound revival of physical structures with socioeconomic and cultural enhancement.

Many monofunctional areas went a long way and were transformed into mixed neighborhoods. The "Living Above the Shop" project in Dublin has been a prime example, encouraging and assisting shop owners to convert their upper floors into residential spaces. Previously deserted and dangerous in the evening, commercial streets have become the thoroughfares of vibrant neighborhoods (EFLWC 1997b).

Diversified mixed-use developments have been introduced even at the scale of one complex, typically comprising a shopping mall, offices, and apartments. In Galway, the main commercial center provides a prime example of a multifunctional place. It includes part of a discovered ancient wall, the shopping malls, offices, and a complete housing estate on the top terrace for inhabitants who wish to live in the city center and yet enjoy their individual homes and gardens.

Bringing city to the periphery is possible through mixed developments and vital neighborhoods. The Huddinge, in the south of Stockholm, offers a successful experiment in transforming a suburban shopping center into a town square, a lively public space for the community. The location, next to the train station, generated the creation of new offices and apartment units and the whole area has been reshaped after the model of the medieval part of Stockholm.

In the United States, compact development is focused on new housing, as converting existing housing to higher densities could be prohibitively difficult. Increasing population and employment density in metropolitan areas could reduce vehicle travel, energy use, and CO_2 emissions by 11 % by 2050.

Urban sprawl, largely made possible due to private cars and extensive motorway and highway systems, still reflects the preferences of many citizens for living in single-family homes. Dispersed, car-dependent development patterns, however, involve numerous costs, including the use of vast quantities of land, increased reliance on private cars, and greenhouse gas emissions. Compact, mixed-use development could reduce the number of vehicle miles traveled by shortening trip lengths, and by making walking, biking, and public transit more viable alternatives to driving. The key precondition is for jobs, schools, and shops to be nearby as it is the case for all truly mixed-use developments, subjects of holistic urban approaches (TRB 2009a).

Studies estimate that doubling residential density in a US metropolitan area might lower household driving between 5 % and 12 %. If higher density were paired with more concentrated employment and commercial locations, and combined with improvements to public transit and other measures to reduce private car use, household driving could be lowered by as much as 25 % (TRB 2009b).

The quantification of the potential effects of compact development could help assess illustrative scenarios looking forward to 2030 and 2050. If 75 % of new and replacement housing units were developed at twice the density of current new development, and individuals drove 25 % less, personal travel, fuel use, and CO_2 emissions could be reduced by 7–8 %, relative to a base case, by 2030, and by 8–11 % by 2050.

Local zoning regulations would be a large obstacle to widespread compact neighborhoods, and initiatives could meet resistance from existing landlords and politicians. Their legitimate concerns about congestion, local taxes, or home values may be at odds with regional and national goals, such as housing affordability or climate change. In the near term, the primary opportunities to increase density are in areas already experiencing changes, such as the inner suburbs and areas close to public transit. In the longer term, adopting compact development would likely require changes in housing preferences and a greater political consensus in support of stronger public control of land use. Public infrastructure investments, such as public transport, and economic policy instruments, such as congestion pricing and higher parking fees, could promote compact, mixed-use development (TRB 2009b).

8.3 Sustainable Architecture and Dignified Public Spaces

Public places are the most democratic of spaces as they belong, by definition, equally to all citizens. Streets and squares form the arteries and veins of a city, places that have to facilitate circulation of energy throughout a city. They are the places where people come together to celebrate and to protest, to express joy or indignation. Noble, safe, attractive, and enjoyable public spaces can enrich collective life. Open spaces have great potential as islands of civilization in the archipelago of the city. Attractive public spaces foster citizen participation and promote exchanges and interactions. Open-air spaces should not just be the space left after

the definition and design of the built places, but should be given prominence as civic spaces and shaped as a matter of priority. Urban leaders should always take care for public places to be accessible to all and include everybody.

The agora, the focus of civic life in the ancient Greek polis, the archetype city-state, constitutes a powerful public model placed at the crossroads of market and assembly, which orchestrates all urban functions. Citizenship, justice, culture, exchanges and public health were well anchored in those cities-states, where the assembly, the *vouleutirion*, the theater, the stadium, the marketplace, and the sanctuaries had the noble aim of promoting the physical and mental well-being of citizens.

Environmental and cultural landscaping of public spaces is very important in forging identity. Public space is often highly charged, with multiple risks of conflicting interests. It can become an arena of confrontation and of exclusion. Qualitative recommendations for the functional and aesthetic character of squares, roads and pavements, roadside plantings, and public lighting have been developed and implemented in many cities. Brussels provided a good example with the Manual of Public Spaces (Région de Bruxelles-Capitale 1995).

Historic public spaces can invite endless journeys. The Via Appia in Rome and the Sacred Street in Athens go deep into place and time. The two cities, cradles of European civilization, competed in reorganizing their ancient heritage into cultural parks to be best enjoyed by citizens as backdrops of everyday environments. The Imperial Forum in Rome and the monuments surrounding the Acropolis crowned by the ruins of the Parthenon in Athens have been enhanced to become the focal points of urban archaeological parks. Natural and cultural lungs of the two capitals, they provide a living essence distilled from the magic of the ages.

In Siena, the exceptional medieval heritage became the principal resource for future visions. This does not only consist of the built environment, but also of the traditional *Palio*, the legendary local celebration that reinforces the social bond of the city.

Many public places keep reinventing themselves throughout history. The Brussels Grand Place initially was an open-air marketplace on a dried-up marsh near the port on the Senne River. At the beginning of the thirteenth century, three indoor markets were built on its northern edge. Other buildings, made of wood or stone, enclosed the place. Improvements to the Grand Place from the fourteenth century onwards marked the rise in importance of local merchants. The Brussels City Hall, built on the south side of the square in the first half of fifteenth century, made the Grand Place the seat of municipal power. To counter this symbol, one century later the Duke of Brabant built a large building that became known as the King's House. Wealthy merchants and the increasingly powerful guilds of Brussels built houses around the square. In 1695, the French army bombarded the mostly defenseless city center. Only the stone shell of the town hall and a few fragments of other buildings remained standing and the square was rebuilt in the following 4 years by the city's guilds.

A World Heritage Site, the Grand Place was often voted the most or one of the most beautiful squares in Europe. Every 2 years in August, an enormous "flower carpet" is set up in the Grand Place for a few days. The first flower carpet was made

in 1971, and due to its popularity, the tradition continued, with the flower carpet covering a full 24 by 77 m.

Resource-conscious architecture made great strides over the last years and has been supported, since 2006, by the global award for sustainable architecture. The award honors, every year, five living architects in search of an architecture that is innovative in relation to energy, materials, and technology, and proposes higher standards for housing and public amenities while fighting ecological imbalance and social inequality. The award is run by the LOCUS Fund, which seeks to identify and reward the most engaged architects from all parts of the globe and to federate them in participative urban renewal projects in developing countries.

The European Union Prize for Contemporary Architecture Mies van der Rohe Award, granted every 2 years to acknowledge and reward exceptional architecture, offers public institutions and private actors an opportunity to reach a higher understanding of the cultural role of architecture in the sustainability of European cities. The prize is also intended to encourage young architects. The common denominator of all projects is their search of excellence in conceptual, technical, and constructive terms, and their contribution to the European city. The prize aspires to be a stage for research, development, and demonstration of exceptional private homes and public buildings; museums and cultural equipment; educational, health, and sports facilities; and large-scale infrastructure projects.

The M. van der Rohe Pavilion of Barcelona was chosen as the symbol for this prize. Designed as the German Pavilion for the 1929 Barcelona International Exhibition, it embodies excellence and innovation. The Pavilion was dismantled after the exhibition but, despite its short lifespan, it came to be regarded as one of the best architectural works of the twentieth century. In 1959, O. Bohigas wished to rebuild the pavilion, but the political and cultural climate in Spain was unfavorable and reconstruction on the original site of Montjuïc only started in 1983. One year after the completion of the works in 1986, the European Parliament discussed the idea of the prize.

In 2001, the prize crowned the Kursaal auditorium and congress hall in San Sebastian, conceived as two gigantic rocks standing at the mouth of the Urumea River, as an organic part of the landscape. All other facilities, including the exhibition halls, meeting rooms, offices, a restaurant, and musical functions are located in the platform at the base of these cubes, which serves as the meeting space between the cultural center and the city, and ensures open public access.

The auditorium celebrates its character of almost a geographical accident with a slight inclination towards the sea. Its volume, integrated asymmetrically inside the glass prism, seems to float within it. The asymmetry is oriented in such a way that a visitor entering the foyer is unconsciously led towards the highest level where Mount Urgull and the sea can be contemplated in all their splendor from a singular window. This window punctures the building's double wall, composed of a steel skeleton clad inside and out with special laminated glass elements. The result is a neutral and luminous interior space. Outside, the glass surfaces protect against sea winds, making the volume a dense, opaque, yet changing, mass by day and a source of light by night.

Similar design and structural criteria have been used in planning the smaller congress hall, which is also inscribed in an inclined prism. The rectangular, almost square, congress hall adheres to the best acoustical and functional requirements. The asymmetry is less evident, but the view from the foyer of Mount Ulía and the sea in the background is just as spectacular.

The Oslo national opera and ballet, which was awarded the M. van der Rohe Prize in 2009, has been designed as the first element in the transformative agenda for an urban area of the Norwegian capital. The Opera has an imposing size and a compelling aesthetic expression. The marble-clad roofscape forms a large public space in the urban landscape and the fjord. The concept for the final building involves a dynamic combination of three elements, the wave wall, the factory, and the carpet.

The Opera House stands on the Bjørvika peninsula, which is a symbolic springboard of a harbor city to the rest of the world. The dividing but also uniting wall is realized as a large wave where art confronts everyday life. The architect proposed that the production facilities of the opera house should be organized as a self-contained, functional, and flexible factory. Finally, the carpet symbolizes the horizontal monumentality of the city, the idea of togetherness, shared ownership, and open access for all.

Integrating environmental concerns into innovative design, the Oslo Opera is one of three projects in the EU-project "ECO-Culture," which focuses on energy efficiency in cultural buildings. The materials, with their specific weight, color, texture, and temperature, have been vital to the design of the building. They included white stone for the carpet, timber for the wave wall, and metal for the factory. During the realization of the project, a fourth material, glass, which allows for the exposure of the underside of the carpet, has been given specific attention.

The 2011 Prize crowned the Neues Museum in Berlin, initially designed by F. A. Stüler and finished in 1859. Extensive bombing during World War II left the building in ruins and the structure abandoned to nature. City authorities engaged in a rigorous process for the rebuilding of the museum leading to the international competition, won by D. Chipperfield Architects in 1997. The key aim of the project was to re-envision the original volume, and encompass the restored parts, creating a new harmony between the old and the new.

The archaeological restoration followed the guidelines of the Charter of Venice, respecting the historical structure in its different states of preservation. The new exhibition rooms are built of large-format prefabricated concrete elements consisting of white cement mixed with Saxonian marble chips. Formed from the same materials, the new main staircase replaces the original without replicating it, sitting within a majestic hall that is preserved only as a brick volume. Other new volumes are built of recycled handmade bricks. In 2009 the Neues Museum reopened to the public as the third restored building on Museum Island, part of the UNESCO list of World Heritage Sites since 1999 as "an outstanding example of the Enlightenment vision of making art publicly accessible, given material form in a central urban setting."

The Museum Island, Berlin's Acropolis of the arts, is a unique ensemble of five museums built between 1824 and 1930 and illustrating the evolution of modern

museum design over the course of the twentieth century. Its collections span 6,000 years of artistic endeavor and offer an opportunity to stroll around between the centuries of human history. The island is also home to the Altes Museum, a neoclassical masterpiece completed on the orders of K. F. Schinkel in 1830, the Alte Nationalgalerie completed in 1876 according to designs by F. A. Stüler, the Bode Museum opened in 1904 to exhibit the sculpture collections and late Antique and Byzantine art, and, finally, the Pergamon Museum, which contains multiple reconstructed and historically significant buildings such as the Pergamon Altar and the Ishtar Gate of Babylon. The Master Plan for the rehabilitation of the area, adopted in 1999, aims to turn the site into a state-of-the-art world cultural offer by 2015.

8.4 The Hallmarks and Infrastructures of Urban Futures

Symbolic projects can offer significant landmarks to the city and re-equilibrate the urban fabric and flows, enhance magnificent skylines and shorelines, and structure urban territories. They can act as strong catalysts for the future of the cities and the regions. Of very diverse scales, they range from ambitious government plans or unique international events, such as Olympic Games, universal exhibitions, and high-level fairs to local art museums. Their planning and construction with respect to sustainability principles and ecodesign are essential given their emblematic dimensions and ripple effects.

Large-scale structural projects for sustainable development demand foresight, long-term planning, flexibility, and *ex ante* impact assessment, citizen participation, and communication. Flexibility is imperative for adapting high-scale projects to market fluctuations, whereas continuity is linked to a shared vision for the future of the infrastructure. Citizen consultation and partnership with major stakeholders are extremely important. The success of the projects depends on public support and a constant and affirmed political determination, capable of withstanding changes in elected representation. Early examples include the re-development of the Tokyo Station Area and the Tokyo Waterfront, presented by the Japanese National Policy Research Council as vehicles for introducing private capital to public high-level projects (METROPOLIS 1996).

Many innovative structural projects metamorphosed urban waterfronts. Water has often oriented the way that cities grow and develop. Cities depend on the waterways, and the waterways achieve significance through the cities. Rivers are mirrors of ecological awareness and cooperation among the territories that they cross. Harbor cities are shaped by geography, nature, climate, history, and culture. As a result of economic and technological reforms over the last decades, city-center ports have gone, leaving behind deserted shipyards, legacies, and relics of the industrial revolution.

In Boston harbor, a symbol of the city's birthright, civic activism triggered a dramatic regeneration and an outstanding new waterfront. Bordeaux's riverside is getting metamorphosed as a considerable number of new projects try to wake up the

sleeping beauty of the city. They establish bridges between the sober classicism of central Bordeaux, part of the World Heritage since 2007, and a daring new architecture. The city plan has been redefined and the waterfront reflects a new quality of health and wealth. Among the future architectural gems of the city, a cultural center on wine civilization aims at establishing new bridges between the region and the world.

Recognizing waterfront heritage as a diminishing asset is crucial for encouraging selective preservation along with quality urban design. The planning of the Belfast waterfront has been driven by the strong will to create a new face for the city. Spaces of hope replace places marked by violence. The integrated management of the dual city–harbor resource is essential.

In Galway, the renewal of an abandoned and dilapidated area, past hub of economic activities, provides interesting lessons. Economic measures were introduced, promoting rehabilitation as well as new construction. The regeneration respected Galway's unique character and atmosphere and promoted a functional mix, essential for the vitality of the city center. A balance has been struck among residential, commercial, cultural, and tourism functions (BURA 1997).

From Liverpool to Turku and from Genoa to Bilbao, disused dock infrastructures have been transformed into exhibition halls, shops, craft workshops, and centers for ecological, leisure, civic, and cultural activities. Business incubators bring new capital into the areas and help create local enterprises and services. Functional diversity is increasingly important and public access to the waterfront is considered to be decisive. Waterside promenades gradually replace industrial docks and welcome citizens.

The Eastern Dock Island at the east of Amsterdam's Central Station is a component of the large-scale project to develop the south bank of the bay. The movement of harbor functions has presented new opportunities to transform the area into an intensive mixed urban neighborhood with residential, commercial, recreational, and cultural functions, including the public library and the conservatorium. The new public library, opened in 2007, was designed by architect J. Coenen through an exploratory methodology. The architect's sketches were a record of a complex quest to find the ideal solution. A central underground system for long-term energy storage delivers air conditioning and heat to the buildings at the desired temperatures.

Liverpool's waterfront, a world heritage site, reflects the role of the city in the development of the world's trading system and dock technology. Docks were not just functional sites; they had rights to architecture and art. The best-known Albert Dock, restored in the 1980s, is a living textbook of harbor industrial architecture. Part of the old dock complex hosts the Merseyside Maritime Museum, an anchor point of the European Route of Industrial Heritage, the International Slavery Museum, and the Tate Liverpool. The world's still largest brickwork building and Pier Head's "Three Graces," as well as the Royal Liver Building, built in the early 1900s and surmounted by two bronze domes with a liver bird, the symbol of the city, on each, always attract attention.

The revitalization of Swansea's Maritime Quarter has been completed with the Wilkinson Eyre's National Waterfront Museum opened in 2005. The project includes the renovation of an existing warehouse building and the creation of new galleries to house objects witnessing of Wales' industrial and maritime past. The design has been inspired by the unique history and context of the site. The curves of old railway tracks offered a strong sense of movement, and their lines have been reinstated into the new landscape.

Genoa's harbour, the most important in Italy and one of the biggest in the Mediterranean, has become the center of cultural, tourist, and commercial activities. In 1992, on the occasion of the Columbian Celebrations, the waterfront was completely redeveloped and the ancient harbor zone rehabilitated and opened to the sea. Native architect Renzo Piano restored the historical buildings, including the cotton warehouses, and created new landmarks including the Aquarium, the Bigo, a sort of trademark of the port activity offering eye-catching views, and a big sphere made of metal and glass, installed in the water, and unveiled in 2001 on the occasion of a momentous G8 Summit. R. Piano also projected the subway stations and, in the hills area, the construction, in collaboration with UNESCO, of "Punta Nave," the Renzo Piano Building Workshop.

In Finland, Turku also had to face the decline of industry and harbor infrastructure on the river Aurajoki. In 1987, the municipal council organized an architectural competition for a new master plan for the area and its phantom spaces of closed-down factories and warehouses. The winning entry "Sigyn" introduced a magnificent mixture of old and new structures in brick, steel, and glass, and proposed them as functional spaces for educational, economic, and cultural purposes. Two massive former shipbuilding halls and a former rope factory, once voted as the ugliest building in town, composed a major fine arts complex, including a conservatory, the Turku School of Art and Communication, and the School of Fine Arts.

The regeneration of the London docklands is more than emblematic of many transformative waterside projects. During the nineteenth century, London's harbor was one of the busiest in the world, but, by the end of the 1950s, decline of the portside industries and manufacturing, containerization asking for docks equipped with large cranes and an increase in ship size left many docks derelict and abandoned. These developments led to a spiral of decline, marked by decrease of population and employment, inadequate services, lack of open space and recreation facilities, and poor access to the rest of London with heavily congested narrow roads and a lack of public transport.

The regeneration works led to the thorough transformation of an area of eight-and-a-half square miles stretching across parts of the East End Boroughs of Southwark, Tower Hamlets, and Newham. The London Docklands Development Corporation, set up in 1981 to lead the project, has worked for 17 years to bring a new face and significance to the place. Other organizations involved in the redevelopment process included the national government offering incentives such as grants and reduced rates to encourage private investment, property developers responsible for building large office blocks such as Canary Wharf, local housing associations that obtained home improvement grants, and civil society organiszations and conservation groups.

The environmental regeneration led to the creation of a network of pedestrian and cycle routes through the area with access to the river and dock edge through waterside walkways, the creation of pedestrian bridges and new open public spaces, a water-based ecology park and London's first bird sanctuary at East India Dock Basin, and the planting of 200,000 trees. The economic regeneration led to the doubling in employment and numbers of businesses, the conversion and gentrification of old warehouses to new homes and a transport revolution with the opening of the Docklands Light Railway in 1987 and major new roads and the building of the City Airport in the former Royal Docks, attraction of financial and high-tech firms, TV studios, and newspapers.

Successes include the impact on the local economy and businesses, the rapid rail connection to central London greatly improving accessibility in and out of the docklands, and a wide range of economic, environmental, and social benefits, including thousands of new housing units and quality jobs. Most of the criticisms related to the lack of benefits for the local population, as the original "East Enders," including many old dockers were unable to afford the high costs of the new expensive houses and flats and had not the skills required by the new jobs. The community spirit of the area has also been altered as the "yuppie" newcomers did not truly mix with the previous local society.

Unique high-visibility events bring special opportunities for cities, regions, and nations. They hold the megachallenge of creating an infrastructure and an environment with the occasion of a short-term event but planning it to serve long-term purposes. Global attractions based on once-in-a-lifetime events, can put a city on the map and a sporting or cultural event can act as a magnet to draw public attention and propel the city onto the world stage. But a city cannot rely only on single attractions or once-in-a-lifetime events, it has to use them as a stepping stone for the much longer journey (PricewaterhouseCoopers 2011).

The 1992 Olympics was a key catalyst for the renaissance of Barcelona. The city, which had long lived with its back to the Mediterranean, invented a new waterfront and was definitely reconciled with the sea. Enriched with the new quarter of the Villa Olimpica, it was enhanced with thorough restoration projects and noble public places. The rehabilitation of the Ciutat Vella has been an unparalleled event, in terms of investment, effort, and civic spirit.

Ciutat Vella is nestled between the sea and the Eixample district, a strict grid pattern crossed by wide avenues designed by the visionary I. Cerdà. Running down the heart of the district, Las Ramblas offer the delights of a vibrant public artery and seals the link to the sea. The four historic quarters of Ciutat Vella, including the gothic quarter, have been thoroughly transformed through selective renovation, rehabilitation, ecoretrofitting and ecoconstruction, civic centers, pedestrian precincts, and green public spaces. Thoroughly designed small interventions acted as stem cells that injected into the body of the city led to a positive metastasis and overall renewal. The invisible hands that made everything happen are the strong neighborhood groups that cooperated with the authorities and played a pioneering role in the allocation of housing and services and the enhancement of public life (Ajuntament de Barcelona 1995).

Along the dynamic horizon of Barcelona, other innovative projects found fertile ground. The creation of the district @22, the "innovation district," in the place of the former industrial zone known as "Catalan Manchester" is a good example. The plan was approved in 2000 by the city council when the new 22@ land designation was introduced, replacing the 22a designation used in industrial soil contexts. The district bridges the industrial with the knowledge-based economy and intends to convert the area into the city's technological and innovation district, as well as to increase leisure and residential spaces (Rowe 2006).

The 1992 world exhibition gave Seville and the island of Cartuja the opportunity to become a laboratory and a symbol for urban innovation. Seville has itself been on exhibition during the Expo, as the mirror of a multicultural past, a magnifying glass for the present, and a telescope for the future. The legacy of the Expo included a thematic park opened just 8 months after the closure of the exhibition and a technological and business park.

The 2000 Olympics were prepared as "Green Olympics" and endowed Sydney with a sustainable new organic part. A 640-ha industrial wasteland in Homebush Bay, previously intended for an urban renewal project after 100 years of industrial and military uses, was fully reinvented for the Olympic Games and transformed into the Sydney Olympic Park. After the end of the 2000 Olympic Games, the Park has been converted to a multipurpose facility that continues to host many sporting events every year. The Sydney Olympic Park Master Plan encourages a broad range of commercial, residential, recreational, leisure, and cultural activities that create new value and attract new assets. Urban design and landscaping principles adopted in the Master Plan emphasize excellence and efficiency (Mega 2010).

The 2004 Olympic Games have endowed Athens with an integrated Olympic Public Transport System, after the radical restructuring of the network throughout the greater Athens region. The legacy of the Olympics to the Greek capital includes 120 km of new roads, 90 km of upgraded roads, the 40 km Suburban Railway, 40 fly-overs, 7.7 km new metro lines, a 23.7 km tram network, modern train stations, and a new state-of-the-art traffic management center. The Olympic village has been transformed into high-quality homes for low-income working families, who have been selected by draw.

A triple Olympic city, London has long been a multifaceted city and a great commercial and financial center on its way to becoming a global center for the arts, culture, and entertainment. The city has been enriched with new landmarks. The new iconic tallest building in Europe, the Shard, has been praised for its creative and bold design and criticized for disrupting the historic views. Already competing on the London skyline with the Gherkin, a most recognizable landmark designed by N. Foster for the Swiss reinsurance company, it is entering the world emulation of the tallest world marvels. Since the San Giminiano towers, this competition never stopped and leaves the Shard far behind the Burj Khalifa in Dubai, 828 m high and the projected 1.6 km high on the equator line, 13 km from Quito.

Sustainability was a prominent criterion in the preparation for the London 2012 Summer Olympics. The 2012 Olympics brought a revival to London's East End. The Games venue in Stratford was developed on a brownfield site, previously

isolated from central London. A bubbling new energy also erupted in adjacent districts with warehouses being transformed into artist's homes and workplaces. The Olympic stadium can be flexibly resizable from 80,000 to 60,000 seats and features flooring made from recycled tennis balls. The wave-shaped Aquatics center designed by Z. Hadid is considered to be a masterpiece in sports stadium design. The 11-m tall "Orbit", a unique fusion of art, architecture, and engineering, by A. Kapoor, is the landmark of the new Olympic park. The Games acted as a catalyst for growth through the legacy of world-class infrastructure, business hubs, and new vibrant neighborhoods.

Harbors, airports, and railway and bus stations are gateways to cities, temples of welcome and farewell. Lyon's main railway station was constructed in 1978 as part of the new Part-Dieu urban neighborhood project. A very busy station also for passengers in transit, it was built in conjunction with a shopping center and a major government office complex. Lille also paid attention in creating a new railway station for European high-speed connections and a gateway to the United Kingdom. Liège has chosen a bridge by S. Calatrava for the railway station design to unite the city with many European destinations. Lyon had already chosen a fan-shaped canopy by the same architect for its airport Antoine de Saint-Exupéry.

Berlin Brandenburg Airport, south of Berlin, named after the former Berlin mayor, German Chancellor and Nobel Peace Prize winner Willy Brandt, has been conceived as a global air gate for the German capital city. The airport is inheriting some infrastructure of the existing Berlin Schönefeld Airport, the southern runway of which is the new airport's northern runway. The initial capacity of the airport is 30–50 million passengers. Noise-abatement regulations ask for flights to be scheduled between 5:00 a.m. and 24:00. A major railway station built under the airport's check-in terminal provides connections with the city center and the wider region.

The airport features the latest cutting-edge technology and a clear and sober design fostering simplicity to help passengers find their way. Airport 3.0 is a system expected to provide realtime flight information both through monitors and directly to travelers' smartphones. The airport also intends to provide a symbol for definitively taking off from the city's cold war opaque past towards a luminous and transparent future (New European Economy 2012).

A welcoming gate to Madrid could begin at the Barajas airport and especially at Terminal Four. Designed by A. Lamela and R. Rogers, winning them the Royal Institute of British Architects' 2006 Stirling Prize, the terminal is configured to give passengers a stress-free start to a luminous journey through glass corridors and sky domes that allow natural light to pass through. According to Rogers, "Airports are the cathedrals of our time." The passages in the terminal are flooded with light and introduce citizens and visitors to the senses of the city.

The Atocha railway station is another wonder in Madrid. Passengers arriving at the station find themselves sharing the domed atrium of the station with exotic plants and palm trees in a small jungle. Retail and coffee shops overlook the tropical garden. Between the airport and the Atocha station, the world's first inclined skyscrapers further welcome visitors and citizens to the city center of the Spanish capital. Designed in 1996, the "Puerta de Europa" towers are twin office buildings

of a height of 114 m and an angle of inclination of 15°. Leaning towards each other, over the main road artery, the towers form an open portal that, being at the northern end of the business district, symbolizes the gateway to Europe (New European Economy 2012).

The design of the Kansai International Airport illustrates human ingenuity and co-operative effort. Created in a typhoon zone three miles offshore, it is a good example of the integration of structure, function, and environment with a sense of purpose. The need to address environmental problems at Osaka International Airport, while satisfying the growing demand for air transport in the Kansai region, led to the building of the airport in the southeast of Osaka Bay. The protection of the coastal and marine environment was extensively studied and carefully addressed. The construction and administration of the airport were conducted by a special corporation established through joint investment by the national government, local authorities, and the private sector. The airport, opened in 1994 as Japan's first international airport to be operational round-the-clock, serves the entire Kansai region, the historical, economic, and political heart of the country.

Watercolour 9
Paris, A Living Cultural Heritage and Legacy

Chapter 9
The Civic Bond: Cities for and with Citizens

Abstract Present and future citizens are the political stakeholders of cities in a multipolar and interconnected world. They have the right to consultation and involvement and the duty to exercise democratic scrutiny of policies. Active citizenship means participation in and responsibility for decisions on the future of a city. New governance architectures seek to enhance the potential of all invisible hands of urban societies and economies and build a social consensus on a future vision to be realized with the efforts of all. Citizen empowerment is increasingly considered as ethically correct and a recognized driver of change.

This chapter examines the emergence of new models of citizen participation in responsible cities, a sine qua non condition for sustainability. Innovative partnerships can maximize the potential of synergies, enrich the content and the methods of cooperation, and serve as catalysts of change. Institutional alliances are enriched with a variety of participatory schemes. A world bond involving coalitions of cities, both from the developing and the developed world, can play a major role in addressing global common challenges and achieving the millennium goals for the renaissance of the planet. It can build on the C40 alliances.

9.1 Urban Governance 2.0: Co-Leading Cities in Interaction with All Actors

Urban governance is the science and art of cogoverning societies with the participation of all actors having a stake in the future of a city. The transition from government to governance implies the recognition that visions, strategies, and policy options should respond to the evolving dynamics, preferences, and aspirations of society and involve all those concerned. In most cities, new civic bonds have been sought with business, advocacy groups, and civil society, expected to invigorate the debate between governments and the constituencies they represent, increase public transparency and accountability, and enhance the collective capacity for reflection,

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judgment, and decision. Assemblies of children or municipal councils of youth can extend accountability towards future generations.

The very word democracy comes from *demos* which means "municipality" in Greek, an indisputable reference to cities as political entities. Cities have promoted open democracies since the age of Pericles, the greatest leader of ancient Athens. In his "Epitaphios," the famous funeral oration and epitome of the Athenian national consciousness, Pericles urged citizens to become "lovers of the city" (Thucydides). An interesting link between democracy and sustainability can be found in an old Athenian custom. Before becoming a fully fledged citizen, every young man had to promise to leave the city richer and better than when he first became part of it.

In ancient Athens, true citizenship meant being an active member of the city. Although far from perfect, the type of democracy practiced in Athens in the fifth and fourth centuries BC is reputed to be the best government that humanity had invented till then. Cleisthenes is credited with reforming the constitution of ancient Athens and redesigning the social-political landscape of the city and the surrounding region which were fully represented in the city government. Greater Athens was divided into three areas, including the center of the city, the coast, and the area beyond the hills. Citizens belonged to the 10 tribes, the *phylae*, each of them split into thirds, one for each region, and further split up in 140 municipalities of various sizes.

Athenian democracy introduced the concept of equal rights and the notion of accountability. The primary function of the government was to guarantee justice for all citizens. The annual rotation of power, the sharing of privileges, and citizen participation in decision making were among the key elements of the genesis of a democratic city, in which no person or group could become too powerful.

Democracy meant more than equality of privileges under the law for all citizens (*isonomia*). The government truly had to represent the citizens of Athens and decide on their behalf. The three political bodies included the Assembly, deciding in some cases with a quorum of 6,000, the Council of 500 members (*Voule*), and the Courts with a minimum of 200 up to 6,000 members. The Council of 500 comprised 50 men from each of the 10 tribes and decided on the issues to be discussed. The members of the council were selected by their municipalities and could only serve one term. The military was set up the same way as the *Voule*, representing all tribes (Raaflaub et al. 2007).

The Assembly was open to all male citizens, meeting 40 times a year. Important decisions on domestic and foreign policy issues were debated and the final decision or proclamation was carved in stone and erected in prominent places such as the agora. Each year, an *archon eponymous* was selected as the chief magistrate of the city. His responsibilities included conducting investigations of legal cases, in particular those that involved the state. He was responsible for protecting the orphans and heiresses with no family and to appoint the *choregus*, in charge of the religious festivals. The office of *archon eponymous* was held for only 1 year, and that year was named after him. Archons were chosen by the *aeropagus*, the council of elders of the city, composed from previous archons.

The courts had six judges known as the *thesmothetae* with responsibility in law-making but little true power inasmuch as the Athenians believed that trials should involve mass participation. The more important the trial, the more jurors were involved. Citizen juries of 501 judged individual conflicts. Suits that involved state officials were judged by a jury of 1,001 and the most serious cases by a jury of 1,501. The juries voted by secret ballot and were symbolically paid for their service, as much as an average worker.

The governance of cities experienced many ebbs and flows since the Athenian laboratory of city democracy and the development of city-states. Urban democracy, representative and direct, is a key element of the permanence of cities and of their capacity for sustainability. Representative democracy always has to address the challenge of the duly constituted authorities, linked to the representative role of local groups. Participative democracy can lead to truly publicly owned policies. Great strides have already been made since the transition from urban governments to urban governance and the participation of all stakeholders. Citizens have been gradually invited to broaden the visions about the future of cities and act as strategic partners rather than protesters. Empowerment has become ethically correct and a recognized driver of change.

Civic agreements in many cities launched new partnerships with civil society organizations. Efforts for citizen consultation on the gestation of visions and plans expanded. In Emilia Romagna, a region with traditional openness and the paradigm of small and medium enterprises, civic bonds thrive. R. D. Putnam asserted that the region is not populated by angels, but the social capital and the cultivation of the civic community promote strong and responsive collective action (2002).

At the dawn of the civilization of sustainability and with the advent of 2.0 models, there has been a clear shift from direct ideological representational systems of democracy to a more interactive participatory and direct democracy. Normally associated with Web applications that favor interactivity, interoperability, and user-centered design, the label 2.0 is being grafted onto the forms of urban governance for a continuous reinforcement of the civic bond and the ongoing confirmation of civic values.

Participative democracy can increase considerably the political capital of a city and be underpinned by instant direct democracy, greatly enabled by Web 2.0 processes. Much depends on the quality and commitment of the human and social capital and the political leadership. Governments should give special opportunities to the concepts and ideas proposed by those usually without a voice. Horizon scanning and anticipation can be decisive and mediation at an early stage critical to build trust. Leadership at all levels is a sine qua non condition and the exchange of selected practices a most inspiring tool.

Participatory and shared leadership has become a subject of attention among political analysts, social experts, and behavioral scientists. Shared leadership, occurring when the role of leader is actively and intentionally shifted depending on the issues or the context, can bring shared ownership and dynamism in many projects. Participatory leadership recognizes that leadership at all levels can bring great impetus towards addressing the challenges of the future. It empowers all citizens to

become responsible and motivating leaders, promotes policy ownership, and facilitates the consensual building of shared visions.

Democracy always has to provide real and virtual forums to exert sound judgment and help citizens to be transformed from mere consumers and users of urban infrastructures and services into responsible city actors, sharing values, codeciding on visions, and performing actions. Their representation and participation can be extended through action planning and schemes, citizen forums, and dialogue and consensus workshops, bringing together often opposed actors on neutral grounds and on equal terms (Abbott 1996).

A democratic infrastructure is formed in most cases through formal and informal mechanisms of horizontal and vertical cooperation between government bodies and partnerships with nongovernmental actors, mainly industry and civil society organizations. Governments have, in some cases, begun to promote the formation of new spatial structures, such as intercommunal frameworks, regional platforms, territorial pacts, and sustainability contract areas. These structures, beyond traditional administrative boundaries, promise more coordinated spatial planning and more coherent allocation of public resources, as well as greater transparency, visibility, and accountability.

Regional and local authorities should be endowed with the resources to manage the multiple sustainability-driven functions, fulfill new mandates, and ensure policy implementation and evaluation. Fiscal federalism, based on the search for a balance between distribution of powers and allocation of resources, can be instrumental for sustainability. Responsible monitoring and evaluation should be facilitated by 2.0 schemes.

National leadership is necessary to provide a coherent conceptual framework and coordinate the thematic policies of different national ministries, enable territorial authorities to set priorities and commit resources, promote public–private partnerships and share the risk and cost of innovations. Leadership at the local and regional levels is necessary to define territorial needs, propose visions, coordinate the implementation of programs, and mobilize public and private resources to invest and develop a permanent dialogue with the other territorial authorities.

Leaders have to interpret the needs, values, and preferences of the citizens, elaborate plans towards sustainable development, facilitate and stimulate the interaction of the different actors and partners, and guarantee the consistency of the various options and decisions. Stockholders, the owners of the physical assets, stakeholders, having particular interests in territorial success, and outside partners, providing resources and competencies and having an interest in territorial development, can invest great energy in a particular place and open new perspectives for the future.

9.2 Citizenship and Accountability to the Future

Citizens are the political stakeholders and society truly the ultimate frontier for all policies. If governments wish their policies to be owned by citizens, they should allow as many voices as possible to be heard, and as many values as possible to be

represented during the elaboration of common visions and plans and the selection of the desired futures. Residents, users of public infrastructures and services, have to be properly informed on important emerging issues, and duly involved in the formulation of possible policies. Decision makers should invest in a better understanding of public opinion and the preferred options. Making the community, especially the underrepresented social groups, better informed and more aware and willing to take part in a shared future is a noble challenge. Projects must not only be scientifically robust, but also socially acceptable and compelling.

Partnerships are linked to the shift in public policies from direct interference to indirect or conditional policies, such as incubation and mediation. They should enhance the capacity, contribution, and commitment of the public, private, and community sectors and improve the ability of a society to act proactively and drive change. Public–private partnerships should work as an orchestra under a public conductor for the overall improvement of urban forms, functions, and life.

Public multigovernance alliances could be formed by forward-looking national, regional, and local governments and be enriched with effective public–private partnerships. Strategic public–private partnerships have a great potential in balancing objectives of competitive strength and social and environmental well-being. They have the potential to take more risks, reduce the social costs of projects, and lead to enhanced outcomes from public and private investment. They offer ample grounds for coalitions to overcome sector and institutional dissonance and play a critical role in the implementation of sustainable development policies. A clear vision and structure, a strategic and tactic approach, a critical mass, assertive leadership, flexible adjustments, and continued evaluation and assessment are usually suggested as the success factors of the partnerships.

Citizens, cobuilders of visions and initiators of actions, can contribute decisively to creating a collective momentum for better public policies. Structured collaborative events, which free creative individuals and articulate a sense of vision, can create a thrust for the future. Processes such as the charette are being used to bring together the richness of diverse opinions and ideas and build consent on possibly controversial projects at the earliest possible stage. Citizen platforms can provide more permanent and effective interfaces among experts, policy makers, and citizens.

Urban politics could mark civic progress through regular citizen consultation schemes and referenda. Bologna was the first European city to organize a referendum on the closing down of its historic center to private cars. In Amsterdam, two referenda held in 1997 sought the population's views on the new metro line and the extension of the city to sensitive land ecosystems. Sustainable development issues offer an excellent opportunity for strengthening the urban social fabric and connecting with other communities in the world and the future.

The City Mayors Foundation, an international think tank for local government, proposed the World Mayor Project and every 2 years recognizes a mayor with an outstanding sustainability vision for urban communities. Mayors wishing to be considered for the Prize are first asked to sign the City Mayors Code of Ethics. The Code is signed by thousands of city leaders striving to provide its citizens with happiness, security, and prosperity and wishing to perform their duties "beyond any reproach."

The prize, awarded since 2004, honors mayors with vision, passion, and skills to make their cities outstanding places to live, work in, and visit. The project aims to highlight the results of city leaders with knowledge, enthusiasm, and integrity, social and economic awareness, ability to provide security and to protect the environment as well as capacity to foster good relations between communities from different cultural, racial, and social backgrounds.

Children, the citizens of the future, are at the very heart of sustainable development and urban politics. The well-being of children is a litmus test for the present and future of the society as a whole. In Finland, the "Children as Urban Planners" project in Kitee aimed at educating active future citizens in environmental awareness and responsibility for their built and natural environment. Hundreds of schoolchildren studied the urban history of Helsinki and then redesigned the city center. Thousands of cities are creating municipal councils of children to promote civic awareness and engage the citizens of the future (EFILWC 1997b).

The Save the Children organization promotes children's rights and supports children in disadvantaged condition. A global network of nonprofit organizations from 120 countries has a rich record of crisis-driven work. The "Every Beat Matters" campaign, which started in 2012 aims at eliminating preventable child deaths. The "Rewrite the Future" campaign started in 2006 and strives to ensure a good education for children unable to attend school due to conflict or war. In 2008, the organization surpassed its goal of improving education standards for eight million children by reaching more than ten million.

The citizens of the future should be given the place that they deserve in all forums for sustainable development. In preparing for the Rio+20 conference, three NGOs, Oikos, Terre des hommes, and the World Future Council, launched in March 2012, an online petition for signatures demanding world leaders to support the establishment of Ombudspersons for Future Generations.

According to the above-mentioned three NGOs, despite numerous international processes and agreements on sustainable development, human well-being is threatened by irreversible damage to the Earth and its ecosystems. Yet political decisions are still driven by short-term thinking and flawed market preferences. For present and future generations the basic right to a healthy and fulfilling life seems severely undermined.

Ombudspersons for Future Generations could act as a driving force behind the sustainable development agenda while ensuring accountability and accessibility. They can act as representatives for those who are not yet able to express their interests and bring sustainability to the heart of decision making at all levels. This offers an opportunity to break the short-term orientation and stand up for future generations.

The movement continued. In Oxford, in September 2012, the Director-General of the World Trade Organization led a meeting of international business, government, and other leaders to address the gridlock in international and national efforts tackling key global problems and launched the Oxford Martin Commission for Future Generations. The commission draws on innovative interdisciplinary research, an analysis of global best practice, as well as a distinguished forum of renewed

experts to provide advice and recommendations based on longer-term strategic thinking. It intends to inform a range of policy issues, including population and economic reform, energy supply and demand, effects of scientific and technological advances, food security, and climate change.

9.3 Volunteering in the City: The Seeds of Human Solidarity

Voluntary approaches with the active participation of citizens and industry are most important for sustainable development. In Rio+20, the plethora of diverse voluntary pledges has been one of the most encouraging signs. Many cities develop particular approaches to attract voluntary commitment on various fronts of the sustainable development agenda, especially on climate change. Berlin and Helsinki extend the city's reach through voluntary agreements with the private sector to further their climate protection goals (CDP 2012b).

From voluntary schemes to volunteering for the city, the leap is not without significance. Citizens regularly offering their time, energy, and skills pro bono in their city constitute a precious urban human resource that has to be appreciated and enhanced. Exceptional events often served as catalysts of commitment. In preparing, for example, for the 1992 Olympic Games, Barcelona created and trained a body of 40,000 volunteers. After the great support during the Olympic Games, this body was considered a living asset and was offered new opportunities. The municipality helped create the association Volunteers 2000, which assists in policies and projects, safeguarding the functioning and minimizing the cost of every action.

In Athens, 55,000 volunteers, Greek and foreign, were selected and trained in order to offer their services during the 2004 Olympic Games. The municipality of Athens organized a dedicated body of volunteers to help visitors discover another face of the Greek capital city beyond tourist stereotypes.

Citizens, proud of the places they live in, are an extraordinary resource for any city. In Brussels, the ARAU (Atelier de Recherche et Action Urbaines) association brings together aware citizens and local residents actively caring for the enhancement of their urban heritage. The outrageous construction of motorways and tunnels and the demolition of some important buildings, such as the "Maison du people" by Horta, in the 1960s, spurred the willingness of citizens to engage in efforts for a better city rather than simply protest. The challenge is to become responsible citizens and begin reading, living, and writing the city.

Committed citizens have often acted as ambassadors of their cities and contributed to city twinning schemes. The earliest examples of twinning cities include the treaties between ancient city-states designed to protect each other's interests in times of hostilities. The Romans were particularly effective and the tradition continued into the Renaissance. Most recent twinning schemes in Europe have their origins in the hope of peace and the unprecedented involvement of the citizenry in warfare.

The twinning activity became much more intense after World War II and brought together many former enemies. In 1947, Bristol, for instance, sent citizens as ambassadors to Hanover and Edinburgh and signed a twinning agreement with Nice. And on the other side of the Atlantic, the US Sister City program in 1956 became a citizen diplomacy network strengthening partnerships to increase global cooperation at the municipal level, promote cultural understanding, and stimulate socioeconomic development. The program created a movement for local community development and volunteer action by motivating and empowering individual citizens, municipal officials, and business leaders to engage in long-term actions of mutual benefit.

The choice of twin cities is usually founded on various geographical, industrial, or cultural characteristics and factors, growing from long-standing traditions rooted in past or recent links prompted by political solidarity. Old university towns have close links, as for instance, Leiden twinned with Oxford and Cambridge with Heidelberg. Sustainability ethics create new forms of global solidarity among local communities increasingly aware of their common destiny.

Over the last two decades, city-twinning became quite popular in Europe, including not only cities from countries with long-standing cooperative experience but also from the postsocialist states. Twinning, encouraged by the European Union, is viewed by many European municipalities as an instrument for both addressing local problems and ensuring sustainable development (Joenniemi and Sergunin 2011).

The EU enlargement towards the East brought together cities and towns that once belonged to countries lying across the old dividing line of the Iron Curtain. An imaginative example comes from Vienna and Bratislava, which created the "Twin City Vienna–Bratislava" aiming to be one of the most influential urban conglomerations in Central Europe. The new Twin City has the opportunity to become the heart of Central European sustainable life.

At microlevel, twinning of urban neighborhoods can go even further in linking urban world citizens. Downtown Bonn is surrounded by a number of districts that were independent municipalities until a few decades ago. As many of these had their twin cities before the local government reorganization, Bonn entertains a tight-knit network of twinned municipalities in other European countries. The inner city of Bonn maintains twinning with Oxford and a district of Budapest and its various districts are twinned with a great range of diverse cities. All these microtwinning schemes create a lively tapestry of international understanding.

Many partnerships create twinning schemes among developed and developing world cities or promote south–south cooperation. The World Urban Forum or Summits at the level of semicontinents or continents, such as the African Summit of Civil Society Organizations, organized by the UN/HABITAT drew from efforts to forge suitable partnerships for building capacity and facilitating interaction between local leaders for collective learning. The African summit tried to foster the role of CSOs and strengthen the voice and representation of the entire sector in the global south. The bonds between African CSOs enabled them to interface effectively with other institutions and consolidate their voice as an important player for African development.

9.4 Local Shared Leadership and Global Governance

On the global scene, city twinning schemes have planted the seeds towards the creation of a world coalition for cities. City alliances could be instrumental for achieving the Millennium Declaration specific goals. The last of the UN millennium goals concerns the development of a global partnership for development. The social compact among developing countries, responsible for their development, and developed countries, supporting them through aid, debt relief, and trade access, has been beneficial but further commitments are needed. Progress is also required on the international agenda for trade, technology transfer, access to essential care, and promotion of youth employment. Cities could play a great role.

A strong partnership of cities could yield sufficient collective power to influence opinion and prod policy farther up the global agenda. Cities often have more freedom than nation states to put into place progressive strategies that are changing citizen's lives. The C40 Cities, a global network of large and engaged world cities committed to implementing locally meaningful actions to help address climate change. The C40 Cities represent the world's megacities and account for approximately 14 % of global GHG emissions.

The C40 alliance was formed in 2005, when representatives from 18 megacities came together to pursue action and cooperation on reducing greenhouse gas emissions. The meeting resulted in an agreement to cooperate on preventing climate change by taking decisive and immediate action on procurement policies and alliances to accelerate the uptake of climate-friendly technologies and influence market dynamics. This was the start of the C40 Climate Leadership Group, comprised of cities in the developed, developing, and emerging economies. In 2006, C40 invited the Clinton Climate Initiative (CCI) to become partners in world-class projects to address climate change in significant, practical, and measurable ways.

The Clinton Climate Initiative aims to address the core issues driving climate change at the invitation of city and national governments and with businesses around the world. The Initiative supports programs to reduce greenhouse gas emissions that are both economically and environmentally sustainable, such as increasing accessibility and deployment of clean energy, reversing deforestation, and reducing carbon emissions in cities and communities. The initiative embraced a holistic approach to tackle the major sources of greenhouse gas emissions and influence the people, policies, and practices that affect them.

Municipal governments can have a major direct impact on the global market for green technologies. Cities purchase building materials, appliances, and systems for thousands of buildings, such as schools, hospitals, administrative offices, and police stations. Cities also buy and operate municipal fleets of vehicles and run their water and waste systems. Through the C40–CCI partnership, cities are able to pioneer energy-efficient and clean-energy products and technologies. This collective effort can significantly reduce greenhouse gas emissions and mitigate climate change on a large and measurable scale.

Buildings and infrastructure are the most tangible assets that cities have in common and in a much more concentrated form than the rest of the world. Much energy is still inefficiently used in buildings that could even be transformed into net energy producers. The deployment of energy-efficient equipment is considered to be the most cost-effective immediate path to sustainable development, greater energy security, and lower greenhouse gas emissions. The IEA estimates that energy-efficiency improvements could contribute to almost half of the reductions in energy-related CO_2 emissions potentially achievable by 2030.

In May 2007, the creation of a global Energy Efficiency Building Retrofit Program brought together eight of the world's largest energy service companies, five of the world's largest banks, and 17 of the world's largest cities in a landmark program designed to reduce energy consumption in existing buildings. The program provides cities and private building owners with access to the necessary funds to retrofit existing buildings with more energy-efficient products and processes leading to energy savings up to 50 %. If all participating cities replaced all appliances in municipal buildings by energy-efficient ones, a great deal of energy could easily be saved.

As part of the Clinton Global Initiative, Amsterdam is cooperating with Seoul, San Francisco, and Cisco through the Connected Urban Development program for making cities more sustainable. The program involves the development of urban ecomaps to create awareness among citizens of the impact of carbon emissions on their urban environment. It provides information on carbon emissions from transportation, energy, and waste among neighborhoods, and advises on ways to reduce residents' carbon footprints. Raising awareness could empower citizens to move from collective intelligence to collective action.

The development of urban infrastructure and technology transfer to the developing world could be two domains of intercity cooperation with the higher potential for sustainable development. They require effective cooperation between governments, industry, and financial institutions. Developing world cities could be the gates for the cleaner technologies to upgrade the world infrastructure for water, energy, and sanitation. Significant penetration of cleaner technologies in developing countries would need access to the best available technology, capital for the necessary investments, and an adequate institutional and financial framework. Cities, in cooperation with business coalitions, could facilitate smooth international exchanges, access to effective markets and services, and transfer of state-of-the-art technology.

The picture of the developing world cities is very complex and diverse. On energy infrastructure, the example of cities in some OPEC countries, which built their entire economy on oil transit and exportation, is significant. The structure of energy supply in the developing world as a whole presents some particular features. There is relatively more use of coal and renewables, particularly due to the primitive use of biomass. Noncommercial traditional energy, mainly including firewood, charcoal, crop residues, and animal waste, accounts for approximately 10 % of global primary energy use, but reaches 30 % in developing countries and 70 % of final energy consumption in sub-Saharan Africa. Its use, based on obsolete

technologies, is highly unsustainable and, in many cases, also contributes to deforestation. City-twinning schemes should help facilitate the transition to clean energy options.

Cities from the European Union, the world's largest donor of development aid, have a critical role to play, particularly in creating strategic partnerships for the transfer of cleaner technologies. Advanced energy technology dissemination actions, carried out in cooperation with cities in developing countries, could, for example, boost the development of energy services based on renewable sources. Furthermore, European cities could help developing cities to improve their governance structures and balance and integrate their pro-poor, pro-jobs, pro-growth, and pro-environment agendas for smart and sustainable and inclusive growth.

The penetration of renewable technologies in the developing megacities of the world can yield multiple benefits for the environment, security of energy supply, and the global economy. Decentralized generation presents a special opportunity and the command and control power grids, which presently leave a large share of the population outside, could gradually be completed with more decentralized and efficient, cleaner, and service-oriented systems.

Collaborative projects initiated by the International Energy Agency, known as "Implementing Agreements," could be the basis for inspiration of the mechanisms and structures for the development of new energy systems, as well as for the deployment of clean technologies in the marketplace. Activities under these Implementing Agreements have been fundamental building blocks in facilitating progress of new or improved energy technologies. The legal contracts and standard rules and regulations allow interested partners to pool resources and to foster the research, development, and deployment of promising technologies and innovations.

Renewed applied research and technology organizations work together with emerging megacities to provide models for emulation. The German Fraunhofer Institute is developing new concepts and solutions to save energy, tackle pollution, and improve quality of life in Seoul. The capital of South Korea is a typical megacity, vast, effervescent, and full of nuisances, that wishes to be transformed into a green city with clean air. Its population has quadrupled in 50 years. This growth had a dramatic impact on the environment, bringing about a huge impact on resources, and an impressive increase in air pollution and traffic noise. The city decided to invest in innovative concepts and technologies. Researchers of the Fraunhofer Institute for Solar Energy Systems developed an energy-efficient prototype building for Seoul, designed to incorporate all the principles of modern energy-saving technologies and sustainable energy sources.

Over half the Seoul population live in high-rise apartment blocks built over the last decades of the twentieth century. By German standards, these buildings were poorly insulated and inefficiently heated and cooled. Overheating in summer also causes the growth of fungus. Sensors monitoring temperature and humidity, 24 h a day, helped control the situation. The indoor climate was then simulated and recommendations were devised on better energy efficiency and comfort. As in many megacities, one critical issue in Seoul is soundproofing. The traffic in the streets of the South Korean capital produces incessant background noise. A new regulation on

reducing impact noise, more stringent than the corresponding regulations in Germany, has been in force since 2006.

Services for citizens are another area in which the city of Seoul wished to use state-of-the-art technology. The objective is to make contacts with public authorities simpler, more productive, and friendlier. The National Information Agency is developing special IT services, not only providing information and online procedures and services, but directly involving the citizens.

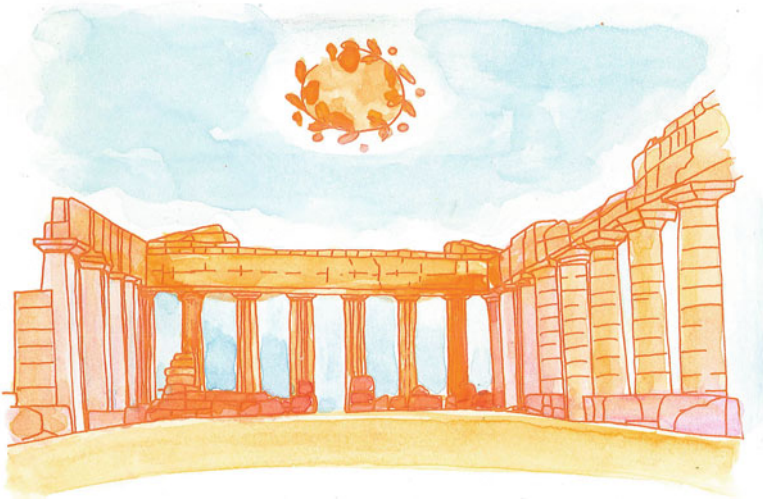
Other headline world initiatives include the C40–CCI Climate Positive Development Program and the Carbon Finance Capacity Building program. A key milestone in 2011 was the C40 Cities Mayors Summit in São Paulo, in which C40 announced new partnerships with the World Bank and the Council of Local Governments for Sustainability to accelerate climate action in cities through streamlined financing and greenhouse gas accounting and reporting. The release of two reports developed in collaboration with the Carbon Disclosure Project and Arup, respectively, emphasized the critical role of measurement and transparency in tackling climate change in megacities.

On June 19, 2012, mayors, delegations from the C40 Cities Climate Leadership Group and a former US president, assembled in "Rio + C40: Megacity Mayors Taking Action on Climate Change," an event to highlight the concrete climate actions taken by C40 Cities. New data revealed that C40 Cities have the potential to reduce their annual greenhouse gas emissions by over a billion tonnes by 2030, an equivalent to the annual GHG emissions of Mexico and Canada combined. With just the already planned measures, C40 Cities are on track to reduce their collective annual emissions by 248 million tonnes by 2020.

Building on these significant accomplishments, C40 launched a solid waste peer-to-peer learning network. With support from the World Bank and the Climate and Clean Air Initiative of the US State Department, C40 are establishing a new network to assist local governments in reducing methane emissions through solid waste management. C40's partners offer technical assistance to help participating cities develop viable projects that reduce methane gas production, enable access to financing, and facilitate sharing for active peer-learning and collaborative work.

In Rio+20, mayors and local government leaders called on national governments and international organizations to provide more financing and support for local climate action. Carbon Disclosure Project research shows that cities are largely financing their climate change actions without significant external support, as 64 % of their initiatives are funded through general municipal funds (CDP 2012a).

Watercolour 10
Athens, “The Eye of Greece, Mother of Arts” (J. Milton)



Chapter 10
Codesigning Fair Cities for the Next Generations

Abstract From enlightenment and anticipation to action, strategic foresight can provide the insights to build a sustainable vision for a preferred future out of many possible futures. Thinking ahead and together with citizens can spectacularly open the spectrum of optimal futures but also help coevaluate the drivers, the barriers, and the conditions for change. Strategic planning for the implementation of a compelling transformative urban agenda has to address many spatiotemporal patterns in cities and must therefore focus not only on the three spatial dimensions but also the time dimension. Time is a scarce and most precious resource. Local time plans can enhance the capacities of cities as chronotopes and improve resource efficiency and quality of life.

The aim of better codesigned policies is to achieve better lives. Urban observatories and sustainability indicators can take the pulse of cities and their citizens and serve as compasses in the journey of sustainability. Impact indicators are powerful instruments and could serve as yardsticks and compasses for prospective policy making and also for assessing and reorienting policy implementation.

A strategic global CityPedia by and for world cities and citizens could bring together trends and opportunities, visions and plans, best, good, and appalling practices, and enrich distributed capacity to synthesize insights. Such a global effort could foster solidarity among world citizens and enhance noble emulation towards the civilization of sustainability.

10.1 "There is no auspicious wind for those who do not know where they want to go" (Seneca)

Vision building is the first mobilizing element for creating the sustainable cities of the future. It has to be compelling and it is increasingly the subject of consensus and participative governance. The discussion of many possible alternative futures, envisioned by all stakeholders, is a key element in this process in order for the future

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not to result in an unwelcomed continuation of the past. Multi- and interdisciplinary, scientific, technical, and social approaches are crucial as many challenges are global, multifaceted, and interdependant.

Strategic foresight, which always has to be accompanied by hindsight, deliberately cuts across the traditional boundaries of sustainability science disciplines and policy areas. It can act as a driver of mutual social learning interactions that stimulate the generation of common public visions. Increased macrocomplexity and need for cooperation create a space for participatory innovation and socially driven processes. Paradigm shifts and quantum leaps are possible if integrated in a coherent vision for the desired future.

Strategic anticipation includes the exploration of future possible prospects through the early identification of emerging challenges, opportunities, threats, and horizon scanning for unforeseen turbulences, weak signals and "black swans," low-probability/high-impact events. Setting the strategic questions, identifying driving forces of change, determining main issues and trends, clarifying levels of impact and risks and degree of uncertainty, creating probable scenario narratives, assessing policy options, and identifying inflection points are important elements of the process. Impact assessment of alternative possible, probable, and preferred futures, exploration of alternative scenarios, and consensus building can lead to an ambitious, collective, and engaging vision.

Some governments and cities integrated strategic foresight in their decision-making mechanisms and developed policy portfolios to achieve the desired visions according to sustainability criteria and financial constraints. Scenario planning is often complemented by risk assessment approaches. The process well integrated in the heart of governments could help strike a balance between bureaucratic effectiveness and creative thinking and lead to forceful goals backed by all stakeholders.

Cities striving to reach their intended destination need to be well aware of their starting position, and their strengths and weaknesses. They have to decide together with their citizens where they want to be in the future and understand the significant trends that might influence the direction in which the future unfolds. Striving in the global knowledge economy for a sustainable future requires a dynamic local balance among economic, social, and environmental objectives and demands that the appropriate people, skills, and capabilities are developed, and city leaders demonstrate their abilities to appreciate these assets and invest in the ways that they can be enhanced and allowed to prosper.

Many cities envision ambitious long-term strategies for the future. New York's bold agenda for 2030, the PlaNYC was released in 2007 as an unprecedented effort to prepare the city for welcoming one million more residents, strengthen the economy, fight climate change, and enhance the quality of life for all New Yorkers. The Plan brought together over 25 city agencies to work toward the vision of a greener greater New York. The updated plan has 132 initiatives and more than 400 specific milestones until the end of 2013 (New York City Mayor's Office of Long-Term Planning and Sustainability 2011).

By 2030 the population of New York City is expected to increase to more than nine million, including newcomers and present citizens along with their children and grandchildren. This intergenerational multicultural city can offer tremendous

opportunities, enrich communities, spread the economic winds to new heights, and optimize well-being for all. But unplanned and uncontrolled growth can drain the capacity of public infrastructure, burden the city, and harm quality of life.

In the journey to sustainability, progress against goals should always be closely monitored and publicly disclosed. In New York City, during the years 2007–2011, 64,000 units of housing were created and 20 new neighborhoods became accessible by public transport. A new era of parks has been initiated in order to bring over 250,000 more New Yorkers within a 10-min walk from a park. The city's first bus rapid transit system has been launched and $1.5 billion US was committed for green infrastructure to clean waterways. Nearly half a million trees are being planted and unprecedented investments focus on the drinking water supply network. Over 30 % of the yellow taxi fleet is already green and regulations are expected to phase out polluting fuels. The process to remediate and revitalize brownfields is being streamlined and the cleanup of the most polluted plots is progressing. Last but not least, public plazas have been created for pedestrians, including one in Times Square, the "crossroads of the world," attracting inhabitants and visitors.

New York City issued the Executive Order to reduce municipal GHG emissions 30 % by 2017 and created the Climate Change Adaptation Task Force to advise on the adaptation measures. The creation of the Office of Environmental Remediation and the release of the Sustainable Stormwater Management Plan marked more steps forward. The second phase of "Schoolyards to Playgrounds" was launched on municipal buildings as part of the commitment to reduce city government greenhouse gas emissions (City of New York 2011).

The obstacles to achieving some of the goals were also disclosed. New York's efforts to maintain, improve, and expand the public transport network have been hindered by the lack of a stable and adequate funding source. Congestion continues to be very expensive in terms of money, time, wasted fuel, and air pollution. The global recession has forced the city to reduce its capital budget, and delay some PlaNYC 2030 projects. Several initiatives have also been slowed by a lack of state or federal permission, action, or funding.

The crisis has also affected the vision for *Grand Paris* (Greater Paris), the initiative announced in 2007 by the French President for "a new great plan for the Paris metropolitan region." In 2008, an international urban and architectural competition for the future development of metropolitan Paris was launched. Ten teams gathering architects, urban planners, geographers, and landscape architects proposed a vision for building a European metropolis of the twenty-first century, well-positioned on the global agenda (Atelier Parisien d'Urbanisme 2008).

The Boston vision for 2030 charts the way to a resilient city reinventing the innovation economy and promoting a civic agenda. The democratization of access to data and information is considered very important to foster informed public discourse and capacity to co-evaluate progress on shared civic goals. Some of the major objectives concern children and their access to safe pedestrian walkways and bikeways, transportation, and arts facilities. Education measures to enhance preparedness from cradle to career are given full attention. The proposed new paradigm plans to "Innovate locally, exchange regionally, export globally" with a

world-class human capital and an open and dynamic civic culture (Boston Foundation & the Citistates Group 2004).

The vision for a world-leading city-state has been proposed for Boston after interviews with 300 Boston opinion leaders and observers from government, academia, business, and advocacy groups. The vision suggests that it is hard to think of a twenty-first century city-state so ideally positioned as Boston in the "century of the intellect." Decisive factors are imagination and collaborative leadership, necessary for Boston to address critical challenges of global warming, public health, energy and water supply, shortfalls of knowledge workers, lack of affordable housing, and weakened civic ties.

10.2 From Vision to Strategy and Spatiotemporal Patterns and Policies

The creation of quintessential sustainable cities of the future demands the masterful interweaving of multiple registers, scientific, sociological and cultural, and can only lead to prototypes (Mega 2005). Since Hippodamus and the first grid plans, the collective search of the optimal urban forms for the desired future has been nourished by many concepts. Strategic planning and programming are important instruments towards the preferred future of sustainable cities and they affect the flows of energy. They ask for creative rigor to encapsulate objectives for the longer term, define the location of activities and infrastructure, and set priorities towards the execution of strategies.

Cities should evaluate their resources, respect the geophysical and cultural local limits, seek a symbiosis with the bioregion, and mobilize invisible hands and appraise investment and opportunities costs. Strategic urban planning for sustainability requires a comprehensive interdisciplinary assessment of urban assets, a natural resource information system, and an identification and analysis of the policy distortions and bottlenecks. Tactical decisions have to be inscribed in the overall policy framework and prevention to be considered an investment.

Strategic plans have to reconcile thematic and territorial policy objectives and be analyzed and discussed, codecided, coimplemented, and coevaluated. New principles can be injected into old plans and ensure change within continuity. The Copenhagen "Five Finger Plan" has been a prime example of a postwar plan directing the future expansion of the city into the countryside. Sustainability principles can preserve the green wedges, consolidate the fingers, and equip them with highly performing public transport.

Most sustainability debates insist on density and intensity, and call for limiting urban sprawl. Urban sprawl can deform the peripheries of cities. The threats are very high for cities that are surrounded by trademark landscapes. In New England, the precious legacy of old mill towns is in peril as Greater Boston expands. As a tidal wave of jobs moved out of Boston and near Routes 128 and 495, residential

choices were attracted by low density, car-dependent areas, far from public transit and infrastructures. The Massachusetts Smart Growth Alliance, an alliance of the state's top environmental and housing advocacy groups, highlighted that sprawl did not help to keep real estate prices low and could create unwillingness to live in the Boston region if it "starts to look and feel like anywhere in USA, combined with an extraordinary cost of living" (Boston Foundation & The Citistates Group 2004).

Strategic plans for sustainability focus upon bringing abandoned urban land into mixed-use development and seek to restrain peripheral growth to key locations dependent upon public transport. Cooperation beyond administrative borders is a major issue and has often to overcome local divisions and invest dissent into an integrated approach that can bridge territories, people, and opinions. Integrated risk management is another key issue.

In Japan, Tokyo, a labyrinth of cities, enjoys limited atmospheric pollution, low unemployment, an efficient public transport system, and high life expectancy for its citizens. Risk has often been the source for new concepts and processes. The Kobé earthquake in 1995 provoked a whole range of innovative managerial responses. The plans for the reconstruction of the city include cardinal innovations for the disaster-proof city, born out of the urge to create something eternal.

Transport and land-use policy and planning constitute two interconnected instruments for sustainability. Suburban garden cities or new satellite towns, which have developed around subway stations, have often been transformed into cloned suburbs without any independent identity. Sustainability imperatives ask for these suburbs to become consolidated vibrant neighborhoods with new offices and jobs near public transport stations, cultural facilities, and noble public spaces.

Transportation plans have to be integrated organic parts of the strategies to concretize the consensual visions. The Greater Paris vision is an instructive case because the Île-de-France region surrounding Paris had already published a transportation plan when the previously mentioned vision process took place. Later, the architects of Grand Paris joined together to present another transportation plan. After much negotiation, a compromise between the national government and the Île-de-France regional government was announced but the vision for Greater Paris met with governance divergence and dissonance and transport proved to be a sensitive link in the chain. One can question the overall process and reflect on a public consultation versus experts' consultation benefits.

The London Plan, which came into force in February 2004, aims at concretizing the vision of the metropolis for 2025. The population of London is expected to rise as the city's capacity to attract people from all over the world, from wealthy expats to asylum seekers, is expected to continue. In 2030, London could be a city that is over 40 % overseas-born and constituted 40 % from nonwhite population. The city could be more cosmopolitan and tolerant, and more attractive to talented creative mobile citizens of the world. The skyline will probably have even more towers. Down to earth, the city aspires to tackle congestion more comprehensively and reinvent its transport services with a greater number of electric vehicles.

Medium-sized cities can make small plans beautiful. In 1982, Evora was the first Portuguese city to prepare a municipal master plan. The political situation after the 1974 revolution favored citizen participation and the municipality led a long project of consultation. The common reflection and dialogue allowed the rigorous respect of the plan by all concerned. It trained the collective conscience and favored participation in all urban activities. The plan, approved by the government in 1985, aimed at creating a viable economy and improving the environment and living conditions. Ten years later, Evora was the leader of the European network "Strategies for Medium-Sized Cities." The city demonstrated that informal input along structured dialogue can enhance citizen involvement and respect for the plan.

Cities are chronotopes, with interconnected spatial and temporal dimensions and interrelated historical and geographical aspects. "Geography is history in place, history is geography in time" (E. Reclus). As are space and water, time is a scarce resource for cities. The time dimension greatly matters in advancing towards sustainable development. It introduces concerns about intergeneration distribution of capital and serves as a litmus test for the well-being of individuals and societies. Time management has a potential for extending the limits of spatial planning. Some governments and cities have been pioneers in promoting plans strengthening places through the enhancement of time budgets (INU-Politecnico di Milano 1997).

The concept of the "24 hour city" gained attraction, even if it most often refers to the always active commercial districts of some cities that never sleep. Time plans in Italian cities such as Milan, Florence, and Bolzano try to optimize public services offered by cities to citizens. They have been linked to mobility plans and led to the modification of timetables of municipal services. In Rome, a laboratory for the restriction of the metropolis to cars during certain days and hours per week, the municipality, trade unions, the city time office, and the office for citizen rights signed an agreement on the reform of timetables of municipal services. Women's associations have been very active in improving the opening hours of social services and bringing them into harmony with the times of citizens and the pace of life.

The process of reconfiguration of urban spaces and times can have a substantial resounding impact when new cells are injected into the body of the city. Strong sustainability actions ask for the enhancement of every possible space or resource and especially waste. A combined rubbish incinerator and power plant with a ski slope on its roof by architect B. Ingels is an inspiring example in Copenhagen. A mountain created on a multistory garage can combine functional, aesthetic, and health objectives and address Denmark's lack of mountains. The same architect is also the creator of the "8" house on the edge of Copenhagen, an apartment complex that wraps around and in on itself. The rising and falling roofscape creates a continuous platform and park and cycle track and inhabitants can bike to their front door.

Crowd-sourcing urban design can help create new typologies for urban commons to be collectively enjoyed. In Copenhagen, the Superkilen is an extraordinary 1-mile long urban corridor that runs through the cosmopolitan Nørrebro quarter inhabited by residents originating from 50 different countries. The creation of the park, also by architect B. Ingels, has been a laboratory for public

participation. Citizens were asked to identify essential elements of their culture that they wished to find in Superkilen. The urban corridor was enriched with a Moroccan fountain, Chinese palm trees, and benches, reminding inhabitants of various parts of the world.

10.3 "Imagineering" Better Policies for Better Cities and Better Lives

Better planning should lead to better policies and ultimately better lives. The level of life has been the subject of many debates. Many organizations tried to measure and appraise the level of quality of life with the use of various quantitative and qualitative indicators. These issues raised questions about whether traditional measures of national and urban welfare built around macroeconomic statistics are able to capture the reality of citizens' lives in a complex world and serve as significant yardsticks and compasses towards sustainable development.

Gross domestic product encapsulated as fully as possible national welfare during the last century. In 1968, R. Kennedy had suggested that "the GDP measures everything apart what is worth living for." This is an ongoing challenge at the center of many efforts and projects. Shortly after the birth of the Organization for Economic Co-operation and Development, in 1962, the US economist and Nobel Prize winner S. Kuznets suggested that "Distinctions must be kept in mind between quantity and quality of growth, between costs and returns, and between the short and long run. Goals for more growth should specify more growth of what and for what." These considerations are more valid than ever in search of sustainability metrics.

Sustainability indicators can be linked to the question of greening national accounts, and aggregating and comparing data in monetary forms. Genuine saving indicators or gross welfare product indices attempt to broaden the usual measure of saving to account for the cost of environmental depletion and degradation and investment in human capital or welfare. The UN Commission on Sustainable Development proposed in 1996 a methodology and framework of indicators, organized according to the "driving–state–response" model. The proposed indicators for sustainable human settlement comprise three driving force indicators (rate of growth of urban population, per capita consumption of fossil fuel by motor vehicle transport, and human and economic loss due to natural disasters), state indicators (the part of population in urban settlements, area and population of urban formal and informal settlements, floor area per person, and house price to income ratio), and one response indicator (infrastructure expenditure per capita).

European efforts for creating a common set of urban indicators have multiplied over the last decade of the twentieth century. The EU sustainability monitoring initiative "Towards a local sustainability profile – EU common indicators" launched in 2000, has been developed as a bottom-up approach in close collaboration with local authorities participating on a voluntary basis. The set includes five core indicators of citizen satisfaction with the local community, contribution to global warming,

mobility patterns, green spaces, local services, and air quality. Five additional indicators have been suggested, focusing on: children's commuting patterns; local management; noise pollution; sustainable land use; and ecolabeled, organic, and fair trade products.

Indicators should capture critical features of a city and contribute to making it more visible and transparent; help structure and harmonize databanks; enrich decision making with relevant and timely information; assist appraisals, comparison, and prediction; stimulate communication; and promote citizen empowerment and participation. They should embrace all sectors and neighborhoods contributing to the coevolutionary process of sustainable development. An indicators assessment board should validate the set of indicators, and ensure that the framework is regularly updated and validated.

Urban thematic indicators can shed light on a city's performance in all fields contributing to sustainable development and according to the specific policy objectives. Aggregate indices, such as the human development indicator, the genuine savings, or the ecological footprint and happy planet index, may inform about the overall performance of a city versus precise combined criteria. The development of a sustainability index after the thematic policy performance indicators is a complex task, inasmuch as indicators have to be weighted by contribution to sustainability levels and all the previous levels of aggregation have to be taken into account. Finally, it is important to highlight that no indicator can inform if a city integrates socioeconomic and environmental policy objectives which, however, is at the center of sustainable development (OECD 1996; EFILWC 1998a).

Many cities tested and introduced frameworks of indicators recently. Seattle is often quoted as a classic example of a dynamic city, breeding ground of successful businesses such as Boeing and Microsoft, with a coherent set of award-winning indicators. The Seattle framework demonstrates that indicators can reinforce local communication processes and promote common understanding (Sustainable Seattle 2008).

Qualitative indicators and reports are also very important. The State of the City report, published by the City of Amsterdam every 2 years, can be an inspiring monitoring tool. It draws information from a questionnaire sent to residents together with data from municipal statistics and other sources. Results are compared to the national situation as well as to other Dutch cities. Such State of the City reports could be inspired by the great tradition of the State of the Union addresses that produced many reports on both sides of the Atlantic. They offer an assessment of the past and a compass for the future in a form to be understood by all and invite all to action.

The Boston Indicators Project was initiated in 2000 with the goal of presenting progress through 2030, Boston's 400th anniversary. The framework offers new ways to understand Boston and its neighborhoods in a regional context. It aims to democratize access to information, foster informed public discourse, evaluate progress on shared civic goals, and report on achievements in 10 sectors: civic vitality, cultural life and the arts, economy, education, environment, health, housing, public

safety, technology, and transportation. The website of the Boston Indicators allows accessing data for more than 200 measures of 70 shared civic goals.

A series of imaginative biannual reports integrates and enhances quantitative and qualitative information and evaluates Boston's prospects. The first report on "The Wisdom of Our Choices: Measures of Progress, Change and Sustainability" introduced the framework of indicators and measures identified through a rigorous process involving more than 300 experts and stakeholders. The report noted that the booming knowledge economy was creating an "education divide." The second report, "Creativity and Innovation: A Bridge to the Future," highlighted Boston's institutional, physical, and cultural assets, but noted a worrying trend, the move of young people away from Boston and Massachusetts, mainly due to factors linked to the cost of living (Boston Foundation 2001, 2003).

All following reports revealed particular aspects of the city and the region. The third report, "Thinking Globally, Acting Locally: A Regional Wake Up-Call," noted that the region was suddenly competing for jobs and talent not only with other US regions, but with China, India, and other emerging economies. It called for a coherent, collaborative response and issued an Emerging Civic Agenda. The fourth biennial report on the period 2005–2006, during which the local and regional economy strengthened considerably, suggested remarkable progress on the civic agenda (Boston Foundation 2005, 2007).

The 2012 edition of Boston Indicators celebrates a City of Ideas. Greater Boston has ridden out the economic downturn better than much of the United States, but without a critical reinvention of its innovation economy, Boston could lose much of that advantage. The report builds upon a theme that first surfaced in the 2009 Boston Indicators Report, "A Great Reckoning: Healing a Growing Divide." It suggests that economic inequality in the city has reached even more serious levels, as the region's economic growth sectors create new wealth, but leaves poorer parts of the city behind. Boston could be described as a resilient twenty-first century city in reducing inequality and developing a more robust, sustainable local economy (Boston Foundation 2009, 2012).

Boston has been among the top cities of the SustainLane US City Rankings of the 50 largest cities, an inspiring benchmark exercise on the unfolding efforts of cities towards sustainable development. Since the first SustainLane rankings in 2005, world events have made sustainability an even more vital concept. Hurricanes and crises underlined dependence on unpredictable forces. SustainLane's rankings cover indicators of quality of life, such as local food availability, air and water quality, pedestrian and park space, and road congestion. They also recognized the growth of clean technologies, developments in renewable energy, waste management, advanced transport services, alternative fuels, and green buildings.

The SustainLane City Rankings focused on urban policies and practices that differ across the country and can reveal the distinctive figures of the various cities. The US winner of the 2009 third ranking exercise was Portland, Oregon, recognized as the most sustainable city, followed by San Francisco, Seattle, Chicago, New York, and Boston. Portland particularly excelled in clean technology and green building development, overall quality of life, and sustainability planning and management.

More than ever, citizens suggest that they have a high quality of life and work hard to be involved in urban policy making, boards, projects, and practices that affect sustainability.

Sustainability ethos is high on Portland's agenda, and leadership for sustainability is exercised at all levels. It is not only demonstrated by the local governments but also by all actors including civil society and businesses. The municipal administration leads by example in promoting renewable power and green buildings. Citizens opt for the most sustainability-oriented options in everyday life. Portland continues to attract businesses, residents, and tourists and has become a magnet of sustainable growth.

International comparative analyses should always be regarded with a sound dose of scepticism, inasmuch as many statistics are culturally dependent and the conception of indicators is limited by national differences in data definitions and collection and composition methods. Comparisons are meaningful when they refer to truly comparative units, in size and function. Systematic territorial indicators are necessary complements to national indicators serving as international comparisons. Regularly reporting on territorial progress towards international targets and commitments can promote policy coherence and accountability of national decision makers at the local and international level.

The EU Urban Audit, first launched by the European Commission in 1997, constitutes a major exercise to develop indicators and enable an assessment and benchmarking of EU cities. Several concepts were tested and volumes of data were collected during the pilot study in 1999, the large-scale data collection round of 2003–2004 and the collection round of 2006–2007. The data, which went through stringent quality controls, have been available from Eurostat since April 2008. The cities were selected in cooperation with the national statistical offices and are geographically dispersed to ensure a representative sample. Data are collected for the core cities, for the larger urban zones, and for a small subset of variables focusing on districts.

The added value of the Urban Audit lies in its wide choice of indicators, its large geographical coverage, and its long time series. The audit consists of more than 300 indicators, composed and calculated from the 336 variables collected by Eurostat. They cover most aspects of quality of life, including demography, housing, health, crime, labor market, income disparity, local administration, educational qualifications, environment, climate, travel patterns, information society, and cultural infrastructure.

Following the first Urban Audit of 2003–2004, a report on the State of European Cities synthesised the main insights. The strongest urban population growth rates were recorded in peripheral EU15 member states and particularly in Spain, where some urban areas experienced average annual increases of 2 % or more. Cities in Ireland, Finland, and Greece also experienced some of the highest population growth rates. By contrast, many urban areas in Central and Eastern Europe witnessed an overall population decline. In virtually all cities, suburbs continued to grow or declined at a rate lower than the core city (EC 2007d).

In 2009, for the first time, 185 cities from EU27 were covered by the Urban Atlas, produced by the European Commission and member states with the support of European space technology. Composed of thousands of satellite photographs, the Urban Atlas provided detailed and cost-effective digital mapping, ensuring that city planners have the most accurate and up-to-date data on land use and land cover. The Urban Atlas intends to enable urban planners to better assess risks and opportunities, ranging from threat of flooding and impact of climate change, to identifying new infrastructure and public transport needs.

The hard evidence basis should always be usefully completed with soft elements. Apart from the facts and figures, perception studies are important supplements to indicator frameworks. The Urban Audit Perception Survey, conducted in 2009–2010 to assess the local perceptions of quality of life in 75 cities in the EU27, Croatia, and Turkey, complements the data from the main Urban Audit exercise (EC 2010d).

The main findings suggest that residents of northwestern European cities were most satisfied with health care services, but satisfaction was lower overall concerning job opportunities and the availability of reasonably priced housing. Except for nine cities, a majority of respondents suggested that poverty was an issue in their city. Opinions about the presence of foreigners in the surveyed cities were generally positive. At least in 68 cities, a majority of respondents agreed that their presence was beneficial. However, in almost all cities, the respondents who agreed that foreigners in their city were well integrated were fewer than those who agreed that their presence was good for the city.

Trust and safety in cities were among the issues given priority focus and the picture across cities was mixed. In about one third of them, less than half of the respondents agreed that most of their fellow citizens were trustworthy. Several Eastern European capitals were at the lower end of the scale. In most Nordic cities, about two thirds of respondents always felt safe in their city. There was a strong correlation between the proportion of respondents suggesting that most of their fellow citizens could be trusted and the proportion of those always feeling safe in their city. Respondents across all surveyed cities were more likely to say that they always felt safe in their neighborhood than in their city.

In ranking the three main challenges facing their city, respondents typically opted for "job creation/reducing unemployment", "availability/quality of health services," and "educational facilities." Job creation and reducing unemployment appeared among the three most significant problems faced by respondents in 64 out of the 75 surveyed cities. The need to improve the quality/availability of health services appeared among the top three priorities in 54 cities.

There appears to have been an improvement in the perception regarding air and noise pollution in European cities. In all Italian cities, a large majority of respondents agreed that air pollution was a major problem. In most cities, more than half of respondents agreed that noise was a major problem and this proportion ranged from 51 % in Rotterdam and Strasbourg to 95 % in Athens. Most cities seemed to have made progress regarding cleanliness in the past few years.

There was a strong correlation between the perceived levels of air pollution and opinions about public health, the same cities appearing at the higher and lower positions of the rankings. Cities where respondents were more likely to agree that there was a commitment to fight climate change were also the ones where respondents were more likely to agree that their city was a healthy place to live.

In almost one third of the surveyed cities, a slim majority of respondents stated that their city spent its resources in a responsible way. All surveyed German cities, except Munich, were at the bottom of the ranking relating to administrative services. The proportion of respondents disagreeing that resources in their city were spent responsibly ranged from 52 % in Leipzig to 73 % in Dortmund. There was a strong correlation between the proportion of respondents agreeing that resources were spent in a responsible way and those feeling that administrative services were efficient.

In a majority of cities, at least three quarters of respondents were satisfied with their city's cultural facilities, such as concert halls, museums, and libraries. In 69 cities, a majority of respondents were satisfied with public spaces, such as markets and pedestrian areas. Many cities at the higher end of the ranking, where most respondents were satisfied with their city's markets and pedestrian areas, were situated in northern and western European countries.

In 25 cities, at least three quarters of interviewees were satisfied with the beauty of streets, public spaces, and buildings in their neighborhood, and in another 40 cities, between half and three quarters of respondents expressed satisfaction. A majority of citizens were satisfied with parks and gardens in their cities except in 7 of the 75 cities. Similarly, a majority of citizens were satisfied with outdoor recreational facilities in all cities except for nine of them. Many citizens found it difficult to estimate their satisfaction with their city's sports facilities and the share of those who "do not know" reached 44 % in Liege and Riga.

In about half of the surveyed cities, roughly two thirds of respondents were very or rather satisfied with their city's public transport. Europe's capitals were among the cities with the highest proportions of respondents who used public transport to commute, for example, 90 % in London, 56 % in Bratislava, and 52 % in Sofia. The largest proportions of "frequent public transport users" were found in Paris, London, Prague, Stockholm, and Budapest, where, at least three quarters of respondents took a bus, metro. or another means of public transport in their city at least once a week.

The OECD "Better Life Initiative" and "Measuring Progress of Societies" projects foster the development of key comparable indicators to measure the well-being of societies. The organization has suggested 11 topics reflecting what the OECD has identified as essential to well-being in terms of material living conditions (housing, income, jobs) and quality of life (community, education, environment, governance, health, life satisfaction, safety, and work–life balance). An interesting element is the "Your Better Life Index", to be composed by citizens, based on the principle that everybody can easily establish a personal ranking depending on individual values and priorities (OECD 2011b).

The two previous volumes of this trilogy proposed sets of indicators for cities to adapt and develop over time. On the basis of an historic set of Dutch indicators (Adriaanse 1993) and a first implementation by medium-sized cities, two waves of

indicators were proposed in 2005 and 2010 and a further set would only bring cosmetic improvements (Mega 2005, 2010). The author therefore suggests that the indicators of the previous volumes are always relevant, as also are the limitations. For those who look for directions to further improve such sets of indicators, it is suggested to consider indicators capuring the diversity of cultures, languages, and generations coexisting and interpenetrating in cities.

10.4 Navigating through Uncertainties: Towards a Strategic "Creative Commons" CityPedia

As the second decade of the millennium advances, human capacities for imagining even the near future have proved inadequate. From the 9-11 and the tsunami's devastation to the outbreak of the financial turbulence that plunged the global economy into a crisis and the Fukushima disaster, the signs went unheeded until after disaster had struck. It seems that in times of high uncertainty and complexity, the world has a greater potential for shocks and risks to resilience and urban responses to global challenges are at a critical inflection point. In a time of multiple transitions, human understanding of the urban, as the future horizon for the great majority of the world citizens, stands at a turning point.

Navigating into the complex and unknown and its infinite range of uncertainties has always inspired humanity. Exploration can enter a new chapter in the era of interconnected citizenry and urban geopolitics. It can become a shared adventure open to many more world citizens conscious they are part of a global community. Diversity of perspectives could be greatly enriched by the variety of cities and creative dissent could be invested in a global differentiated effort. A common strategic foresight exercise could introduce new ways of thinking and perceiving opaque events, and enrich urban ways of engaging with the world. The emerging urban worlds seem filled with just as much opportunity as risk, but seeing both of these forces in their multiple facets and appreciating their interrelatedness requires arrays of new lenses and an unflagging awareness of diverse views.

The globalization of the 2.0, and increasingly n.0 cooperation, is a shift going far beyond the bilateral and even multilateral collaboration of cities and governments. Escalating strategic opportunities and risks to the urban environment such as migration and conflicts over scarce resources, governance deficits, forced migration, extreme weather effects, and civil emergencies create needs for common action from the interconnected world communities and on the economic, social, and natural systems.

In times of sharp transitions and scarce finances, it is difficult to distinguish the most urgent for world urban citizens. Translating foresight into readiness, imagination into opportunity, and present reality into future possibilities requires relentless questioning of the multifaceted urban realities and their interconnected socioeconomic, environmental, cultural, and political dimensions. Interdisciplinary approaches led to a mastery of fields including engineering, biology, philosophy,

architecture, art, and science, that, in continuous dialogue, can provide new palettes for creating visions. There are clear signs of emerging requirements for urban specialists of the whole and for a systems approach that can articulate the risks and opportunities inherent in complex, globally interdependent systems.

Cities need new eyes and new ways of seeing to extend their limitless frontiers. Great creative minds, artists and scientists, are the most well equipped to detect the early signs of seismic change in society, economy, politics, technology, religion, and philosophy and represent the world in unprecedented ways. These unique perspectives have to be captured and valued. Social technologies could be used for the confrontation of exceptional views and the crowdsourcing of new policy ideas. Social platforms can also harness the great cognitive surplus of urban societies by using leisure time for creating quality content and engaging with the world citizens (Shirky 2010).

Cities are very complex worlds and demand a new global architecture of foresight and risk assessment to benefit from the breadth of visions of other world cities and citizens, including best, good, and appalling cases. The slow procession of multiple summits, in which cities and social society often constitute the most unconventional partners, indicates that traditional processes for dialogue, consensus, and assessments lag dangerously behind scientific knowledge and new discoveries. New global circuits and even "global survival circuits" are needed (Sassen 2012).

A global distributed network can help scrutinize and cross-fertilize knowledge and insights on societal challenges and their consequences at all levels. Organizations and citizens should be given access to content and distributed rights to create and edit. This creative urban commons holds the potential to register a whirlwind of change more rapidly, synthesize insights, and raise public awareness in time to mitigate risks and seize opportunities. A global urban foresight commons could evolve in parallel with and capitalize on existing government and intergovernmental structures and extended urban networks, and further nurture open and largely unregulated global interactions.

The need for rapidly and transparently connecting, updating, and translating the best of science, knowledge, and experience of global, European, national, regional, and local actors is incontestable. A global network could serve as a clearinghouse for rapidly aggregating and evaluating information and insights, foresight, and hindsight. The commons would bring together identified trends, assessment processes, and foresight methodologies to the evaluation of a larger and more diverse community of world citizens.

Global urban foresight commons, involving millions of participants worldwide, would need to evolve organically, initially in a bottom-up fashion, with an international mix of early contributors. The system can be conceived as a robust urban form of Wikipedia, a Strategic CityPedia, with capacities for globally distributed synthesis, and for evaluation of forward-looking assessments, the visions that can be built and the pathways to make the visions come true.

Once a critical mass of expert and citizen participation is achieved, organizations could contribute resources to the global urban foresight commons, realizing the energy and time benefits of a collaborative approach to mapping risks and

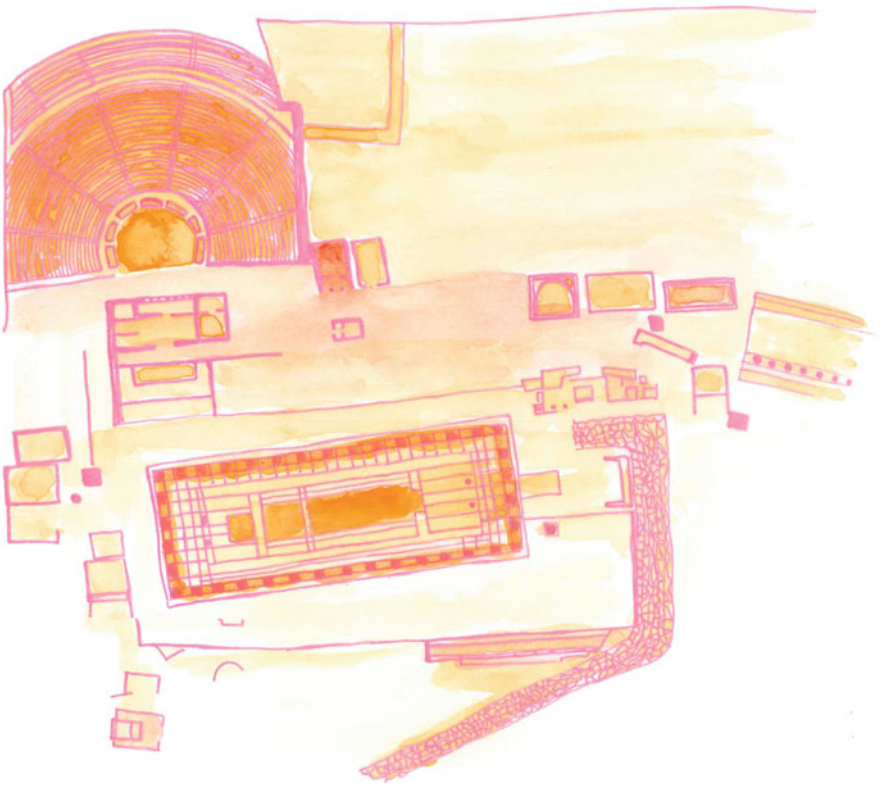
opportunities on common challenges. Furthermore, such a Strategic CityPedia could transcend the often slow or partial politics of single-policy advocacy groups and networks, and overcome the boundaries of individual government agencies and multilateral organizations.

A global foresight CityPedia could continuously and clearly bring future possibilities into the present in ways that people can understand and in which they can participate and act for their needs and wants to create together with the citizens of the world the sustainable cities of tomorrow.

Watercolour 11
Delphi: The Oracle of Time

"Life is short, and Art long; the crisis is fleeting; experience perilous, and decision difficult"

Hippocrates



Chapter 11
European Cities and Interconnected World Experiences

Abstract This final chapter addresses the European urban constellation, a unique polycentric archipelago of large, medium, and small cities, and reviews, in a nutshell, two decades of visions, declarations, and policies for urban sustainability in the European Union. The recognition of the four dimensions of subsidiarity, local, regional, national, and European by the Lisbon treaty highlighted the importance of multilevel governance. Cities have an essential role in the implementation of the strategy Europe 2020 for a smart, sustainable, and inclusive Europe on the ground and the upholding of the European social model, the shared value of social justice and citizenship, human rights, and democracy.

European responses to global urban challenges could inspire world cities, even the small ones like Brussels, but also inspired by cities such as Bangkok, an amazing urban laboratory. Strategic partnerships such as the EU–China Partnership on Sustainable Urbanization are crucial in order to share the European experience with China preparing for its urban billion citizens. The US–Brazil Joint Initiative on Urban Sustainability, another exemplary public–private partnership supporting investment in sustainable urban infrastructure, is indicative of cities and citizens working together to illuminate the emerging world of tomorrow.

11.1 The Cities of the European Union: A Constellation of Visions, Declarations, and Actions

Europe is first and foremost urban, a constellation of thousands of cities and urban agglomerations, shaped by legendary cultures. Only London and Paris could claim the attribute of global megacities. Smaller world cities, such as Brussels, Amsterdam, or Vienna, try to enhance their human, social, cultural, and manmade assets. Vibrant urban conglomerations developed in many European countries. The Randstadt surrounding the Dutch "green heart" or the German Emscher Park in the Ruhr, once the nucleus of Europe's steel and coal industries, are noteworthy examples of urban

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megaregions. Intangible bonds and networking are also crucial for cities willing to build upon each other's experiences and achieve quantum leaps. Cooperation may be more important than competition in the world of tomorrow.

Europe is rich in a variety of small and medium-sized cities having an intermediate position in the urban system and boosting the dynamism of a polycentric urban network. "Small large" cities are usually on a more human scale and they offer a better physical and social environment than large cities. Their advantages make them attractive for investments when more powerful cities have environmental and social problems or decaying industries and infrastructures. Intermediate medium-sized cities are often more open to the countryside and may act as an interface between larger cities and regions. Medium-sized cities on the orbit of metropolitan areas face special opportunities and threats. Their geographic position provides advantages of access to resources and international networks, but also disadvantages in developing autonomous identities and complementary functions (EFILWC 1997d; Bellet et al. 1998).

Since the 1990s, urban issues have been high on the political agenda of the European Union. The Green Paper on the Urban Environment and the Reports on the Sustainable City recognized the role of cities as fulcrums of economic activity, innovation, and culture. The EC Communication "Towards an Urban Agenda in the European Union" expressed the intention to make EU policies more urban-sensitive. The Framework for Action for Sustainable Urban Development insisted upon better coordinated and targeted EU action for urban areas (EFILWC 1997a).

The European Initiative Urban, launched in 1994, tried to address problems and enhance opportunities in EU cities. Urban I (1994–1999) assisted 118 cities of the European Union to improve their living and working conditions, whereas Urban II (2000–2006) assisted 70 sensitive urban districts in improving their competitiveness, social conditions, and environmental regeneration. The Urbact program capitalized on the experiences of the Urban projects and promoted exchanges between cities through the creation of thematic networks, and the dissemination of exemplary practices to all European cities. Cities of the member states that joined the European Union since 2004 benefited from the initiative "Urbact Support for Cities," through the visit of experts and the provision of advice for the enhancement of the urban environment (EC, Urbact II 2011). In 2013, Urbact helps cities improve their capacity to identify and respond to citizen needs. Elected officials from cities taking part in Urbact projects are trained to strengthen their capacity and skills in sustainable integrated urban development. The general objective is progressively to build a core European group of highly skilled elected representatives and bring excellence to urban policies.

Early in the new millennium, the EU strategy of sustainable development, adopted in Gothenburg in 2001 and revisited in 2006, explicitly mentions urban problems, including congestion, deterioration of the vital nerves of the cities, urban sprawl, poverty, and social exclusion. In 2006, the European Commission adopted a thematic strategy on urban environment, structured around four priorities selected in concert with the social actors: the urban environment, transport, sustainable construction, and urban design. For each topic, the Commission presented the

challenges, policies already in progress, and prospects for future actions. Furthermore European programs provided possibilities for training and capacity building for local authorities, to develop the skills necessary for the management of the urban environment (EC 2009c).

Member states and the council of ministers have also been active in urban affairs. The national governments committed themselves to support urban strategies, including those of small and medium-sized towns, in their efforts for Europe to become the most dynamic knowledge-based economy in the world. In 2004, the Dutch presidency of the European Union promoted a set of common principles, the "Rotterdam acquis," to help shape successful urban policies. In 2005, the British presidency underlined the concept of sustainable communities and the importance of cooperation to acquire the necessary skills and competences. During the 2007 German presidency, ministers in charge of urban affairs signed the Leipzig Charter on the sustainable European city (Leipzig, May 2007), a statement of shared principles for urban development policy in Europe.

The charter recognizes European cities as parts of a common heritage. The reinforcement of the distressed areas, youth employment, the fight against exclusion, and sustainable architecture are key objectives of European cities highlighted by the charter. Recommendations cover all dimensions of urban development policy, including creation and preservation of dignified public spaces, sustainable infrastructure, energy efficiency, innovation, education, and training (Council of Ministers 2007).

The territorial agenda also provided a springboard for European governments to promote polycentric cooperation between cities and create new forms of partnerships between the cities and the countryside, to cement the regional clusters for increasing competitiveness, to brace the trans-European management of risks, such as the effects of the climate change, and to strengthen the ecological structures and enrich cultural resources. The Slovenian presidency of 2008 promoted the development of synergistic dynamics through coordinated actions for territorial cohesion and urban development.

Cities offer a privileged ground to reconcile Europe with its citizens. This was the message of the conference "Cities, Places of Every Possibility," with the eloquent subtitle "From Lisbon to Gothenburg, Cities Make Europe," during the French presidency of 2008. The Declaration of the Ministers in Charge of Urban Development (Marseille, November 2008) brought forward the main challenges for cities, including environment and climate change, competitiveness, social cohesion, and citizenship. It recognized that cities are key actors for reducing emissions, waste, and risks (Council of Ministers 2008).

Viable cities open to citizens and the world can drive progress towards sustainable development. Since 2003, the open days of the European Week of the regions and cities, organized by the European Commission and the Committee of the Regions, bring together in Brussels each October thousands of participants of all the regions of Europe. In 2012, the 10th edition of open days embraced hundreds of events in Brussels and 230 additional local and regional workshops throughout Europe. Sharing ideas and insights on a wide spectrum of issues, ranging from

boosting innovation and addressing short-, medium-, and long-term societal challenges were at the heart of the discussions. A platform for exchanges with public and private investors has served as a laboratory of ideas.

Closer to the cities and on the road from Rio (1992) to Istanbul and Habitat II (1996), the first conference on European Sustainable Cities and Towns (Aalborg, May 1994) marked a paramount step in the move towards urban sustainability with the signature of the "Charter of European Cities and Towns: Towards Sustainability," a starting point for the European Campaign of Sustainable Cities and Towns. This generated a massive movement of cities in Europe and an important pillar in the pantheon of world networks and movements (ICLEI 1995).

The Charter of European Cities and Towns Towards Sustainability, seen as the European version of Local Agenda 21, states that cities and towns should define their living standards according to the carrying capacity of nature and advance towards social justice, prosperous economies, and environmental improvements. Social equity is considered to be a precondition to the achievement of sustainability, as the inequitable distribution of wealth causes both unsustainable behavior and increases resistance to change. The charter advocates the development of urban sustainability indicators as yardsticks of progress.

The charter embraces an ecosystem approach to urban challenges and declares the responsibility of European cities for many global problems. Patterns of division of labor and land use, transport, industry, consumption, leisure, and, hence, values and lifestyles are not neutral. Sustainable development cannot be achieved without governments, local communities, and citizens rising to meet the goal of leaving next generations an, at least undiminished, capital. Each city is unique and has to find its distinctive path towards sustainability. Integrating the principles of the charter in its policies reinforces its vigor and forms a common basis for progress.

Equitable regional interdependencies are given importance by the charter which recognizes that cities cannot export problems into the broader environment or the future. Priority is also given to ecologically sound means of transport and sustainable mobility. Emphasis is placed on the reduction of greenhouse gas emissions, the enhancement of biodiversity, and the preservation of ecosystems. The signatories of the charter committed to develop Local Agenda 21 plans in partnership with their citizens and asked for sufficient powers and solid finances to carry out projects heralding sustainability (ESCTC 1994).

The European campaign of sustainable cities and towns brought together important networks and associations of local authorities that wish to benefit from the collective wisdom. The Association of Cities and Regions for Recycling, the Climate Alliance, the Council of European Municipalities and Regions, the Énergie-Cités, Eurocities, the International Council for Local Environmental Initiatives, Medcities, the Union of the Baltic Cities, the World Health Organization Healthy Cities Project, and the World Federation of United Cities joined forces to strengthen the implementation of the charter and share the results. The campaign introduced the Sustainable City Award which recompensed best practice and promoted noble emulation. The campaign recognized the active, progressive, and firm commitment of cities including Ferrara, Heidelberg, and Oslo to the sustainable development process.

In many cities, sustainability started becoming an innovative, creative, and proactive process embedded in the institutional culture and practices, and the subject of a structured, effective, and meaningful dialogue with their citizens and their stakeholders. The second conference on European Sustainable Cities and Towns (Lisbon 1996) urged cities to move from charter to action, whereas the third conference (Hanover 2000) marked the leap to the new millennium with the mayors' convention declaring local sustainability as their highest political priority (ICLEI 1997).

The Charter of European Cities and Towns celebrated 10 years of interconnected efforts for sustainable development with the "Aalborg + 10" Conference in 2004. This fourth conference was marked by the discussion of the Aalborg Commitments, conceived to assist cities and towns in achieving sustainability and signed by 110 representatives of local governments. The 10 Aalborg Commitments, signed by more than 600 local governments, constitute a tool to help local governments shape robust policies and set clear qualitative and quantitative targets to implement the urban sustainability principles of the Aalborg Charter.

Seville hosted the fifth conference of the European sustainable cities in 2007, which took stock of the experience of cities since the adoption of the Aalborg Commitments. The Seville conference brought together more than 1,500 elected representatives of the European cities and reconfirmed, once again, the responsibility of cities for sustainable development and their will to exchange their experiences and to engage in joint initiatives.

Dunkirk hosted the sixth conference of the European sustainable cities in 2010, which concluded with two political declarations. The Dunkirk 2010 Local Sustainability Declaration advocates the transition to a sustainable, green, and inclusive economy, overcoming the current resource- and energy-intensive models. It demands the prioritization of investments and a more efficient and greener resource management to enhance citizens' quality of life. European cities and towns must ensure that all citizens can discover and enjoy a low-carbon lifestyle. By signing the declaration, participants insisted that change can only be made with the support of national and international governments and institutions.

The Dunkirk 2010 Call on Climate Action asserted that local governments send strong messages to national and international governments in order that the disappointment of COP15 (Copenhagen, 2009) is not repeated. It asks for more ambitious reduction targets to achieve a meaningful longer-term climate agreement. This call also suggests that to achieve a low-carbon, climate-resilient, and green economy in Europe, local and regional governments must be fully integrated parties in negotiations and decisions.

To promote research and innovation and address urban challenges, some member states joined forces like in the Joint Programming Initiative (JPI) Urban Europe, an initiative of 15 European countries and public research that tries to make better use of funding across Europe. The initiative identified urgent issues to be addressed in order to create attractive, sustainable, and economically viable urban areas in which European citizens and communities can thrive. Major challenges include social deprivation and segregation, urban sprawl and congestion, environmental

degradation, and climate change. To make cities attractive places to live and work in a global village, governments agreed to exploit the advantages of their cities and help realize their potential for innovation and competitiveness.

The JPI Urban Europe aims to develop innovative approaches to address societal challenges adequately and create urban places of vitality, liveability, and accessibility. It also tries to advance research on the understanding of the complex urban system to develop comprehensive policies taking utmost advantage of emerging technologies and governance options to help develop prosperous European areas. Building on existing research and policy initiatives, Urban Europe brought together multiple and diverse strands of thought and proposed a strategic research agenda.

Research issues at various levels include urban scenarios and foresight activities for policy-oriented roadmaps and planning concepts, demonstration and pilot projects, monitoring, and benchmarking. The purpose is to shed light on hitherto unexploited assets in European urban areas by focusing on the great advantages of urban agglomerations and the quality of networks and linkages (European Commission, VU University Amsterdam, 2011).

The initiative brought together the various actors having a stake in urban areas as hubs of innovation and living labs for sustainability, places of social cohesion and integration, intelligent intra- and interurban transport, and communication systems. Representatives from a variety of interested research councils and centers, universities, ministries, science and technology platforms, and other networks from all participating countries defined together priorities for research. A first joint call for innovative research was organized in 2012.

11.2 Cities, the European Model of Social Justice and Citizenship, and the Strategy Europe 2020

The first decade of the millennium ended with the entry into force of the Lisbon Treaty and the year 2010 was a landmark year for the recognition of the local authorities in the European Union. Subsidiarity is guiding the sharing of competences among European, national and subnational, regional, and local authorities. It is intended to ensure that decisions are taken as closely as possible to the citizen and cities are constantly vigilant that action at the community level is justified in the light of the possibilities at national, regional, or local levels. Except for the areas that fall within its exclusive competence, the European Union cannot take action unless it is more effective than action taken at the national, regional, or local level.

The Lisbon Treaty recognized the four dimensions of subsidiarity (European Union, national, regional, and local) and the aim of social, economic, and territorial cohesion. Cities constitute the most condensed local level, the only places where the synergetic effects enhance and foster the simply additive ones. Research and innovation to explore and analyze the complex urban dynamics insist on the importance of an inherently interdisciplinary perspective and multifaceted approach to question and improve contemporary concepts, methodologies, and policies.

As a consequence of the new legal and institutional framework, the Committee of the Regions is facing considerable challenges to monitor the implementation of the principle of subsidiarity throughout the entire policy-making process. One of the major novelties brought by the Lisbon Treaty, the right for the Committee of the Regions to bring an action before the Court of Justice on grounds of subsidiarity has made the committee one of the points of reference in monitoring the application of the principle of subsidiarity (CoR 2011a).

The Lisbon Treaty also introduced the Early Warning System, through which the national parliaments have 8 weeks to send reasoned opinions on subsidiarity to the European Commission, the Council, and the European Parliament. This procedure could lead to the reconsideration of the EC proposals if a number of national parliaments detect that the subsidiarity principle may be violated.

The Subsidiarity Monitoring Network, managed by the Committee of the Regions, is facilitating the early exchange of information between local and regional authorities and the European Union regarding various legislative and political proposals which, once adopted, could have a direct impact on these authorities. Its members include parliaments and governments of regions with legislative powers, local and regional authorities without legislative powers, and local government associations in the European Union.

The network aims at raising awareness as regards the practical implementation of the subsidiarity and proportionality principles and enabling local and regional authorities to be active in monitoring the implementation of these principles. The network also tries to identify citizen-friendly measures for better law-making and simplified procedures. It acts as a mutual learning laboratory for the identification and exchange of best practices and experience between local and regional authorities on the application of the subsidiarity principle and the decentralized implementation of EU policies (CoR 2011a).

Thematic subsidiarity workshops extend the subsidiarity debate towards practical issues in policy domains where decisions are mostly shaped at the local, regional, or national levels. The workshops encourage a dialogue between the relevant EU institutions, local and regional authorities represented in the Subsidiarity Monitoring Network, and think tanks, focusing on one or more EU initiatives.

The 2012 Summit of European Cities and Regions, in Copenhagen, offered an outstanding opportunity to assess the contribution of the European Union to the development of its cities and the urban futures targeted by the European policies. Fifty-five years after the signature of the founding treaties, the summit provided a springboard for dialogue and debate on the key role of cities and regions for implementing Strategy Europe 2020 and reinforcing the leading voice of the Union.

The summit praised the role of European cities as cradles of innovation that can create a better future for all, by turning new ideas into growth, prosperity, jobs, and well-being and made clear that Europe 2020 is for all levels of European leadership, including the regional and local authorities, which ultimately make it happen on the ground. A welcome occasion to exchange views on best innovative practices to turn challenges into opportunities and progress towards a sustainable urban development, the summit was dedicated to the European urban fabric in the twenty-first

century, a concept taking account of the long-standing capacity of European cities and regions to reinvent themselves in terms of liveability, enhanced economic, social, environmental, and cultural assets and innovative planning and governance.

Apart from sharing insights, the summit demonstrated the political will to address the issues at stake, especially during the discussion of the EU cohesion policy for 2014–2020. The adoption of a political declaration underlined the engagements of Europe's regions and cities and the commitment of their leaders in driving sustainable development. Despite decades of cohesion policy in the European Union, the full potential of cities has not yet been fully reached. A coherent and integrated EU policy for urban areas together with genuine multilevel governance is always to be devised (CoR 2012).

Sustainable development and green growth in Europe's cities and regions are crucial for finding a path through the economic and financial crisis and engaging in sustainable recovery. The Copenhagen Declaration sets out clear environmental, social, and economic goals for European cities. The European Union is called upon to ensure adequate financial support for a cross-cutting urban policy and to give greater priority to territorial cooperation between European cities. The declaration also points out the need to strengthen the role of cities and regions in European policies (CoR 2011b).

In 2011, the European Commission had organized a reflection involving a number of urban experts and representatives of European cities on the urban challenges, visions, and ways ahead. The conclusions emphasized that cities are key to the sustainable development of the European Union and uphold the European model of social justice and subsidiarity. Sustainable urban development is at risk and there is an urgency to turn the threats into opportunities and new forms of governance are essential to grasp these opportunities.

The reflection highlighted that cities are fertile grounds for science and technology, culture and innovation, and individual and collective creativity. However, cities are also places where problems such as unemployment, segregation, and poverty are concentrated. Foresight is seen as a significant tool for managing transitions, overcoming conflicts and contradictions between objectives, and developing a better understanding of capacities and conditions for change (EC 2011a).

European economies are unable to provide jobs for all. Weakening links between economic growth, employment, and social progress have pushed a larger share of the population out of the labor market or towards low-skilled and low-wage jobs. Growing income disparities led to the spatial concentration of inequalities in terms of poor housing, low-quality education, unemployment, and difficulties or inabilities to access certain markets and services. Sociospatial segregation processes might lead to marginalization and isolated subcultures with fundamentally hostile attitudes to mainstream society in many cities.

The administrative boundaries of cities no longer reflect the physical, social, economic, cultural, or environmental reality of urban development. New forms of flexible and effective governance are needed. Urban sprawl and the spread of low-density settlements is one of the main threats to sustainable territorial development as it results in costly public services, overexploited natural resources, insufficient

public transport services, and heavy car reliance and congestion in and around cities. The model of the compact European city is increasingly appealing to the world.

The potential of socioeconomic, cultural, generational, and ethnic diversity must be further exploited as a source of innovation. Turning threats into opportunities demands the full realization of the potential of any kind of diversity. Competitiveness in the global economy has to be combined with sustainable local economies by anchoring key competences and resources in the territorial fabric and supporting social participation and innovation. Cities of tomorrow have to be elderly friendly and family friendly, as well as places of tolerance and respect towards multiple generations, races, and religions.

An emerging shared European vision confirms cities as places of high quality of life, green and healthy, with an advanced degree of social cohesion, fulfilling housing, education, and health care for all, democracy, cultural dialogue, and diversity. A holistic approach to environmental issues is more than necessary, as the many components of the natural ecosystem are interwoven with those of the social, economic, cultural, and political urban system.

There is a consensus on the key principles of future European urban and territorial networks that should be based on balanced economic growth and territorial organization of activities, with a polycentric urban structure, strong metropolitan regions, and other compact urban areas that can provide good accessibility to services and high environmental quality.

Balanced territorial development can be promoted by thriving and dynamic small and medium-sized cities playing an important role in the well-being not only of their inhabitants but also of the surrounding rural populations. They are essential for avoiding rural depopulation and urban exodus. The multicentrality of the European network of human settlements is another European feature and asset the potential of which has not yet been well evaluated.

New forms of governance encouraging shared visions and reconciling competing objectives and conflicting development models are essential to address the challenges. Cities of tomorrow have to offer models of sustainable urban development and match place- and people-based approaches. Formal government structures have to be combined with flexible informal governance structures that correspond to the scale of the challenges.

Governance systems should ensure coherent spatial development and an efficient use of resources, adapted to evolving circumstances and to various territorial, supra-urban as well as infra-urban, and temporal scales. Horizontal and vertical coordination is crucial for combining investments and sharing services on a larger territorial scale. New governance models have to capitalize on citizens' empowerment, participation of all stakeholders, and innovative use of social capital. In the context of weakened links between economic growth and social progress, social innovation offers opportunities to widen the public space for civic engagement, creativity, innovation, and cohesion (EC 2011a).

The cohesion policy proposed by the European Commission for the period 2014–2020 includes an ambitious urban agenda. First, it suggests to ring-fence for the purpose of integrated sustainable urban development a minimum of 5 % of each

member state's European Regional Development Fund allocation. This 5 % ring-fencing would be carried out through the new Integrated Territorial Investment instrument. With this instrument, all or part of fund management is delegated to cities. Second, the Commission proposed to set aside around €400 million for innovative urban actions to support forward-looking and sustainable urban development; and third, to establish Partnership Contracts to ensure that all levels of governance are properly involved in the design and implementation of the annual operational programs that execute the strategy Europe 2020.

To facilitate the effective involvement of local authorities in the implementation of the strategy Europe 2020, the Committee of the Regions created the Europe 2020 Monitoring Platform. Its members include regions and cities networking for actions on growth and jobs and contributing to the EU debate. It aims at facilitating the exchange of information and good practices of multilevel policymaking for growth and jobs among local and regional policy makers. The platform organizes policy workshops in which members can have a direct debate with representatives of the EU institutions, external observers, and experts. It also manages surveys offering information on territorial developments and members' opinions on their involvement in the process and on the sharing of best practises.

The annual Monitoring Reports are important tools in implementing the strategy Europe 2020. The second monitoring report highlights that an immense effort by EU cities and regions is already being made in virtually all policy fields and that the Europe 2020 Flagship Initiatives are viewed as potentially beneficial for local and regional authorities across the European Union. Greater knowledge of the policy measures proposed by each of them would even further increase their relevance and value for local and regional policies. However, in spite of some progress, the strategy Europe 2020 is still being hampered by a "partnership gap." In most cases, local and regional authorities were merely consulted, but not truly involved as real and equal partners, in the design and implementation of the National Reform Programs. Genuine multilevel governance approaches, including territorial pacts, have been implemented or planned in some, mostly thematic, cases. Broader adoption would help the Europe 2020 strategy to bear fruit and increase its ownership by Europe's citizens (CoR 2011b).

11.3 Lights on Brussels: A Small World City

11.3.1 A Multicultural European Capital in the Making: Milestones in a Nutshell

Brussels, a small world city in the heart of Europe at the cross-roads of history is 1,000 years old. A walled concentric city under foreign rulers, it has been cosmopolitan since the sixteenth century and the reign of Charles V. It became a royal city in the eighteenth century and an Austrian territory for 80 years before coming under French and Dutch rule.

In 1830, a Brussels-based revolution led to insurrection and independence. The industrial revolution found Brussels the capital of a heavily centralized state, extending beyond the medieval walls to care for the new populations of industrial workers. King Leopold II expanded the kingdom and created new boulevards following the example of Haussmann's works in Paris. The medieval walls were demolished and replaced by boulevards to facilitate the extension of the city center beyond the original heptagon (Corijn et al. 2009).

The turn of the twentieth century was marked by a splendid art nouveau movement and an artistic and scientific avant-garde, many attempts at modernization, a French-speaking culture independent of Paris, and a bitter struggle for nonconfessional education. The reign of the private car after WWII and the interconnected urban sprawl led to the spatial formation of the metropolitan Brussels Region, composed of 19 communities. At the end of the century, Brussels-capital is a region and a community in a multidivided state.

The beginning of the third millennium found Brussels exceeding one million inhabitants, as the established informal capital of Europe with almost one tenth of its population working in and depending on the European institutions. In the global space of flows, Brussels is a node for administrative and legal services and nongovernmental organizations. Capital of Belgium and one of the three regions of the country, Greater Brussels is a services center with industry contributing barely 6 % to the GDP. The motor of the second richest area in the European Union, it does better in economy than the rest of the country and strongly accumulates power and capital. But it performs worse than the country in relation to reducing unemployment, also because of new types of immigration.

The sociospatial structure of Brussels is the result of processes of suburbanization, gentrification, urban renewal, and exclusion. Suburbanization has been socially selective with working-class neighborhood formation and densification of the city in the nineteenth century and a rich periphery serviced by sprawl and private car mobility. The gap between the center and the periphery increased with poor innercity inhabitants paying for public services also used by the rich suburban population. The deindustrialization of the late 1970s led to the consolidation of immigrant neighborhoods where survival strategies favored ethnic entrepreneurship and the informal economy. Increased mobility of capital led to great effort by local authorities to attract and maintain investment.

Sociological analyses of Brussels highlight multiple divisions. It is a fragmented and segmented city with concentrated ethnic populations in precise parts of the city. In the city center 80 % of housing is rental and the majority of the population lives in deprived neighborhoods. Most residentially socially unstable housing estates demonstrated serious states of deprivation. Up to 6 years of difference in life expectancy can be observed between the disadvantaged districts and the wealthy neighborhoods.

Brussels is a multicultural city with foreigners covering a broad spectrum from asylum seekers to high-level expats. Until 1960, Brussels had a fairly moderate number of foreigners. Mass immigration took place until 1974 and attracted mainly workers from southern Europe and northern Africa. The new millennium saw dual

waves of high-skilled and low-skilled migrants from Eastern Europe, Africa, and Latin America and a stream of asylum seekers.

Cultural, ethnical, and religious diversity is a strong feature in the city which counts 118 neighborhoods. Multilinguals account for 40 % of the households and foreigners are almost one third of the population of the city. Since 1999, immigrant-origin citizens have been represented at all levels of government and, since 2012, 1 of the 19 mayors of the Brussels-Capital Region is of Turkish origin.

The population is increasing both due to growing birth rates, with one third of inhabitants less than 25-years old and growing external migration. 20,000 more households are expected by 2020. The Sustainable Development Plan for 2020–2040 for the Brussels region pleads for a new multipolar physical entity, made out of six territories and 100 self-sufficient quarters. It aims at creating a city of proximity, with all citizens having access to schools in a distance shorter than 1,000 m. It wishes to become a smaller world capital (Bruxelles Capitale. Agence de Développement Territorial 2009).

11.3.2 The European Quarter: For a New Balance between the Local and the Supranational

Most of the EU institutions are located within the European Quarter of Brussels, which is the unofficial name of the area corresponding to the approximate triangle between Brussels Park, Cinquantenaire Park, and Leopold Park. The European Commission and the Council of the European Union are located in the heart of this area near Schuman Square and station and the European Parliament next to Luxembourg Square and station.

The EU presence in Brussels had significant social and economic impact. Many see the prosperity of Brussels "as a consequence of the European presence." As well as the institutions themselves, large companies, law firms, and CSOs and NGOs are drawn to the city to be close to the EU policy-making system. More than half of European civil servants live in the Brussels Capital Region with more than 60 % in the communities surrounding the European district.

Brussels has 3.5 million square meters of occupied office space and half of this is taken up by the EU institutions, accounting for a quarter of available office space in the city. The majority of EU office space is concentrated in the European Quarter. The most iconic structure is the Berlaymont, the primary seat of the European Commission. It was the first building to be constructed for the community, originally in the 1960s and inspired by the UNESCO headquarters building in Paris, designed as a four-pointed star on supporting columns. Originally built with flock asbestos, the building was fully renovated in the 1990s and was reoccupied by the

Commission in 2005. Across the quarter, the Commission occupies more than 60 buildings with the Berlaymont and Charlemagne buildings, the only ones over 50,000 m^2 (Demey 2007).

The landscaping and design of the European district has been criticized as not to the height of a mighty European construction able to support the politics of imagination. The social physiognomy of the highly centralized district has also been criticized as being an "administrative ghetto" isolated from the vibrancy of the city. There is also a perceived lack of an architectural symbol to represent Europe. Others see Brussels as a "soft capital" rather than an "imperial city," reflecting the EU's position in serving Europe.

The historically residential area has been transformed into a modern office-oriented zone. Office floor space has tripled since 1981 and anonymous buildings have replaced historical and residential buildings. Brussels wished to consolidate its position as the informal capital of Europe and invested massively in infrastructure in the quarter. A master plan is under preparation to redevelop the quarter concentrated around the axis provided by the Rue de la Loi and give it some visual and symbolic identity.

In March 2009, a team led by French architect C. de Portzamparc won a competition to redesign the axis of Rue de la Loi and create a "symbolic area for the EU institutions" giving "body and soul to the European political project" and creating a multifunctional quarter with not only offices but also housing and commercial functions and open public spaces. The central road would have two instead of four lanes, returned to two-way traffic and could be endowed with a tram line connecting the quarter to the city-center.

A series of buildings with three progressive levels of height would be built on both sides of the axis with three taller "iconic buildings among the highest in Brussels," also given the fact that "building higher allows to turn closed blocks into open spaces." However, many residents believe that high-rise office buildings literally put residences in the shade. Most buildings would be between 16 and 55 m high with the tallest ones up to 80 m high. The freed-up space would serve for housing, shops, and cultural and leisure spaces to give the area a more human face and a multifunctional purpose. At the end of 2012, the quarter is in expectation of the results of the impact study that will influence its future.

Among the future historic landmarks, the House of European History, an initiative of the European Parliament, aims at promoting better understanding of European history and European integration, through exhibitions, a collection of objects and documents representative of European history, educational programs and cultural events and publications. The idea of creating a House of European History was launched in 2007 by H.-G. Pöttering, in his inaugural speech as president of the European Parliament, "for a better understanding of the development of Europe, now and in the future."

11.4 Bangkok: The Laboratory of a Developing Future Metropolis

11.4.1 The Genesis of a Metropolis: Explosive Growth and Problems in a Nutshell

Bangkok, strategically situated in a meander of the Chao Phraya River, has been the capital city of Thailand for more than 200 years. Many defining national events have unfolded in Bangkok which has undergone tremendous changes, growing rapidly, especially in the second half of the twentieth century, to become the premier city of Thailand. The center of Siam's modernization in the late nineteenth century, subjected to Allied bombing during World War II, and the modern nation's political stage, Bangkok experienced many waves of fortune and numerous uprisings and coups d'état on its streets since the 1970s. The metropolis has gradually grown up to the range of 10 million inhabitants. Chiang Mai, Thailand's second city, has a population of only 250,000 people.

Bangkok's progress in time epitomizes the perpetual struggles between tradition and modernity in a country in which the monarchy is held to be sacred and inviolable. The city is made of multiple contradictions. Floating markets flourish next to high-tech glass shopping malls, and spirit houses celebrating the spirit of the land, always bedecked with offerings and incense, thrive next to office skyscrapers of the latest technologies, luxurious hotels, and the modern temples of shopping malls. Misery and well-being coexist harmoniously behind the luminous and genuine Thai smiles and Brahma, the creator, Shiva, the destroyer, and Vishnu, the preserver, seem always present in purifying Buddhist celebrations.

History reveals that, after the fall of Ayutthaya, King Taksin established his new capital at Thonburi where he had canals (klongs) dug to make a defensive island. His successor, King Rama I, the first king of the current Chakri dynasty, moved the capital to the eastern bank in 1782, to which the city dates its foundation under its current Thai name. Rama I modeled the new capital after Ayutthaya, with the Grand Palace, and royal temples by the river. The plan of the original buildings and their position exactly copied the royal compound at Ayutthaya. Government offices were located within the Grand Palace, and the residences of the aristocracy were concentrated south of the palace walls. Settlements spread outwards from the city center. The new capital is referred to in Thai sources as Rattanakosin.

Upon completion of the royal district in 1785, the city was given a new name roughly translated as "Great City of Angels, the Repository of Divine Gems, the Great Land Unconquerable, the Grand and Prominent Realm, the Royal and Delightful Capital City Full of Nine Noble Gems, the Highest Royal Dwelling and Grand Palace, the Divine Shelter and Living Place of Reincarnated Spirits," and commonly shortened as Krung Thep, City of Angels.

Life bustled on the banks of the S-shaped Chao Phraya River where vessels always range from the humblest rowboats and taxi-boats to floating markets and

splendid royal barges. The river has been the most significant axis of Bangkok. At the time of the city's foundation, most of the population lived by the river or the canals, often in floating houses on the water. Waterways served as the main channels of transportation, and farming communities depended on them for irrigation. Outside the city walls, settlements sprawled along both river banks. Forced settlers, mostly captives of war, also formed several ethnic communities outside the city walls.

King Rama IV welcomed western ideas and innovations, but was also obliged to acknowledge western power, with the signing of the Bowring Treaty in 1855. During his reign, industrialization brought the steam engine, modern shipbuilding, and the printing press. Influenced by the western community, Charoen Krung Road, the city's first paved street, was constructed in 1864. Land transport would later surpass the canals in importance, shifting people's homes from floating dwellings towards permanent buildings. The limits of the city also expanded during this reign, extending to the Krung Kasem Canal, dug in 1851.

King Chulalongkorn (Rama V), fascinated by western science and inventions, was set upon modernizing the country. He traveled widely, adopting and adapting some European ways while maintaining Siam's culture and sovereignty. He engaged in wide-ranging reforms, abolishing slavery, and the feudal system, and creating a centralized bureaucracy and a professional army. The concept of nationhood was adopted, and borders demarcated against British and French territories.

With Chulalongkorn's reforms, the governance of the capital city and the surrounding areas came under the Ministry of Urban Affairs. During his reign many more canals and roads were built, infrastructure was developed with the introduction of railway and telegraph services and electricity was introduced, first to palaces and government offices, then to serve electric trams in the capital and later the general public. The European influence was reflected most noticeably in architecture, including the neoclassical Ananta Samakhom Throne Hall at the new Dusit Palace, connected to the historic city center by the grand Ratchadamnoen Avenue, inspired by the Champs-Élysées in Paris. The Marble Temple cut out of Carrera marble and with Palladian pillars is one of the finest temples of that period.

By 1900, rural market zones in Bangkok began developing into residential districts. The Memorial Bridge constructed in 1932 to connect Thonburi to Bangkok promoted growth and modernization. Bangkok became the center stage for power struggles between the military and political elite as the country abolished absolute monarchy in 1932. It was subject to Japanese occupation and Allied bombing during World War II, but rapidly grew in the postwar period as a result of US developmental aid and government-sponsored investment.

The explosive urbanization of Bangkok started in the 1950s and 1960s. The burgeoning metropolitan area was united in the 1970s with the merger of the provinces and local administrations of Bangkok and Thonburi, separated by the Chao Phraya River, the permanent most significant axis of Bangkok. The metropolis has been governed since then by the Bangkok Metropolitan Administration (BMA), created in 1975, with an elected governor since 1985.

Following the United States' withdrawal from Vietnam, Japanese businesses had a leading role in the region, and the expansion of export-oriented manufacturing led

to the growth of the financial market in Bangkok. The spectacular rising of industrialization and economic development, especially during the decade of the 1980s, together with the centralization of the activities of the national government, are the main origins of the primacy of the capital city, described as "the goose that lays the golden eggs for Thailand." Bangkok continued to be the unrivaled center of economic activities, especially industry, services, and trade, and a major redistribution node in southeastern Asia and the Asean economy.

The increasing density of population, due to population growth and migration, disorderly urban settlements, and rapid economic development have brought an exceeding demand for infrastructure, public utilities, and services. This resulted in the deterioration of the urban environment, public services, and urban quality of life. The decline of the quality of life of Bangkok residents has long been the subject of discussion among policy makers, planners, administrators, academics, and communities. "Magic eyes," a business-minded environmental organization founded in 1984 tried to invest in environmental action that was also good for the economy.

The 1997 Asian financial crisis obliged the government and the city to reconsider their values and priorities. By then, many social and environmental burdens had become unbearable. The strain on the infrastructure was particularly reflected in the city's notorious traffic jams but also social inequalities and air and water pollution.

The problems of traffic congestion, air and noise pollution, flooding, sewage and water pollution, and refuse collection and disposal had already been evident by the time of the Rio Conference on Sustainable Development (1992). The absence of effective public mass transport was the basic issue of the Bangkok traffic system, leaving the city in "permanent traffic congestion." The construction of expressways, subject to urban tolls for priced access, alleviated a part of the problem. And since December 5, 1999, Bangkok has enjoyed a skytrain mass transit which has offered more than 1,586,240,955 passenger trips up to September 30, 2012. It transformed the face of public transport in Bangkok and constitutes the safest, cleanest, most comfortable, and convenient way to surf the city, through skyscrapers, lotus ponds, and temples, and embrace the vibrancy of all urban facets in the heart of the bustling metropolis.

The location of the Bangkok Metropolitan Area, at the deltaic plain of the Chao Phraya River estuary, has made the city and the surroundings particularly vulnerable to flood. Much of the city areas and the suburbs are as low as mean sea level. The 2011 floods, the worst floods in more than 50 years, highlighted the inability of the government and the metropolis to have the full control of the situation. The flood hazard in Bangkok is not only a natural occurrence but is also linked to urbanization and resource management. The groundwater consumption in the growing suburbs is one example that partly causes land subsidence. The sewage and water pollution in the city of Bangkok is getting very serious as a result of the lack of the sewage system with the exception of some community treatment plants constructed by the National Housing Authority and small installations in hotels and department-store buildings.

Bangkok is a pulsating city searching for its equilibrium among many different worlds. Inequality and instability went hand in hand with student uprisings in 1973

and 1976, antimilitary demonstrations in 1992, and successive protests and antigovernment demonstrations, as the "Yellow Shirt" and "Red Shirt" movements from 2008 onwards.

Bangkok is a hot city. The daily average high temperature in Bangkok is above 40° C (104.2° F), prompting warnings from authorities for residents to be alert for heat-related ailments. The heat has been exacerbated by poor urban planning, heat-trapping building design, and the inadequate parks and green areas. Although a tropical city, Bangkok has fewer trees and green spaces in proportion to its population than other Asian cities. An Asian Green City Index of 22 cities released in 2010 by the *Economist Intelligence Unit* estimated the average surface of green space per inhabitant in the metropolitan area of Bangkok to be 3 m^2. This is well below the average of 39 m^2 and contrasts with other cities in the region. Neighboring Kuala Lumpur, another victim of rapid development and poor planning, still has 44 m^2 of greenery per person.

11.4.2 Institutional Framework and the Planning Imperative

The mission of the city planning department is to conserve the unique historical and cultural heritage and to plan for the well-being of citizens. It has to preserve historical areas by respecting international conservation principles and the activities of the communities, establish regulations and rules to control the construction sites located near historical and religious sites, and rehabilitate the historical areas and buildings especially on Rattanakosin Island.

The Bangkok Metropolitan Administration (BMA) is organized in accordance with the Bangkok Metropolitan Administration Act 1985, as the sole organization at the local authority level, responsible for the well-being of Bangkok residents with some financial support from the national government. The BMA has to directly report to the Minister of Interior. According to the Act, the BMA is comprised of the governor and the Bangkok Metropolitan Assembly. The governor is the chief of the city administration and is elected by popular vote for a 4-year term. The Bangkok Metropolitan Assembly is the legislative body, comprising 55 elected members. At the district level, district councillors are also elected for a 4-year term.

The BMA had limited resources and authority to fulfill its responsibilities. The institutional framework and the division into offices, departments, and district offices often created confusion. All the agencies under the BMA are designed according to their tasks. The city administration faces several constraints on urban planning and urban management. There are many empty mandates for functions that the BMA is responsible for without having the practical means to do so. The linkage between the national government and the BMA is not clear in terms of devolution of power or decentralization. Many issues related to the BMA's responsibilities, authorities, and subsidies are frequently debated among all agencies concerned such as the National Government, the Ministry of Interior, and the BMA.

The BMA has realized that effective development planning is imperative to establish Bangkok as a modern and functional city of promising environmental

quality and sustainability. Unplanned urban growth has proved to be unsustainable and inefficient. Considerable efforts have been undertaken to lay the foundation for an effective urban planning system. Over the last years, a series of planning, environmental, and transportation studies have been carried out with the ultimate objective of making Bangkok a healthier, more attractive, and effective city in which to live and work. Studies by the Massachusetts Institute of Technology and the European Commission have confirmed the necessity for the master plan to specify long-term visions for the metropolis and prepare for the high speed of urban development. All of these studies provide recommendations and a wide range of choices and long-term visions.

The Master Plan 1997, prepared by the Department of City Planning with the technical assistance of outside consultants from MIT and the EC, provided orientations and recommendations for more sustainable human urban districts and neighborhoods. The reorganization of the planning agencies, both the Department of City Planning and Department of Policy and Planning, have been the first priorities, followed by the training of planning officers.

11.4.3 Citizen Participation and Planning for Sustainability

The evaluation of the Fourth BMA Five-Year Development Plan (1992–1996) had highlighted that the failure of the implementation of many development projects was partly due to the lack of citizen participation during the planning process and at all levels of planning, including city, district, and community levels. The Bangkok residents had very little information about any projects by government agencies undertaken in the city and hadn't any opportunity to express their needs and wants, contribute their ideas, and demonstrate their interests.

Citizen participation has been defined as the local involvement of citizens with development agencies in setting priorities, defining projects, and carrying out selected urban projects. Participation is encouraged by workshops, public hearings, surveys, and appointments of representatives of community and stakeholder organizations.

The BMA tried to provide opportunities for Bangkok residents to have access to adequate planning information and be directly involved in the planning, execution, and evaluation of the Fifth Five-year Development Plan (1997–2001). They could determine the future of the city, through the appointment of local representatives, media, meetings, and public hearings, especially for the large infrastructure projects affecting a large population.

At the turn of the millennium, Bangkok had to provide the necessary infrastructure and services to satisfy the social and economic needs of the population. But it had also to demonstrate its care for the environment. River and water supply quality was deteriorating. Canal water pollution was very severe due to untreated wastewater often discharged into the public sewers. Groundwater contamination was also threatening. Rapid urbanization brought noise pollution, large volumes of garbage,

land subsidence, and the growth of slums. Since then, the city of Bangkok has been struggling to deal with the effects of population growth, and the impact on the local environment and quality of life.

Bangkok's long-term plan is based on biophysical and socioeconomic conditions and trends, and must be able to address distribution of wealth and quality of life issues and improve the environmental status. Water management is an extremely sensitive issue, as economic sectors such as agriculture, industry, transport, and households compete for limited fresh water.

The Bangkok Agenda 21, initiated in 1998 as the blueprint for development for the next 20 years, aims to improve Bangkok's urban environment and quality of life. It includes 10 priorities developed through public consultation and review. Leading the urban economy towards sustainability is the top priority of Bangkok Agenda 21, followed by the use of urban planning to improve quality of life. Reorganizing traffic and transport to raise the quality of air in neighborhoods and investing in green urban areas come next, whereas fifth ranks the aim to make Bangkok a clean city.

A recognition of the requirements of good governance in the BMA to meet the challenges of the future comes in sixth position, followed by easy access to information in the BMA. The use of human resources as a strategic tool in social and economic development come together next with citizen involvement in the development of a better Bangkok. Environment, culture, and tourism are ranked as the ninth top priority, and Agenda 20 also aims to combat poverty, the growth of slums, drugs, and HIV-AIDS (UNEP/ICLEI/Cities Alliance 2007).

The Metropolitan Master Catalogue is the driving force for the physical development of Bangkok. Containing overall development targets for the metropolis, and an overview of urban functions and infrastructure, the Catalogue links physical development to the city budget and enables the administration to guide urban development. It comprises 50 District Catalogues, online databases updated by each district on a biyearly basis. The District Catalogues help the district offices to implement the strategic plans for the metropolis. Each Catalogue includes: a plan based on the strategic agenda; community regulations concerning land use, building, and the environment; and a databank providing basic analytical and planning tools. Furthermore, a Sustainable Urban Management Handbook has been prepared to facilitate implementation.

A Bangkok Comprehensive Plan, updated every 5 years, is used for development planning and resource allocation. The Bangkok Comprehensive Plan includes strategies, objectives, and targets on air pollution abatement. The BMA also developed a Green Areas Master Plan that aims to increase green public areas, and through which residents are encouraged to plant trees in their front yards.

Efforts focus on the development of mass transit, establishing vehicle emission testing points to identify polluting vehicles, promoting sustainable transport and the use of alternative fuels such as ethanol or natural gas. Overextraction of groundwater in Bangkok has aggravated land subsidence. Impacts include changes in the elevation and slope of streams, damage to roads and storm drains, high tides reaching farther inland, floods and tides receding more slowly, and soils becoming salty and unproductive. In response to these phenomena, policies and regulations

concentrated on groundwater extraction. Six large-scale wastewater treatment plants have been constructed to protect water quality, and policies on effluent standards have also been implemented.

To deal with municipal waste, the BMA provided separate containers for food waste, recyclable waste, and hazardous waste to collect the garbage generated in the metropolis each day. Households are encouraged to sort their waste. Collection and disposal efficiency have been a priority for the BMA.

In a city reputed to have a dense network of NGOs and CSOs, Bangkok Agenda 21 has also paved the way for greater public participation. An intensive communication and awareness-raising campaign has been carried out in schools and communities, using workshops, printed materials, and other media. The BMA organized the Communities Love Canals Project, where representatives from all communities participated in identifying solutions to garbage dumping and wastewater discharge in the canals. The BMA also set up the BMA Environmental Protection Volunteers from schools and communities to help raise environmental awareness, and to develop environmental projects, particularly on air quality management.

Bangkok Agenda 21 has set the course for environmentally, socially, and economically sustainable development. The development agenda has provided basic principles for the numerous activities implemented by the BMA. A detailed assessment of the status of the environment and the creation of the Metropolitan Master Catalogue tried to ensure that physical development takes environmental and social concerns into account. Policies and regulation on water quality, waste management, air quality, and energy security were put in place to ensure better resource management (UNEP/ICLEI/Cities Alliance 2007).

Infrastructure was also improved, for example, storm drains and dikes along roads have been constructed or upgraded to prevent flooding. The Metropolitan Master Catalogue has proved its use as an analytical and planning tool. Environmental considerations were built into the urban management structure from the start, and communication was used to involve the public and stimulate community involvement. In addition, the skills of the BMA staff in geodetic tools and methodologies have been enhanced. The Bangkok experience demonstrates that local Agenda 21 can work even in very large cities if they include well-structured participatory actions.

The BMA established the "Bangkok's Public–Private Cooperation Council" with the main purpose of strengthening cooperation especially from private sectors including NGOs active in urban and community development. This organization comprises Bangkok citizens such as academics, businessmen, administrators, politicians, community representatives, and social workers, contributing their ideas, experiences, resources, labor, and time to the future of the city (UNEP/ICLEI/Cities Alliance 2007).

Bangkok, one of the fast-growing metropolises of the emerging world is in search of sustainable development. Making Bangkok sustainable and liveable with strong economic and social, physical, environmental, and cultural assets is a challenging objective for the services responsible for metropolitan planning and policy. Good governance and urban practices and policy, including land use and transport

planning, should strive to create sustainable infrastructure and environmentally friendly neighborhoods. A holistic urban approach should also care for adequate green spaces and park areas, providing oxygen for all urban functions.

11.5 The European Union–China Partnership on Strategic Urbanization

11.5.1 The Sheer Magnitude as the Utmost Challenge

Launched at the European Union–China Summit in February 2012, the European Union–China Partnership on Sustainable Urbanization aims at fostering cooperation and dialogue on urban planning, energy supply and energy demand management, green digital cities, urban mobility, water and air quality, and waste management, as well as the social integration of migrants in cities. It is also intended to strengthen cooperation for the development, transfer, and sharing of low-carbon and environment-friendly technologies and to enhance the energy efficiency of cities.

China experienced the most rapid transformation from a land of villages and rural communities into an urban country. According to China's National Bureau of Statistics, the level of urbanization in the country crossed the highly symbolic 50 % threshold in 2010. According to the estimates, 350 million people will be added to China's urban population by 2030. Cities have been the major drivers of China's impressive economic growth and, not surprisingly, urbanization is at the heart of China's 12th Five-Year Plan (Friends of Europe 2012).

The pace of urbanization in China has been fast and sustained. It represents a challenge not only for the country, but also for the world. European cities offer precious models for developing and emerging economies that face enormous challenges arising from the sheer scale of their urbanization. It is in the interest of all to support China in its endeavor to have cleaner cities that offer a higher quality of life. This will contribute to a balanced socioeconomic development and to a more rational use of energy and other natural resources with obvious impacts at the global level. It also means opportunities for healthy growth and business. The European Union–China Partnership on Sustainable Urbanization could be a first-order world model to enhance international cooperation on science and urban innovation.

Although China, as a whole, is less urbanized than OECD countries, it nonetheless has the world's largest urban population, with over 600 million urban citizens in 2012. China's urbanization and the growing number of metropolitan regions constitute unprecedented global phenomena, but the issues confronting all levels of government in managing this evolution are not unique. Most EU countries have faced a wide array of urban management challenges, and are continuing to acquire valuable experience to share.

By 2025, one billion people, or 64 % of China's population, will live in cities. The country is expected to have 221 cities with more than one million inhabitants,

versus 35 in Europe, of which 23 cities will have more than five million people and 8 megacities over ten million. Chinese cities are to build almost five million buildings from 2005 to 2025, of which almost 50,000 would be skyscrapers, the equivalent of 10 New York Cities (MGI 2011a, 2012a).

The urban economy will generate over 90 % of China's GDP by 2025, and 15 % more in 15 years. Migration will be a driving force of future urbanization which will result in an extraordinary stress on resources. Urban water demand is, for example, expected to increase by about 70 % compared with 2005 levels.

11.5.2 Building upon Each City's Endogenous Attributes

An OECD report providing a synthesis of trends in urbanization and urban policies in member countries, issued a key message for China. Successful urban development strategy should build upon each urban region's endogenous attributes, that is, not only physical infrastructure, but also the knowledge and skills of workers, and the social capital needed to trigger and sustain innovation. Interconnected efficiency issues in the provision of public services, strategic infrastructure, human capital formation, economic diversification, and agglomeration strategies are vital (OECD 2012a).

The European Union–China Partnership on Sustainable Urbanization can provide an open forum for European Union and Chinese decision makers and stakeholders to share experiences and develop joint solutions to address the economic, social, and environmental challenges brought by the unprecedented rates of urbanization. The intelligent energy design of buildings and urban mobility policies, the relation between the rational use of energy and air quality, the role of distributed energy and energy efficiency are not only crucial for the environment, they are also vectors of economic activity and generators of local jobs.

Europe is going through an exciting process of reinventing the ways in which citizens live, move, use, and produce energy and handle information in their daily lives. Cities are encouraged not just to invent and share better technologies and innovative solutions, but also to become more and more attractive for citizens, investors, and professionals. Industry is participating in the partnership and is encouraged to develop new solutions, in ways that can also be useful for China and the European Union.

Knowledge and technology transfer and sharing could constitute the backbone of the European Union–China Partnership on Sustainable Urbanization. The European Union could provide many types of models needed by China in search of equilibrium between tradition and modernity. As the Shanghai Declaration, crowning the World Expo 2010, underlines, building "cities of harmony" requires a re-examination of the relationship among people, cities, and the planet. European and Chinese mayors, architects, urban planners, and industry leaders have many opportunities to meet, identify, and find solutions for common problems and priorities. The European

Union–China Partnership on Urbanization already provided for the organization of the first European Union–China mayors' forum in 2012.

The potential for European Union–China cooperation in creating sustainable ecocities is immense. Although the rise of megacities is a phenomenon across Asia, the speed and scale of China's urban development is not just unprecedented but almost beyond imagination in urban history. In 1980, only less than a fifth of China's population lived in cities. Urban population reached 690 million in 2011, accounting for 51.27 % of the total population. Between 1990 and 2005, 103 million people migrated from rural to urban areas. The total number of migrant workers in 2011 was 252.78 million, up by 4.4 % compared to 2010.

The partnership opens up bright opportunities for cooperation in improving low-carbon and resource-efficient urban structures, transport systems and services, waste management, as well as water and air quality. China and Europe can work together on building energy-efficient ecocities by sharing technology and expertise on urban planning, energy supplies, and energy demand management, and developing green digital cities.

Beijing can probably mobilize some of the national resources and know-how needed to tackle the massive and demanding task of coping with the "urban billion." However, this urban expansion also poses a huge challenge for local and national leaders in need of public funding to provide competitive infrastructure and social services and deal with pressure on energy resources, land, water, and the environment. To create energy-efficient cities, China will have to reform the fiscal system under which a large slice of locally collected taxes is sent back to the central government, leaving city authorities with an "empty mandate."

China's urbanization offers world exporters and investors promising lucrative new markets that, if aligned with sustainability criteria, can boost green growth. Europe's green companies are especially well placed to provide the technological solutions needed to tackle many of China's urbanization challenges and help integrate rural migrants into city life, which guarantees access to basic services, including health and education.

11.6 The United States–Brazil Joint Initiative on Urban Sustainability

The Joint Initiative on Urban Sustainability (JIUS), created by the United States and Brazilian presidents in March 2011, is a public–private partnership supporting investment in sustainable urban infrastructure. The JIUS brings together government, community, and industry leaders from the United States and Brazil to generate economic growth, create decent jobs, eradicate poverty, and protect the environment by investing in green infrastructure and city-scale green technology strategies. It enables individuals to identify key links among policy, finance, and projects that can help cities and communities increase investment in urban

sustainability. Projects in Rio de Janeiro and Philadelphia demonstrate the portfolio of actions available to cities interested in scaling-up investment in urban sustainability.

Leading up to Rio+20, JIUS partners convened meetings in Rio and Philadelphia to identify key areas for potential cooperation and investment, with an emphasis on solid waste, water and wastewater, and transportation infrastructure. The launch of a new platform for communities, local officials, developers, and investors is expected to promote opportunities for greater economic, environmental, and health benefits through sustainable infrastructure. Partners gathered for a high-level JIUS meeting in Philadelphia in January 2012, to explore specific projects that could be the basis for sustainable investment portfolios in Philadelphia and Rio de Janeiro, and made a plan to capture this potential in an online tool that other cities could contribute to and use.

The initiative intends to enhance opportunities rising with the planned event investments in Rio de Janeiro for the 2014 World Cup and 2016 Olympics and provide evidence that a green economy can be a real driver for scaling up infrastructure investment, and result in prosperity and job creation in cities. Through broad public and private cooperation, the joint initiative has helped to identify new pathways for investing in urban sustainability, especially in poor and underserved areas.

In order to expand this platform to capture urban sustainability opportunities in cities, JIUS partners are collaborating with C40 Cities and various knowledge partners to share best practices. They also work with implementing partners, including the Tijuca Centre for Applied Sustainability, to mobilize additional finance for green infrastructure, while generating environmental, social, and economic benefits for urban communities.

Through the JIUS, the US Environmental Protection Agency has helped catalyze new opportunities for US businesses and institutions. For example, in the Rio de Janeiro metropolitan area, a green real estate developer from New York City established a partnership with the Rio-based Institute for the Study of Labour and Society to develop an investment plan for the redevelopment of the Gramacho landfill and Jardim Gramacho district. Policy priorities, drawn from local consultations, include green buildings, public transport, and affordable housing, renewable energy and electricity, transit, and efficient water and waste networks, as well as a job-training center.

In addition to supporting knowledge-sharing among cities, JIUS participants have also worked to identify real opportunities for investment in sustainable infrastructure at large scales. Unlike traditional construction works, sustainable infrastructure is often small and diffuse, making traditional project financing analysis difficult. For example, large-scale energy-efficiency retrofits typically involve many residential and commercial buildings. Similarly, green stormwater infrastructure projects consisting of hundreds of trees, roofs, roads, and parking lots, are rated unfavorably compared to conventional utility-scale projects with fewer, larger, more expensive components, such as pipes or treatment plants. By bringing together projects into portfolios, the JIUS demonstrates the scaling up of sustainable actions and highlights the role of governments at federal, state, and local levels as catalysts for mobilizing investment in building the greener economies and smarter cities of the twenty-first century.

Watercolour 12
Bangkok, A Laboratory of a Megapolis of the Future

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Watercolour 13
Rome, The Eternity of Sustainability

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- www.bis.gov.uk/foresight
- www.c40cities.org
- www.citymayors.com
- www.csiro.au
- www.sustainable-cities.org
- www.eolss.net
- www.lincolninst.edu
- www.metropolis.org
- www.millennium-project.org
- www.oecd.org
- www.un.org/esa/sustdev
- www.uncsd2012.org
- www.unhabitat.org
- www.undp.org
- www.unep.org
- www.unfpa.org
- www.urbact.eu
- www.whitehouse.gov/issues/urban_policy
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- www.wff.org
- www.worldwatchinstitute.org
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Human Ecosystems in Harmony with a Resource Scarce World

- www.europa.eu.int/comm/environment/urban
- www.unep.org
- www.sustainable-cities.org
- www.eolss.net
- www.un.org/esa/sustdev
- www.calculator.bioregional.com/
- www.europa.eu/climate action
- www.iclei.org
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- www.unfccc.int
- www.eea.eu.int
- www.footprintnetwork.org
- www.panda.org/livingplanet
- www.climatesummitformayors.dk
- www.london.gov.uk
- www.dogme2000.dk, www.kk.dk
- www.acrplus.org
- www.myclimate.org
- www.toronto.ca/bbp/
- www.calgary.ca/footprint
- www.wasteeng.org
- www.hamburg.de, www.stockholm.se
- www.ipcc.ch
- www.worldwatchinstitute.org
- www.legrenelle-environnement.fr
- www.unhabitat.org
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- www.oneplanetliving.net
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- www.megapoli.info
- www.cityzen-project.eu
- www.stockholmresilience.org
- www.symbioCity.com

Cities Ahead of the Energy Transition

- www.ademe.fr
- www.asimpleswitch.com
- www.europa.eu.int/comm/energy
- www.eumayors.eu
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- www.energie-cites.org
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- www.ises.org, www.estif.org
- www.fuelcell-info.com
- www.managenergy.net
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- www.windday.eu
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- www.ec.europa.eu/transport
- www.internationaltransportforum.org
- www.civitas-initiative.eu
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- www.gart.org
- www.smilesprogramme.eu
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Pioneer Cities in the Creative Sustainable Economy

- www.weforum.org
- www.kobenhavn.dk
- www.stockholm.se

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- www.cushwake.com
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- www.CoFoundersLab.com
- www.barcelonaactive.cat
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- www.theatlanticcities.com
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Intergenerational Cities Embracing Diversity and Social Justice

- www.citiesofmigration.ca
- www.fas.ie
- www.socialexclusionunit.gov.uk
- www.ilo.org/greenjobs
- www.globalcompactfoundation.org
- www.who.dk/healthy-cities
- www.urbansecurity.org
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- www.ville.gouv.fr
- www.espoir-banlieues.fr/
- www.youngfoundation.org
- www.interculturaldialogue.eu
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- www.coe.org
- http://portal.unesco.org

Cities of Education, Science and Innovation, Culture and the Arts

- www.intelligentcommunity.org/
- www.ilab.harvard.edu
- www.citiesofscience.co.uk

- www.cite-des-sciences.fr
- www.ec.europa.eu/culture
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- www.mp2013.fr
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- www.insead.edu/…/centres/…/ingenuity-awards
- www.thebreakthrough.org
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Sustainable Regeneration and Enlightenment

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- www.cities21.com
- www.bcn.es
- www.berlin.de
- www.harbourbusinessforum.com
- www.urbanvillages.com
- www.urban-villages-forum.org.uk
- www.urbantaskforce.org
- www.biennialtownplanning.org
- www.miesarch.com
- www.smb.museum/smb/standorte/index.php
- www.adottaunaguglia.duomomilano.it
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The Civic Bond: Cities for and with Citizens

- www.ec.europa.eu/citizenship
- www.arau.org
- www.coe.int/clrae
- www.c40cities.org

- www.4d.org
- www.comite21.org
- www.clintonfoundation.com
- www.wiserearth.org
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Co-designing Fair Cities for the Next Generations

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- www.sustainlane.com/us-city-rankings
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European Cities and Interconnected World Experiences

- www.ec.europa.eu/regional_policy/urban
- www.cor.europa.eu
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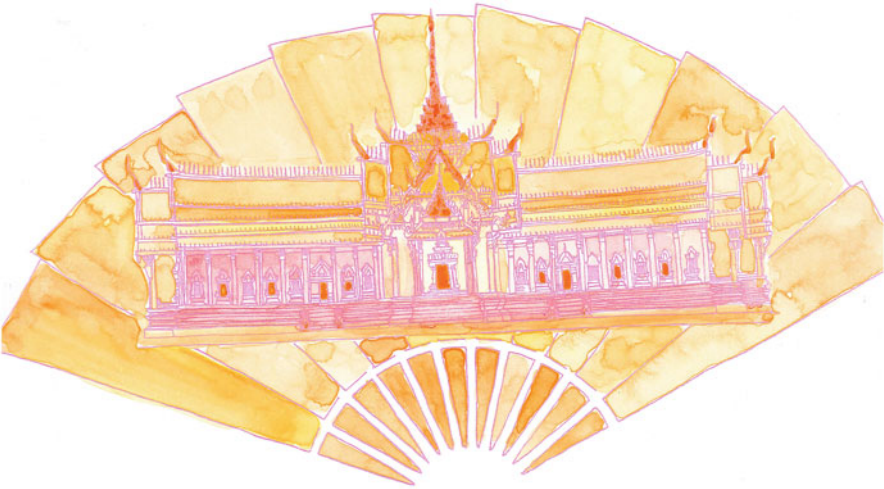
- www.epa.gov/jius

Watercolour 14
Ayutthaya, The Legend of Old Civilisations



About the Author

Dr. Voula Mega graduated as an engineer from the National Technical University of Athens and completed her DEA diploma at the National Geographical Institute in Paris. She continued with a DEA at the French Institute of City Planning. She was conferred a Ph.D. on city and regional planning and policy at the École Nationale des Ponts et des Chausséees and l'Institut d'Urbanisme in Paris.

Her postdoctorate studies include research on regional policy at the Oxford Brooks University and environmental economics and policy analysis at the Harvard Institute for International Development, at the Harvard Kennedy School of Government. She also received a scholarship from the Massachusetts Institute of Technology for a study on innovation and the dynamics of technology and organizations.

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Her research and publications address the scientific foundations, values, culture, and innovations for sustainable development visions and policies and the cities of the future. She believes that science and the arts are free and can uplift visions and herald a better world. Strategic foresight and planning for desired futures can open a vast array of opportunities.

She started her career as special adviser to the Greek Government and held important positions in various European and international organizations. As research manager at the European Foundation for Living and Working Conditions, an EU agency in Dublin, she introduced pan-European projects on innovative sustainable cities. She worked as international expert on sustainable development at the Organization of Economic Co-operation and Development in Paris. In 2001, she joined the European Commission in Brussels and works as senior policy analyst at the Directorate-General for Research and Innovation. She has been responsible for energy research policy and social and ethical implications, strategic planning, and programming, the public consultation on the European research area, the ex-ante impact assessment for the Researchers' Partnership, and futures studies in relation to the European Forum on Forward Looking Activities.

Her academic activities include invited master's lectures at the University of California at Berkeley, Tokyo Institute of Technology, Columbia University, Prince of Wales Institute of Architecture, Institut Français d'Architecture, the European University of the Environment, University College of London, Catalan Institute of Technology, and the Universities of Athens, Bologna, Trieste, and Parma. She has been Associate Professor at the National School of Public Administration, Athens.

She has published and copublished many books and hundreds of articles with the European Union, United Nations, UNESCO, OECD, and international publishers and magazines, in Greek, English, French, Spanish, and Italian. Most recent titles include *Bio-diver-cités. Des défis d'avenir pour des villes citoyennes* (Saarbrucken, EUE, 2012), *The Desirable Future of Innovative Cities* (Saarbrucken, LAP, 2011), *Sustainable Cities for the Third Millennium. The Odyssey of Urban Excellence* (New York, Springer, 2010), *Modèles pour les villes d' avenir* (Paris, L'Harmattan, 2008), and *Sustainable Development, Energy and the City* (Springer Science + Business Media, New York, 2005).

She also published the poetry collections *Siren Cities* (in Greek, English, and French) accompanied by drawings (Athens, Exantas 1997) and *Dawns and Souls for Europe* (in English and French by Persée, Paris 2008), official selection for the European Book Prize 2008. An exhibition of watercolors, drawings, diptychs (poetry/design), and photos at the European Parliament (February 16–21, 2004) united her artistic work on cities under the title "The Song of Siren Cities."

She lives in Athens, Brussels, and Paris and enthusiastically learns and creates every day.

Watercolour 15
Singapore City in a Hybrid Orchid

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