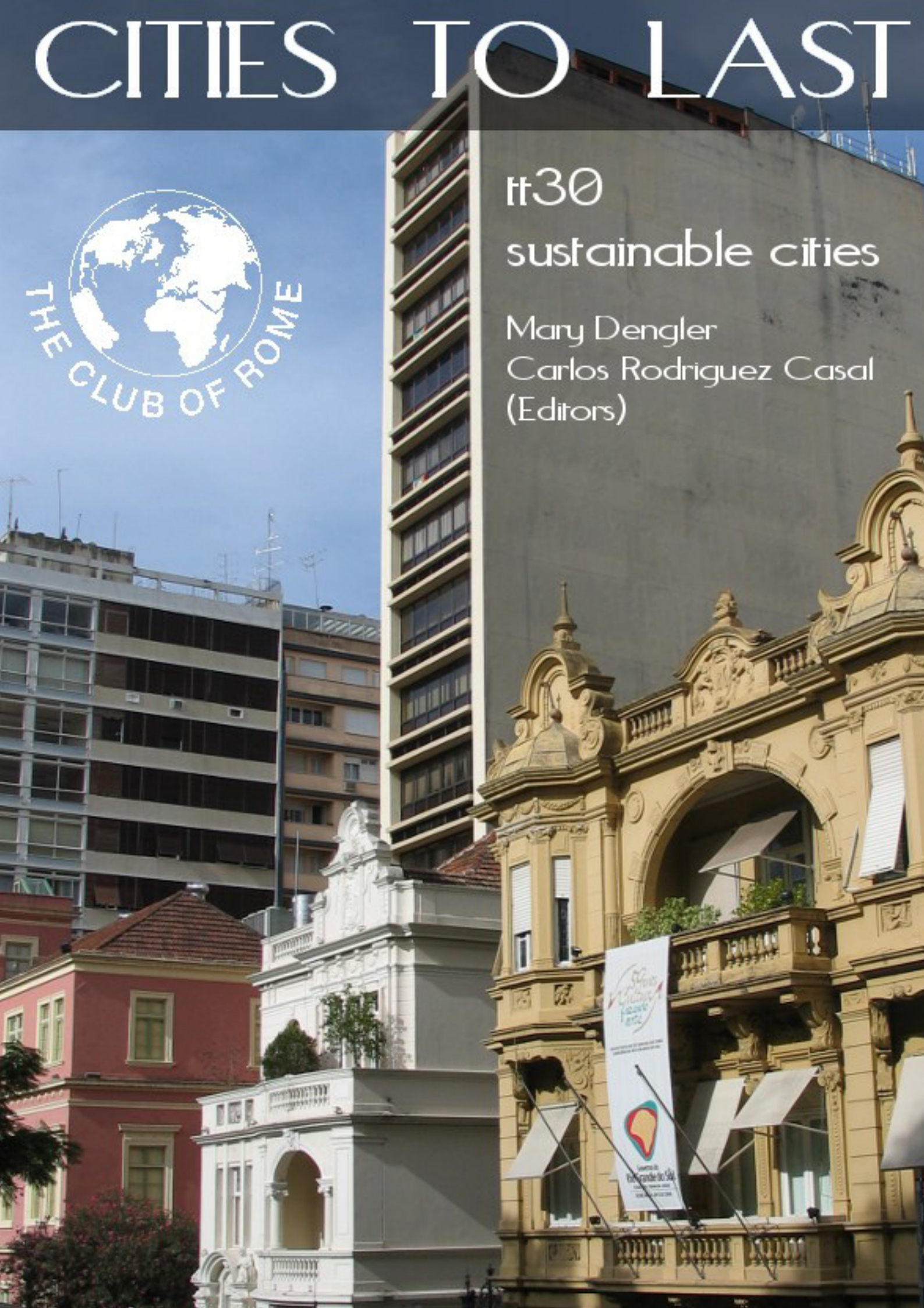
CITIES TO LAST



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tt30 sustainable cities

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(Editors)

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Preface

Between now and 2030 the world will see more change than it experienced during the entire 20th century - social, political, environmental, and demographic. Some of this change will be generally beneficial, but much of it will be enormously disruptive of established patterns. More than half the world's people live in cities, and they will be the ones most affected, since they depend profoundly on an orderly system for moving energy and materials into the urban core and transporting wastes out. This book is important for those who wish to start anticipating future problems and preparing for their solution.

Dennis Meadows, co-author The Limits to Growth and President Laboratory for Interactive Learning.

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Chapter 1
Constructing Sustainable Cities: An introduction to Cities to Last

Mary Dengler [3]

I live in a city, and there is a slightly more than 50% chance that you do too. In 2008 approximately 3.3 billion people, more than half of the world's population, lives in an urban area (United Nations Population Fund, 2007). Growth of cities has occurred both in their total number, the expansion of geographic area of existing cities (urban sprawl) and total population. The number of megacities, which are defined as urban areas with more than 10 million people, has grown from only 2 (New York-Newark and Toyko) in 1950 to a projection of 22 by 2015 (Hassler, 2007). The trend of urbanisation continues with projections for 2030 that 5 billion people, approximately 60% of the world's population, will live in urban areas (United Nations Population Fund, 2007). The geographical distribution of that growth will not be uniform; the majority of the growth will be in developing countries[4] where many of today's urban dwellers encounter particular challenges of provision for basic needs (food, water, safe shelter) and infrastructure services (sanitation, transport and energy).

United Nations Population Fund suggests that population growth will be "particularly notable in Africa and Asia where urban population will double between 2000 and 2030…[and where] the accumulated urban growth of these two regions during the whole span of history will be duplicated in a single generation" (2007: 1). This means that a whopping 81% of urban inhabitants are projected to live in developing countries by 2030 (United Nations Population Fund, 2007). Hence, seeking a more sustainable path for urban growth urgently needs to encompass igniting global concern and engagement to devise solutions that address the social justice issue of improved provision for the basic needs and infrastructure services in developing countries, so that the urban areas in developing countries have the capacity to become healthy built environments with economic prosperity, socio-cultural diversity and quality education opportunities.

Whether in developing or developed countries, cities are an essential location where consideration of how to reduce individual and collective ecological footprints for a more sustainable path towards development needs to occur. Cities not only have an increasingly large percentage of humanity, they also offer economies of scale for devising solutions in the shift to more sustainable societies. For example, cities in developed countries feature extensive public transport networks, which mean that urban dwellers do not have to rely on cars for daily transportation. Similarly, urban dwellers typically has a smaller housing footprint by living in apartments that inhabit less physical space on the earth's surface

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[4] Including an estimated 12 of the 22 megacities having projected populations of 15 million or more by 2015. While 2015 projections include the original megacities New York-Newark (19.9 million) and Tokyo (35.5 million), the majority of other 2015 projected megacities above 15 million are situated in the global South: Delhi (18.6 million); Dhaka (16.8 million); Jakarta (16.8 million); Karachi (15.2 million); Kolkata (17 million); Lagos (16.1 million); Mexico City (21.6 million); Mumbai (21.9 million); São Paulo (20.5 million); and, Shanghai (17.2 million) (Moore and Gardner, 2007). Hence, approximately 77% of individuals that live in cities with populations exceeding 15 million will be found in developing countries.

(through multi-level buildings with multiple inhabitants) and often less square footage overall, compared to suburban inhabitants in single family homes. The energy demands for heating, cooling, lighting, etc are then also reduced.

To pursue a more sustainable path in the future, the continued trend of urbanisation suggests as a crucial foci exploring how societies can continue to improve, or in the case of developing cities, be designed in the first instance, to be more sustainable locations to live, work and enjoy through diverse recreation and culture? For example, subterranean public transport systems in cities like London, New York, Paris, and Toyko enhance the connectivity and livability of the cities while minimising over-crowding issues at street level. Megacities in the global South like Cairo, Karachi, Lagos, Mexico City and Mumbai either entirely lack or have inadequate subterranean transport systems. Mexico City, for example has a population more than double of London[5] but a subway system that is approximately half the length, accounting for only approximately 14 percent of journeys (Furniss, 2008). The cost is highly prohibitive and also the rapidity of growth in some cities means that such extensive engineering projects are often not practicable to meet current needs of solving congestion issues. Rather than universally building subterranean transport systems, other solutions may be more suitable in some locations. For example, São Paulo[6], the financial centre of not only Brasil but also much of South America, experienced rapid growth and related increase in traffic congestion. To reduce traffic gridlock more quickly and at a substantially lower cost than a subterranean system São Paulo has successfully implemented a high-capacity bus rapid transit (BRT) system. A single lane of BRT traffic is estimated to transport 15,000 passengers per hour in one direction – a number that replaces the equivalent of an estimated 7 lanes of freeway traffic (Guizzo, 2007). While the BRT system has provided an effective approach to help alleviate some congestion in São Paulo, cities are inherently complex and require a multi-faceted approach responsive to socio-economic and geographical variability, such as making use of waterways as transport mechanisms in some cities.

Cities to Last identifies some issues that challenge transformation to sustainability and offers examples of some solutions. The task of building sustainable cities that are pleasant environments today and that will endure for future generations is a wide remit that will require the ongoing mobilisation of government, business, civil society and residents of the diverse neighbourhoods within cities. This book is a contribution towards offering a timely collection of articles with examples drawn from different locations to explore various facets of building 'cities to last'. Treading on the path of sustainability requires that as a global community while we recognise urban sustainability as a shared global concern that we also consider issues and their solutions at appropriate scales and in different socio-cultural and economic contexts.

The book begins by situating cities as key entities in the global scale environmental issue of climate change. Sippel (Chapter 2) explains the relationship between cities and climate change and argues that cities can be instrumental stakeholders in influencing global climate policy. Van Breemen (Chapter 3) continues the engagement with cities and global scale environmental concerns by focusing on the specific challenges potentially presented by climate change for cities in the developing world.

[5] London's population is 7.5 million while Mexico City has 18.9 million people (Furniss, 2008).
[6] The city experienced approximately a doubling of population from 9.6 million in 1975 to 18.3 million in 2005 (Moore and Gardner, 2007).

Moving from the situating cities in global scale environmental issues, Tulbure (Chapter 4) presents sustainability monitoring at regional and local levels and White (Chapter 5) engages with the challenges of making good, long-term planning decisions in cities. White provides a theoretically grounded and practical tool, the 'Sustainability Lens' that can be deployed to enhance both planners' decision-making and engagement with wider stakeholders.

Sources of energy supply provision and how energy is used are crucial infrastructure issues that underpin the sustainability of urban areas. Wollgam et al (Chapter 6) consider how nations and their cities can shift to a post-oil area of energy provision. Rogelj (Chapter 7) then explores different types of opportunities for deployment of renewable energy and more sustainable energy schemes in cities. She illustrates her argument by providing compelling examples of existing sustainable energy practices in some European cities.

In addition to renewable energy, other types of technological innovation also offer clear benefits in the pursuit of building 'cities to last.' At the scale of individual homes and workplaces, Chastanet (Chapter 8) considers how technology can facilitate networking and reduce commuting and further explains how energy use can be reduced through the implementation of smart technology in buildings to lower heating, cooling and lighting costs. Eivazzadeh and Schauer (Chapter 9) focus on the potential benefits of technology offered specifically through Web 2.0 applications.

Crucial to the existence and instrumental to the continued growth of cities is the movement of people to urban areas. Migration can occur within nations and trans-nationally for economic and socio-cultural reasons. Astonitas (Chapter 10) explores the dynamics of trans-national migration from Latin America to the United States. Lester (Chapter 11) explores an approach deployed in Cairo for helping reduce socio-cultural tensions amongst refugees. Human interaction and the collective result of many individuals' actions are important for the livability and sustainability of urban areas. Nolte (Chapter 12) explores the path to sustainable cities from the perspective of individuals as decision-makers, emphasising the need to challenge individuals to shift to longer-term and more holistic thinking. Finally, Hamilton and MacLeod (Chapter 13) consider how individual psychology shapes the collective urban environment, indicating the importance of individual self-awareness, responsibility and action.

The existence of cities is a testament to humanity's economic, social, cultural and architectural achievements and diversity. The shift to building cities to last is a challenge that requires human action and ingenuity toward better integrating environmental concerns for the long term benefit of humanity. The pursuit of sustainability is in itself not a finite destination but rather a path that entails continued global, national, city-based, neighbourhood, and individual efforts. As many of us walk our daily paths through urban areas, a consideration of how cities can be more sustainable is of great benefit for both the present and the future.

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Chapter 2
Cities and Global Climate Policy: A New Milestone Plan

Maike Sippel[7]

The role of cities in climate protection is not limited to their potential for local emission reductions. The huge potential for local emission reductions cannot be fully realized without a global climate policy framework. Therefore, cities must become active stakeholders in global policy making. They can do so by following a 'milestone plan', which includes raising awareness for a binding global climate agreement, communicating the limited possibility to realize local emissions reduction under the current and insufficient global climate framework, building alliances with other cities around the globe and finally lobbying for global climate policy.

Climate Change

Scientific Evidence

There is a substantial body of scientific evidence that indicates climate change is a reality that is occurring at present. For example, eleven of the twelve years in the period 1995-2006 rank among the top 12 warmest years in the instrumental record (since 1850), sea-level has risen at almost 2 cm per decade from 1961 and more than 3 cm per decade from 1993 onwards, and intensity and frequency of extreme weather events has also increased. According to the Intergovernmental Panel on Climate Change (IPCC) these phenomena can be attributed to the increase in anthropogenic sources of greenhouse gas concentrations.[8] The amount of carbon dioxide in the atmosphere in 2005 (379ppm) exceeds the natural range of the last 650,000 years (180 to 300ppm). The sharp increase in greenhouse gas emissions began coincides with the advent of the industrial revolution, because its major driver is the consumption of fossil fuel. Depending upon the reaction of humanity to climate change, average global temperature is projected to increase in the range from 1.1 and 6.4°C in the 21st century.

Climate Change and Cities

Climate change is affecting people, infrastructure and ecosystems all over the world and is, in particular, negatively influencing developing countries. Cities are home to more than half of the world population and cities face severe threats from climate change. With a warming of 3 or 4°C, the rising sea levels may result in tens to hundreds of millions of more people being flooded each year. This is not only a serious risk for small islands or low-lying countries like Bangladesh, but also for large coastal cities such as Buenos Aires, Calcutta, Hamburg, Hong Kong, Karachi, London, Miami, Mumbai, New York, Shanghai, St Petersburg, and Tokyo.[9] Also linked to climate change, the melting of glaciers is putting the water supply of hundreds of millions in peril. The loss of glaciers in the Himalayas alone will lead to fresh water shortages of one tenth of the human population, including cities such as New Delhi or

[7] Dr. Maike Sippel studied architecture and city-planning before earning her doctorate in economics for a work on climate protection in north-south city-partnerships. She has worked in projects for sustainable development and a better path of globalisation during her years of study, and continues to combine research and campaigning in the context of the Global Marshall Plan Initiative. She lives in Stuttgart (Germany) and is mother of two.

[8] IPCC 2007a. The IPCC (Intergovernmental Panel on Climate Change) assesses the latest science on climate change in a neutral and comprehensive way.

[9] Stern 2006

Calcutta.[10] Loss of glaciers in the Andes is threatening the water supply of cities like Quito in Ecuador, LaPaz and El Alto in Bolivia, and Bogota in Colombia.
Furthermore, extreme weather events, like the heat wave in Europe in the summer of 2003, are projected to become more frequent with climate change. They may particularly have a profound effect on cities. In France, the 2003 heat wave caused an estimated 14,800 additional deaths and mortality was highest in cities. Almost a quarter of deaths occurred in France's five largest cities, which represent only approximately 7% of the total French population.[11]

Economic Consequences of Climate Change

The Stern report, compiled in 2006 by former Chief Economist of the World Bank Lord Nicholas Stern, directed public attention to the adverse economic effects of climate change. According to Stern, climate change is possibly the greatest and widest-ranging market failure ever seen and "our actions now and over the coming decades could create risks of major disruption to economic and social activity, on a scale similar to those associated with the great wars and the economic depression of the first half of the 20th century."[12] He concludes that without effective investment in climate protection, global warming will probably reach 2°C in the medium term and 5°C in the long term. He estimates that climate change will cost as much as 5 to 20% of global gross domestic product (GDP). Kemfert from the German Institute for Economic Research (DIW) estimates that with a temperature rise of 1°C until 2050, climate change costs in Germany alone will reach a 137 billion Euro by the year 2050, or 2 trillion Euro globally.[13]

Although processes of climate change are already underway, it is still possible to avoid its worst effects at reasonable costs – provided that immediate action is taken on the local, national and international levels. Stern calculates that in order to limit global warming to 2 to 3°C, greenhouse gas concentrations should be stabilized below 550ppm. To achieve this scientists estimate that it will require preventing the further rise of average annual emissions until about 2020 and reducing emissions by 1% per annum thereafter.[14] This would require investments of approximately 1% of global GDP for the next decades until 2050.

Climate Protection

Realizing such a scenario requires a global energy transformation. Emissions can be reduced for example by reductions of energy demand, improved energy efficiency, or through cleaner power generation technologies, including the increased use of renewable energies. Where the continued use of fossil fuels is inevitable, carbon emissions may be sequestrated, that is stored away instead of released into the atmosphere. Furthermore, emissions from deforestation and other land use changes have to be reduced. Preventing deforestation is an especially cost-effective means of climate protection.

Climate Protection – A Prisoner's Dilemma

Greenhouse gas emissions disperse in the atmosphere all around the world. Their greenhouse effect occurs globally and independent of their place of origin. Therefore, climate protection activities by a single city or country will not benefit this city or country exclusively but lead to very small benefits for everybody in the world, which are shared equally irrespective of their

[10] UNEP / World Glacier Monitoring Service 2008
[11] Pirard et al. 2005; own calculations
[12] Stern 2006, page iv
[13] Kemfert 2005
[14] IPCC 2007b, p20f

contribution to climate protection. The atmosphere is a 'global public good' since it belongs to no one in particular, or rather to all of us.
This is the main reason, why climate protection is extremely complicated to achieve. Of course, everybody would be best off if everybody behaved in a responsible way and contributed to climate protection. However, the 'free-rider' principle says that for a rational individual it is even more attractive to benefit from the contributions of everybody else and not take their own individual actions to participate in climate protection activities, thus saving the costs that would arise with it. This is however not acceptable for the remaining climate protectors – and more players will stop their climate protection ambitions due to the perceived unfairness. Social scientists have a term for such a situation: they call it a 'prisoner's dilemma'.

Without adequate rules and governance frameworks, public goods like the atmosphere are not included into cost calculations in the market place. For good reason Stern refers to climate change as the "greatest market failure".[15] Any strategy to mitigate greenhouse gas emissions must therefore include globally binding agreements on the 'use' of the atmosphere.

Global Climate Policy

The United Nations Framework Convention on Climate Change (UNFCCC) laid a foundation for international climate policy in 1992. The Kyoto Protocol to the UNFCCC was signed in 1997 and came into force in February 2005. It includes a greenhouse gas emission target of -5.2% for 38 industrialized and transition countries and a first commitment period from 2008 to 2012.

The Kyoto Protocol is an important first step towards effective global climate protection. However, the United States is still boycotting the Kyoto Protocol and developing countries, including newly industrialized countries like China and India, are not included in mitigation efforts to date.[16] The emission targets under the Kyoto Protocol are far too weak and a new global regime is needed that includes all nations. Furthermore, adaptation to the consequences of climate change is not addressed sufficiently by the Kyoto Protocol. An ambitious, more inclusive and integrated follow-up to the Kyoto Protocol is urgently required and international negotiations on this topic, beginning in Bali, are in progress.

Role of the City in a Global Prisoner's Dilemma

When we talk about climate protection in the urban context we usually end up with a catalogue of measures and programmes that reduce a city's emissions. These may include improved energy efficiency in buildings, more sustainable modes of transport, or the flaring of landfill gas to avoid methane emissions. However important these contributions may be, a single city's climate protection programme is only a marginal contribution to solve the global problem. Furthermore, the most respectable efforts and results will be more than overcompensated by growing emission trends in other parts of the world, like the US, China, and India, if we fail in global climate policy.

Therefore cities must take responsibility on the global stage. The challenge now for cities is to help bring a global climate agreement into being. They must overcome the temptation to

[15] Stern 2006, page viii
[16] China is close to overtaking the US as largest CO_2 emitter. However, when compared on a per-capita-basis, energy related CO_2 emissions in China are still only about one fifth of US emissions, and Indian per-capita emissions are little more than twentieth of US emissions (IEA 2007).

concentrate all their energy and awareness exclusively on the concrete things that are possible locally and broaden their focus.

Role of Local Emission Reductions

Half of the world population live in cities[17] and a major part of the world energy consumption occurs in cities. That means that, at least theoretically, there is a substantial emission reduction potential at the city level. Cities are also quite interested in climate protection. For example, in Germany 381 cities are member to the international city network for climate protection, Climate Alliance, which represents more than 40% of the German population.

However, cities' interests do not really translate into results in terms of meaningful emissions reduction. Despite so many cities being active in climate protection, in Germany local activities have led only to a small amount of direct and measurable emissions reduction. Improved energy efficiency in city-owned buildings seems to be the primary field where significant emission reductions have been achieved.[18] Local climate protection activities also have a very limited impact on a country's overall emissions. This is demonstrated by the case of Australia. Australian cities are very active in the Climate Protection Campaign (CCP) under the ICLEI [19] network: 82% of the Australian population live in cities that participate in this campaign. The 230 cities follow an ambitious milestone plan, which includes concrete reduction targets, emission inventories, and action plans (see Table 1). Nonetheless, the achieved emissions reduction of 2.9Mt CO_2 for 2006 will reduce Australia's emissions by less than 1%.[20]

[17] UNCHS 2001
[18] Blümling 1999
[19] ICLEI – International Council of Local Environmental Initiatives
[20] ICLEI CCP Australia, 2006; IEA 2007

Cities Changing the Framework

Why is it that the local emission reduction potential is so difficult to realize? There is a certain amount of emissions reduction that comes with co-benefits, such as cost savings, improved quality of life, or enhanced economic development. Sometimes, the co-benefits may even be higher than the costs associated with the climate protection measure. However, as Stern and other economists reported, ambitious emissions reduction targets do involve costs. Effective climate protection must include a price on greenhouse gas emissions and

Table 1: Cities Reducing Local Emissions

Milestones		**Activities**
1	Baseline emissions inventory and forecast	- calculate greenhouse gas emissions for a base year (e.g., 2000) and for a forecast year (e.g. 2015)
2	Adopt an emissions reduction target for the forecast year	- target fosters political will - target creates a framework to guide the planning and implementation of measures
3	Develop a Local Action Plan	- multi-stakeholder process - describe policies and measures - including timeline, description of financing mechanisms, and assignment of responsibility to departments and staff
4	Implement policies and measures	Possible activities of local authority: - consumer and role model (e.g. energy efficiency improvements to municipal buildings, cities car park) - planning and regulation (city-planning) - supplying and operating (e.g. energy efficiency in water treatment, recovery of methane from waste management) - promoting and advice (public awareness and education efforts, e.g. school projects)
5	Monitor and verify results	- begins once measures are implemented - continues for the life of the measures - feedback that can be used to improve the measures over time.

Source: ICLEI 2008

heavy investments in climate-friendly technology. Now, there are limits to a city's possibilities to impose energy taxes, begin emission trading or force local stakeholders to invest in climate technology. The limits may be jurisdictional. Moreover, even if legal, it may just be not pragmatic to enforce climate policy. For example, a company will likely have difficulties to accept substantial costs coming with city-imposed climate protection activities, if competing companies in other cities or countries do not have to bear the same costs. Since the company wants to survive in the market place it will not accept a competitive

disadvantage that arises from its local authority's ambitions for climate protection and could seek to relocate.

As a result, the scope for local authorities to enact effective climate protection policies is rather limited. This is not to say that local climate protection measures are meaningless if global climate policy continues to lag behind measures required. There are a number of beneficial reasons to realize local emissions reduction right now. Firstly, even a small contribution is better than no contribution at all, and it can be a step in the right direction. Secondly, local measures help the discussion about climate protection to gain momentum. Local measures raise awareness among local stakeholders. Thirdly, cities' activities provide best practice examples for climate protection with high visibility. New approaches can be tested, and best practices can be identified and multiplied.

Finally, delivering real life examples of climate protection lends the legitimacy and credibility one would need to demand for effective national and global climate policy. For cities to provide such best practice examples in climate protection may help them to meet the most important challenge: to focus their local actions on positively influencing improved global policy. Cities across the world need to adopt a new milestone plan that gives orientation for how local contributions can influence a global climate protection framework. A suggestion for this new milestone plan is presented in Table 2. The new milestone plan starts from a city's achievements and activities, e.g. from the old milestone plan. The innovative approach begins with new milestone 1) 'awareness-raising for the global nature of the climate protection problem'. Then follows milestone 2) a 'clever strategy to meet the prisoner's dilemma' where cities can become climate-friendly as far as it is possible in the present situation, i.e. without an ambitious and effective global climate regime in place. At the same time, they must speak openly about the nature of climate protection as a prisoner's dilemma, and the limits it creates for local level climate protection efforts. This communication must also include the city's strong desire to do more, as soon as a global climate framework is in place. By joining in alliances across the world and finally getting involved in global policy making for climate protection, cities will be actively engaged in the new milestone plan.

Table 2: Cities Changing the Global Framework

Milestone		**Activities**
1	Raise awareness for importance of global frameworks	- Put own efforts in the context of global policies (e.g. derive emission targets from Kyoto targets) - Apply for organisation of next UN climate negotiations
2	A clever strategy to meet the prisoner's dilemma	- Component 1: become climate-friendly as far as possibly without losing competitiveness in the global 'marketplace' - Component 2: Speak openly about the limits to local reductions and about the possibility to do more when global frameworks are in place
3	Building global alliances	- Participate in city-partnerships, city-networks - Get all local stakeholders involved (local authorities, companies, citizens)
4	Lobby for global climate policy	- Put pressure on national and global decision makers - Include all local stakeholders

Examples of the New Milestone Plan

Two examples briefly illustrate how concrete activities under the new milestone plan can take form: climate protection activities in city partnerships and the US mayors' campaign for the Kyoto Protocol. The concept of city-partnerships evolved in the late 1940s. A large number of those first partnerships developed between cities in France and Germany. The partnerships had a clear foreign policy objective, namely to build bridges of understanding, and to prevent another human catastrophe such as World War II. Today, some 15,000 to 20,000 city partnerships are believed to exist worldwide. Since the 1970s, about 2,000 partnerships of a new type were founded.[21] At the centre of these 'north-south partnerships' was community development.

City partnerships focus on different topics including society and health, cultural exchange, environmental protection, and economic cooperation. According to the United Nations Centre for Human Settlements they provide a good environment to realize sustainable urban development.[22] City partnerships could now help to avoid global human catastrophe, which is a possibility associated with climate change.

The potential of city partnerships to enhance global climate policy is multiple and due to the more diverse character, it may be larger in north-south partnerships. To begin with, successful city partnerships are based on mutuality and reciprocity. Both characteristics must be at the core of global climate policy, too. Furthermore, partnerships often involve different stakeholders in a city and not just local authorities. Thus they practice broad participation. Finally, city partnerships reach down to the individual citizen: awareness of a partnership city

[21] UNDP 2000, 4.7
[22] Habitat News 2002

may make 'global citizens' of both cities inhabitants. The most important contribution of city partnerships to global climate policy is probably this training effect: raising awareness for the global nature of certain problems, and demonstrating the importance of city-wide and global cooperation to solve these problems.

For north-south city partnerships, climate protection seems to be a natural topic. For example, in north-south city-partnerships that involve a German city, almost half of them include environmental activities. About one quarter of them include climate activities specifically in areas such as waste, waste water, energy and traffic.[23]

To follow the new milestone plan, climate protection should be put on the agenda of north-south city partnerships, where it is not already incorporated. Furthermore, it should be introduced in the much larger share of city partnerships that are between cities in industrialized countries. Cities could also establish special 'climate partnerships'. These may be north-south, or they might involve cities from especially important parties to global climate negotiations. An example for the latter is a project by Climate Alliance and its partners that has just begun - promoting city partnerships between cities in Germany, Japan, and the USA[24] – and might well be seen as a way to train for cooperation between these countries in global climate policy.

The second example for applying the new milestone plan is the action taken to address climate change by U.S. Mayors. The United States of America is the only major industrialized country that still refuses to join the Kyoto Protocol. Nevertheless, the Kyoto Protocol came into force on February 16, 2005. On this same day, Seattle Mayor Greg Nickels launched the 'U.S. Mayors' Climate Protection Agreement'.[25] The agreement includes three components: 1) meeting the Kyoto Protocol targets in their own cities; 2) pressuring the state and federal governments to enact policies towards meeting the Kyoto targets, and 3) urging the U.S. Congress to establish a national emission trading system.
The agreement now has more than 800 mayoral signatories including large cities like New York, Los Angeles, Chicago, San Francisco, and Washington. Being aware of the limited success of past attempts to realize the local emissions reduction potential, and knowing the reasons for it as explained above, one may well doubt if all these cities will reach the 7% Kyoto target of the USA. Nevertheless, the U.S. Mayor's Climate Protection Agreement is a clear political message of the participating cities towards the U.S. government and towards the rest of the world.

Conclusion

Climate change clearly is an important topic for cities since they are seriously affected by the adverse effects of climate change. Furthermore, there is a huge potential for emission reductions at the local level. However, despite a general interest in climate protection by many cities, this potential is far from being realized. Due to the nature of climate protection as a 'prisoners' dilemma', voluntary activities cannot solve the global climate problem. The huge potential for local emission reductions cannot be fully realized without a global climate policy framework.

[23] CAF/ Agenda Transfer LAG3W 2000, Difu 2002, Sippel 2007
[24] http://www.localclimateprotection.eu
[25] http://www.seattle.gov/mayor/climate/

It is time for cities to realize that their most important contribution to climate protection is not by setting ever more ambitious reduction targets or by implementing more and highly advanced tools, but by entering the stage of global climate policy. They can do so by following a new ‘milestone plan’, which includes raising awareness for a binding global climate agreement, communicating the limited possibility to realize local emissions reduction under the current and insufficient global climate framework, building alliances with other cities around the globe and finally lobbying for global climate policy.

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Chapter 3
A reflection on cities and climate change in the developing world

Inês Freire Van Breemen [26]

In the coming decades many urban areas in developing countries will face an increase in population density and migration from the rural areas to the cities. The need for increased public utilities and services will further aggravate aspects such as water, food, sanitation, air pollution and health conditions. Climate change[27] can contribute to further degradation of the resilience and capacity of vulnerable urban communities, due to the increased frequency and intensity of the aforementioned situations and by prompting new hazards and vulnerabilities. Millions of people may need to migrate, urgently requiring the recognition of climate refugees, some of whom will relocate to cities.

This opens a spectrum of interventional opportunities. A more strategic approach to sustainable urban development needs to be in place to safeguard people's welfare and livelihoods and climate change can prompt this change. Climate change strategies and frameworks need to be designed and incorporated in development, urban planning and management. There is time, space and opportunity for change and we should take this opportunity to analyse the dynamics and relations within cities in developing countries; analysis of the existing realities can enlighten us as to how we should walk along the climate path towards more sustainable urban development.

In this chapter I reflect on some of the challenges that cities in developing countries will face due to climate change, as well as their relevance for expanding the dialogue about and actions towards climate change. I will not focus on a specific city, but highlight matters relevant for the sustainability of cities in the developing world.

A snapshot of cities

The conditions in urban areas have worsened, in recent years; however, urban migration continues to increase. As cited in the UN-Habitat report, by 2007 half of the world's population was living in cities, and 1 billion of those people reside in slums and illegal settlements. The cities in the developing world represent 90% of the world's urban growth, as well as the vast majority of slums (UN-Habitat 2006:4).

Urban areas are expanding around the world due to various reasons. It is not the aim of this chapter to discuss in detail the reasons behind increased urbanisation in contrast to the decrease of rural growth, nor to dissect the disparities faced in urban areas. These matters are discussed in several publications (e.g. see UN-Habitat 2006; Seabrook 2007; Roaf *et al* 2005,

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[27] For the purpose of this chapter I use the definition developed by the United Nations Framework Convention on Climate Change (UNFCC):
"a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (IPCC 2008:78).

Revi 2008, etc) and other chapters of this book. It is important, however, to contextualise the urban arena to understand the increased vulnerabilities that these areas experience.

Cities are a place of opportunities and have an important role in nations' economic activities. Both in developing and developed worlds, they contribute to more than 50% of the gross national product (UN-Habitat 2006:46). They also provide better access to services and goods, and are better equipped with infrastructures, when compared to rural areas. However, the benefits that urban areas provide do not reach all urban citizens in an equitable way. Urban poverty is rapidly increasing, reaching levels as worrying as that of rural poverty. Slums or illegal settlements include a significant number of the urban poor, who often survive on a daily basis through informal and traditional economic practices.

Several realities co-exist in cities, and some people live in more vulnerable and marginalised conditions than others. "Cities are made up of worlds within worlds, often not touching each other and unaware of each other's existence" (Seabrook 2007:17). If cities are places of opportunities for employment and investment, creativity and technology, they are also places of enormous disparities. With the increase of urban population and slums, precarious and unsustainable human livelihoods become an alarming issue.

Most cities, especially in developing countries, have not been and continue to remain unprepared for the current exponential expansion of population, in many cases due largely to migration. This continuous growth in the developing world has and will experience further aggravation of problems that cross several areas and sectors, such as access to potable water, food, sanitation and solid waste collection, shelter durability, increase of diseases (e.g. HIV/AIDS, cholera, etc.) and conflict and violence. Adding to this, there are significant socio-economic inequalities, disproportionate access to services and information, and the quality of education and health care. To reach the international Millennium Development Goals (MDGs), urban poverty needs to be seriously addressed, and living conditions of slum dwellers need to be seriously tackled, "not at the expense of rural areas, but alongside them" (UN-Habitat 2006:51).

A snapshot of climate change

For the first time in history, mankind is faced with a common enemy of global proportions: climate change. Climate change is a serious threat to sustainable development, and it is predicted to take the form of increased droughts, water shortages and floods, desertification, sea-level rise, increased salinity and the occurrence of extreme weather events. Mitigation measures are not sufficient to tackle this immense and long-term issue; changes are already occurring and we urgently need to find ways to adapt to these effects of climate change.

It is recognised that the effects of climate change are not just a problem of the North or a problem of the South, a problem of rural areas or a problem of urban areas, but instead is an issue that affects everyone – rich and poor, powerful and disempowered people. Even if one considers climate change as a place-based element, which enforces the needs for decentralisation and local solutions to this global issue, these changes also have global consequences. This calls for global governance and democracy, in which human rights must be considered as well as global responsibilities. Global collective action about how to better address climate change is important to guarantee the sustainability of our planet.

"We need to move beyond rhetoric and integrate climate science into socio-economic dimensions important to…communities and policy makers. This is not a case of 'either/or'; we need to achieve integration of disciplinary knowledge" (Meinke *et al* 2006:108-109). The competitive advantage principle does not fit within this reality; we need to identify a better path for the world's common future. Social relations are crucial, and they cannot be fixed to a certain boundary. We need to build and invest now on global relationships and networks, using a more 'bottom-up' approach to globalisation.

As mentioned in the Community Based Adaptation to Climate Change Bulletin (IISD 2007:2), "development processes and trajectories will be affected by the rate of climate change, and this is especially important for developing countries with growing economies". Although developing countries are amongst the most vulnerable to climate change impacts, they were not the primary contributors of greenhouse gas emissions. In the climate change discussions, it is recognised by many that the developed countries, being the ones that contributed the most to this situation, should start seriously tackling their greenhouse gases emissions, giving developing countries the right to develop, and assist them in adapting to the imminent climate change impacts (e.g. UN Adaptation Policy Framework).

One also needs to consider that many developing countries favour development of urban areas. As a result, we see migration patterns, as well as mismanagement of land, contributing to the expansion of illegal settlements. Communities in these slums and illegal settlements are often also marginalised in broader processes of planning and governance. Also, the pursuit of economic growth continues to occur through fossil fuels consumption and often at the cost of social development and environmental protection (e.g. China), and investment in (dominant) urban areas, over rural communities. Thus, urban-favoured policies can worsen climate change, even within developing countries, not only with the incentive for an economy driven by the production of greenhouse gases emissions, which will impact on the global balance, but also due to the increase of local-based social and environmental vulnerabilities.

The intention of reducing energy use, while raising the quality of life although sound, still leaves some questions.

- How much are the global and powerful elites ready to go beyond the techno-fixes and a market-based trade system?
- How far is the North willing to adjust their life styles? How much are they willing to invest in the reduction of greenhouse gases emissions and genuinely assist the South?
- And, for the South, how far are they willing to accept less fossil-fuel dependency and less over consumption-driven economies?

Reports, like the Stern Review (2007:507-644), discuss the need for better international governance. It is true that some activities are already occurring, but there are still several interests and conflicts that need to be addressed. Both developed and developing countries need to take their roles seriously, and pragmatically accept that with rights, come responsibilities.

International negotiations are still heavily focused on an 'us' and 'them' dialogue, but some are already aware that this will not productively move the world forward and that a redirection in this dialogue needs to occur. The neo-liberalist approach needs to be challenged and "national and international development objectives – including the MDGs – will be critically affected by the impacts of climate change on the most vulnerable groups and communities" (Intermediate Technology Development Group n.d:1). A more strategic approach to

development goals needs to be in place to safeguard people's welfare and livelihoods. The climate change perspective needs to be considered in the foundations of development, and as part of poverty alleviation in both urban and rural areas.

Cities in the developing world: an expansion in climate change dialogue

As mentioned above, urban areas in developing countries are expanding exponentially and their success is relevant to the achievement of the MDGs goals. On one hand, cities are an important place for a nation's economic growth, but on the other hand they are foci of production of greenhouse gases emissions. On one hand cities in developing countries, search for growth, but on the other hand, they are also becoming vulnerable to climate effects. How can they balance out these two extremes and shift to more sustainable development?

Already traffic congestion, air pollution, inadequate solid waste management, lack of sewage infrastructures and access to potable water impacts upon the quality of urban environments. A significant percentage of precarious slum housing in cities in developing countries is located in areas that are prone to natural events. In practical terms, periods of severe weather-events have knock-on effects, such as drainage congestion and spread of water-borne diseases. Climate change effects will have direct and indirect consequences in these cities, contributing to important socio-economic consequences, which will further aggravate the living conditions of the most vulnerable.

Urgent change is needed to ensure the sustainability of cities in developing countries. There is no single or simple solution, but I believe that climate change can be the serendipitous event that promotes the required shift towards poverty alleviation. Like Meadows (1999:1), I believe that even if complex, there are places (leverage points) in the system where "a small change in one thing can produce big changes in everything", challenging the present power structures and aiming for political manifestations centred in principles of inclusiveness and equity.

I see the emergence of climate refugees as instrumental for prompting widespread recognition of the issue and a change in approach. Migration is in its way an adaptation strategy. One sees people, within a country, moving from rural to urban areas looking for better livelihoods. With climate change effects, a broader migration will also occur, in which citizens from one country will move to neighbouring countries, exacerbating illegal immigration and illegal settlements. This trans-national migration, particularly in developing countries, will bring serious issues to the host country and to the livelihoods of those that need to migrate, including the possibility of legislation preventing them to own land in a foreign country (Roaf *et al* 2005:207).

This new migration, potentially involving millions of people in the future, will further intensify poverty in the South. Since most people tend to move to urban areas because these are the areas favoured by national policies, cities, which are already suffering from serious problems of urban poverty, will be further impacted.

At this stage, although beginning to be acknowledged, the impact those climate refugees will have on host countries is not yet a widely discussed issue. Such refugees are not yet internationally recognised, not having the same rights as other refugees. The exception and leader in not only acknowledging but also opening its borders to climate refugees is New

Zealand, which has agreed to accept citizens of the low-lying Pacific atoll country of Tuvulu. However, I believe that this issue needs to be more comprehensively addressed and as soon as possible.

Assuming the extension of the 'polluters-pay' principle, in which developed countries take a fair share of climate refugees, then for instance, the USA, an major greenhouse gasses emitter, would have to accommodate 5 million refugees a year (Roaf *et al* 2005:209), not including those within its own nation that will also suffer from climate change (e.g. New Orleans event in 2006). How would the North cope with such an increase in their population? How unbalanced would their socio-economic conditions, which are already shown to be fragile, become? Would it not be better to seriously invest in an economy less dependent on fossil fuels and assist developing countries to address their vulnerabilities, instead of continually resisting radical change, which will otherwise bring further problems and costs?

If the illustrations of climate change refugees, their places of migration, and subsequent impacts in host nations and people are seriously mapped and communicated within international negotiations, I believe that there is a window of opportunity for real reforms. I think during the future climate negotiations, in 2009, the issue of climate refugees needs to be properly addressed. If there is serious international commitment to recognise these refugees, the North may approach its responsibilities from a different angle. This may also contribute to countries like China and India, who will also be severely affected by displacements, to have another attitude at the negotiating table. I see an opportunity for developing countries to shift their role at the negotiating table, to be empowered, and seriously negotiate with developed countries on trans-national issues.

Cities: a hope

National policies need to be more trans-national, holistic and inclusive. They cannot be fixed to urban or rural; policies need to reflect the interrelations between these two areas, and also incorporate neighbouring influences. National policies regarding nations' development and energy consumption, land management, migration patterns, and illegal settlements' exclusion, need to be seriously re-considered.

When a climate change phenomenon occurs, if cities are unprepared, devastating costs will occur nation-wide (deaths, collapse of economic centres, mass migration, etc.). You cannot choose to have climate change 'out of sight and out of mind', as one can with poverty. Climate change will unravel the worlds existing within a city (e.g.: cyclone in New Orleans, USA; floods in Caracas, Venezuela; or more recently the cyclone in Rangoon, Burma). For a city to survive, these worlds will need to collaborate.

Climate effects and refugees will impact cities. Thus, I see cities in developing countries as having an opportunity to have an active role in shaping national policies, and consequently international ones. Urban areas are definitely crucial when considering how to respond to climate change: high consumption of energy and production of waste occurs in cities; urban local authorities have been engaging with issues of sustainability; urban local authorities have a better insight of local strengths, vulnerabilities and resilience.

It is important that local authorities are empowered and have a say in national and international agendas, but, at the same time, they need to create space and opportunity for

people's empowerment. The most vulnerable are key-actors in fighting climate change. Local authorities in urban areas in developing countries need to shift their view on urban planning and governance, and need to ensure that things, like access to basic conditions, such as water and sanitation are a human right, which cannot be left to market forces and "can only be done by governments working with, and accountable to, those who are most at risk" (Huq *et al* 2007:8). Since limited budgets are one of the main constraints, they need to seriously evaluate the main priorities within their cities and identify the areas of vulnerability that may be aggravated by climate change effects. The opening up of local dialogue on climate change, strengths, vulnerability and resilience is required within cities, to encourage the redirection of investment and the building of partnerships.

The engagement processes are iterative and dynamic. It is imperative that these engagement processes are designed to "build the types of social capital which can help improve resilience within … communities", and be able to translate scientific content into "actionable knowledge" (Meinke *et al* 2006:108-109). Participatory approaches enable community members, local politicians and organisations to work together, determine their assets/strengths and understand the importance of compromising on issues that may be of a high priority to them, in the name of the community. The sharing of basic information and public awareness, amongst interested groups is crucial when assessing present and future vulnerabilities and resiliencies to climate change. Proper communication and participation strategies need to be in place.

Nonetheless, one needs to be aware that while acknowledging that the process of moving from individualised to shared goals is crucial, it is subject to conflicts and tensions; therefore, it needs to be accompanied by good facilitation, both for intra- and inter-group discussions. Examples of decisions and signs of willingness to change can be seen in the city of Bogotá, Colombia and its former Mayor Enrique Penalosa; the participatory budgeting in Porto Alegre, Brazil; or the City of Cape Town with its recent preparation of a 'Framework for Adaptation to Climate Change'.

Furthermore, it is important within the climate change governance framework to focus on the personal dimension, focusing on critical self-awareness. As Mahatma Gandhi once said "you must become the change you wish to see in the world" (Chambers 2004:16), and you have the power to do so. This is obviously not a straight-forward process and the biggest challenge is to encourage the most powerful and wealthy to accept this dimension. Why should they change, when they are presently enjoying the benefits of neo-liberalism? There are several behavioural strategies that can be considered, but for those to be successful we need to assure that individuals visualise realities and climate refugees can provide that 'human face'.

Conclusions

If cities in developing countries want to succeed, we have to focus on "the need for cooperative structures rather than competitive structures" (Ife & Tesoriero 2006:276). As Kelly *et al* (1997:145) emphasises "there is no proscribed formula to use frameworks…. The usefulness of a framework is that it focuses attention on particular aspects that helps discussion and aids our common understanding".

For each situation there is a reality and each actor has a part to play. To move towards sustainable development social and political changes need to exist; however, the answer is not

to simply eliminate the social and political structures existing within the neo-liberal approach, but instead to find ways of transforming them and including others. We cannot consider development without power (political manifestation) and relationships (social manifestation), but to better understand these dimensions we need to analyse their interrelations within the horizontal and vertical structures. We should search for strengths and not only deficits.

Climate change is an issue that affects us all and a proper illustrative communication at all levels will open a window of opportunity to expand the present dialogue. It is important to have a global sense of place rather than a conceptualisation of the local as discrete communities, moving away from the "prior technical fixation toward a more holistic focus which stresses the contextual specificity of environmental problems and includes a people-oriented agenda based on the [assets], needs and rights of local people" (Brohman 1996:305).

On the preceding pages, I have argued how cities in developing countries, one of the most vulnerable areas in the world to climate change, can also become one of the most important agents of change. If on one hand, climate change draws a negative scenario in terms of the Earth's future sustainability and on the increase of urban poverty, on the other hand this may be just the right crisis to strategically make us more united and just. "Practising locally and globally is the big challenge…using the approach of globalisation from below" (Ife & Tesoriero 2006:280).

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Chapter 4
Sustainability monitoring on regional and local levels

Ildiko Tulbure[28]

Abstract

In order to operationalise the concept of sustainable development as a general and flexible methodology it is necessary to develop a systematic approach that monitors progress towards sustainability. Sustainability monitoring on regional and local levels plays an important role, especially regarding the discussions about sustainable cities. As the sustainable development discourse has evolved there also have been ongoing discussions about the identification and meaning of sustainability indicators (SDI). There is general agreement on the concept of integrating economic, ecological and social development to improve quality of life for present and future generations.

SDI help decision-making processes by establishing aims, quantifying them, and verifying the possible effects of measures before introducing them. Three main directions are observed in the development of SDI. This chapter particularly focuses on the development and use of environmental indicators at the regional and local levels. Environmental indicators include specific attributes of air, water and soil quality. As an example, an air pollution indicator (API) is discussed and applied at a regional level for two countries.

The concept of sustainable development

Beginning in the 1970s, the world began to realize the undesired effects of human activities, especially those caused as a by-product of industrialisation. After the Conference for Environment in Stockholm in 1972 and the first report of the Club of Rome The Limits to Growth (Meadows 2007) it was understood that in addition to the desirable effects of technological progress, undesired and negative effects were also appearing. After this time the environmental awareness in the western world began changing (Dieren 1995). Worldwide discussions began amongst political, scientific and social leaders in order to identify solutions. This was made more complex because the issues manifested in different locations in varied ways both environmentally and socio-economically. The Club of Rome continues to be engaged in these debates and in 2001 created a forum to include the younger generation of leaders through thing tank 30 (tt30) (Lengsfeld 2001), who is also involved in considering how to improve global governance for sustainability (Lengsfeld 2003). Nowadays, we are confronted with a series of global problems known as the 'trilemma' of our society: world population growth, growth of the energy and natural resources consumption and environmental pollution (Dieren 1995) (see Figure 1).

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The Brundtland Report of the World Council on Environment and Development (Brundtland Report 1987) represented a result of these worldwide political discussions, and provided an initial conceptual definition of sustainable development. The concept of sustainable development was discussed on the Conference for Environment and Development in Rio de Janeiro 1992, more commonly known as the Rio Earth Summit, as is the closing document 'Agenda 21', which argues that people should 'think globally and act locally'. After this time numerous statements have emphasised the linkages between economic, social and ecological systems (Banse 2007, Jischa 2005, Tulbure 1995, Tulbure 2003).

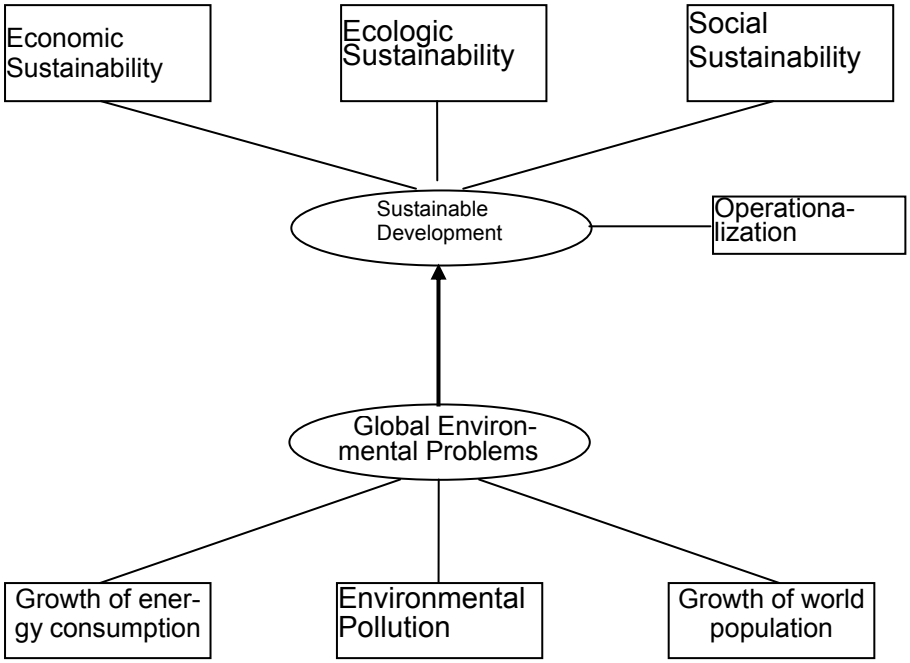

Figure 1. Global environmental problems and the concept of sustainable development (Tulbure 2003, p. 47)

Methodology to Operationalise Sustainable Development

In order to apply the concept of sustainable development on regional level two strategic possibilities have been discussed:

1) establishing goals at the global level, with the measures to achieve these goals prepared on global and national level and applied on regional level; and,

2) establishing goals at the regional level, with the measures being prepared at regional level and directly applied and the effects of these measures also being evaluated on national and global level.

Both of these strategic approaches have different benefits and weaknesses. An example of the first strategy is the goal of finding renewable energy supply systems that have a minimal effect on the environment. Such a project has been realized at the IIASA (International Institute for Applied Systems Analysis) in Luxenburg and Vienna is called Global Energy

Perspectives to 2050 and beyond. The IKARUS project (Instruments for Reducing Emissions of Gases relevant to Climatic Changes) developed by several institutes in Germany (Tulbure 2007) is another example. Another study on regional level have been carried out by the Clausthal University of Technology in Germany, represented by developing a regional 'energy, pollution, and population risk model' (EPR) for applying the concept of sustainable development at a regional level (Tulbure 1997). In the mathematical model EPR integrates the three main aspects of sustainable development: economic aspects related to technological factors by energy E, ecological aspects by an indicator for air pollution P and social aspects by including population risk R (Tulbure 1997). With the help of a database, which describes economic, ecologic, social and political frames, simulations have occurred providing different development scenarios. The goal is to find the right ways for the proposed aims and to help with concrete measures the decision making process on political level (Jischa 2005, Lengsfeld 2003 Tulbure 2003, Tulbure 2007).

The second strategy is illustrated by many actions in form of Local Agenda 21 led especially in Western European countries after the Rio Earth Summit in 1992 (Bund 1996). On this point national scenario studies could be mentioned, which try to find sustainable ways for the future national development in global context. For instance, the action plan 'Sustainable Netherlands' by Friends of Earth Netherlands in 1992 or the study 'Zukunftsfähiges Deutschland' (Sustainable Germany) by Friends of Earth - Association for Environment and Nature Protection and the Wuppertal Institute for Climate, Environment and Energy (Bund 1996). This second strategy is very relevant when trying to move local or regional development of cities in the direction of sustainable cities.

A general methodology in order to operationalise and monitor sustainable development is as follows (Tulbure, 2003):

1) defining the issues;
2) establishing the relevant geographic space and temporal scale;
3) establishing concrete aims for the studied case;
4) adopting a systems approach by modeling interactions among the singular elements;
5) verifying the possible results, which could be obtained after introducing the proposed measures;
6) developing monitoring, evaluation and control instruments;
7) applying in the practice the developed concept.

The operationalisation is only possible, when for an individual problem-case concrete aims are established and from these aims concepts to achieve them are developed. Sustainability is to be for each different case newly defined. The geographical and temporal scales are to be established for each case. The concept of sustainable development has been explored at both regional and local levels (Tulbure 1995, Tulbure 2003). To make the concept of sustainable development applicable in the practice on national or regional levels, operational criteria are needed. Such criteria may include specific priorities, which may be different from one region to another region, or from one country to another. Controlling instruments are indicators known as sustainable development indicators (Jischa 2005, Tulbure 2003) (see Figure 2).

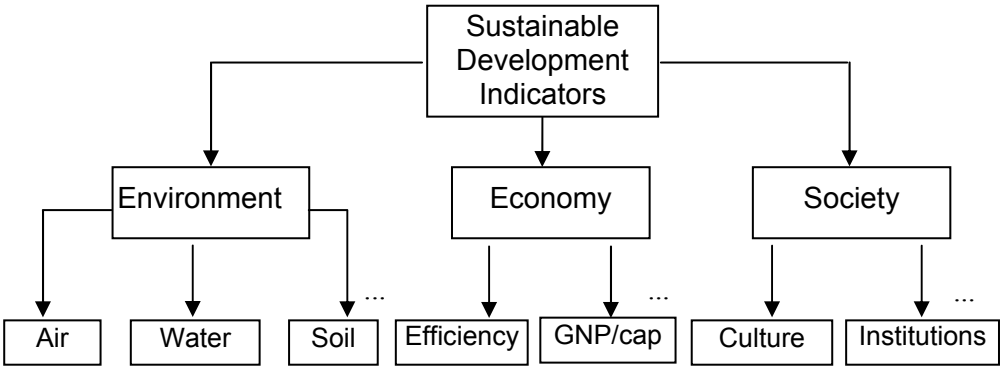

Figure 2: Some possible components of Sustainable Development Indicators (SDI) (Tulbure 2001, p. 276)

Sustainable Development Indicators

The creation of these indicators allows planners to better formulate and to monitor progress towards achieving the aims for improved sustainable development (Jischa 2005, Tulbure 2003). The possibility to make informed corrections is enabled through effective monitoring programmes. Indicators also serve as a tool that helps to better understand the possible effects by introducing certain measures.

There is a growing consensus amongst political economists and engineers that the gross national product (GNP) as an econometric tool, does not represent an appropriate measure for the quality of life of a nation. It gives information about national economies, but it does not consider many parameters that influence the life quality, such as: environmental pollution, use of fossil fuels, and social aspects. This means that GNP cannot be used alone as a sustainable development indicator and there is a need to develop indicators for ecologic and social aspects and to integrate them in order to develop at the end such complete SDI.

By defining new indicators some requirements have to be met:

- to offer information about the process that they describe;
- to have a function of prevention and control;
- to use transparent methods;
- to be easily applied; and,
- to offer the possibility to compare different alternatives.

Several attempts to define indicators for sustainable development have been undertaken, especially in the EU and the United States (Mitchell 1996, Brundtland 1987, Tulbure 2003). In the development of SDI three directions are observed:

- defining one single aggregated indicator;
- defining a set of indicators for measuring sustainable development; and,
- defining partially aggregated indicators for each component of sustainable development.

Illustrating aggregated indicators are examples including: the Index of Sustainable Economic Welfare (ISEW), the Human Development Index (HDI) and the Ecological National Product (ENP) (Bund 1996). These indicators are integrating several fields by taking one indicator for each field and then aggregating them to obtain a SDI indicator. The second direction is represented by a system of indicators to measure sustainable development, such as in the German region Baden-Württemberg developed by the Academy for Technology Assessment in Stuttgart (Pfister 1996) or the indicators system for the town Jacksonville, Florida (Bund 1996)

The third possibility is given by the modular design of the SDI (Figure 3). Each of the three significant components of the concept of sustainable development are described by an indicator (Figure 2). In order to gain one single SDI the aggregation problem of the three components has to be solved. There are many aggregation methods, for instance by calculating mean values. As simple as the method is, it is based on the restriction that each component has the same weight by the aggregation. Other methods are based on weighting coefficients, but the calculation such weight coefficients has to be clarified. In our department in Germany we have established an aggregation method based on 'fuzzy logic', which seeks a transparent aggregation and eliminates the negative aspects of other methods (Tulbure 1995). As I have mentioned, to build a sustainable development indicator means first of all to define the components of the indicator. In this case, one of the components is represented by indicators for environmental aspects, as for instance air, water or soil quality.

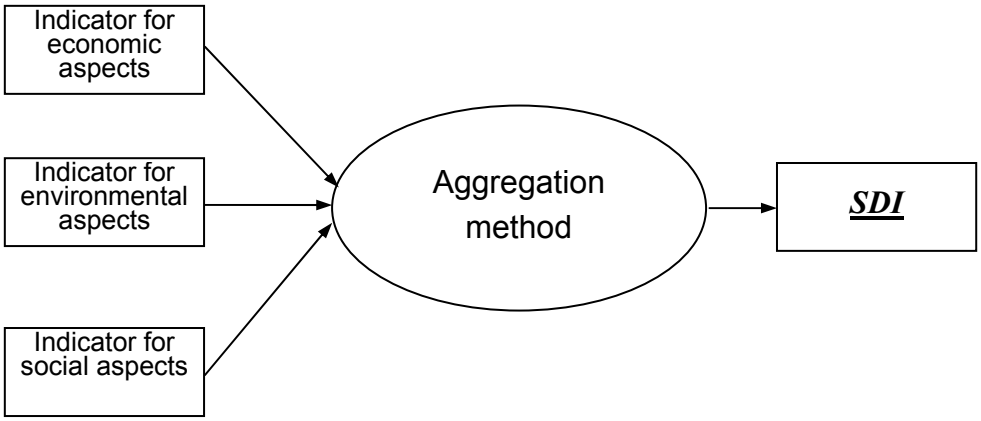

Figure 3. Aggregation levels for the proposed sustainable development indicator (Tulbure 2001)

Environmental indicators

Environmental indicators are used to characterize the behaviour of environmental systems, where two aspects are of primary interest. One aspect concerns the description of the state of a system at a certain time. The other aspect refers to the dynamic behaviour of the system (see Figure 4). Depending on the proposed limits of the analysis, environmental systems can be approached at different levels, for instance on local, regional, national or global level. The use of environmental indicators is essential on local level, especially when discussing strategies to move urban development towards sustainability.

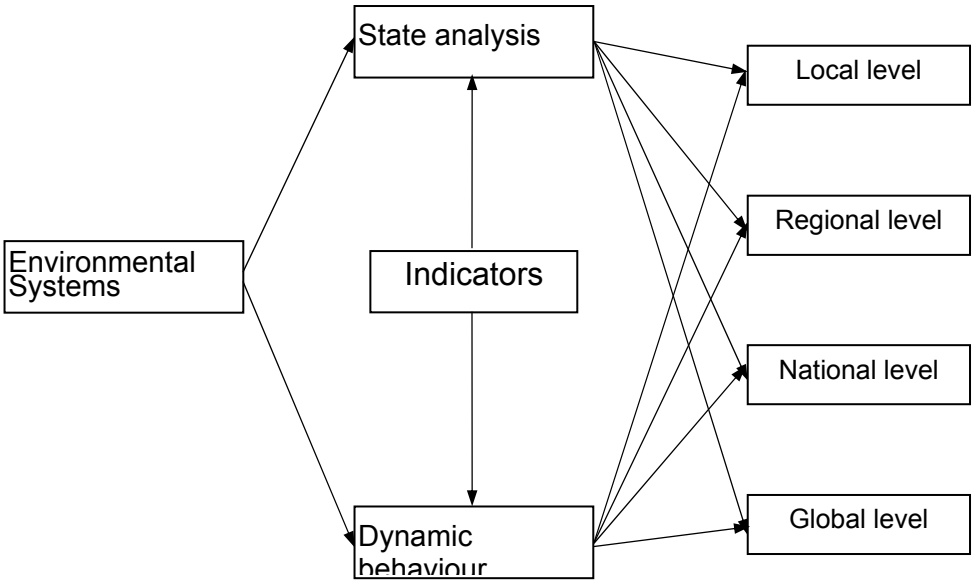

Figure 4. The role of indicators by describing environmental systems (Tulbure 1997)

Worldwide there are many preoccupations to define environmental indicators. Well known is the OECD-model, so called 'pressure-state-response model' Bund 1996. Mitchell (Mitchell 1996) provides a structural classification of environmental indicators as specific, composite and key indicators. Many indicators for air, water or soil pollution have been defined and are used nowadays in many countries (see for details Mitchell 1996, Tulbure 1995 and Tulbure 2003). For instance in Germany the Luftbelastungsindex (LBI index) for air quality is used and published every week by the Journal of the German Engineers Association. When studying the indicators used, one observes that many of them integrate coefficients that are not transparently defined or assume that effects on the environment of different pollutants are equivalent. In order to minimise these deficiencies new methods have to be developed and used. Such new methods are represented by soft-computing methods, which are starting to be used and applied in several human activity fields. , Fuzzy logic particularly offers possibilities to use new methods for defining indicators by its potential to integrate complex variables and uncertainties in the systematic and exact mathematical approach (Jischa 2005, Tulbure 2003, Tulbure 2007)

5. Conclusions

In the process of operationalisation of sustainable development an important component is monitoring sustainable development on a regional and local level. Monitoring sustainable development on a regional and local level means developing and applying sustainable development indicators. Having the vision of developing sustainable cities it is very important to develop a unified strategy for sustainability monitoring on regional and local level. Worldwide there are three directions to define sustainable development indicators. A modular design of SDIs has been discussed, each module corresponding to one of the three

aspects of sustainable development: economical, social and environmental aspects. Environmental aspects are described by environmental indicators, which play an important role when defining SDIs.

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Chapter 5
Best practices for urban sustainability implementation

Lockey White[29]

Best practice v. best technology (or program)

The initial inquiry that led to this chapter relied on an assumption: that it was actually possible to determine the top 'best' technologies and programs for the practice of urban sustainability. Perhaps certain types of light rail, or community garden systems, or innovative recycling programs, or environmental policies, etc. would be the most cost effective at improving sustainability. Yet, early on in the investigation a ranked list of technologies and programs implemented lost relevance. Depending on the budget and needs of the community, the best technical solution for one could be the worst solution for another community. Because of this, the commonalities between the *processes that led to the best results* came to the forefront. The best practices, in most cases, were not ones based on implementation of particular technological solutions, but rather practices aimed at ensuring that the most appropriate and sustainable technological or programmatic solutions were implemented under the specific circumstances.

Of course the 'best' practice for a city to be sustainable, is the practice that helps the environment, society, and the economy most and for the longest period. In general, the best technologies save money and resources (e.g. trees, energy, and water) and meet community needs (e.g. infrastructure, housing, and energy). In general the best programs stimulate employment, commerce and healthy communities. Actions (through technical solutions) that can accomplish some or all of the above would usually be considered at least a 'good' practice. Often technologies change too quickly for the label 'best' to be more than just a fleeting title. However, if the best processes are in place for ensuring a deep understanding and appreciation of sustainability in decision-making, adoption of the best available solutions to implement can occur.

Quantifying urban sustainability

If urban sustainability is a quantifiable goal, then sufficient data entered into a formula can tell us how sustainability should be implemented. Of course there are significant quantifiable aspects to sustainability, such as identifying water availability and energy needs for projected population growth. If the community's goal is the minimum amount of resources needed for survival, then the math is simpler. But this inquiry is more difficult when seeking subjective goals.

In general, sustainability is about current and future generations having enough to live decent lives. However, the concept of 'enough', once we go beyond basic survival needs, becomes highly subjective. While survival of life on earth, including humans, is a primary objective of

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sustainability, most sustainability advocates aim higher. For most people sustainability is not only a question of survival, it is one of seeking a quality existence for (current and future) people, the economy, and the environment. At this point subjective issues of fairness and philosophy are manifest. Goals like 'livable', 'enjoyable', and 'aesthetically-pleasing' are often undervalued in a purely quantitative inquiry. Civic leaders cannot ignore these less tangible but very real social needs. What people really seek is not a sustainable city, but a sustainable *community* that meets their needs on a mental, physical, and spiritual level. They want a place where they can live well and are proud to call home.

Best practices emerge through use and acceptance over time. As more cities adopt sustainability ideals, it will be easier to find a city that looks and feels so much like your city, that what worked for them will probably work for your city. Until then, cities often remain in the pioneering stages of sustainability implementation. At this stage experimentation, rather than restraint, should be encouraged. The goal should not be one of only re-enacting what has worked in the past, but in learning how the city and all of its inhabitants can shape something together that will work even better in the future.

Civic leaders should be concerned about sustainability

People look to their elected leaders to provide for the well-being of the community in the present and future. This public expectation creates both explicit and implicit mandates for city leaders to manage from a sustainable city viewpoint. However, for city leaders and managers tasked with spending the finite pool of tax dollars in the most efficient and effective way possible, adding another consideration as complex as 'sustainability' might make their job more difficult. The goal of this chapter is not to overwhelm the reader with a laundry list of options and technologies, which will become out of date after publication, but to provide decision-making tools and processes (similar to business process best practices) for achieving urban sustainability.

Even though sustainable development has existed as a concept for over thrity-five years, precious time was lost when leaders chose to ignore that which they did not fully understand. The current state of affairs is such that urban managers no longer have the luxury of waiting. The time for large-scale sustainability implementation has come. Hopefully, the tools and suggestions below will provide some support for those embarking on this complex quest to make human civilization truly sustainable.

Common practices for successful sustainability projects

After reviewing sustainability programs in multiple cities on several continents, some general themes emerge. While the programs and projects implemented vary widely in details, five practices in particular emerge as foundational to successful sustainability implementation.

1. Tri-focus: the three pillars of sustainability are addressed effectively and simultaneously

2. Multidisciplinary: in approach, project design, and teams

3. Linkage of present and future: critical and immediate community needs are not ignored

4. Collective vision: knowing what the community wants, and beginning with that outcome as your primary aim

5. Information-sharing: reaching out to other communities

The following sections explore these common practices that enhance the likelihood of successful sustainability projects.

Tri-focus: addressing the three pillars of sustainability

Because the needs of the world are so immense, the most effective way to efficiently address the diverse needs of a community is to embrace multiplicity. Except in the most extreme cases, we do not have the luxury of solving one problem at a time. Instead we must favor those solutions which address the three pillars of sustainability at once: environment, economy, and society (or people, planet and prosperity).

One example of this approach is a solution common in the cities of Germany: schrebergartens (Photograph 1). These small gardens surround the urban centers and are provided to city dwellers for a small fee and long-term lease. Those with a small garden on the side are more content to live in a dense urban environment, because they have a private green space nearby as a retreat. Most people grow vegetables, herbs and fruit in their gardens, which also helps to supplement the food supply of the city with fresh produce. Because these gardens are contiguous and pervasive throughout the urban boundaries, there is a strong habitat benefit for otherwise displaced species of birds and wildlife. This, combined with a tradition of farmers markets in German cities, places a wholesome rural vein inside the otherwise urban experience. The people of the city benefit through better quality living; additional economic opportunities are provided by, at a low cost, having an arable plot of land; and, environmental benefits include more wildlife and green space.

Photograph 1. Schrebergartens in Frankfurt, Germany. Schrebergartens are green spaces more individualised than community gardens, but not as luxurious as a second home. People in urban Germany often rent schrebergartens, small community-owned plots, which can also have small structures on them. The cities in Germany benefit socially, environmentally, and economically when they are surrounded by these affordable garden networks. Source: Der Spiegel Magazine "RENT-A-PLOTGermany's Garden Ghettos" April 11, 2006 http://www.spiegel.de/international/0,1518,410799,00.html Photo courtesy of Wolfgang Rehmert (2008)

Regardless of the particular solution implemented, the best practice in sustainability implementation, for all cities and all projects around the globe is the practice of multiplicity. One should always ask: 'How can I design this solution to solve many problems at once, without creating significant new ones?' A basic framework for this type of decision-making is often missing from everyday city management. Many city-level projects are relatively mundane and do not require exhaustive impact statements. Few want to add even more layers of bureaucracy to a civil servant's duty of meeting immediate citizen needs. Yet it makes sense to have something pervasive that is quick and easy-to-use in place that prevents tunnel vision in project design, implementation and assessment. To fully understand sustainability and to help make it a reality, people who make both large and small decisions for the City must don tri-focals. One way to do this is to use the Sustainability Lens diagram below.

The Sustainability Lens

The ultimate goal of the Sustainability Lens (Figure 1) is to bring the sometimes overwhelming complexity of sustainability implementation to a level of grace and simplicity that will allow those charged with the task of making their city sustainable to move forward with confidence. In order to ensure that proper weight is given to the specific objectives and needs of the community, the process of sustainable decision-making must first start with a prioritization of needs. What are the most critical and urgent needs of your community? What projects or programs must be implemented *now* to prevent unnecessary death and irreversible decay? It is the public official's duty to move forward from this point.

Once the top needs have been determined, the next step is to analyze solutions proposed for meeting these needs through the sustainability lens. The goal is to not only to meet immediate community needs in an efficient and effective manner, but also to favor solutions that have spin-off benefits in other areas related to sustainability for both the present and future generations.

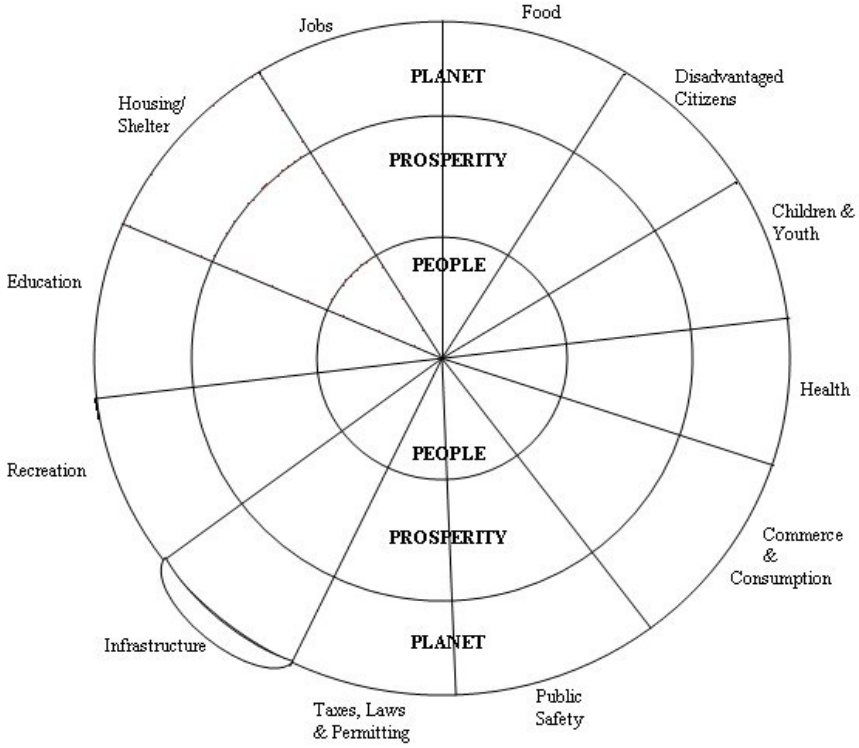

Figure 1. The Sustainability Lens – The core aspects of sustainability are viewed in relation to other urban management and development priorities.

Using the Sustainability Lens:

Figure 2 provides a sample application of the Sustainability Lens. The concentric circles remain fixed but the user can change the size and title of the various topical wedges based on their perception of needs and priorities, emphasizing the wedges that are the highest priority for that community. In the above diagram, the infrastructure wedge is emphasized by a special tab to show that the project under consideration is especially relevant to urban infrastructure.

During the planning phase of individual projects and programs, decision-makers should take the time to color in this diagram. A different color or pattern should be used to represent People, who are at the core of all of urbanity; Prosperity, the aspiration of most people in the city; and Planet, which provides the systems, space and resources that we all depend on. Planners should color in each wedge segment that the proposal impacts in a positive and sustainable way. If the project has a negative impact to a specific segment, it should be colored black. Neutral or no impact remains white. A new lens should be created for each proposed solution under consideration.

At the end of this process, each option's lens diagram should be compared. If a proposed solution has a very small amount of the lens colored in, it is an indicator that the project design should be re-visited to see if it can be made more sustainable and far-reaching while retaining its effectiveness for achieving its primary goal.

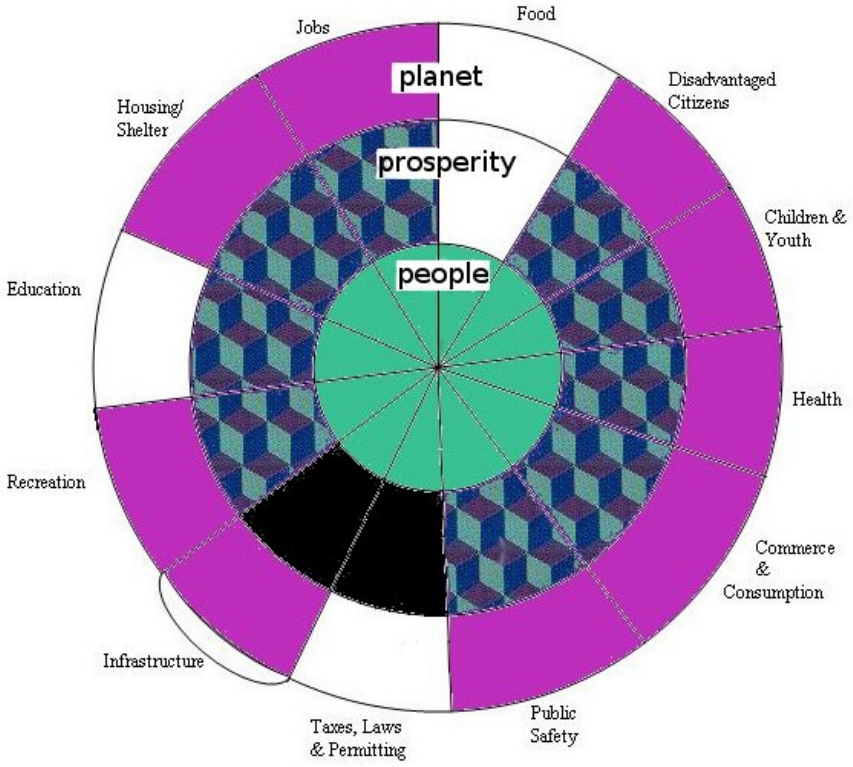

Figure 2: An example of The Sustainability Lens in use. Here the implementation of a large-scale, affordable public transportation system is evaluated.

In a review of thousands of projects aimed at enhancing the sustainability of urban environments, public transport still remains and integral component of urban sustainability. This is reflected well by the fact that almost the entire Sustainability Lens diagram is colored in and there are few blacked out areas.

Of course the use of the lens diagram is by no means precise. Those who use the lens can add quantifiers and weights to the various segments to create a formula for decision-making that is more scientific and exact. However, even the most detailed decision matrix has built into it biases and assumptions. Often the illusion of precision can give decision-makers a false sense of security. It is important that decision-makers keep their intuition intact when analyzing options for the future of their city. The Sustainability Lens is a tool that provides an imprecise yet comprehensive means of comparing options. This allows users to get an immediate sense for what the proposed project or plan really brings to the table. Both benefits and drawbacks are captured, and multiple aspects of the planning conundrum can be evaluated simultaneously.

To provide even more balanced planning and perspectives for those using this tool, blank lenses (with instructions) should be distributed to departments and stakeholders potentially affected by the proposed project. Project planners can ask the various stakeholders to complete the lens for the solutions proposed. Where there are significant differences in how the wedges are colored, planners should ask for further explanation as to what the perceived positive and negative impacts are. This enhances dialogue and collaboration with those most impacted by the proposed project or program, while also increasing the accuracy of final lens results (Dengler, personal communication, May 2, 2008).

Multidisciplinary: in approach, project design, and teams.

From the beginning of the sustainability debate in the 1970s to the present, the value of multi-disciplinary approaches to solving sustainability-related problems remains unquestioned. Cities are no exception to the generally accepted sustainability best practice for almost all situations: have more than one perspective on a problem. When project design and implementation teams have the same backgrounds and disciplines, they are trained to look at a problem in a certain way. Having a multi-disciplinary team and approach significantly opens up fields of possibilities. This best practice is now standard for most major projects. The issue now is which disciplines should be included and at what stage of the project. The answer usually depends on the project, its budget, and the availability of participants who can help.

Creativity is a key ingredient to this kind of problem-solving. Often people remain within existing parameters for practices and solutions. Over time, city employees and leaders can become either unable or unwilling to brainstorm innovative approaches. The best way to stimulate creative thinking is by recruiting a multi-disciplinary team. Each person will bring to the problem a new perspective, a new way of looking at the problem and new tools for addressing it. By combining these diverse viewpoints and angles towards solving a problem, a well-rounded solution can be achieved. This is also essential for preventing new problems from arising during implementation. Often new problems can be foreseen by those trained to look at the proposed solution differently.

Linkage of present and future: critical and immediate community needs are not ignored

For someone who could be dead tomorrow from exposure due to homelessness or other hazards, the fact that money which could have been used to help them today was spent on something that only impacts the distant future is infuriating. We have no future if the present needs are not addressed. But in serving immediate needs of the present, it is important to also consider the needs of tomorrow and invest in a community while helping the individual.

A sustainable city is not just a ‘green’ city, but also a healthy city on all levels. Decisive action is necessary when individuals and communities are in crisis. Poverty must be dealt with for sustainability to matter to most people. Day to day survival, for the vast majority, will always be the ultimate priority. Without economic means, without social and financial stability, a city will collapse. The most eco-friendly city in the world will collapse when its economy falters and there are no employment, housing and income opportunities for its citizens.

But how can sustainability be accomplished without major trade-offs? The trick is to eliminate the dominance of ‘either-or’ thinking. Tax money does not need to go to either low income housing or environmental projects. It can and should address as many problems as it reasonably can simultaneously, giving priority consideration to critical community needs.

One example of this approach can be found in San Francisco, California at the Plaza Apartments (Photograph 2). For this project, public money was used to recycle/ re-use a large old decaying commercial building by making a multi-use complex (business, shops, restaurants, and entertainment) combined with housing for homeless people.

The core purpose was to help the homeless, serving a critical and immediate human need. This need was directly met while a downtown area was revitalized. This stimulated economic development, jobs, and commerce while providing subsidized housing and transition programs for the homeless. The renovation used cutting-edge sustainable building technology and green materials, incorporating alternative energy and energy efficient design. Because the Plaza apartments looked at the homeless problem from the beginning with the multi-focus sustainability lens, rather than the single focus problem-solution lens, all aspects of the project were designed to further multiple societal goals.

Solar Roof on the Plaza Apartments, San Francisco, California: Photo by KQED QUEST (CC) see: http://www.flickr.com/photos/kqedquest/sets/72157600048063659/

Photograph 2. San Francisco's Plaza Apartments next to Skid Row. This building won awards for its green design and also provides permanent affordable housing with on-site mental and physical health services for homeless people, replacing a sub-standard hotel in a blighted San Francisco neighborhood. Called an "extraordinary project with a limited budget," supporters of this project note that "This colorful and dignified building gives hope to residents and provides an anchor in a challenging neighborhood." http://www.aiasf.org/Programs/Awards_Program/Design_Awards/104.htm

Collective vision: knowing what the community wants, and beginning with that outcome as your primary aim

It generally goes without saying that project success is more likely when it enjoys the support of its beneficiaries. Too often projects and programs are designed and implemented without enough dialogue in place regarding what the community members actually want. As a result civic leaders use a lot of guesswork and inevitably let their personal biases seep into the decision-making process. Because the decisions made affect so many people and generations, sustainability implementation especially requires a strong foundation. The purpose of the visioning process is to create a fertile environment for developing new ideas that work.

The process is as simple as visualizing the ideal community and documenting this vision, both individually and with a group. Civic leaders should gather as much information as possible from prior community meetings and vision sessions. If the community has not had a public visioning session, leaders should organize one. It is important to do whatever it takes to create a solid vision of what the citizens want their city to look and feel like five, ten, twenty, and fifty years into the future. Perhaps even seven generations from now. How the vision will become reality is not important during the visioning stage. The important part is developing and maintaining a cohesive vision that includes all major stakeholders' views. Of course some interest groups might have opposite visions. Participants should focus on the views held in common, while also making an effort to accommodate diverse opinions.

Information-sharing: reaching out to other communities

Some ideas look brilliant on paper, but fail miserably upon implementation. Why? It is just as important to look at project failures as it is to successes in order to determine what is right for a community. Before implementing projects, communication with peers in other cities that have implemented similar projects can be informative. Rather than relying on articles and reports, direct contact should be sought whenever possible. Public relations campaigns will always try to spin reality in a more positive light in order to increase public support for sustainability in general. Talking to the people directly involved will often lead to candid responses and a more realistic and current view of the challenges faced. This is as simple as asking: 'Does that project or program work well? Why or why not?' It might be that the circumstances faced by one community are different enough that what became problematic there will still work well somewhere else. A great resource for finding examples from other cities is ICLEI, an online network of local governments for sustainability.[30] More than 700 cities, towns, counties, and their associations from around the world are members.

Conclusion

Urban planners and community builders have a huge task ahead of them. Natural and traditional agrarian systems for directly supporting most people have broken down beyond quick repair. Billions of people on this planet are in a situation of dependency upon their city. If basic services break down or the people in control of the city do not do their job well, true suffering on a grand scale can result.

Meanwhile, many of the earth's vital resources diminish with each day that passes, often unnecessarily so, because of urban environments that encourage consumption and waste over

[30] For more information see www.iclei.org.

conservation and sustainable use of resources. Re-tooling already existing cities in order to make sustainability a priority is both expensive and difficult. This, combined with fiscal volatility, makes the job of city managers one of the most important and most difficult jobs on the planet.

All city inhabitants are consumers, polluters, producers, and can be problem-solvers. Every member of the community holds a piece of the solution and the problem in their pocket. The task of the urban leaders is to acknowledge this, and engage its citizens in the challenge of being a part of the solution. This is best done early on, before a finalised proposal is presented, by inviting community members to share their community vision with urban leaders during the visioning process. City leaders can show its citizens that it governs with true compassion and understanding of the problems that individuals face by ensuring that critical community needs are made a priority. When people know that their individual needs are being taken care of, they are much more likely to also support shared community goals like sustainability.

Continued community engagement should be encouraged by recruiting diverse views for multi-disciplinary planning and advisory teams. Feedback should be broadly sought, via generous distribution of sustainability lenses or other tools for constructive input, to keep dialogue alive. And when in doubt, urban leaders should never forget to reach out. Often the same problems are encountered by multiple cities simultaneously and it makes sense for these cities to find each other and share information on solutions that work to accelerate the adoption of beneficial projects and programs.

Together the above processes will help urbanity plan, evaluate, communicate and implement this huge concept called sustainability. By creating a strong foundation and fertile ground from which great ideas can grow, these five sustainability process best practices will not only enhance urban survival, they will help the communities that apply them to flourish sustainably.

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http://www.cardiff.ac.uk/archi/programmes/cost8/ COST Action C8
"Best practice for sustainable urban infrastructures" COST – European Cooperation in the field of Scientific and Technical Research

http://www.iclei-europe.org/ International Council for Local Environmental Initiatives

http://ec.europa.eu/environment/emas/index_en.htm

http://www.sustainlane.us/ 110 best practice documents and a secure directory of participating government officials from over 450 cities, counties and states

http://www.ekosi.com/samples/usreport.pdf Urban Sustainability Leading Approaches,

Tangible Results Excerpted from EKOS Report to the City of Seattle, January 2000
http://www.portlandonline.com/osd/ The City of Portland

Office of Sustainable Development resource list:
http://www.mfe.govt.nz/publications/urban/urban-sustainability-worldwide-nov03/html/page12.html

http://www.icsc.ca/
International Centre for Sustainable Cities (ICSC)
http://www.plusnetwork.icsc.ca/

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Chapter 6
Sustainable cities in oil producing countries – different ways to shift to the post oil era

Gordon Henrik Wollgam[31], Meir Javedanfar[32], Michaela Unterbarnscheidt[33] and Tim Kraski[34]

Income from oil - a blessing or a curse for the cities of oil producing countries?

What does oil have to do with sustainable cities? Quite a lot, at least in oil producing countries. Oil is not only their most important source for energy but also their major source for income. It is this income from oil that can fuel tremendous growth, stimulate investments, help to build up modern infrastructure and support the establishment of quality education systems. This income from oil can also contribute to a shift towards low-carbon technologies, environmentally friendly products and development towards sustainable living conditions as a whole.

However, high income from oil can also lead to corruption, negligence of investments in modern industries, suppression of human rights and even failed states. One way or the other, income from oil is an important driving force for change, development and the implementation of sustainable living conditions. Income from oil can catapult formerly remote places to major global hubs for finance, recreation and transport. It can also leave cities in corruption, mismanagement and civil unrest.

In 20 years, two thirds of the population of the world‘s major oil producing countries will live in cities. This is reason enough to have a look at their preparedness to use their income in the era beyond oil which, in some countries may be looming much closer than global analysis often implies.

As the chances and risks for oil producing countries are high, the window of opportunity to benefit from oil income is often a narrow one: several of the world‘s major oil producing countries are already producing at maximum capacity with no significant chance for a substantial increase of income form oil extraction. The price of oil is likely to remain highly volatile. The costs of oil exploration and drilling are forecasted to rise. The economies of the industrialized countries are undergoing major efforts to reduce their oil consumption and increase their energy efficiency. For example, the average fuel consumption of German cars has decreased by 40 per cent since the 1970s.[35] However, it is not yet known to what an extent low-carbon technologies (i.e. hybrid cars and alternative energies) will offset the growing demand from emerging economies like India and China.

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[35] Deutscher Automobilverband/German Association of the Automotive Industry (VDA): http://www.vda.de/de/co2_klimaschutz/

The public debate about climate change has been intensifying over the last few years. As the price of CO2 emission certificates is likely to rise considerably in the long run it might become too expensive to explore remaining oil reserves. On top of that, many oil producing countries are situated in volatile, often unstable regions. Recent forecasts have shown that the world's coal reserves are considerably larger than its oil reserves. This might lead to a shift away from oil as a major source of primary energy to coal and would leave oil producing countries situated in geopolitical hot spots cut off from a major source if income.
If we speak of sustainable cities we should also speak of their opportunities and probabilities to create sustainable income. Generating this sustainable income and transferring it towards progressing sustainable development is a key challenge for the world's major oil producing countries.

Many papers, articles and books have already been written over the last few years in order to explain what is likely to happen to the world economy, to growth and technological developments once oil is effectively running out. What has not been done so far, however, is to attempt to forecast what is actually going to happen to a specific national economy, to the society and to the political system of an oil producing country once oil runs out. To shed some light to this highly complex question we have developed the concept of beyond oil and the beyond oil index which allow us to make a number of forecasts based on a considerable number of data and statistics taken from credible sources.

Three different types of oil producing countries

Countries cope very differently with the challenge to transfer their oil focused economy to a broader-based, diversified and sustainable economic system. An in-depth review of their transition capacities shows that there are three different scenarios to coping with beyond oil economies. The beyond oil index, developed by an international working group, led by members of tt30, the young think tank of the Club of Rome, has developed an algorithm to analyze their 'beyond oil preparedness'. According to this project work, three different scenarios exist for the era beyond oil: post-oil economies, transition economies and economies with unfavorable conditions.

Post oil economies
Post oil economies are still major oil producers on a global scale. However, oil is no longer their primary source of income. Beyond oil economies generate their GDP by using a broad spectra of different industries and services. Income from oil is considerable; however, it is not a dominant component of their GDP. Some beyond oil economies, such as Norway, have accumulated large funds to facilitate a post oil transition. Generally, post oil economies have already seen their national 'peak oil'. For example, oil production in the United Kingdom has been consistently decreasing over the last year. With estimated reserves of only 6.5 years[36] oil will soon become a marginal source of income to the UK.

Another characteristic of post oil economies is their political stability and wealth as well as their particular emphasis on high quality education and investments in future technologies.

Transition economies

[36] BP Statistical Review of World Energy 2007, Oil Reserves,
http://www.bp.com/sectiongenericarticle.do?categoryId=9017902&contentId=7033474

Typically, transition economies are large oil producers that have recognized the importance of a diversified economy with investment in non-oil and non-gas activities. Role models for transition economies are the United Arab Emirates and their neighboring countries. Though often overlooked as being one of the world's largest oil producers, China also belongs to this group.

Transition economies are characterized by a dynamic, fast-growing economy in which growth is not driven by oil production itself but by longer-term, large-scale investment undertaken by using the income from oil production. Transition economies have opportunities to make the quantum leap to post oil economies in the longer term. However, while their economies are usually very dynamic, their political framework often suffers restrictions of individual rights and efficient legislation. It is often these factors that limit the upward potential for long-term welfare and freedom in transition economies.

Economies with unfavorable conditions for the beyond oil era
Economies with unfavorable conditions for the beyond oil era have not been able to transfer income generated from oil to welfare and development. They are also experiencing considerable difficulties to establish a stable, well-functioning political framework, an open society, and a favorable climate for foreign investment.

Economies with unfavorable preconditions for the beyond oil era are characterized by higher levels of corruption and a discouraging framework for local and foreign investment. The oil reserves of many of these countries are often rather limited so that their oil boom might have passed by before any actions have been taken to transfer oil income to development and welfare. Some of these economies can compensate for deficits in the management of income from oil with income from other sectors and are on the verge of becoming transition economies, like Russia. Others are in danger of becoming failed states lacking appropriate government institutions and experiencing persisting poverty.

Figure 1 illustrates the approximate location of different countries in terms of their preparation for the era beyond oil. The following sections provide case studies of different nations that illustrate the qualities of the three different types of economies.

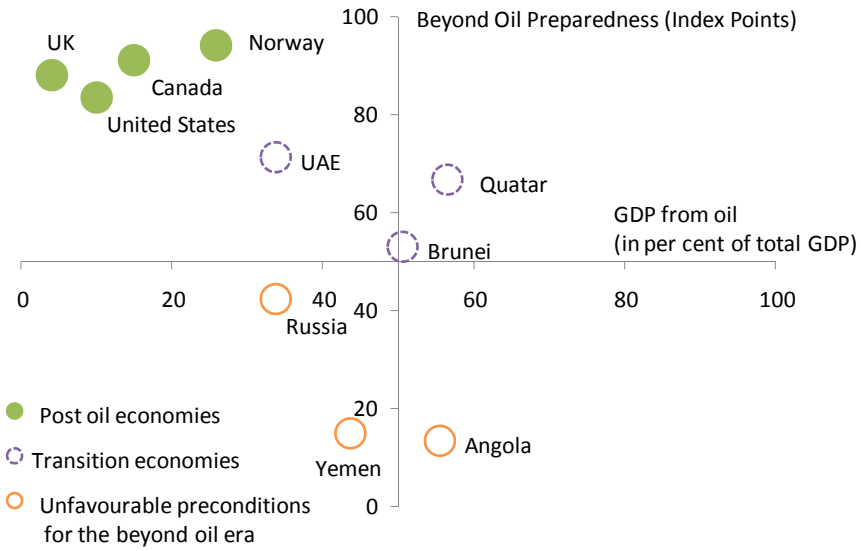

Figure 1. Location of different countries in terms of their preparation for the post oil era. Post oil economies , Transition economies and Economies with unfavorable preconditions can be clustered using the two criteria BeyondOil Index and GDP from oil (in per cent of GDP).

Case study 1: Post oil economies - the example of Norway

Norway's first oil field Ekofisk was discovered in 1969 and Norway became one of the major oil-producers in the 1970s and 1980s. In recent years, production has declined and today, Norway accounts for about 3% of global production and is the world's eleventh largest oil producer. At current levels of production and given that the estimation of reserves is correct, Norway's onshore proven reserves of crude oil will last for about eight more years. Norway claims part of the Arctic and the Barents Sea and according to experts' estimates, these regions hold one fourth to one third of the world's remaining undiscovered oil and gas (offshore reserves). However, Norway and Russia have yet to agree their border in the Barents Sea and in the summer of 2007, Russia claimed a part of the Arctic Ocean the size of Western Europe.

In June 2007, the Norwegian Parliament approved the proposed merger of the Norwegian petroleum company Statoil, for which the Norwegian state still holds majority ownership, and for Norsk Hydro, an oil, energy and aluminium company. If the merger proceeds, the company will be the largest offshore oil and gas company in the world.

Norway's emergence as a major oil and gas producer in the mid-1970s led to complete transformation of its economy. The country developed from one of the poorer Western European countries, whose economy was characterised by shipping, fishing, agriculture and forestry, into a country with the second highest per capita GDPs in the world (after Luxemburg) and a continuous government budget surplus. In the Human Development Index of the United Nations Development Programme, Norway occupies the first place: it is the country with the highest standard of living in the world.

In the transition of Norway's economy, a period of 'classical' western industrialization was skipped and today, oil industry and services, which account for more than 50% of Norway's GDP, are the most important sectors. Oil revenues smoothed this transition process and today oil exports remain an important source of revenue. As the country consumes little of the oil it produces and as power supply is primarily from hydroelectric power plants, Norway is one of the world's largest oil and gas exporters. This also positions Norway for the era beyond oil as a country that has already made a transition to alternative energy sources.

Describing the current situation, the Norwegian historian Francis Sejersted identifies Norway as a reason-led political culture whose development was favoured by several factors, such as the small size of the country and its location on the edge of Europe.

Due to the healthy state finances, it is to be expected that the government will continue to invest in coming years. In the mid term, especially the construction sector and infrastructure development offer opportunities for foreign direct investment. However, future economic prosperity will also depend on the pace of technology-driven innovation and R&D intensity, which at present remain low compared to other benchmark countries. Interestingly, Norway has extremely high power consumption: calculated per capita, it is one of the highest worldwide, but also is mainly reliant on renewable sources rather than oil. Apart from the sustained economic growth, an effective bureaucracy, a high government capacity for reforms and an open-mindedness for new technologies are positive features which cast a positive light on Norway's transition to the beyondoil age.

With the aim to balance fluctuating oil prices and to guarantee intergenerational justice for the era beyond oil, Norway created the 'Petroleum Fund' in 1990. Since then, a portion of the oil-revenues have been channelled into the Fund. In 2005, the Petroleum Fund was combined with the country's pension fund and is now known as the 'Pension Fund – Global'. Only a very small percentage of the Fund's yearly revenues can be used by the government. With a value of more than 300 billion dollars in April 2007, the annual growth rate is situated around 4.5 %. The Fund is managed by the independent Norges Bank, which is Norway's Central Bank. An advisory Council on Ethics advises Norges Bank on excluding certain companies from the Fund's investment universe on ethical grounds.

Due to Norway's sustained economic growth, the well-managed 'Pension Fund–Global' and the skills of its society, the country is one of the best-prepared countries for the transition to the era beyond oil.

Case study 2: Transition economies - the example of United Arab Emirates

The UAE controls roughly 10 percent of the world's oil supply and nearly 5 percent of the world's proven natural gas reserves. Oil and gas production provide approximately 30% of the country's GDP. As a result of high income from oil, UAE's real GDP has been growing at a pace of minimum 4% from 2004. Meanwhile, the UAE government has been successful in reducing inflation through strict macro and microeconomic practices, such as control of the country's interest rates and expenditure discipline.

The UAE economy is bolstered by several important sectors, such as construction. Today the skylines of Dubai and Abu Dhabi are dotted with cranes, which are one of the biggest

construction booms in the Middle East. Projects such as Palm Island[37] and Burj Dubai, the world's largest skyscraper[38], are attracting attention and investment. Tourism is another major income generator for the UAE economy. UAE's is attractive to tourists as a shopping destination, conference centre, and for sports tournaments. For example, UAE has the newly constructed indoor Ski Park, which is the world's largest indoor ski slope. Meanwhile UAE companies themselves are leading the way in the growth of local economy, especially in the construction and Telecom sector. Ettisalat, UAE's telecom operator is the Middle East's largest Telecom company, with stakes in Saudi Arabia, Pakistan, and a number of African countries. Meanwhile Emaar Construction, a UAE company, is the Middle East's biggest construction company, with large projects in numerous countries across the globe. Dubai's retail sector is another important sector. Many tourists, from Europe, Iran and the Indian subcontinent visit the UAE for long shopping trips. There have been, however, concerns that the UAE economy may be overheating. This was seen since early 2006, when the country's stock exchange fell by more than 5% in a space of a week and stock markets remaind volatile since then.

One of the major drivers of the UAE economy, and its beyond oil preparations, is the country's business friendly regulations. The UAE government has created a secure legal environment to protect the rights of both local and international investors. This is indicated by UAE's economy being ranked as 'moderately free' by the Heritage Foundation/Wall Street Journal Index of Economic Freedom (2008)[39]. This factor has lead to an increase in the level of foreign investment in UAE's non-oil sector. Furthermore, the UAE government is currently involved in, and actively encouraging UAE companies to invest in the non-oil sector in the UAE and abroad. These investments will produce income streams for the UAE economy for the day oil is no longer economically viable to extract. This focused policy has led to the UAE becoming of the most prepared countries for the era beyond oil. The biggest indicator of the success of the UAE economy's efforts to diversify is the fact that today only 30% of the country's GDP is provided by oil. This is compared to 20 years ago, when 65% of the GDP being provided by income from oil[40].

Case Study 3: Economies with unfavorable preconditions for the beyond oil era – the example of Angola

Angola is the second largest oil producer in sub-Saharan Africa, after Nigeria, with off-shore Angola being hailed as a world-class exploration and production area. Oil and oil derivatives provide over 90% of Angola's total export revenues. Over the past decade production has almost doubled, mounting from 35.4 million tonnes in 1996 to a total of 69.4 million tonnes in 2006. At present, Angola produces in excess of 1.49 million barrels per day and thus accounts for 1.8% of global oil production. As of 2006, Angola had 1.2 billion tonnes of proved oil reserves[41]. However, as several enormous off-shore oil fields have recently been discovered, the real amount may be up to twice as high when including large unexploited hydrocarbon potential remaining both on- and off-shore.

[37] http://www.thepalm.ae/
[38] http://www.burjdubai.com/
[39] http://www.heritage.org/Research/features/index/countries.cfm
[40] International Energy Agency:
http://www.iea.org/Textbase/stats/countryresults.asp?COUNTRY_CODE=AE&Submit=Submit
[41] BP Statistical Review: http://www.bp.com/sectiongenericarticle.do?categoryId=9017903&contentId=7033469

Oil resources were first commercially discovered in Angola in 1955. Production soon experienced a massive rise and eventually overtook coffee, formerly the leading export commodity, by generating over 30% of total revenues by the mid-1970s. Nowadays, the economy is highly dependent on the oil sector; however, oil revenue has had minimal influence the standard of living of the population, the majority of whom still rely on subsistence agriculture[42].

In Angola the early 20th century had witnessed some highly sophisticated development of modern infrastructure for diamond mining, plantation agriculture and trade[43]. In the aftermath of World War II, a boom in construction and agriculture boosted Angola's growth. Initially, coffee headed the country's export league tables, and by the 1970s Angola had become the world's fourth largest producer both of coffee and diamonds[44].

It was not until the discovery of significant oil fields off the coast of Cabinda province in 1966 that Angola focused its efforts towards oil production[45]. After gaining independence from Portugal in 1975, the national oil company Sonangol was established to oversee and manage all fuel-related activities. Sonangol is allowed by law to acquire up to a 51% stake in any exploitation business[46]. In 2002, the death of the opposition leader Jonas Savimbi put an end to more than a quarter of a century of fighting between his National Union for the Total Independence of Angola (UNITA) and President José Eduardo Dos Santos' Popular Movement for the Liberation of Angola (MPLA), who have been defending their hold on power since 1975. Weak institutions and a strong dependency on mineral resources coupled with the crippling effects of a long civil war, as well as issues stemming from the Paradox of Plenty call for improvement in the quality of governance. The present management of public finances provokes considerable conflicts of interest between the government and Sonangol, some of whose tasks would usually fall into the realm of the Treasury and Central Bank. However, there is room for improvement in terms of transparency, good governance and institutional quality.

Although oil driven double-digit growth has remained substantial over the past years – peaking at 19% in 2005[47] – other aspects of the economy remain largely undeveloped, with much of Angola's infrastructure still marred from the 27-year-long civil war. Consequently, despite its enormous wealth in natural resources, the country is persistently dependant on food imports.

The central bank's policy aimed at stabilising the exchange rate of the Kwanza showed first effects in 2005, when significant earnings from oil exports supported the measures and eventually contributed to reducing consumer inflation to only about 13%, down from 325% in 2000. As a first step to modernise the non-oil sector, Angola started to rebuild its public infrastructure with the help of a $2bn credit from China. However, structural corruption and

[42] International Energy Agency, Statistics on Angola: http://www.iea.org/Textbase/stats/countryresults.asp?COUNTRY_CODE=AO&Submit=Submit
[43] U.S. Department of State, Background Note: Angola: http://www.state.gov/r/pa/ei/bgn/6619.htm
[44] http://www.globalsecurity.org/military/library/news/1999/10/991006-angola23.htm
[45] World Bank: Undeveloped Oil and Gas Fields in the Industrializing World, A Description of Potential International Investment Projects for the Petroleum Industry, ESM Report 239/2001, http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2001/06/23//000094946_01061304010765/Rendered/PDF/multi0page.pdf
[46] Angola - Oil & Gas History: http://www.entrepreneur.com/tradejournals/article/159821697.html
[47] World Bank Statistics on Angola: http://ddp-ext.worldbank.org/ext/ddpreports/ViewSharedReport?&CF=1&REPORT_ID=9147&REQUEST_TYPE=VIEWADVANCED&HF=N&WSP=N

lack of effective government reforms continue to hamper development investments, which prevents the country from mobilising and drawing upon its other assets such as diamonds, gold, extensive forests and fish resources.

In response to the economy's overwhelming reliance on oil and oil derivatives, Angola is at the bottom of the beyond oil table (Figure 2). Fledgling measures to boost the non-oil sector and reduce Angola's dependency on the petroleum industry cannot be expected to show significant impact on the country's revenue structure within the near future.

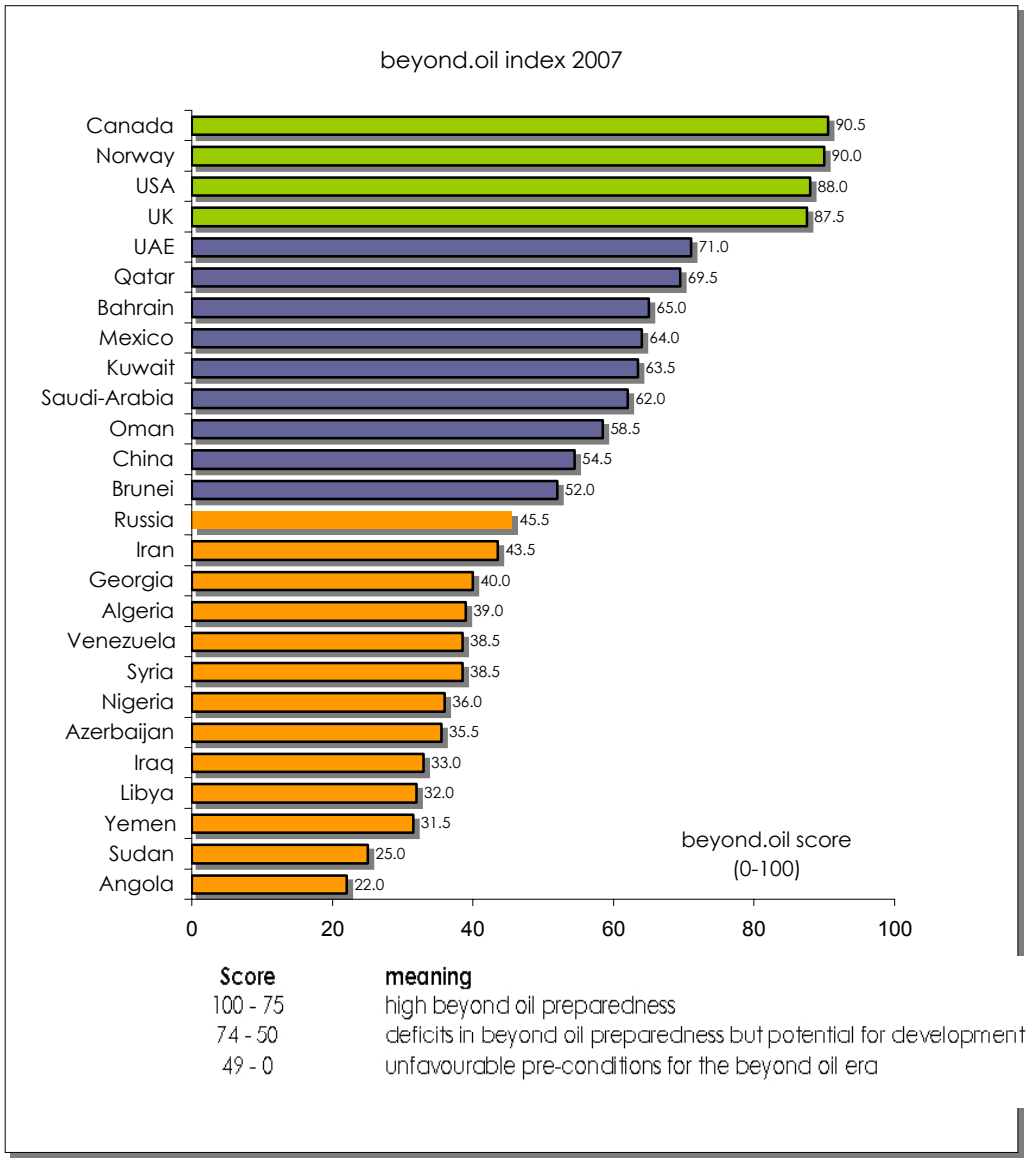

Figure 2. Beyond oil index 2007. These results are generated from analysis done by the tt30 beyond oil project team.

A post-oil study for sustainable cities - how is it done?

The 'Beyond Oil' project aims to identify the readiness of the economies of oil producing countries for the time when oil is no longer available as their main income generator. As a first step, this project has analysed the economies of 26 major oil-producing countries. The

aim of this survey is to give a fact-based, holistic outlook of what actually is likely to happen in 26 countries when oil is no longer economically viable to extract.

The study analyses 26 countries, using 20 different criteria. To calibrate the study, 16 of these criteria have been derived from internationally recognised indices. Three other criteria have been derived from commonly used studies, such as statistics of proven oil reserves. One criterion is based on an algorithm developed by the project group and is completed by a individual country research.

We have clustered these criteria into to four groups: general economic framework, political framework, society/ future skills and oil-related factors. Our fundamental assumption is that the beyond-oil-preparedness of a country largely depends on the first three clusters whereas oil-related factors play an important, yet not dominant role. Accordingly, we have given the non-oil factors 60% weight in the study whereas oil-related indices account for 40%.

The final study will consist of two major elements:

1. A league table which will rank all 26 surveyed countries (the Beyond Oil Index).
2. A survey derived from the index providing detailed background information on weak and strong points of each country in the index.

We intend to update the beyond oil ranking on an annual basis.
For further information please go to: www.beyondoil.net

Chapter 7
Renewable Energy for Cities

Melita Rogelj [48]

In a fast moving and developing modern world, energy is a core factor in our daily lives. Perhaps it is the evolution of our individual and collective demands for energy that is moving at an unrecognizable pace? Being currently based in Brussels, this chapter makes some observations from the perspective of a city dweller, reflecting on the EU experience and intentions to bring leadership in renewable energy development of cities and regions.

Due to the reality of fast growing cities, the EU is facing unprecedented energy challenges. Cities, as pulsating centres of life, act as the hearts of their surrounding regions and offer people a place to work and enjoy their lives account for around 80% of European population and 60% of the world's population. [49] Each year the number of people living in cities increases by 60 million which means that each month the equivalent of a population of a city the size of Madrid requires service provision in an urban area. Cities and their suburbs account for around 80% of the total energy demand in Europe. [50] An increasing number of buildings have to be provided with energy for lighting, heating, cooling as well as various electric installations and appliances. In this way half of the energy is used in private households, offices and public buildings.

By harnessing natural sources of energy like the sun and the wind, renewable energy sources can replace our reliance on outdated, polluting power plants that rely on fossil fuels. Today's solar panels efficiently transform sunlight into electricity while blending into the design of homes and office buildings. Modern wind turbines rise high above the ground, capturing the strongest winds to produce reliable electricity. Meeting our energy needs with clean, renewable energy can move us towards a brighter, cleaner, and less expensive energy future. Cities around the globe are discovering that investing in innovative renewable energy sources reduces global warming emissions and creates a reliable source of clean, homegrown electricity.

Some cities are moving forward by financing the construction of renewable energy projects themselves. In some cases, cities are working with local municipal utilities to construct wind turbines. In other cases, cities are working with privately owned utilities and renewable energy developers to construct solar arrays on city buildings, schools, and homes. Other cities are beginning to incorporate renewable energy requirements into their contract renewals with privately owned local utilities.

The pivotal points in human history are when new energy regimes and new communications regimes converge. This is the central theme of Jeremy Rifkin's vision of the 'third industrial revolution', which argues that distributed communications will enable the grow of hydrogen fuel cells by 2030 (Rifkin, 2002). Every home, every office, every industrial park, every

[48] Melita's primary focus is developing enterpreneurial strategies for organizations to shift operations towards environmental, social and financial sustainability using eco-innovation principles, strategies and policies. Currently working on project development and assistance to renewable energy providers to install solar, wind, hydro and biomass in Europe, including South East Europe, Western Balkans, Central Asia and Russia.
[49] Energy – Yearly Statistics, European Commission and Eurostat, 2007
[50] Doing More with Less ; Green Paper on Energy Efficiency, DG for Energy and Transport, European Commission

industrial region has fuel cells powered by hydrogen, which stores renewable energy. We can use solar, geothermal, hydro and waves to generate electricity and some of the surplus renewable energy to electrolyse water and grab hydrogen for storage, for the grid, and for transport.

"The reason people are powerless is that they have no power" is Rifkin's statement at the European Business summit on February 22, 2008 in Brussels, Belgium. Within the context of Rifkin's description of the third industrial revolution, it's power to the people that allows us to finally get the power of energy provision distributed to more people. Because renewable resources exist everywhere – unlike coal, oil, gas and uranium – there can be something for everybody. If we can harness renewable energy, store it in the form of hydrogen, and distribute it through smart power grids, the developing countries will be able to have electricity and become players in the third industrial revolution and in globalisation. This truly would be bottom-up globalisation.

The question is: how to provide this 'power to the people' in the context of large cities' infrastructures? In current flows of needs, desires and dreams, the dispossessed and the ambitious are flooding into cities. Some cities are struggling to cope, while others are showing flexibility and dynamically reconfiguring themselves. For example China has created an industrial powerhouse from what were fishing villages in the 1970s while Lagos and Dhaka attract a thousand new arrivals every day. In Britain, central London's population has started to grow again after 50 years of decline.

We are faced with this reality of unstoppable growth and the resulting destruction of the natural environment and natural resources. The feature length documentary *Manufactured Landscapes*[51] tracks the beauty and horror of industry's imprint of the earth – it shows images like quarries, recycling yards, factories, mines, dams. The documentary summarises the general problematique facing civilization in general and cities in particular with the statement that "It is not about right or wrong, but about [adopting] a whole new way of thinking".

Taking into account the third industrial revolution, maybe this new way of thinking is about establishing a more level playing field? We can call this a flat revolution with tremendous power because it allows us to distribute energy much more equitably as we are moved from the elite energies of the 19th and 20th centuries – fossil fuels and uranium – to the more democratic energy possibilities of the 21st century. Renewable energies, hydrogen storage for those energies and smart power grids to share those energies offers the potential for people to be much more aware of their energy use and more self-sufficient. Wealth and economic activity follow energy, because energy is the key to producing, amassing and distributing wealth.

EU initiatives for cities and regions

In the European context there are numerous initiatives specifically promoting the creation of renewable energy sources that offer the potential for sustainable and secure energy futures. The EU Energy Commissioner Andris Piebalgs said at the conclusion of the 2008 EU sustainable energy week that: "It is not a question of energy supply, but question of national security" (1 February 2008).

[51] Manufactored Landscapes – a feature documentary by Jenniefer Baichwal, 2006 Canada, 90 mins.

The EU's most visible tool for funding action to improve market conditions and move us towards a more energy intelligent Europe is the Intelligent Energy Europe programme **(**http://ec.europa.eu/energy/intelligent/index_en.html). With the ManagEnergy (www.managenergy.net) initiative of the European Commission Directorate-General for Energy and Transport, there is very broad and rapidly growing support to the work of actors working on energy efficiency and renewable energies at the local and regional level. The main tools are energy sector advice, training, workshops and online events. In addition, information is provided on case studies, good practice, European legislation and programmes. They also host http://www.managenergy.tv/ which gives access to live Internet broadcasts, video recordings and chat discussions from European events on energy efficiency and renewables, as well as European Commission documentary videos on broader energy and transport issues. The recently launched "Covenant of Mayors" is bringing together European energy actors – in this case mayors of Europe's most pioneering cities – in a network to exchange and apply best practices across these cities and beyond to improve energy efficiency significantly in the built environment. Another initiative is Sustainable Energy Europe (www.sustenergy.org), which is a European Commission initiative in the framework of the Intelligent Energy Europe Programme. This will contribute to achieving the European Union's energy policy targets within the fields of renewable energy sources, energy efficiency, clean transport and alternative fuels.

One program that is progressive in terms of integration of initiatives at the city scale is called CONCERTO. The CONCERTO initiative, in the context of European research and technological development, is supporting actions that are both sustainable and energy efficient. As stated in their brochure and introductory materials "Helping communities integrate energy efficient strategies into high quality local development towards integrated local community energy policy to improve the quality of citizens life is the CONCERTO baseline."

CONCERTO was launched with the idea to harmoniously blend energy production from renewable energy sources with the application of energy saving measures on a local basis. Its strategic vision is to demonstrate through dedicated forerunner cities how communities in Europe can reach energy performance targets, which are 30% above their existing national targets. CONCERTO cities are starting to demonstrate the high potential for energy efficiency – which can be achieved within realistic market conditions. They will then publish and share "best practice policies" with other cities in order to raise their performance above that required by legislation. The CONCERTO initiative will mobilise over 3 billion € of investment for sustainable energy related actions, and achieve energy savings with significantly lower investments than would be possible only with individual measures. Successful CONCERTO cities are expected to achieve a payback of their initial investments within 10 to 15 years, leading to the stimulation of replication on a much larger scale in the future.

In order to help reach the European energy and climate change policy objectives, the CONCERTO initiative supports demonstration and diffusion of innovative energy solutions in cities in which energy efficiency and renewable energy sources are integrated. For example, consider the European Council decisions of March 2007: 20% energy efficiency, 20% of renewable energy sources in the EU energy mix and 20% reduction of greenhouse gas

emissions by 2020 and beyond[52]. Best practice examples at the European level from the CONCERTO initiative will highlight the way towards a sustainable future and will focus on the legal, technological and financial framework needed to further promote the CONCERTO goals. In seeking answers and giving best practise examples for a more sustainable future there has been a need for innovative technological initiatives to solve problems of cities in terms of energy consumption so that at least 30 % of energy consumption is reduced and 30 % of renewables are provided, especially in the case of expanded dwellings and retrofitting urban areas.[53] This innovative approach leads to a global optimization of the CONCERTO communities, in terms of energy flows and also urban planning and social issues.

Experiences have shown that it is crucial to operate with an integrated approach, with energy efficiency measures combined with supply of renewable energy sources as it helps to cut the cost and improve the comforts of living for the community. So far there are 28 communities in CONCERTO working together in 9 projects to support a sustainable future – refurbishment and urban renewal working together to establish a sustainable future reducing consumption of 4000 citizens by about 30%. [54] The family of CONCERTO communities will continue to grow in part by employing energy service companies and new technologies to move ahead. Aiming to spread the concept of communities across Europe as a way towards integrating energy policy and improving quality of citizens lives. Examples of demonstration activities range from solar collectors to refurbishment activity to urban sustainable construction.

Another initiative that is a host to local authorities to exchange best practices with each other is Energie-Cites (http://www.energie-cites.eu/). Based on the rationale that over 75% of all energy consumption in Europe occurs in urban areas, local authorities more than ever have a pivotal role to play. Taking action at the local level will help to reduce energy consumption and energy bills while reducing local emissions and effluents, stimulating local growth by making use of locally available resources as well as recognition as an innovative town or city. "IMAGINE", a long-term initiative of Energy Cites, aims to help communities to better prepare the energy future of their territories, combining foresight reflection with action in the field to help cities achieve the goals of the European Union in the field of energy efficiency and climate protection (www.imagineyourenergyfuture.eu).

Some other initiatives that are targeting local authorities and cities for assistance in transition to renewable energy follow:

- http://www.sustainable-cities.eu/ provides practical guidance, project ideas and tools, showcased in the Sustainability Kit and in the linked partners' websites.

- *Better Integration for Sustainable Energy* http://www.bise-europe.org/ BISE aims at encouraging the creation and strengthening of networks of towns and cities promoting energy efficiency in the New Member States, Candidate Countries, Western Balkan Countries and the Ukraine.

- *Sustainable energy communities* http://www.belief-europe.org/ promotes concepts at a European scale, setting up Local Intelligent Energy Forums in 20 communities from 11 European countries with each community involving relevant local stakeholders.

[52] Brussels European Council 8/9 March Presidency Conclusions
http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/93135.pdf
[53] Inteligent Energy Europe, Multiplying Success in Buildings : 21 innovative projects for an energy intelligent Europe
[54] Concerto Newletter, Issue 2, December 2006

There are numerous initiatives at the regional level pooled together with the Declaration of European Regions for Development of Energy Efficiency and Renewable Energy (full text on www.fedarene.org). Given the European cultural and political context the reasoning is that only by including regional actors in the drafting of the White Paper on Energy, it will be possible to find the right tools for addressing the challenges of energy dependency and at the same time contribute to regional economic development. The European Commission identifies the regional level as a key actor in decision-making about energy. Some examples of regional initiatives include:

- Enercy region (www.enercyregio.net) is an action programme for strengthening energy efficiency and source saving by sustainable development in European regions: enercy – impulse – development and testing impulse programs.
- The European energy award (http://www.european-energy-award.ie/) is a qualified instrument for steering and controlling communal energy policy in order to systematically review energy-related activities. The European Energy Award® (eea®) allows municipalities to identify strengths, weaknesses and potential for improvement and, above all, implement energy efficiency measures effectively, representing some regional best practice examples, such as (www.een-sachsen.de in German, www.een-rer.it in Italian)

Some renewing practices from European cities

It is evident that using energy in a more sustainable manner is the most effective way to improve security of energy supply, reduce carbon emissions, foster competitiveness and stimulate the development of a large market for energy efficiency products. So which European cities have taken the lead in this direction and commenced their transitions to renewable energy?

One example is Freiburg, with its leading solar research institutes based in the city and its use of solar power makes it a leader of the German 'Solar League'. The city is on schedule to meet its aim of 10% by 2010, with subsidised solar panels on the roofs of houses, schools and businesses. Waste sorting and recycling facilities are also highly developed, and recently built neighborhoods in Freiburg's suburbs have been planned and built with environmental concerns in mind. One resident states that "living in an 'eco-city' like Freiburg inspires a positive, forward-thinking outlook"[55]. In addition to renewable energy use, other factors like efficient public transport, the community spirit engendered by Freiburg's ambitions and achievements, and cleaner surroundings all contribute to this resident identifying themselves as living in an 'eco-city'.

Another 'eco-city' is the Bavarian town of Erlangen, which implemented a pro-bicycle policy soon after Freiburg, subsequently seeing a 75% increase in bike use. The town also has a low rate of water consumption and has made progress in the field of solar power.

The three winners of the 2003 European Sustainable City Award – Ferrara, Heidelberg and Oslo - have also made significant progress. Ferrara's recycling system is particularly impressive, Heidelberg stands out for its energy saving activities (led by the city authorities and the university – reducing their carbon dioxide emissions by 35% and 13% respectively), and Oslo's public transport system and waste-reduction programmes are both very successful. Another Scandinavian city known for its environmentalism is Stockholm – generally

[55] Please see : http://www.europeangreencities.com/pdf/publications/Final%20report_EGCN_web.pdf

considered the world's most environmentally conscious capital city.[56]

Navarra, northern Spain, is most famous for hosting one of Europe's most controversial festivals – the running of the bulls in Pamplona – celebrating the power of nature let loose in city streets. Now another kind of natural power has made the world turn its head. From Pamplona you can see wind turbines on the surrounding hills. There are more than 30 wind farms in the region, which produces some 65% of its electricity from renewable sources, creating some 6,000 jobs.[57] Their investments to renewables include mini-hydro, biomass and solar power – and government education efforts have helped win solid backing from the community. Its investment in linking renewable energy sources to the electricity grid, for instance, helped give entrepreneurs the confidence to move into the sector. "Other regions have more wind, more sun, even more money. So what's the difference? Infrastructure. Navarra invested in energy infrastructure 20 years ago, and now we are able to move the energy around."[58]

Güssing, located in southeast Austria, was a backwater until the Iron Curtain fell. Its population was ageing, as young people left to find work, leaving behind a city with acute fuel poverty and unemployment problems. So, in 1991, Güssing started working on cutting fuel bills – encouraged by local leadership – before moving on to investing in renewables. For example, "the mayor of Güssing jokes that he went to the top of the hill to throw himself off because the books wouldn't balance. But from the top he could see assets they'd never thought about: forestry, farmland and sunshine."[59] A key early project, opened in 1996, was a €10.1 million biomass district heating plant using fuel from wood chips. This provides heating and hot water to houses via a 27-km grid, without the need for individual boilers. In all, there are more than 30 renewable energy projects, including biodiesel, biogas and photovoltaic plants. Güssing is now home to the European Centre for Renewable Energy, and companies in the region export renewable energy technologies and expertise internationally. From spending €6.2 million on in 1991, the municipality now generates €13.6 million from the sector – with 1,000 new jobs created and 50 companies attracted to the area since then.[60]

Apeldoorn is located in the Netherlands and the local leaders have set a target of getting 100% of their energy from sustainable sources by 2020 – even though studies suggest they might only get half as far. In one project, the city renovated 364 houses in the St Joseph social housing community – fitting better insulation, replacing boilers, and adding rooftop photovoltaic panels that produce up to 1MW of energy in total. Renewable energy subsidies from various sources made up around half of the €11.75 million project costs. Tenants accepted a €20-€25 per month rent increase to help pay for the work; and in return the energy company promised them an equivalent reduction from their fuel bills.[61]

The Danish island of Samsø in the Kattegat Sea, home to 4,500 residents, gets 100% of its electricity and most of its heat from renewables – and the community is at the centre of the scheme. The island has 21 wind turbines, of which ten are offshore – with five owned by the municipality. Many houses have installed technologies such as solar heating and heat pumps.

[56] Please see : http://sustainable-cities.eu/Sustainable-Cities-Awards-101-2-3-.html
[57] Please see : http://sustainable-cities.eu/Sustainable-Cities-Awards-101-2-3-.html
[58] Please see : http://www.europeangreencities.com/pdf/publications/Final%20report_EGCN_web.pdf
[59] Please see : http://www.europeangreencities.com/pdf/publications/Final%20report_EGCN_web.pdf
[60] Please see : http://www.europeangreencities.com/pdf/activities/ConfNov2004/summaries/10_Energy%20innovations%20in%20Gussing%20as%20economic%20engine.pdf
[61] Please see : http://www.apeldoorn.nl/

Islanders were able to invest in the co- operatives that financed the wind farms and other renewable energy projects – giving partial community ownership of the scheme. "One of the keys is that we didn't leave anybody out," says Søren Hermansen, director of the Samsø Energy Academy. "It's not a social project, but it has to benefit everybody. Some people thought wind power would scare tourists away," but that's far from being the case; the island now attracts additional eco-tourists – and with tourism the main source of income for the community, that's good news for everybody."[62]

The Linz Solar City, located 7km outside the northern Austrian city, was designed to be sustainable and affordable – and it looks purpose-built for the 21st century. Its hub is a tram station, with shops, a church and bars – and 1,300 modern buildings grouped around it. The most striking are laid out in the form of an amphitheatre, so that each gets maximum benefit from the sun." Virtually every building has some kind of solar panels on it – solar thermal or photovoltaic," says German. "The whole thing is supported by a biogas power plant 2km away. Political leadership was crucial," he adds, pointing out that the municipality of Linz made the decision in the early '90s to invest in sustainable affordable housing. "It wasn't until the late '90s that they pulled the plans together, but within four years, people were moving in."[63]

These cities show us is that it is possible to make real progress in helping the environment also by making the task attractive to the public. Without popular support public transport, recycling, waste-reduction and renewable energies would not work. Establishing a community-led effort to do so can overcome people's initial reluctance. To do this, commitment is needed from multiple actors, especially financially. It is evident that the 'eco-cities' are located in some of the wealthiest areas of Europe – and many of the schemes mentioned are not inexpensive. However, for Europe's impact on the environment to be improved, our governments need to give the necessary support, investing in the transformation of many more urban areas into 'eco-cities' like Freiburg. It's no good waiting for people to make their lifestyles more sustainable themselves; authorities should bring environmental consciousness to the masses, and if this comes at a price, it is a price worth paying.

Yet, mostly we need to see this transition not as a cost, rather it is becoming more evident that renewable energy is a very profitable investment for the future as there is visible and rapid growth of the renewable energy industry.

Making renewable energy easy, cheap and sexy?

In the long run even if there will be a premium for buying green, people will ultimately buy in a green scheme because they are interested in living green, if they understand it as their basic human right. Molding human nature still is the key to success for any carbon-neutral project, planners acknowledge. "If sustainability is going to work it has to be easy, cheap and sexy," said Jean-Paul Jeanrenaud, head of business and industry policy for the World Wildlife Fund International in Switzerland.[64]

[62] Please see : http://www.energiakademiet.dk/default_uk.asp
[63] Please see : http://www.linz.at/leben/4701.asp
[64] Breaking Ground on Eco-Cities Near Shanghai, Plan for 500,000 People is Largest of Its Kind BUSINESS OF GREEN By Kevin Brass

Coming back to the Vision of PAN European decentralized generation – with hundreds of small networks interconnected – calls for visibility of these networks. Associations, networks of cities, dynamics of all kinds of projects show that we are moving towards the model of low carbon cities and that we are rethinking the city for a post carbon society. These cities projects demonstrate that investing in renewable energy and energy efficiency programs helped them and shown them how to:

- Save money
- Provide economic benefits to their residents
- Reduce future energy cost risks
- Comply with and improve upon clean air standards
- Provide a more livable environment
- Enable local leadership and coordination of multiple stakeholders
- Make an energy balance sheet for the area – how much money for fuel is leaving the community
- Enable actors to spot the business opportunity and go for it
- Demonstrate and sell the benefits – environmental and financial – in schools, colleges and communities
- Make use of regional, national and European funding
- Give residents the chance to invest
- Piggyback off existing infrastructure where possible

There are existing technological solutions and their implementation demonstrates how to continue improving on them and developing the field. But it is crucial to have in mind that technologies make promises and people deliver results. When people have chosen the transition to renewable energy with commitment, we can see that renewable power projects really can work and on a serious scale – which is the level of a dynamic fast growing city.

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Chapter 8
Networking Society with ICT: Connecting Homes and Workplaces for more liveable Cities

Pierre Chastanet [65]

Introduction

In 1998, at a lecture at Berkeley's Department of City and Regional Planning, Spanish sociologist Manuel Castells commented:

> *If we are able to seize the opportunity of renewing city and regional planning to confront the challenges of the Information Age, maybe we could contribute to link up science, technology, culture, and politics, thus enabling the local to control the global, so that function and meaning, productivity and social justice are integrated and reconciled*[66].

Information communication technologies (ICT) are providing unique intercommunication and interaction capabilities that shorten physical and geographical boundaries in an unprecedented manner, bringing us closer to our geographically distant families, friends, and colleagues. The deployment of ambient networks and intelligent control systems in our homes and workplaces also influences the quantity of energy required to operate them. This chapter explores how ICT contributes towards creating more energy efficient homes and workplaces and how this can shape society. ICT transforms our social and economic activities, linking us both to established and distant communities as well as offering opportunities to create new communities, ideally those shaped by more sustainable behaviours.

Connecting homes today and in the future

Individual households roughly represent two thirds of buildings' contributions to CO_2 emissions. The remainder is from workplaces and commercial buildings. This means that modification of individual behaviour in homes can cumulatively (if changes are implemented across many households) have a positive influence on reducing emissions and ICT is a tool that can be deployed to optimise reduction of energy consumption. Table 1 shows an average distribution of energy consumption in a household.

Table 1: average energy consumption in a household[67]

Energy Consumption	**1990**	**2005**
Space Heating	58%	53%
Appliances	16%	21% *(*)*
Water Heating	17%	16%

[65] Pierre Chastanet is Administrator at the European Commission in charge of Research Programme management in the field of Network and Communication technologies and the Internet of the Future. He previously held various management positions in a Fortune 20 company, including Head of Global ICT Innovation. Pierre Chastanet holds an M.S. in Telecommunication Engineering and a M.A. in International Politics. The views expressed in this article are solely those of the author and do not necessarily reflect the views of the European Commission.

[66] The Education of City Planners in the Information Age, Manuel Castells, Berkeley Planning Journal 12 (1998): 25-31

[67] Worldwide Trends in Energy Use and Efficiency, International Energy Agency, 2008

Lighting	4%	5%
Cooking	5%	5%
(*) From which idle		*3%*

In developed, and increasingly in newly industrialised nations, increased general access to technologies like personal computers, printers, TV's, new media players, and network equipment has increased the contribution of ICT equipment to the energy bill of a household[68]. The proliferation of such equipment in the home and increasing energy bill, particularly in the context of rising oil prices, provide an opportunity for ICT innovations towards optimisation of energy use. Home automation, sometimes called 'domotics', enables distributed and remote control of domestic applications (inside and outside the house), shared usage of appliances in the home environment and eventually changes to habits and lifestyle of its inhabitants. However, the installation of communication and control systems is a prerequisite for automation and communication across home appliances to allow energy optimisation.

ICT and automation can become powerful enablers towards pursuing energy savings. For example, a reduction of one degree Celsius can lead to a gain of up to 7% of the energy consumption for heating in a household[69]. The monitoring and adjustment of temperature across every room of a house can be achieved through the deployment of sensors, communicating through wired or wireless connections with a central energy processor. Intelligent systems can follow the activity of individuals in the rooms and even identify patterns of presence or motion and then correlate them with weather forecast data and local conditions information to anticipate specific energy needs. The real time monitoring and daily reporting of energy consumption via easy to use and understand graphical interfaces is also an important factor to help change the behaviour of individuals. If the basics of such control systems are not new, two factors come into consideration for the potential of their rapid deployment. Firstly, while the cost of such systems has largely decreased, their reliability has greatly improved, which allows the products to be in the mass market. In particular the affordability of a new generation of sensors, actuators and controllers enables the initial investment to be rapidly offset through reduction in energy consumption. Secondly, advances in communication technologies are now largely facilitating the deployment of such installations.

Cabling an existing house for home automation has barriers both in terms of cost and hardware installation. However, recent developments in radio technologies have enabled the emergence of wireless standards with low-energy consumption (e.g. Zigbee, Z-Wave). Power Line Communication (PLC) is also an option for automated meter management systems, in particular in geographically remote areas. PLC would enable deployment of an interoperable energy management system capable of managing local power demand and re-dispatching local loads, and would enable maximising advantage of distributed energy generation and "demand side management" (i.e. the control of electrical equipment such as meters, switches, heaters and domestic appliances).

Bringing greater broadband connectivity to the home represents another major advance in terms of foundational ICT infrastructure for the home. Broadband revolutionizes the

[68] However, the development of appliance standards has been an efficient instrument for increasing energy efficiency of appliances used in commercial and residential buildings. One example is the Energy Star program for home electronics and home offices in the US). See UNEP07-2.

[69] U.S. Environmental Protection Agency's Energy Star Program and UNEP07-1

accessibility to data and services; it enables people to explore unprecedented sources of information at greater speeds without requiring physical movement to another location. Doing on-line shopping, reading an electronic book, visiting a museum's collections virtually, experiencing a music concert live with an extraordinary realism, attending a conference or a lecture, conversing with family and friends located on the other side of the globe – or down the street – as if they were nearby, running a health-check: each of these examples represent new and future entertainment, education and health services that have or will become accessible from home thanks to ultra-high broadband communications. The access to such high-quality and close to reality services will require the multiplication of multi-purpose, ultra-high definition screens throughout the house, as well as sensors (e.g. high-definition cameras, image analysis systems to sense and transmit emotions or medical parameters) and actuators (e.g. glove to transmit and feel touch, scent diffusion). The ease of access and user-friendliness of this new generation of services will be the next leap to reduce geographical boundaries, reducing the need to transport good and services, while maintaining or developing social and professional communities.

Mobile Working

Broadband is an enabling factors for people working from home, entrepreneurs, and small and medium enterprises (SMEs), which can benefit from a high level of connectivity previously available only to large companies, governments and universities. It will allow the development of new business models, both for entrepreneurs who will exploit new e-commerce opportunities, and for SMEs that will need to reinvent their business processes with a geographically distributed workforce.

Companies are increasingly inclined to move from a fixed-cost structure to more flexible models in order to reduce capital expenditure. Buildings investment is a typical example where companies are looking to make cost savings and reduce office spaces. This trend emerges in parallel with the increasingly mobile nature of many jobs, reducing the time spent in headquarters and thus the need for a fixed office space. This is coupled with the increase of real-estate prices in many cities and the increasing the time for employees to commute to their company's headquarters. These very different dynamics enable both companies and employees to find a common interest by providing mutual flexibility. However, this represents a significant challenge to corporations as they need to develop new capabilities in managing a geographically distributed workforce and remote infrastructures, providing new ICT facilities enabling remote collaboration between tele-workers, corporate headquarters, customers and suppliers, but also sometimes re-engineer their business processes or even re-invent their business models. It is likely that employees will equally spread 80% of their working time between the corporate office and their home, and the remaining of it either in-between or on business trips. Flexibility in the workplace (both in terms of location and timings) will also be a growing factor to attract and retain talented workers. The shift towards a knowledge economy will further increase this phenomenon.

Network and communication technologies therefore can be the source of a major environmental contribution, through reduction of office space (and subsequent building's energy consumption), transport and travel (and associated CO_2 emission). For example, the European Telecommunications Network Operators Association (ETNO) estimates that "if

10% (19.3 million) of EU-25 countries' employees became flexi-workers by 2010, this would result in approximately 22 million tonnes of tonnes of CO_2 reductions."[70]

This new balance between corporate and home office might also have a significant impact on the development of local communities. One can imagine the further expansion of the concept of companies to service mobile professionals, like Kinko's. These local service centres with shared facilities (including meetings rooms, computers, copiers, printers, and faxes) could support the needs of tele-workers of the neighbourhood. On top of the energy and material savings enabled by the sharing of facilities, this may even create new interactions between employees from different companies and possibly new business opportunities – at a local community scale.

Informational Buildings

The traditional supervision of buildings involves the separate management of utilities (gas, electricity, water), facilities (air conditioning, heating) and security (fire, access control, video surveillance, elevators) by building managers, while different professionals manage information technology equipment, including personal computers, servers, voice communication, fax, and video conferencing.[71] The integration of information and control enables a shift to multifunctional systems with integrated building automation systems (for utilities and security/access control) on one hand, and integrated communication systems on the other hand (including voice, data and video services for storage, processing and transmission). These systems have gradually become compatible through IP (Internet Protocol) technologies, enabling a seamless integration of localization systems, electronic building plans and maps, asset management, security, alarm and control. The development of sensors discussed in the previous section will enable integration of alert and control systems at the edge, requiring less bandwidth and storage, take smart actions through actuators (e.g. automatic fire detection and extinction) and resurface only the alarms relevant for human intervention.

The building and construction sector constitutes a major source of employment worldwide, with more than 111 million people directly employed in this area, 75% of which are based in developing countries. However, the financial investment in these countries only represents 23% of the total, which is evaluated at above $3 trillion[72]. The building and construction sector represents around 10% of the global GDP.[73] These numbers highlight the potential economic consequences of changing construction standards to more sustainable buildings, as the demand for new buildings could subsequently slow down because of higher capital investments required to use – often more expensive – sustainable construction materials and techniques, whose return on investment need to be offset through energy savings over time. It also partially explains the reluctance of governments or local authorities to put in place restrictive policies to orient the nature of new constructions or renovation of building toward strong sustainability standards, as the consequences on employment could be disastrous. However, the renovation business of houses and buildings will represent a major source of employment as both households and companies will try to reduce their energy consumption to

[70] http://www.etno.be/Portals/34/ETNO%20Documents/Sustainability/Climate%20Change%20Road%20Map.pdf
[71] Source: DEGW, Teknibank "*The intelligent building in Europe: a multi-client study by DEGW (London) and Teknibank (Milan)*", 1991
[72] UNEP Sustainable Building and Construction Initiative, Information Note, 2006
[73] Ibid.

compensate for the increasing costs of energy. The financial incentive will therefore be a major driving force for adoption of new technologies to improve the energy efficiency of homes and buildings.

From Virtual Building Design to Urban Planning

Advances in digital modelling, CAD/CAE[74] technologies and visualization are enabling to perform rapid virtual prototyping of buildings and to render ultra-realistic architectural projects. It also enables architects to explore the particularities and characteristics of buildings that were previously impossible with traditional design methods. In addition, the real time connection of virtual models and architect teams allows remote collaboration in design and construction.

Software and hardware development of innovative tools enables design at multiple scales (including mechanical and thermal optimization and wiring) from industrial and commercial buildings to urban and larger spatial configurations. However, because of the individual complexity of such models, the constraints of optimization are often done on the scope of a subsystem (e.g. routing of the electrical and network cabling, power calculation of heating system) without taking into account the full building environment, for which specific models would need to be developed (including local climate conditions throughout the year, other perturbations like noise). Progress in software development of physical models and in grid computing of unprecedented processing power should enable to gradual implementation of increasingly holistic models taking into account of all aspects of new constructions, from micro levels (building lifecycle design, maintenance planning, materials to be used, energy consumption optimization, waste management cycles definition, water conservation and re-treatment, CO_2 emissions control) to macro (landscape integration, access to transports, provision of utilities).

The societal changes imposed by the generalization of ICT require different kind of rural and urban architecture and planning. ICT provides new sets of tools to support new constructions or renewal of building and their environmental integration by simulating, sharing, analyzing and documenting the impact of the new construction (e.g. leveraging 2D and 3D modelling software, enhanced reality, virtual walk-through, computed scenario analysis, impact measurement). From this perspective, ICT can present unique opportunities to support the evaluation of new constructions against sustainability standards. For instance, the United States Green Building Council (USGBC) has proposed a rating system called LEED (Leadership for Energy and Environmental Design[75]), which provides a methodology to measure the implementation impact of new construction projects against a defined framework, ensuring the quality of sustainability of future buildings. ICT applications can bring major benefits in streamlining the implementation of these methodologies; therefore, ensuring the respect of sustainability considerations.

Conclusion: reinventing social interactions

[74] Computer-aided design and computer-aided engineering

[75] USGBC: U.S. Green Building Council - Leadership in Energy and Environmental Design (LEED): http://www.usgbc.org/LEED

From the general organization of society at present and instrumental in shaping the future future, ICT provides the tools and means to drive sustainable design of our building and housing conditions and to stay connected to our families, friends and colleagues wherever we live, work, play and learn. Access to knowledge and education, optimization of manufacturing and supply chains, and efficiency of transport are each key functions of society in which ICT is playing a transformative role. ICT is particularly having a major influence on the needs for the type of buildings needed to serve the range of human activities. Creation of new electronic content and digitalisation of existing content enables access to information in an unprecedented manner, which is gradually replacing physical support of information (thus reducing needs for production, distribution, storage and re-processing of paper, tapes, pictures) and thus reducing the need for the associated building and transport. It is therefore not only the means to consume information that ICT is revolutionizing; it is drastically changing traditional places of information and service exchange like universities, medical centres, public administrations, libraries, and entertainment centres by enabling their remote access from connected homes and networked buildings. It also truly challenges the organization of our society as a whole, by reconfiguring our social and economic activities and incorporating them into new generation of homes and urban environment.

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Chapter 9
Metropolis 2.0: Web 2.0 for sustainable cities

Shahryar Eivazzadeh[76] and Thomas Schauer[77]

This chapter explores how Web 2.0 can be applied to sustainable cities. Web 2.0 is an approach related to the Internet, which makes users not only consumers of the added values (usually in terms of knowledge) but also makes them contributors to the content. Web 2.0 is a general definition for systems that offer the potential for generation by distributed users. It makes in a way the term 'user' obsolete because the former user can become an actively participating citizen. Some examples of Web 2.0 applications include Wiki knowledge repositories, social networks, rating web sites, news and photo sharing web sites. New types regularly appear with continued innovation. Web 2.0 is not just a single technology. It consists of a variety of improvements that have one item in common: they enhance the interactivity between the user and the content on the Internet. Providing information on the web is no longer the privilege of specialists or advanced non-professionals; it has become a more widely accessible option, and programmers shift their attention to the provision of frameworks for interaction.

In 2007, Web 2.0 was on the apex of the visibility. Huge amounts of investments were made on new Web 2.0 applications and it was a popular buzz word, both for the IT industry and for users - in business as well as in civil society. It seemed that in the future anybody who would not have a "second Life" would be inevitably left behind. But - as usually - after the hype, there is now the need for a more realistic consideration of the new phenomena and their impact on the IT industry, on business and on our everyday lives.

Web 2.0 and the sustainable city

Principally, Web 2.0, like other technologies, is neutral related to the sustainability of cities. However, the way we use it, affects our social life by enhancing, expanding, extending or accelerating important elements of cities' dynamics. This section explores three aspects of how Web 2.0 can influence urban sustainability.

MetroSense

Firstly, like any complex system cities require monitoring of the vital parameters of sustainability. From monitoring traffic to monitoring crimes rates or to scanning or discovering harmful trends, metropolis-wide sensing and monitoring are applied. A major portion of attention of municipalities and local governments is dedicated to this. Also these bodies 'recruit' their own special "tools". They use police officers, parking attendants, close circuit television cameras, gauges on electrical devices, figures and reports generated by experts, satellite pictures or other devices to collect data. To a lesser extent, they depend on

[76] Shahryar Eivazzadeh is a software expert. Beside his professional activities he has been an active environmental volunteer during the last 12 years in Iran. Information Society as information system, was also a topic of his interest. Shahryar has been a member of tt30 of Club of Rome think tank since 5 years ago.

[77] Thomas Schauer is Director of the European Support Centre of the Club of Rome in Vienna (http://www.clubofrome.at), and has been managing research projects on IT and sustainability.

the citizens themselves for fulfilling those duties, such as reporting eligible voters at addresses or self-reading of energy meters. Monitoring by citizens happens only occasionally and accidentally (for example when illegally deposited garbage is reported), but there are examples for interaction like reporting of radar speed controls on roads by drivers and their communication via the radio.

Web 2.0 opens new opportunities for citizen involvement in providing data about their urban environment. In a proposed Web 2.0 system people could identify issues and post them on that specific Web 2.0 systems, such as noise pollution, the need for litter collection or identification of anti-social behavior. Information provided could be rated in terms of severity and urgency aspects and then the responsible organisation could be informed. The Web 2.0 application could allow the public to monitor progress of the issue by the responsible organisation, which could post ongoing updates. Hence, Web 2.0 can serve as a communication tool that lets the process occur in a more transparent way. Possible benefits of Web 2.0 in monitoring include: democratising the ability to raise issues, offering a technical platform into a database that maintains large amounts of information, enhancing communication of the wider public with officials responsible for implementing policies.

MetroOptimize

Secondly, Web 2.0 can improve optimisation, which is also a key element of sustainable development, given the scarcity of natural resources. Optimising energy consumption and the use of other scarce resources is beneficial toward achieving long-term sustainability and to avoid crises from the lack of resources. Optimisation is enabled by intelligence evaluation, coupled with some sort of calculus. Biological systems demonstrate different optimisation mechanisms such as energy saving by hibernation, applying the evolutionary intelligence, which is the more brutal option for the individuals, compared to the alternative of learning by help of neural systems.

Cities have also developed schemes for optimisation. Optimising traffic flow using different methods or implementing measures for saving energy, starting from very simple steps like creating pedestrian zones or switching off public lights during nights as practiced in some towns.

The Internet provides a platform that enhances the options of reusing and sharing**,** two basic methods for optimization, which can be applied much more efficiently amongst citizens. Also the collective intelligence that can be represented within Web 2.0 social networks could be used in some city optimisation problems. One example is the reuse of objects, such as mediated for a fee already by eBay, which is a system that included interactive features already before Web 2.0. Other examples include the possibilities for better management of car sharing or joint travel among city residents.

Cities are geographically shared points of human civilization. People share space, facilities and experiences within cities. Car sharing and ride sharing are straight forward and effective solutions for traffic jams, which provide multiple benefits including reducing the hassles of driving, consumption of energy, and air pollution. Car sharing via web sites already exists and people use this facility (here we only mean voluntary car sharing among common residents who own cars). Advantages of a Web 2.0 car sharing include finding the best

matches to your point of origin and destination at the same time of day. Matches can happen in real time and you can find the best options along your path. It is easy and safe as sharers are identified and the system can improve itself via direct and easy suggestion by users.

MetroActivism

A third example of the benefits of Web 2.0 to cities is through the mobilisation of grassroots interests. NGOs and other forms of grassroots initiatives are playing an increasingly important role in leading action in society. Ernst Ulrich von Weizsäcker, even assigns to civil society the role to compensate for states' decreasing potential to take efficient measures to foster sustainable development The UN has also started to recognize civil society bodies as a major partner in this process.

New advancements in information and communication technologies have been quite an important element in the rising importance of grassroots initiatives. The local initiatives benefit from sharing experiences with similar interests in other locations. In effect, the local becomes globally networked. Web 2.0 will further enhance these networking effects because such applications have capabilities suited for bringing together spatially separated individuals. People are increasingly organized in on-line community groups and social networks. Traditional Internet groups like fora are often characterized by higher noise to signal relation,whereas Web 2.0 social networks can optimize the communication and help to better match the information and the individuals addressed by the information (like meetings in groups in virtual spaces, or target-oriented RSS Feeds. Activist groups are enabled to find like-minded much easier.

Giving positive feedback to people for civil activities can be another strategy to mobilise action by individuals. For example, the UNEP initiative to plant one billion trees in 2007 was enhanced with a website where people could report the number of trees that they had planted and see how their action influenced progress towards the goal.

Some people consider social networks to be a virtual version of cities where citizens can also communicate. However, they transfer also cities from a spatially located to a virtual entity.

Metropolitan 2.0: emancipation from space

Since the start of the Internet age, ‘real’ cities have begun to be complemented by digital counterparts. There are virtual cities that overlap partially with real ones, but there are also cybercities, which have virtual inhabitants that are in reality physically distributed widely. For example, ‘Second Life’ is a 3D virtual world in which the ‘residents’ themselves shape their surroundings. In such virtual cities, interaction is no longer restricted to direct contacts at the local or the regional level, but between all places with Internet access around the globe. Entering the digital age leads to a cultural change, which not only affects the new ‘cybercities’, but also real urban areas.

Human communication was traditionally done face to face and as travel facilities were not developed, people remained largely in the city or town where they were born. This led to cultures which were separated by geographic boundaries. The relative isolation of these cultures was one of the prerequisites for their creation and maintenance.

Traditional spatial barriers do not separate globalised cultures. Such cultures are not a completely new phenomenon - they already existed in the past. For example, in the Middle Ages there were not only regionally different cultures, but also global cultures such as the religious orders which established specific cultures on an international level. The members of these communities were often active at long distances from their hometowns and their native cultures. The prerequisite for the formation and the maintenance of these global cultures was a system of fixed standards of behavior and a relatively effective communication system. While in the past the emphasis was on the predefinition and interpretation of rules of behavior, there are less explicit rules necessary in the Internet age. Today sets of individuals interested in any topic can gather together on the Internet to form specific global cultures. The coherence of the group is facilitated by a permanent feedback, enhanced through the application of Web 2.0 technologies, and does therefore not need an explicitly predefined code of conduct.

The consequences of Web 2.0 will gradually become visible. The equilibrium between local and global cultures will shift. Of course cultures were not completely isolated in the past as well, as linkages through trade occurred, such as via the Silk Road. However, the degree and intensity of the present globalisation cannot be compared to the early exchange through trade. No longer, it is only the city where people originate that mainly defines their culture. In a globalised world, cities are exposed to different cultures and global trends arise. This means also that identity of future generations may be less attached to their location and their physical surroundings and more connected to global trends and multi-cultural communities.

With globally applied interactive Web 2.0 technologies, our mental surroundings are likely to overlap less with our physical surroundings. The long-term effects of these changes are yet to be determined. We cannot know whether virtual citizens will together start working on the sustainability of their physical surroundings, or whether the real space will become less important to individuals engaged in virtual worlds. Technologies give us the opportunity to revise our vision about sustainability. They can both have positive and negative effects on vital cycles of our societies. Citizens' capacities are enhanced by new technological features and virtual activities may create a ‘metropolitan version 2.0’. The information age in general and Web 2.0 in particular may have effects on sustainability, which we are only beginning to understand. Our look towards sustainability in cities cannot be sufficient and deep enough without considering these technological phenomena.

Chapter 10
Immigration and sustainability: Latin Americans in the United States

Mainé Astonitas [78]

The exhilarating pace at which modern cities have grown in the last three decades and the increasing environmental awareness about sustainability has turned the growth of large cities into an important issue. The growing population of these urban centers, and the many immigrants seeking better economic opportunities, also challenge the sustainability of large cities. Among the many problems that cities face, large-scale migration – both internal and international – and especially illegal or unauthorized migration is considered one of the critical issues.

Still the issues of migration and unauthorized migrants have a longer and more complex history. The arguments about sustainability and the discourse about humanity's footprint on the natural environment have also provided the basis for credibility to political discourses that oppose large-scale migration. However, this is an older issue including concerns about mixed ethnicity and multicultural social environments, posed by some right-wing discourses that oppose social integration and tolerance to multiple cultures or ethnic diversity. The question of sustainability has thus provided another argument for right-wing discourses, in addition to positions on criminality and loss of labor market opportunities for locals.

Immigration policy in the 21st century is less friendly to unskilled people than previously, as in the second half of the 19th century and early 20th century, in what is considered the age of mass migration in the United States. Current migration trends are less cosmopolitan in the dimension of international migration, being predominantly South-North; this is from Asia, Africa, and Latin America to the United States and Western Europe. In the case of the United States, the 1965 amendment to the Immigration and Naturalization Act legislated against ethnic discrimination biases by establishing a preference system according to family status regarding United States citizens and encouraging migration of people with skills in short supply. This legislation was changed again in 1986 with amnesty provisions also known as the Simpson-Mazzoli/Rodino bill. This was an attempt to hinder illegal immigration through tightened border control while at the same time creating schemes for aliens' regularization. These changes reflected the recognition of the incentives to migrate to the United States because of the available economic opportunities and caused a dramatic increase in Latin-American immigration.

All of these set new conditions for immigrants and especially for Latin Americans, for whom geographic proximity facilitates migration. Additionally, the large income differentials between nearby countries offer significant incentives to for individuals to migrate. This is apparent in the case of migration from Mexico to the United States. During recent years, Dominicans, Puerto Ricans, and Mexicans have been the focus of attention when addressing immigration topics because of their large numbers in the United States. Nowadays, in the largest Latin-American cities it is hard to find anyone who does not know somebody or have a

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relative living outside of the country. Immigrants from different parts of the American continent are broadly categorized as Latinos or Hispanics in an attempt to build a unified Pan-American identity.

In the last decades, Latin American countries have been the main origin of illegal immigrants in the United States, with the largest contingents originating from Mexico. In particular during the 1990s, because of a booming economy, the migration flows to the United States increased quite sharply, particularly from Mexico and Central America. Nowadays, greater than an estimated 12 million unauthorized migrants lives in the United States according to the Pew Hispanic Center (2008). They represent almost a third of the total immigrant population. Of these unauthorized migrants 56 % are Mexican, and 22% are Latin-American. Around 66% have lived in the United States for ten years or less, and 44% of the other fraction, has lived in the United States for five years or less. More than two thirds of them have arrived since the 90's, and between 2000 and 2005 their arrival averaged at around 850,000 a year (Passel, 2006). In the Latin American context, the intensification of the civil unrest and wars since the 1980s produced internal displacements as well as international ones. In contrast, it is interesting to notice that the end of the civil wars in Central America in the early 1990s in countries such as El Salvador did not produce a movement of migrants back to their home country (Solimano, 2001).

In 2005, the unauthorized migrants employed accounted for 4.9 % of the work force, which is about 7.2 millions of a total of 148 millions (Passel, 2006). The largely Mexican and Latin-American unauthorized migrant population has concentrated its work force on very specific low wage occupations that require little or no education. This has made them the largest share of the work force in very few and specific occupational categories: 24% of all workers are employed in farming occupations, 17% in cleaning, 14% in construction, and 12% in food preparation industries. This makes the share of unauthorized workers three times larger than the share of natives in construction, extraction and agricultural occupations, and in service occupations their share almost doubles that of locals. For example, even though only 4% of unauthorized workers were employed in farming activities, they make up 24% of all workers in that occupation (Passel, 2006). Unauthorized workers are overrepresented in few industries, rather than in a wide variety of occupations; generally in low education and low wage occupations, as well as in occupations lacking license requirements.

In terms of educational attainment, the Hispanic population has, in general, lower shares of people with high school and undergraduate college degrees than other minority populations living in the United States, such as Asians and Afro-Americans (Solimano, 2001). However, there are great disparities among Hispanic population in terms of education. The Cubans and the other Hispanics are the groups with the highest shares of educated people, while the Mexicans have the lowest. At the same time, the share of Hispanic families living below the poverty level is almost three times that of the Caucasian population and more than twice that of the Asian population. This pattern is consistent not only with their educational level, but also with the employment rates of these populations (Solimano, 2001).

The issue of guaranteeing sustainability creates many questions. On the one hand, are cities sustainable with their large and growing populations of internal and international migrants? On the other hand, can growth of cities be sustained without the large and inexpensive work force that immigrants provide? If cities are to be able to sustain its economic growth in terms of the work force, then this requires a continuous labor supply; migrants supply this labor. In the case of unauthorized migrants, their legal status itself allows maintenance of low wages

and precludes them from integral participation in the life of the cities and within the receiving society.

Education has also a key role in immigration since about 67% of all legal immigrants have secondary education or higher. For example, the issue of bilingualism often explains school or job achievements that will facilitate immigrants' adaptation process to the city. Generally, there is a strong tendency for the level of educational attainment to vary inversely with the distance from the United States (Adams, 2003). Latin American and Caribbean countries generally produce a lower share of immigrants with a tertiary education. This phenomenon may reflect the impact of migration costs – both economic and temporal. That is, prospective migrants with low levels of education in countries, which are closer to the United States can more easily afford the costs of legal (and illegal) migration than similar prospective migrants in more distant countries.

Therefore, international legal migration involves the movement of the educated. From an educational standpoint, international migrants represent an elite that is much better educated than the rest of the population in their country of origin. The vast majority of legal migrants to both the United States and the OECD have secondary education or higher. Legal migration to the United States involves the movement of better-educated people, who are probably more educated than those who remain at home. Hence, an increasing amount of attention has been focused on the relationship between international migration, brain drain, and economic growth. The so-called 'brain drain' phenomenon is detrimental for the country of emigration. The large departure of highly-educated workers from developing countries tends to hinder development, depressing income levels and long-run economic growth rates in developing countries.

Besides their role in the work force, legal immigrants also integrate socially and are an important component of the cities cultural input and diversity. Immigrants try to adapt to society, and although integration is an issue in itself, they are part of local communities. Migrants often bring with themselves their native languages and dialects, their world views, values and memories of their social organization, which later undergo a profound transformation in the urban setting (Altamirano and Hirabayashi, 1997). It is acknowledged that the social networks and ties that immigrants have can contribute to adaptation. However, gradual separation from the mainstream could lead to the formation of ghettos. Therefore, the identification with an ethnic group can also limit life chances by binding group members to certain ethnic traits and not allowing them to succeed with an integration process. Following this, the tendencies that certain diasporas have can express resistance and foster the recovery of a certain type of identity, as well as, conflicting relations with the receiving culture. This encourages segregation in neighborhoods, schools, jobs, and health services, as well as differences in valuation of beliefs, habits, and customs, which could lead to marginalization and aggression.

Anthropologists and historians have thoroughly recognized the importance of socio-cultural identification processes to construct ethnicities, nations, and different types of imaginary communities. Nonetheless, "life consists of constantly crossing borders" (García Canclini, 1995:232). Hence, the flexibility and versatility that each individual displays in two different cultures is an indicator of a successful adjustment. It is relevant to differentiate this flexibility from the concept of the melting pot and from multiculturalism, which are sometimes used to indicate that ethnicity and different groups can differentiate within the same society. Migration makes a person assume different roles during different situations.

Religious participation, sports fanaticism, and other rituals allow immigrants to re-imagine the lost and distant community, speak the same language, and feel protected (García Canclini, 1999). Local immigrants' associations as well as community centers reproduce the customs, habits, and socialization patterns and are safe social places for immigrants and their children. They allow immigrants to maintain their culture, while providing them with a space to discuss the different experiences of others in similar situations. Similarly, these ties and difficulties of integration can promote social networks, symbolic places of reunion and entertainment, such as parks, restaurants, bars, and clubs. The markets of nostalgic products and the activities oriented towards migrants and their families, such as travel and remittances services, are expressions of transnationalism. They also represent identity preservation and links of migrants with their communities of origin.

In the case of unauthorized immigrants, the fact that their legal status does not allow for a full participation of civil rights is an important issue. Since we know that their contribution to the urban economy is undeniable, as well as cultural influence on a city through time, there is an issue of inequality to consider. Whether they have entered the country illegally or not, immigrants have become a large and important share of the population. However, despite participating in the urban economy and society they lack guaranteed civil rights. This situation is not sustainable over time; excluding the rights of an important part of the population that accomplishes economic and social activities of the cities where they live marginalises individuals. The sustainability of cities cannot be separated from these issues since cities also flourish due to the large contribution of migrant populations that are part of them.

Currently, the situation of immigrants is based mainly in the economic needs of the receiving countries. Most of the time people migrate abroad in search for better economic opportunities for themselves and their families offered by foreign countries and measured against the economic opportunities found at home. In fact, unemployment, low wages, and meager career prospects for highly educated people, are each factors that encourage migration. Millions of people that enhance urban growth and development and enable cities sustainability, continue to live without guaranteed civil rights and in poor conditions. This is a problem that has to be solved within the general framework of the sustainability of large and growing cities.

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Chapter 11
"Living Together – CAIRO": A case on the social integration of urban refugees

Todd Lester[79]

The 2006 World Refugee Survey (U.S. Committee for Refugees and Immigrants) estimated a total number of 12 million refugees and asylum seekers worldwide. The United Nations High Commission for Refugees (UNHCR) seeks to protect, assist and build durable solutions for refugees. Alongside voluntary repatriation and resettlement in a third country, local integration in the country of asylum is one such solution.

According to the 2001 UNHCR statistical yearbook, 13% of refugees live in urban areas. Whereas urban refugees are not warehoused or languishing in camps, and may have the opportunity to work (usually in the informal sector), they give rise to a new set of urban issues, such as the December 2005 riot near the office of UNHCR in Cairo in which at least 20 Sudanese migrants died. According to an (December 31st 2005) article in The Guardian[80] Egyptian riot police brutally evicted some 2000 Sudanese from a protest camp in the affluent Mohandiseen district of Cairo who were protesting living conditions in Egypt. The riot ensued.

An (September 17th 2007) article in the LA Times entitled 'United, Cairo's poor and poorer get heard' says that "At 20 million people, Cairo is Africa's largest metropolis and has one of the biggest urban refugee populations in the world. Officially the number is 30,000, though unofficial estimates are as high as 500,000 asylum-seekers and refugees from 35 nations."

A 2006 UNHCR report[81] shows that Iraqis were the second largest group (after Afghanis), with 1.2 million having sought refuge in Jordan and Syria and another 300,000 in the region with up to 100,000 arriving to Egypt. The report suggests "Sudan, with 686,000 of its nationals outside the country, was next. The three other main source countries were Somalia (460,000), the Democratic Republic of the Congo and Burundi (about 400,000 each)." The fact that Cairo hosts the regional office of UNHCR creates an additional pull factor on refugees and asylum-seekers from all the aforementioned, war-torn states except Afghanistan.

Living Together – CAIRO brings Egyptians and refugees of all nationalities together to work for common benefits. The project does so by building capacity in the member organizations of Tadamon, the Egyptian Refugee Multicultural Council, while initiating a far-reaching public campaign to promote diversity as a positive resource in Cairo. Tadamon was conceived as an outreach project of the Townhouse Gallery[82] in 2006 to transfer cultural awareness and cooperative livelihoods activities which have already demonstrated their effectiveness in reducing social barriers between refugees and Egyptians in neighbourhoods where they live together. Currently, Tadamon is a network of 25 refugee and Egyptian-led organizations

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[80] http://www.guardian.co.uk/world/2005/dec/31/sudan.brianwhitaker
[81] 2006 Global Trends: Refugees, Asylum-seekers, Returnees, Internally Displaced and Stateless Persons
[82] The Townhouse Gallery is Middle East regional partner hub of the freeDimensional network.

working to realize the welfare and mutual understanding of marginalised refugees, asylum seekers and Egyptians through networking and coordination of cooperative efforts.

This chapter presents the activities developed and implemented during a Forced Migration and Refugee Studies (FMRS) joint research fellowship at the American University in Cairo (AUC) by Todd Lester and Jakob I. Myschetzky, the directors of social justice organizations, freeDimensional and Inklusion[83].

Background

Cairo has long been a host to large numbers of refugees, and both Egyptians and refugees have long viewed the residency period as a temporary one. Refugees inhabit the poorest Egyptian neighborhoods in Cairo where both populations share the same problems: crowded housing, lack of sanitation, electricity, clean sources of water, schools, medical facilities and employment opportunities. Most Egyptians who live in these slum areas were also victims of forced displacement from rural areas due to their loss of land by 'development' projects or extreme poverty. Although both populations share the same problems, it is easy for impoverished Egyptians to perceive foreign refugees as competitors for scarce resources. This perceived threat manifests in racist and xenophobic behaviour toward refugees who are mainly Sub-Saharan Africans whose cultural norms as well as appearances differ. Refugees, for their part, have self-marginalised from their neighbours.

These tensions have been exacerbated over the past decade by a humanitarian assistance approach focused on serving only the needs of the foreign-born refugees in these impoverished areas. Harassment of refugees and violence between them and their Egyptian neighbours are common. Since 2006, young refugees who had organised themselves into self-help groups have slowly transformed into gangs that resort to violence, illustrating how conflict escalates as a result of sentiments about social inequalities. There is an accelerating need to address the growing conflict and provide tools to prevent further escalation of the situation. In an effort to address this problem, 'A Training of Trainers' (ToT) was offered to a diverse group of representatives from multicultural communitybased organizations (CBOs). The scope was to provide the trainers with concrete tools for handling situations of discrimination, conflict, and a lack of resources while motivating them to pass on the experience and knowledge to their organisations.

In order to create a training that reflected the needs of the CBOs and non-governmental organizations (NGOs) that make up Tadamon, the researchers made extensive site visits to the offices and communities of refugee organisations during the first phase of the project. As such, the recruitment of the trainers was combined with on-site assessments of local issues to be addressed, such as information asymmetry[84]. In the Egyptian civil society context, a ToT is usually offered to founding directors of organizations who, for the most part, receive training regularly. Therefore the aim of Living Together – CAIRO recruitment was to engage second-tier managers who are typically younger than their directors; moreover, the aim was to identify young community leaders with dynamic approaches to learning and optimising their respective community organising efforts. This local knowledge and dedication was further

[83] The research fellowship period was December 1, 2007 – March 31, 2008. To learn more about the fellows' organizations, see www.freedimensional.net and www.inklusion.dk.
[84] During the course of the Living Together – CAIRO ToT, the Tadamon Council was able to launch its own website, hosting information pages for its member organizations – see www.tadamoncouncil.org.

enhanced by strategic selection of the external speakers, who were recruited based on their expertise and position in relation to specific topics addressed within the training program.

Integrated design

- The ToT was offered to 25 representatives from multicultural community-based organisations, equally dispersed across gender, ethnicity, religion, and national backgrounds, including members of the Somali, Iraqi, Ethiopian (Oromo), Palestinian, Sudanese and Egyptian communities. The campaign is conceived as a far-reaching outreach initiative – including community-based arts, creative communication, and public events – to engage community leaders in mechanisms to raise awareness of strategies for 'living together' peacefully. The campaign uses communication toolkits, to identify skills to be transferred during the ToT. These toolkits include: engaging the media; hosting a film screening and other community meetings/activities; and, participating professionally in discussions on contentious issues such as resource scarcity, negative stereotypes and anti-social behavior experienced by refugees and marginalised Egyptians in Cairo. It is envisioned that the campaign will help to build new membership for Tadamon and provide a framework for media, academia, student groups, and the general public to engage with the Multicultural Council. As Tadamon is internally building the capacity to engage the multicultural composition of Cairo, the public campaign creates a role for Tadamon to engage with the business and diplomatic communities, public institutions, and civil society more broadly with examples of good practice for overcoming tensions in a multicultural community enacted by the Living Together Ambassadors (trainees).

The initial training took place on Fridays during February and March 2008. In addition to the communication toolkits, the training modules included theoretical approaches to supporting diversity, films, and role-plays as well as instruction from key figures in the realm of advocacy and service provision for refugees and marginalised groups. Both trainees and speakers participated on a voluntary basis, many of whom have shown dedication and motivation for continuation of the year-long project.

Programme

The ToT consisted of five thematic workshops, which were conducted with simultaneous translation in Arabic and English. In order to make the ToT as effective as possible the first workshop functioned as consensus-building process meeting that served to introduce participants to one another, provide orientation for the Living Together –CAIRO campaign and Tadamon Council. The timetable of the ToT as well as specific focus areas were decided by participants during the first workshop. They were:

FEBRUARY 15: ORIENTATION

In the first session we got to know each other personally as well as organisationally by answering the following questions: Who are you? What organization do you represent? What is Tadamon and how do you fit into its plans? What is the role of a community facilitator? How can a community facilitator (with high priority issues specific to his/her own

community) also serve as an ambassador for the idea of solidarity, or 'Tadamon', in Cairo generally?

FEBRUARY 22: COMMUNICATION

During the second session, we began to build a communications toolkit useful to individual members, their organizations and the Tadamon Council. In the following weeks, the Living Together Trainee cohort used the toolkit to conduct a marketing campaign for the SAWA[85] workshop; planned a press conference and public film screening to raise awareness on refugee issues; and, developed each organisation's web presence.

FEBRUARY 29: RELATING YOUR MISSION TO MEDIA AND TECHNOLOGY

In the third session, we focused on building a professional online presence for each organization via the Tadamon Council website by first assessing how trainees communicate their organisations' mission and purpose, and editing their narratives for viewing by a general public. Next, we began to plan a community film screening and press conference to raise awareness of multicultural issues. We previewed films to be screened at the event followed by a workshop on the press conference planning process that included these questions for consideration: What is a press conference? What sort of competition does your story have in getting a journalist's attention? We closed by focusing on the concrete skills of building a budget; managing logistics, security, and equipment; and, writing a press release.

MARCH 7: GENDER AND DIVERSITY

In the fourth session we addressed the characteristics of difference and diversity as tools for innovation. Through a community mapping process we documented local knowledge from the trainees on information points in their physical neighbourhoods across Cairo. We heard from the British Council on its implementation strategy for diversity management and we used the example of International Women's Day (March 8th) to explore diversity with a panel of women engaged in business and civil society.

MARCH 14: COOPERATIVE LIVELIHOODS

In the 5th session we focused on the necessity of working together to expand access to resources for individuals and their organisations. We invited representatives from Fair Trade Egypt and the NGO Service Center to share their successful local examples of transfer of vocational skills and innovative solutions to unemployment through cooperative livelihoods. Next, we had a discussion on how these lessons could be used to increase capacity in the trainees' organisations by working across ethnic communities to develop income-generating activities.

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At the time of writing this article, the Living Together - CAIRO project is in between its first and second phases. The trainees have hosted a press conference and film screening, thus applying their new skills, and have graduated as 'Living Together Ambassadors'. During the remainder of 2008, a series of public events and collaborative projects will be held, which will be managed by the Living Together Ambassadors. In the long term, their competencies will

[85] SAWA workshops take place every Saturday in the factory space of the Townhouse Gallery, which provides an arena for anyone to create art with other individuals, regardless of background. SAWA was established to encourage and support Egyptians from all backgrounds and refugees, to interact and work together. The resulting exhibitions are very popular and give participants an opportunity to supplement their income through sales of their work.

be shared within their own organisations and they will be employed to conduct subsequent ToTs for new member organisations that join the Tadamon Council. Moreover the ToT is an essential part of the broader awareness-raising campaign, which enhances external relations for the Tadamon Council by creating a corps of Living Together Ambassadors.

During the ToT phase of Living Together – CAIRO (including site visits to Tadamon member organizations), the facilitators were exposed to a range of income generating activities being conceived and implemented within marginalized communities across Cairo. One such project was introduced by an Iraqi trainee whose wife, a fashion designer, had joined a Sudanese woman working in textiles to develop a clothing design business. To commemorate The Night for Intercultural Dialogue (May 22nd), the Living Together Ambassadors staged a fashion show featuring the work of these two women. The event entitled 'Celebrating Diversity' was a great success, attracting over 700 people and creating a diverse, constructive atmosphere that bolstered the launch of a new business while promoting an example of 'living together'. Using the event strategically, we helped the two businesswomen to market their project to a potential investor. In the second phase of Living Together we will focus on business planning and the realization of cooperative livelihood projects introduced by the Living Together Ambassadors.

Chapter 12
Sustainable Humans in the City

Felix Nolte[86]

This brief chapter discusses the development of sustainable cities from the perspective of individuals as decision-makers. Humans are fundamental to the creation and determining the distinctive qualities of cities across the globe. In the paper the idea of a 'sustainable human' is developed from the theoretical framework of bounded rationality and three tools for making sustainable choices are presented; systems thinking, increased time horizon and process rather than goal orientation. The tools are then used to exemplify the topic of the book, Cities to Last.

Introduction

The city of Damascus, Syria, is one of the oldest functioning urban settlements on earth, with more than 6000 years of history. Has Damascus endured because it has been or is more sustainable than other places? The answer is probably no. Why Damascus has been spared when other cities have been burnt down to the ground or deserted for better locations is unknown. However, one thing is certain, the Damascus of today evolved from the Damascus of 6000 years ago.

One of my favorite spots in Stockholm is the old town. Some time ago my wife asked why I was so fascinated with "Gamla Stan" (meaning Old Town in Swedish). My answer was quick and spontaneous – Gamla Stan feels like living in an organism. The constructed environment has developed over time with layers of history built upon each other. Less than a 200 years ago Stockholm, and I guess most cities, were sanitation hazards, with polluted air and water and streets littered with the waste horse carriages and open sewage systems. These were not only unpleasant to the senses, they spread disease through urban areas. Today cities in the developed world have advanced in this sense and Stockholm to the degree that it is considered one of the most 'livable' capitals[87]. The scientific value of this raking can be questioned but the fact is that increasingly, sustainability is regarded as a competitive advantage for cities. In Price Waterhouse Cooper's study from 2005 "Cities of the Future - Global competition, Local leadership" environmental capital is one of the six competitive advantages for a city.

If this awareness of the desirability of sustainability exists on a pragmatic aggregated level in identifying 'livable cities' it also occurs at the individual level. In the same way that the development of cities is an organic phenomenon, our awareness of the desirable qualities of cities is expanding. Today using public transport, saving electricity or water is not only an economic issue, it's also a conscious individual choice for many people - a sustainable choice. Even if we do not fully grasp the city as a system, individuals do perform a lot of good choices. These choices are made in a given context of what bounded rationality.

[86] The writer (Felix Nolte) is a PhD candidate in philosophy as well as political science and has worked as a management consultant in the field of scenario-planning and prospective methodologies

[87] Kahn, Matthew E. and Lostys, Fran. 2007, Reader's Digest Ranking

Bounded to the city

To perform 'sustainably' sound decisions as an individual can be perceived as an impossible task, at least in the framework of rational choice theory. This paper departs from the idea that sustainable choices can be made through the framework of simple heuristics as proposed by bounded rationality. As argued by Herbert Simon, the Nobel laureate and founder of bounded rationality, the goal of bounded rationality is to replace the global rationality of economic man with a kind of rational behavior more adjusted to human capacities and their environments. (Herbert Simon, 1955).

Three rules of thumb to make sustainable choices are: 1) systems thinking, 2) process rather than goal orientation, and, importantly, 3) an extended time-horizon.
These three are intertwined and work parallel with each other; with the ability to extend the time horizon, another kind of systemic thinking that takes into account delays in particular systems can be applied. Process orientation has much to do with a systemic perspective since cause and effect relationships are manifested in multiple and complex ways, thus opening for the potential of looking at the system.

While rational choice sees the shortcomings of people who constantly fail to reach the ideal of perfect rationality, bounded rationality as a theory incorporates the abilities and skills people actually have. The notion of a 'sustainable human' emphases behavioral patterns that takes into account certain issues that may contribute to the actor's ability to make sustainable choices. 'Sustainable' can be seen as a practice that would not hinder opportunities to continue, and, a sustainable human as an individual that performs sustainable choices.

Increased time horizon

Adopting an increased time horizon means that the actor weighs in a dimension beyond the here and now in the decision making process to a greater extent than un-sustainable choices. Why increased time horizon? Ulrich Beck in his work regarding what he calls the 'Risk Society', argues that with modernity comes the ability to influence the future in a way that was impossible earlier, with risks that extend beyond time, space and political boundaries (Beck, 1992). Therefore sustainable humans' increased time horizon actually might be more out of caution than out of some kind of goodness. Our availability to obtain information is of course another thing that facilitates our ability to keep track of historical and prospective processes and impacts more than earlier. The increased time horizon in sustainable choice would hopefully lead to the ambition of increasing the amount of time an activity can continue, making it easier to consider long time trade-offs. This time horizon does not exist independently of the interest of a sustainable human. It is focused on describing how the individual decision-maker might think in relation to determining if a practice is sustainable on a desirable level or not.

Of course in large cities transportation is a big issue – increasingly daily car transportation among young people in Sweden is seen as something that is negative, as it is now identified as an unsustainable practice over time. Youth have criticised their parents' use of cars as a bad habit that is unsustainable in the long term. However, in other locations, particularly in some developing countries where the ownership of cars is growing, car use has different social constructions and is seen as a sign of prosperity in the present without focus on the longer-term sustainability.

Process rather than goal oriented

In science and society adequate processes are assured by procedural rules and regulations of more or less concrete character, from legal procedures to established scientific methods. They have in common that they do not focus on the content, like who did what to whom, or, is this scientific work about this or that, but on *how*. Strangely enough, we give a lot of focus to ends rather than means in our societies, even if the means are what we might disapprove of the most. If an individual wants to rule the world and sets out on a quest to convince others through a democratic process trying to make as many people as possible happy - are the means by which it is performed shadowed by the purely egoistic ends for doing it?

As an individual consumer trying to make a certain purchase the process orientation in relation to sustainability becomes relatively clear. For many people, the issue is not whether to consume or not consume meat, the issue is to try to secure that the process from the farm to the steak on the plate has been carried out in an ethical and sustainable way both in terms of the humane treatment of the cattle and providing a fair price to the farmer. The meat might taste the same, but for a sustainable consumer, the process (how it got there) rather than the goal (the actual taste of the meat) is what matters.

With a good method or process any human activity has the potential to be repeated ad infinitum, while a goal, when reached, is realized and therefore complete. The 'process issue' is not revolutionary; there are more or less formalised and easy to understand process but there always are processes in human activity, individually and institutionally.

In relation to the city, the process regarding how goods are produced and transported is also important. The way to create a 'city to last' is to try to consume products with a low ecological footprint and/or produced in the vicinity of the city in question. For the urban dweller, becoming a more sustainable human means making choices that take into account the process dimension in everyday life..

Systems thinking

Understanding a process is essential to understanding the development of a single issue or the origins of a product. Systems thinking takes understanding processes a step further by seeking to understand how different things are systemically interconnected.(Meadows 1974 and 2004) To see patterns and see the role of the actors and their actions in a system is essential for being able to check or be informed about if the 'behaviour over time' (See for example Sternman 2004)

Systems thinking is about individual decision-makers not only extending the scope in time of the consequences of certain decisions – but rather looking sideways at how other problems might arise from the aftermath of a decision. This includes looking at other spatial scales both smaller and larger. Ecologically speaking, an example of what happens when this is not done would be the introduction of city tolls in certain roads in a city lead to congestions and increased emissions if people don't change behavior thinking systemically. In the case of Stockholm, taking from personal experience, awareness has lead to increased use of public

transportation and bicicles, but at the same time, the road around the city has become overcrowded.

Conclusion

Through experience we have become increasingly aware about involuntary consequences of our behavior and reluctant to proceed without thinking systemically. Since the end of the sixties we have become increasingly aware of the earth as one system, the 'greenhouse effect' being one of the more disastrous aggregated consequences for humanity. In this context, urban residents are encouraged to think systemically: what I do in one field can have consequences for another issue.

The notion of a 'sustainable human' challenges individuals to make more responsible choices that have a longer-term view, consider processes and the wider linkages of issues. Thinking about *how* rather than 'what' will not only assist individuals to make more informed, sustainable choices, but also, ideally, will help to prompt producers to offer products created through more sustainable processes.

With expanding urbanization (cities are increasingly becoming the 'natural' habitat of human) the context humanity is mainly acquainted to is urban, rather than the countryside. We can see this as a tragedy in many senses, but it does not only have to be negative. With bounded rationality behavior adjusted to living in an urban environment and taking into account the rules of thumb stipulated above to make sustainable choices, we can hope to improve and communicate best practice. With increased awareness making sustainable choices in our urban everyday lives, we can contribute to building more sustainable cities to last.

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Chapter 13
Invisible cities: confronting urban challenges from the inside-out [88]

Marilyn Hamilton[89] and Jordan Bruce MacLeod[90]

Recent scientific research about sustainability has confirmed that each geographic bio-region has limits to its carrying capacity. The idea of an ecological footprint (Rees & Wackernagel, 1994) extrapolated this idea by demonstrating that if all cities used the level of resources currently used in the developed world, we would need four or more planets. While it is only in recent decades that we have encountered these limits, it is now abundantly clear that the window in which we have to confront the challenges of sustainability – in all of its dimensions, including our cities – is narrow and closing.

Some say we should not forget the lessons of history, but we are not sure that humanity has ever intentionally learned them in regard to building and designing intelligent cities. Often it is only the artifacts of our failed experiments that remind us that a lesson was available to be learned. Ironically, the reminders show that the teachable moment has existed just after the peak of the city (or civilization's) existence (Diamond, 2005). Once that tipping point is reached, however, it is usually too late for the city and/or the civilization. There are examples from every habitable continent as found in the archeological records of Uxmal, Ashkenaze and Easter Island.

We lack both a philosophy and a science of sustainable human settlement. The State of the World's Cities (United Nations Human Settlements, 2006) should be able to report not just on the major problems of the world's city infrastructure (like poverty, slums and pollution) for which we have data in excess. It should be able to report not even on just the 'best practices' – mainly because those best practices are simply addressing the greatest problems. The State of the World's Cities should be able to report on the relationship of cities to the carrying capacity of their bio-region and the earth as a whole. In order to develop an effective understanding of the dynamics of the whole, the materialist world views of the past are proving to fall profoundly short. Recent discoveries in consciousness studies, biology, developmental psychology, sociology and anthropology attest to the essential importance our psychology plays in determining the quality of human experiences, relationships, behaviours, cultures and social structures. Yet, this psychology remains largely discounted in current economic, planning, design and management functions. Although we may draw great inspiration and information by measuring our trajectory and thereby determine that humanity is collectively on a disastrous path, there is nothing quantitative about the crux of our problem. The converging crises confronting humanity are qualitative issues. It is, therefore, primarily a collective crisis about how we see our world and its problems. Our response to

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[88] This chapter has been adapted in part from Marilyn Hamilton's forthcoming book *Integral Cities: Evolutionary Intelligences for the Human Hive* New Society Publishers (2008)

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crisis must move from the centre of this new vision and address problems and opportunities from the inside-out.

But, who is responsible for the stewardship of urban resources? With the unfolding of human systems, the answer to that question is largely, "That depends which country you are in." International developer, Gail Hochachka (2005) proposes that people's feelings, beliefs and world views affect how they are ready and willing to participate in sustainable behaviours. Moreover, she points out traumatic experiences (like natural disasters and war) can damage people and leave them disabled from appropriate responses.

The value of the invisible

Although, the psychological realities of a city's population have been largely ignored or discounted because they are subjective, invisible and difficult to study, they are just as real as the exterior physical realties of the city. These psychological realities create an interior environment that has just as many or more layers, contours and textures to it as geographic environments. We have studied them through the lenses of psychology, philosophy and the humanities, but until recently we have not recognized that (like our exterior qualities) these interiors evolve and develop. We map the paleontology of our interiors through the shifts in world views that enable the growth of our interior landscapes (and therefore our capacities for response, adaptability and resilience). The key centers of those internalised views are the self, the other (family, clan) and the world (society, sectors, spheres of influence, regions, planet). Modes of governance span a spectrum from dictatorial to democratic. The governance systems reflect the interior world views and mindsets of both city leaders and, in most cases, a majority of citizens. They are ever emergent and constantly being re-negotiated because cities are dynamic entities. But one thing is becoming clear: some world views are more inclusive and more soundly contexted than others. In other words, the internal life of those who coalesce authority, power and influence contributes largely to the capacity of cities to be coherent, adaptable and sustainable. We are fast becoming aware that sustainability means living in the world with mindfulness about our relationship to the world and its realities.

One of the most perennial proofs of this relationship of the internal human environment to the external environment is the tragedy of the commons (Hardin, 1968). The tragedy of the commons has recently been revived as a persuasive discourse through the writings of authors like Jared Diamond (2005), Ronald Wright (2004) and Thomas Homer-Dixon (2006) who have delved into the startling evidence in the ruins of great civilizations to observe that development can have negative consequences on the local environment. Moreover, they have revealed that the commonly held view is often the view that provides the least responsible perspective on how to value and steward a civilization's resources.

Thus, we are learning, that overcoming the tragedy of the commons requires mindfulness, accountability and monitoring of the earth's natural systems. Our internal psychology needs to connect to our external environments, so that we are capable of better governing built environments in a way that both individuality and collective human civilisation can flourish. If we fail at this task, for instance, favoring the interests of a few, without considering the interests of the many, once again nature has demonstrated to us that we lose diversity in the system and ultimately resilience. Both diversity and resilience are what we need most in the face of any disaster. What's more, diversity is a major contributor to innovation, and the driver of new combinations and inventions (Homer-Dixon, 2006).

Once we see the importance of the mindset and world view of urban environments then we can see the underpinnings of a city's attitude and relationship to its bio-region. And with the largest view possible – these days viewable from external satellites serving global positioning systems – we can also see what is working (aligned and coherent), what is not working (misaligned and incoherent) and what are the city's next natural opportunities and capacities for change. Then we are able to notice the different lenses that exist in the city because of different levels of expertise. We can see how the urban infrastructure that is managed by expert managers and engineers integrates scientific knowledge and experience. We can also see that despite the value of this expertise and the infrastructure systems, they tend to distance citizens from taking ownership and responsibility for their contribution to the healthy operation of the natural earth systems.

Cities are faced with the challenging task of translating this expertise into terms that individuals can comprehend and engage with. This is why we need to monitor the use of resources at the user level, by metering the use of water, fuel, waste production, transportation, land use and CO2 production. In the path to more sustainable cities we may have to adopt rationing measures for greenhouse gasses, like CO2 (Monbiot & Prescott, 2007). In the same way that citizens readily adjust their food and housing decisions because they are responsible for paying for them, users of resources who pay as they use, start taking responsibility for waste and inefficiencies that lead to depletion of resources and the tragedy of the commons.

Sustaining the whole city

The active field of sustainability studies is challenged by the same spectrum of definitions, world views and frameworks as other modern issues. How individuals understand sustainability is framed by internalities – whether we are thinkers, writers, business people, or merely trying to survive on a daily basis. Urban sustainability presents an additional challenge, namely the sheer scale of the complex adaptive system that a city includes. When you consider the fluid dynamics of behaviours, intentions, relationships and production systems that constitute urban areas, the concept of sustaining a city can become almost an oxymoron.

Archeological excavations in an urban area can demonstrate the trajectory of a city's evolution and illustrate that the layers of a city are not merely ethereal or esoteric, but are embedded under the city streets. Although this infrastructure changes more slowly than the people who build or inhabit the urban area, it does change. Moreover, it can change in the direction of more or less complexity. So when we consider sustainable cities we have to ask ourselves: what are we sustaining? Regional planner, Ian Wight (2002) is attracted to the idea that cities arise from the act of place making – the integration of all the ways that people interact to create a place. From this vantage point, perhaps it is easier to consider that the pervasive quality we could sustain, in as complex a system as an urban area, is the potential to continually evolve. This would be the key to sustaining the city's resilience as a self-correcting cycle of adaptiveness.

Thus, while we find it somewhat problematic to gain traction with the sustainable city, we find it much more promising to contemplate the evolving city. Evolution is a characteristic of living systems that arises from the resonance and coherence of the system. Resilience arises from the adaptiveness of the system to its dynamic environment. Resonance emerges when the system is aligned externally to its environment. Coherence arises from the alignment of

the elements of the system internally in such a way that energy is optimised. When both resonance and coherence become synchronized new capacities in the system emerge and evolve. We can examine this capacity of evolution from two perspectives. One is holographic and allows us to see how the whole is disclosed from the patterns embedded in its parts. A hologram is a three dimensional image that arises from the interference patterns of two wave patterns. The hologram carries information about the whole in every part of its composition. The other is morphic fields that emerge from the cumulative repeated activity of like holons and like species.

The Holographic city

Thomas Homer-Dixon (2006), in his book, The Upside of Down engages the reader with historical factoids that capture the nature of the holographic city. He derives the nature of three cities from single architectural stones: a foundational stone in the Roman Coliseum; the Temple of Bacchus gate in Baalbek, Lebanon; and the Stone of the Pregnant Woman near Baalbek. Each of these stones provides evidence for the values of the civilization that created them. In that sense they are holographic: a small part of the city which reveals a great deal of information about the city when we consider how they were created, why they were transported there, who did the work, who directed the work, who designed the structures, how they provided the energy to move the matter and the information to communicate the intentions.

Philosopher, Ervin Laszlo proposes that "nature's holograms are cosmic … they link … all things with all other things" (Laszlo, 2004, p. 71). The evidence for a city as a holographic entity – where a part of the city can reveal insights into the whole of it – is available because the city is a holistic system, which arises from the massive interconnections and entanglements of structures, cultures, intentions and behaviours. In this sense, if we laid our hands on any part of the city and traced the connections of that part to all the other parts of the city, we would discover the sub-systems and systems that make up the city – a holograph.

It is quite possible that the holographic nature of the city reveals cities capacity for evolution. We see the whole easily, when the holograph suddenly shifts into view from a discrete entry point of a city. This means, for instance, that if we look at the quality of the health care system or effectiveness of the education system, we can obtain a proxy assessment of the quality of life or the capacity for development in the city.

Morphic fields in cities

Although we cannot always easily gain the insights that holograms of the city could give us, perhaps we can view the whole city through different filters. If we peer through the lenses that Rupert Sheldrake uses, we can glimpse an intangible reality about human existence that has long been known by people who have the capacity to access it. However, this has also been repressed by those who feel threatened by the existence of anything intangible, regardless of the evidence.

Sheldrake, a biologist, has been curious about how species like homing pigeons, parrots, dogs and horses seem to know how to travel long distances and arrive at specific destinations with pin-point accuracy. Individual animals even seem to be able to access human intentions and be able to anticipate human behavior with a high degree of accuracy (Sheldrake, 1988, 1999, 2003). Sheldrake has proposed that each species over time creates an energetic field, invisible

to the naked eye and not registered on any instruments created to date, but, nonetheless, as real as a radio or television signal. His recent research has expanded to include human phenomena like the sense of being stared at, telepathy, foresight and predictive dreams (Sheldrake, 2003). He refers to these energetic fields as morphic or morphogenetic fields. In the human species it appears that some people have more capabilities than others to access the information in these fields. In some remote tribes in the Amazon and Indonesia, and in some indigenous peoples like the Aborigines of Australia, these capacities are highly developed and widely shared amongst some members of their society.

In the so-called developed world, very few people admit to having skills related to these capacities and little credence is given to those who do practice them (an exception includes some police departments who quietly use people with paranormal capacities to assist them in solving difficult crimes). Nevertheless, as evidence builds to confirm the existence of these fields, it is not difficult to speculate that the city may provide a particularly rich ground for demonstrating the existence of these fields. Nowadays we can measure the amount of physical heat generated by the city. We can also control television and radio signals so individual receivers can decode the signals into usable messages that inform and entertain us. If Sheldrake is correct about individual people, in the not too distant future we may discover that every city has a morphic field that reflects (and even transmits) the patterns of consciousness that individuals and groups are generating.

Similarly, Laszlo calls the morphic field, the Akashic Record (Laszlo, 2004) – borrowing from the Sanskrit word for 'sky' or 'space'. Rather than biology he uses the science of physics to suggest that the vacuum of space is not empty, but filled with energy and information that we have simply not recognized nor learned how to access. Accessing it tends to be accidental rather than deliberate, notwithstanding the fact that in most cultures throughout millennia, select individuals have been taught the secrets of doing so. Laszlo suggests that the Akashic field holds a permanent record of human (and earth) activity – just like the brain apparently holds a record of all individual activity since birth (or conception).

The conception of morphic or Akashic fields creates the possibility that we could harness the intelligence that is concentrated in the city to generate much greater (more complex) intelligence capacities. If we could learn how to better think together we would be able to harness the massive leverage of parallel processing that has enabled us to design modern computers and neural networks (like the linking of personal computers for the SETI extraterrestrial life search project). If we could achieve this, we may see a phase shift in human intelligence that will offer urban areas new incentives to improve conditions to better support human existence. In addition, it may offer enhanced capabilities for moving towards sustainability (not over-using resources) and identify emergent opportunties (creating new capacities from existing resources).

The value systems of a city

Regardless of where people are geographically located, our diverse human cultures demonstrate evidence that when life conditions provoked us to change society and culture have evolved, generally in the direction of greater complexity. Beck and Cowan (1996) have modeled patterns of increasing structural complexities of human systems that have emerged as we have moved from the hearth-based circle of family survival, through the bonding systems of clan and tribe, to the power struggles of chief and king, to the ordering authorities of state and place of worship, to the strategic economies of material exchange, to the

accepting embrace of diverse peoples, to the flex and flow of global systems. With each of these levels of historical complexity we have created new artifacts, habitats, structures and forms to structure our human systems. We call the most concentrated and complex of these structures, cities.

The life conditions that stimulated our bodies and brains to adapt and survive were accompanied by an evolving consciousness that enabled the evolution of what it means to be human. Those life conditions contribute to the evolution and the state of well-being of our cities today. The nested hierarchies and patterns of life that manifest and that we extend into the structures of our cities appear in each individual's life. They in turn are interconnected and both inter- and intra-dependent on the system of family, friends, work, health, school and community. Each of which is likewise dependent on the social systems of the city, region, state, and nation and further linked to socio-political and cultural norms and the natural environment (Barnett, 2005; Diamond, 2005). Thus, who we are depends on who and how we are able to grow the potential of the entangled human condition in each of us. And it is the matching of that human potential to the structures of the built environment of the city, and the social and cultural institutions, that creates a coherence of 'optimal life conditions', which will of course vary for individuals.

Memes in the city

In The Selfish Gene, Richard Dawkins (1976) coined the term 'meme' to explain the transmission of cultural units of information. Some of the most common memes include ideas, music, architectural styles, art trends, sound bites of politicians, and advertisements. Memes living in the digital age can be instantly communicated and replicated around the world, to millions of human receivers. Furthermore, they are constantly changing (Dawkins, 1976). Using the terminology 'meme' to signify a unit of cultural transmission, 'memeplexes' connote a cluster of relevant and complementary memes that can 'piggyback' off one another to strengthen the meaning of each individual meme. They can also accelerate, enhance and simplify the transmission or replication process by moving together as a group.

While memes explain the content of cultural information, they do not really explain how they evolve or how they reproduce. When we integrate the concept with value systems such as Beck and Cowan's (1996) 'Spiral Dynamics', we can conceive of each emergent value system as a meme generator or 'memetic' operating system. As a value system evolves and its complexity grows, we may readily predict the quality of the memes will also shift. Equally as predictable is the probability that each value system will generally be attracted to and reproduce memes at the same level of complexity and quality.

Cultural infrastructures such as radio, television, email, the Internet and print media represent the most obvious memetic superhighways for memes to flow and propagate. With the multiple leverage of replicating memes and cultural technology, it may be possible that morphogenetic fields may be expanded to encode both the invisible and visible patterns that connect cultural information between individuals and groups. An increasing understanding of these processes is opening the door to mapping the invisible dynamics. Armed with an understanding of cultural content (memes) and codes (value systems), we are gaining the abilities to map out the location and flows of information and its quality. Detecting these patterns of consciousness enables us to monitor how values interact, change and emerge.

This has not only immense value for identifying historical patterns of consciousness, but also for enhancing and solidifying anticipatory planning practices that stimulate both current and near-term values, and also the longer term, emerging patterns of future value systems. Such technologies, when properly aligned, may carry high potential to positively impact the unprecedented complexity of urban centers and the interdependent global commons. They may also create a grounded pathway to generating an abundance of soft and hard power within urban centers and beyond.

Towards the 'Integral City'

The recognition of the invisible aspect of cities and its consequent mapping are the necessary next steps towards enabling a compelling and effective integrated approach to planning, managing, designing and building our urban centers. Hamilton (2008) calls this whole systems approach the 'Integral City'.

An Integral City is a way of looking at the city, regardless of its size to see it as a holistic system – an organic entity that has emerged from an ecology of consciousness, and that includes (but is not limited to) discursive, political and religious/spiritual contexts together with a specific natural environment (such as mountain, sea or prairie), climate and natural ecology. As such, an Integral City is dynamic, adaptive and responsive to its internal and external life conditions.

An Integral City acts much like a complex adaptive human system that concentrates habitat for humans like a hive does for bees or an anthill does for ants. Like a natural system it encounters similar issues, factors and challenges that affect the concentration of life anywhere: sustaining flows of information, matter and energy for the survival of life (Miller, 1978).

The complexity of multiple types of intelligence and value systems brings into focus the evident need for creating resilient internal and external spaces and structures that allow each of these intelligences and systems to find healthy and symbiotic expression. This will require the coordinated efforts of urban planners, leaders, designers and empowerment of individual urban residents.

For this reason, the current global economic realities also depend on creating resilient internal and external spaces and structures that contribute to both the invisible and visible realities of the Integral City. The present global economic paradigm unabashedly (and unconsciously) discounts the future and rewards myopic values. This naturally leads to the consequent promotion of radical resource inefficiencies, imbalances and vulnerabilities. This economic system will prove constricting and deter the realization of whole systems approaches in our urban centres and world's most pressing problems unless it also evolves within a more holistic framework, such as we propose above. Therefore, issues of urban sustainability and emergence must be addressed within the larger context of global economic structures, politics and rule-sets.

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