S2-4 LCS and sustainable urban development

Stefan Lechtenböhmer
Co-Director Research Group
Future Energy and Mobility Structures
Wuppertal Institute

The question – whether human society will be able to cope with the challenge of man made climate change by developing sustainable fossil carbon free infrastructures and economies – will be answered to a large extent in the cities.

They are not only core to the problem but also to the solution: To achieve a global turnaround towards a low GHG emission world in 2050, infrastructures and particularly urban infrastructures are crucial, as they have an extremely long lifespan and play a determining role for energy use and emissions. To be kept in mind: 50% of these are yet to be built. This will mainly happen in the rapidly developing nations of Asia and Latin America. It is thus crucial to develop concrete visions and examples on how existing urban infrastructures can be converted to become parts of sustainable low carbon urban metabolisms.

In spite of this high relevance of cities and urban infrastructures, urban planning has not been a particular scope of climate science so far (see e.g. IPCC 2007) nor have climate mitigation and adaptation been really key issues in urban planning and development yet. "The environment matters, but may be sacrificed for growth" (Globescan, Mc Lean Hazel 2007). But this situation is changing in the preparation of the Copenhagen conference. Large cities have joined under the Climate Alliance, the Covenant of Majors or the C40-Initiative (see e.g.: www.iclei.org/, www.c40cities.org/, www.eumayors.eu/). Many of them have set themselves ambitious GHG emission reduction targets which come close to the target of becoming Low Carbon Cities. IPCC is discussing to more intensively study human settlements and infrastructures and infrastructure providers such as Siemens are detecting "sustainable urban infrastructures" as a potential future lead market.

For the South German city of Munich we analysed in greater detail, how a city of 1.3 million inhabitants could move substantially forward towards the goal of carbon freedom. The seven resulting key strategies for Munich are presented in the following figure.

Table: Long term GHG mitigation targets by selected cities

	City of Boston	City of Melbourne	City of Sidney[a)]	London[b)]	Munich[b)]	New York City	Toronto	Zurich[c)]
Base year	**1990**	**1996**	**1990**	**1990**	**1990**	**2005**	**1990**	**Nav.**
Base year emissions Mt CO_2e	7	3.5	2.3	45.1	10.2	58.3	22	Nav.
Current Emissions[d)] in Mt CO_2e	Nav.	3.8	3.6	44.3	9.8	58.3	23.4	1.4
tCO_2e/cap	Nav.	6.6	23.7	5.9	7.3	7.2	5.1	3.7
Target year	**2050**	**2020**	**2050**	**2025**	**2030**	**2030**	**2050**	**2050**
Reduction target	80%	100%	70%	60%	50%	30%	80%	70%
Target Emissions Mt CO_2e	1.4	0.0	0.7	18.0	5.1	40.8	4.4	0.4
Baseline Emissions Mt CO_2e	Nav.	4.5	Nav.	51	8.0	89.2	Nav.	Nav.

[a)] Local Government Area; [b)] Reduction target only for CO_2; [c)] own calculations; [d)] Data for 2000 to 2006

Source: Lechtenböhmer et al. (2009), plaNYC A Greener, Greater New York, City of Boston Climate Action Plan, City of Sydney: Environmental Management Plan, City of Melbourne: Zero Net Emissions by 2020, Toronto: Climate Change Clean Air and Sustainable Energy Action Plan; Zurich: own calculations based on the Swiss Energy Research Concept,; Please note that base years, methodologies and scope of the targets differ between cities.

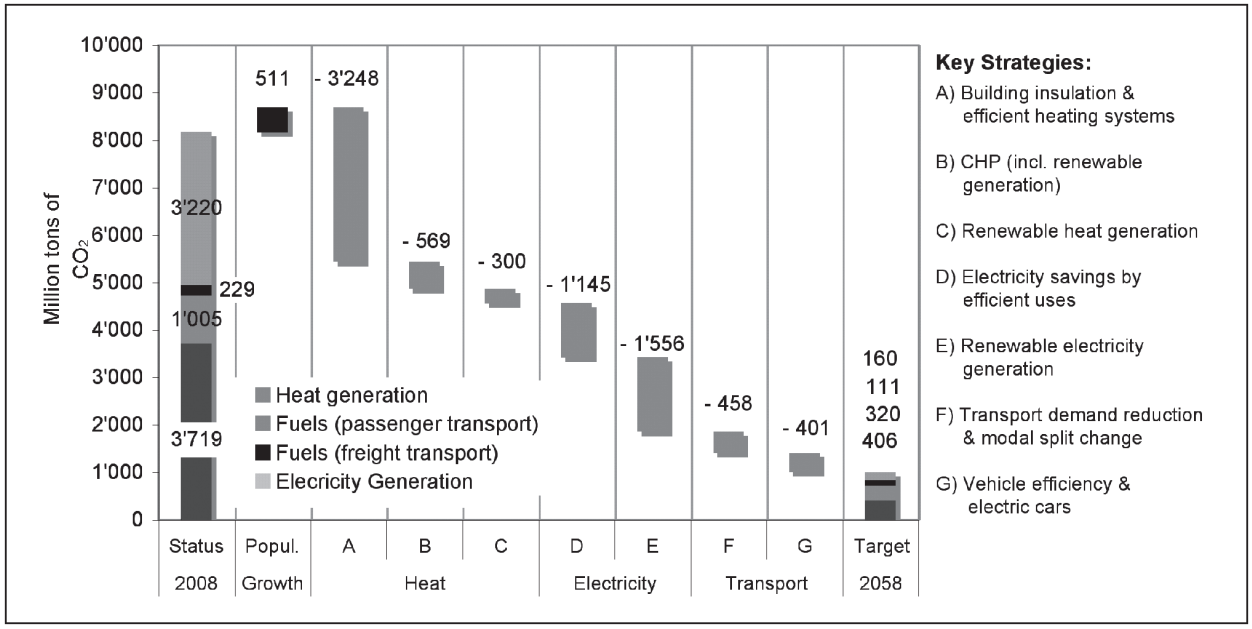

Figure: Key strategies for Carbon emission reduction in Munich, 2058, Target Scenario

Source: Lechtenböhmer (2009) (Note: The GHG emissions from airborne transport as well as other life cycle emissions of goods consumed in the city are not included in the balance.)

Based on the Munich case study three guiding principles for redesigning urban infrastructures can be derived. They show what cities need to change in order to become Low Carbon Cities:

- Become highly efficient in all sectors of demand (households, service sector, industry if relevant and transport); i.e. significantly less energy is consumed to achieve the same level of convenience and utility.
- Adapt their heating, electrical, and transport infrastructures to accommodate a demand that has been substantially reduced through greater efficiency and to support this demand reduction by appropriate infrastructure solutions.
- Convert their energy base to renewable and low-carbon energy sources.

Summing up, cities and particularly metropolises obviously have to play a crucial role for achieving a global Low Carbon Society:

- (Urban) infrastructures determine societal energy use and emissions.
- From a technology point of view low carbon cities would be possible (as shown by the Munich study and others); but technology alone won't do the job.
- Low carbon strategies have to become the leading aspect of urban planning and urban infrastructure development – what they still not are.
- Low carbon redesign of urban structures needs high investment, however, this investment will pay off over the lifetime (some examples for this have been given in Lechtenböhmer et al. 2009).
- First movers can secure high economic chances for their economy and their overall urban development and thus make LCS a promising strategy for urban social and economic development.

The available examples show that transforming a city into a virtually carbon-free urban environment will be a significant challenge. To master it the aim of low energy and low emission cities has to become top priority for all stakeholders: decision makers, utilities, urban planners and, particularly, investors and residents.

In order to enable cities and metropolises to take advantage of the chances a development oriented towards a LCS several issues still have to be solved and research questions to be followed. In a first order these seem to be very much the same as for LCS research in other contexts:

- (More) visions of low carbon cities as well as roadmaps for getting there are needed.

- Policies and institutions to implement the strategies of change towards LCS have to be developed.
- Also theories and models of societal change have to be further elaborated.

More specific questions for achieving LCS at the urban level are:

- How to empower infrastructure planning to push low carbon investment?
- How to successfully regulate and organise transport? (E.g. London's congestion charge)
- How to exploit the local potentials of communication, awareness rising and network creation? (Including issues of lifestyle change)
- How to improve multi level governance with cities as important actors?
- How to determine the economics of shifting urban development to a different pathway? (Including the co-benefits)

Sources:

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