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# On their road to sustainability?

## *The challenge of sustainable mobility in urban planning and development in two Scandinavian capital regions*

The metropolitan areas of Copenhagen (Denmark) and Oslo (Norway) both aim to facilitate economic development, opportunities for choice and growth in the building stock while limiting negative environmental consequences. Since the 1990s, the rate of consumption of land for urban development has been lower than the economic growth rate in both city regions. Land use policies in Oslo and to some extent in Copenhagen have been explicitly geared towards limiting traffic growth. In both cities, public transport improvements have been combined with road capacity increases. Traffic growth has therefore only been weakly decoupled from economic growth. In both city regions, lack of coordination between sectors, levels and administrative territories is conceived a barrier to sustainability.

The theme of this article is how the challenge of sustainable mobility<sup>1</sup> has been dealt with in urban planning and urban development during the period since the 1990s in the metropolitan areas of the Scandinavian capitals Copenhagen and Oslo. We have investigated and compared the ways planners and decision-makers involved in the development of these two city regions have interpreted urban sustainability and formulated land use and transport policies in the face of the sustainability challenges, and how land use, transport infrastructure and traffic has actually developed since the mid 1990s. Our aim has been to suggest explanations for key similarities as well as differences.

In the discourse on sustainable development, *decoupling* economic growth from negative environmental impacts is often emphasised as the key strategy for achieving environmental sustainability. Such decoupling was, for example, emphasised by the World Commission on Environment and Development in their report *Our common*

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1 Sustainable mobility is understood as mobility in accordance with the general principles of sustainable development, involving, among other things, a volume of physical mobility, a modal-split and a transport technology that meet basic mobility needs in an efficient way, take care of ecosystem integrity and limit emissions to an environmentally sustainable level, and are safe and consistent with human health (Centre for Sustainable Transportation, 2002; CIENS, 2006).

*future* (1987) and by the United Nations' General Assembly in 1997. For urban development, the challenge of decoupling lies in finding ways to accommodate growth in the building stock and ensuring accessibility to facilities while reducing negative environmental impacts resulting from the construction and use of buildings and infrastructure. Our case studies of urban planning and development in the metropolitan areas of Copenhagen and Oslo have focused mainly on the transport-related impacts of urban development. A main purpose of the project has been to assess the extent to which the two case city regions have managed to decouple spatial urban development from growth in mobility-related negative environmental consequences. Spatial urban development is here mainly understood as the construction of buildings and technical infrastructure (notably transport infrastructure) and the allocation of land for these purposes, as well as any direct regulatory measures aiming to influence the amount of transport and/or the shares of different modes of transport.

According to theories on the influence of urban form on travel, dense and concentrated urban development is more conducive to sustainable mobility than low-density spatial expansion of the urban area (Newman and Kenworthy, 1999; Stead and Marshall, 2001; Næss, 2006; 2009; 2011; Zegras, 2010). These relationships between urban spatial structures and travel make up an important part of the arguments in favour of the *compact city* as a sustainable urban form (CEC, 1990; Jenks et al., 1996). Moreover, in cities with congestion on the road network, the inhabitants' choices of mode of transportation are influenced by the relative speeds of car and public transport, measured from door-to-door, as well as by the availability of parking facilities. Road extensions in order to reduce congestion will usually release a latent demand for space on the roads and thus cause a higher proportion of the commuters to choose the car mode, whereas faster and better public transport may have the opposite effect (Mogridge, 1997; SACTRA, 1994; Næss et al., 2001; Noland and Lem, 2002).

In line with the above, the study of actual and planned urban development has focused particularly on:

- changes in urban population densities,
- the location of new residences and workplaces relative to the metropolitan centre structure,
- road capacity increases
- and improvements in the public transport system.

The dominating ideas held by urban planners (including land use planners as well as transport infrastructure planners) are of particular interest in our study. Apart from their likely impacts on the actual urban development, we consider it interesting in its own right to compare the way such ideas have evolved in the two countries. In some cases, planners' ideas may converge into doctrines about urban development (Faludi and van der Valk, 1994). A doctrine comes close to what is often termed as a

'hegemonic discourse' within a field of society (Hajer, 1995). The discourses among planners dealing with topics of urban land use and infrastructure development was therefore an important potential explanatory factor.

Since land use and public investments are usually under public control via legal measures and public funding, we may assume that the public decision-making processes, and the prioritisations expressed by key actors in these processes, are important factors in explaining the actual outcome. However, there may not be a direct link between the observed land use and infrastructure and the preceding public decision-making system and discourse. We must also seek explanations in market forces and social and cultural changes in civil society.

## Methods

Fairly similar research methods have been followed in the two city case studies, yet allowing for adaptation to local contexts and data availability. The comparison across case cities has focused on common traits as well as differences and has attempted to explain both. These explanations were first made within each case. Explanations of similarities and differences were thus based on a study of generative mechanisms and cross-cases comparison of these mechanisms, rather than by simplistic methods of co-variation such as Mills' methods of similarity and difference (Bergene, 2007).

Due to time and resource limitations, the description of the spatial urban development has been limited to the strategic level, focusing on key indicators such as changes in the number of inhabitants and workplaces, changes in the amount of urbanised land, changes in population and workplace density, location of new development relative to the city centre and public transport nodes, and the development of major transport infrastructure (urban highways and main public transport services). An important impact variable is the volume of motorised traffic within each metropolitan area, since limiting the growth in urban motoring has been an important policy goal in the two investigated urban regions as well as in European sustainable mobility policies in general (OECD/ECMT, 1994). Sources for data on actual urban development were statistics derived from national and municipal statistics agencies, maps, aerial photographs, monitoring reports from road and rail authorities, etc.

In order to explain the cities' trajectories of urban development, information from previous research studies as well as new empirical data have been utilised. We have chosen to concentrate on the following empirical data sources.

### Plans and policy documents

In each case study, several municipal master land use plans and relevant regional plans have been investigated (four in the Copenhagen case and five in the Oslo case). In

addition, some strategic transport plans have been scrutinised (one in the Copenhagen case and two in the Oslo case). Moreover, national policy documents communicating general national goals and visions for spatial development in the Copenhagen case (two documents) and in the Oslo case (one document) have also been investigated.

### Articles in professional journals

In order to investigate the national discourse among the profession of planners, qualitative content analyses of relevant articles in one key professional journal in each country have been carried out, covering the period from the early 1990s until 2006/2007. These journals are *Byplan* (Denmark, 114 investigated articles) and *Plan* (Norway, 101 investigated articles). Among the total number of articles published in the two professional journals during the investigated period, only those dealing with relevant issues (i.e. urban land use and/or transport infrastructure planning, sustainable development, and/or the combination of these topics) were included in the analysis. The selection was based on a judgement from the titles of the articles and, when in doubt, a closer look at illustrations, section headings, parts of the text, etc.

### Interviews

In-depth, semi-structured interviews were carried out with land use and transportation planners and policy-makers, some politicians, managers of property development companies and representatives from non-governmental environmental organisations. The interviewees in each case region were selected with an eye to including different interests, ideological positions and roles in planning and decision-making. In the Copenhagen case study, 12 interviews were carried out, and in Oslo 11.

Several efforts have been made to secure a high validity and reliability of the research. The interviews were aided by interview guides. All interviews were tape-recorded and transcribed. 'Interpretation schemes' were developed to aid the interpretation of interviews and documents, in order to facilitate a linking of the research questions of the study with the relevant parts of the transcribed interviews and investigated documents. Similar interpretation schemes were developed and used for the analyses of plans and policy documents and articles in the professional journals.

### The case cities

The choice of two North European metropolitan areas as cases was partly made for pragmatic reasons, as the researchers involved had already established a network for collaboration through previous research and were located in Denmark and Norway,

**Table 1 Development of key demographic, socio-economic, political and other urban variables in the metropolitan areas of Oslo and Copenhagen from 1996 to 2008**

Metropolitan area	Oslo			Copenhagen		
	1996	2002	2008	1996	2002	2008
Metropolitan population (millions)	1.002	1.069	1.162	1.722	1.807	1.857
Population within core municipality (millions)	0.489	0.513	0.560	0.477	0.501	0.510
Share of population within core municipality (%)	48.8	48.0	48.2	27.0	27.4	27.5
Annual m <sup>2</sup> floor area constructed per capita during preceding 6-year period		1.33	1.23		0.73	0.95
Km of motorway and motor traffic road lanes completed during preceding 6-year period		104	125		122	30
Km of railway and metro lines completed during preceding 6-year period		83	15		56	32
Percentage of car-owning households		65	72		44	50
Road traffic volume index (1996 = 1000)	1000	1148	1246	1000	1208	1325
Index for NO <sub>2</sub> pollution in the inner city (1990 = 1000)	830	740	830	800	890	800
Regional GDP index (1996 = 1000)	1000	1241	1552	1000	1127	1296
Regional GDP per capita index (1996 = 1000)	1000	1181	1347	1000	1093	1234
National political regime during preceding 6-year period (C = centre, L = left, R = right)		C+R then C+L	C+R then C+L		Soc. dem	Cons/ liberalist
Political regime in core municipality during preceding 6-year period		Conservative	Conservative		Soc. dem/ left	Soc. dem/ left

respectively. They were thus already familiar with the urban contexts making up the case cities. However, there were also theoretical reasons for choosing the metropolitan areas of Copenhagen and Oslo. For one thing, the two Scandinavian capitals are both known as forerunners in terms of sustainable urban development. Oslo received the European Sustainable City Award in 2003, whereas Copenhagen obtained the top rank among 30 cities evaluated for the European Green City Index in 2009, with Oslo ranked third. Notably, both cities had high scores on the two mobility-related criteria of the 2009 index (CO<sub>2</sub> and transport), with Copenhagen ranked third on Transport and fourth on CO<sub>2</sub> and Oslo ranked fifth on Transport and first on CO<sub>2</sub>. Copenhagen and Oslo could arguably be characterised as 'critical cases' of urban sustainability, understood to mean that any main shortcomings and barriers to sustainable urban development and sustainable mobility in these cities are also likely to be present among European cities with lower sustainability ambitions and achievements.

As in many urban regions, the core municipalities include only a limited part of the morphological as well as functional cities of Copenhagen and Oslo. We have therefore focused on the metropolitan areas and not only the core municipalities. The two metropolitan areas differ from each other in terms of, among other things, car ownership rates, economic growth rates and political relations between the national government and city authorities (see Table 1). Both Copenhagen and Oslo have been subject to changes in political and economic conditions during the last couple of decades. In Denmark there has been a shift from Social Democratic to Conservative-Liberalist politics since 2001, while the imprint of neoliberalism on the spatial development appears to have been less pronounced in Norway. The changing political contexts could be expected to result in different approaches to issues such as policy coordination vs. disjointed decision-making, growth management vs. entrepreneurial urban policies and the extent to which policies aim to satisfy or counteract market demand for individual motorised transport.

In the beginning of 2010, Copenhagen had about 1,228,000 inhabitants within the continuous urban area<sup>2</sup> – 625,000 in the two core municipalities (Copenhagen and Frederiksberg) and 603,000 in 17 surrounding municipalities. The Copenhagen Metropolitan Area as understood in this article is equal to Greater Copenhagen as defined in the Danish Planning Act. In the beginning of 2010, the Copenhagen Metropolitan Area thus defined had 1.89 million inhabitants, of which 1.81 million in urban settlements of at least 200 inhabitants and the remaining population in rural areas. The metropolitan area has had a quite moderate population growth during the latest couple of decades, with a 7.5% increase from 1996 to 2010. Like many modern European cities, the Copenhagen Metropolitan Area has a trade and business struc-

2 Here, the continuous urban area of Copenhagen is defined in accordance with the demarcation used in the MOLAND project (2010) initiated by the EU Commission, i.e. with the inclusion of the urbanised land within the so-called Capital Area defined by Statistics Denmark, plus the municipality of Høje Taastrup.

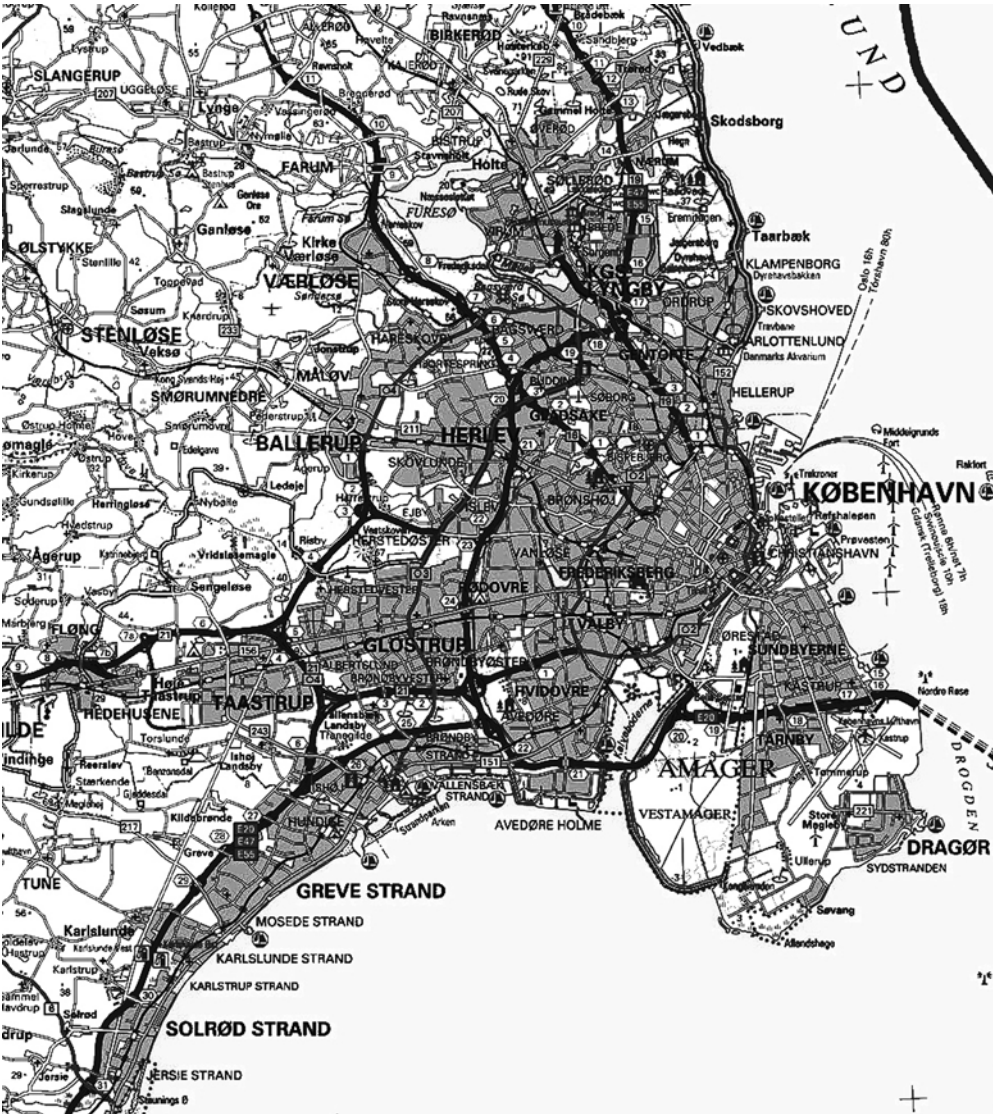


Figure 1 The continuous urban area of Copenhagen, based on a demarcation used in the MOLAND project (2010). The continuous urbanised area of Copenhagen is shown in gray. Major transport arteries (black lines) are also shown. Scale: approximately 1:275,000. Source: The Danish National Survey and Cadastre (2010)

ture dominated by service and knowledge industries, with a sharply declining number of jobs in manufacturing industries since the 1970s, most dramatically within the municipality of Copenhagen. Figure 1 shows the continuous urban area of Copen-

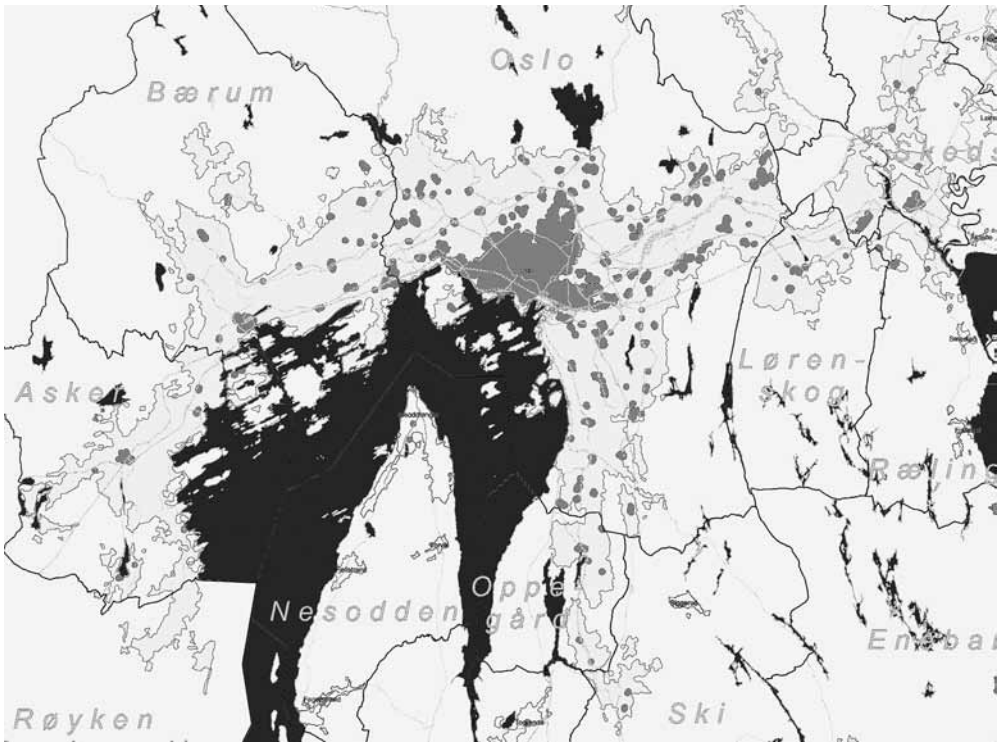


Figure 2 The continuous urbanised area of Oslo is shown in light grey, with centre zones marked in a darker shade of grey. Urban area demarcations as of 2005. Municipal names and borders (dark lines) and major transport arteries (black lines) are also shown. Scale: approximately 1:350,000. Source: Statistics Norway (2009)

hagen, based on the demarcation used in the MOLAND project (2010) initiated by the EU Commission.

At the beginning of 2010, Oslo had about 894,000 inhabitants within the continuous urban area – 584,000 in the municipality of Oslo and 310,000 in 9 surrounding municipalities in the County of Akershus. At the beginning of 2010, the Oslo Metropolitan Area (defined as equal to what Statistics Norway includes in its Oslo region) had 1.21 million inhabitants, with more than 90% living in urbanised areas. The continuous urban area of Oslo as well as the metropolitan area has seen a relatively strong population growth during the latest couple of decades. Within the continuous urban area of Oslo, the number of inhabitants thus grew by 18.5% from 1998 to 2010. Similar to Copenhagen, Oslo has undergone a process of deindustrialisation and today has a trade and business structure dominated by service and knowledge enterprises. Figure 2 shows the continuous urban area of Oslo (in grey), based on urban area demarcations in 2005.



In the Oslo Metropolitan Area the mobility level has been high for decades, and currently nearly three-quarters of all households have one or more private cars at their disposal. In the Copenhagen Metropolitan Area, car ownership has traditionally been considerably lower than in the other Nordic capital regions. However, during the last 15 years, the number of car-owning households in the Copenhagen region has increased considerably, and by 2008 it reached 50%.

## Actual spatial development

Urban dispersal has been a dominant trend worldwide as well as in Europe since World War II (see, for example, Bruegmann, 2005; Iamtrakul and Hokao, 2011). In many European city regions, spatial urban expansion has slowed down somewhat during recent decades compared to the 1950s and 1960s (Kasanko et al., 2006), but, on the other hand, urban sprawl in post-communist Eastern Europe has been particularly prominent. Against this general backdrop of ongoing urban dispersal, the two Scandinavian capitals show more concentrated patterns of development. In particular, Oslo stands out as an example of densification and compact city policies.

Figure 3 shows how population densities have developed within the continuous urban areas of Greater Copenhagen and Greater Oslo since the mid 1950s. In both cities, population densities were significantly reduced during the first three decades of this period. This coincides with high economic growth in Denmark as well as in Norway, with GDP in 1985 35% and 62% higher, respectively, than in 1970<sup>3</sup> (Statistics Denmark, 2010a; Statistics Norway, 2010a). Since the mid 1980s, however, the drop in density has been halted, and in Greater Oslo, population density has increased considerably during the most recent couple of decades. Even though considerable development has taken place in both city regions outside the continuous urban areas of Greater Copenhagen and Greater Oslo, the tendency of reurbanisation and density increase – or at least reduced sprawl – is also evident when looking at the metropolitan area scale.

Copenhagen Metropolitan Area has a long history of spatial urban expansion in the second half of the twentieth century, in spite of low and for long periods even negative population growth in the decades prior to 2000. According to the EEA (2006, p. 12), the annual growth in built-up areas in the Copenhagen Metropolitan Area was about 1.8% in the period from the 1950s to the 1960s, while the pace had been reduced to 0.8% annually in the period from the 1980s to the 1990s. In spite of this reduced pace of spatial urban expansion, Copenhagen Metropolitan Area had the ninth highest percentage of annual growth in built-up areas in the period from the mid 1980s to the late 1990s (1997/1998) among the 24 investigated metropolitan

3 The figure for Norway does not include the contribution from the offshore petroleum sector. GDP data are only available since 1966 in Denmark and 1970 in Norway.

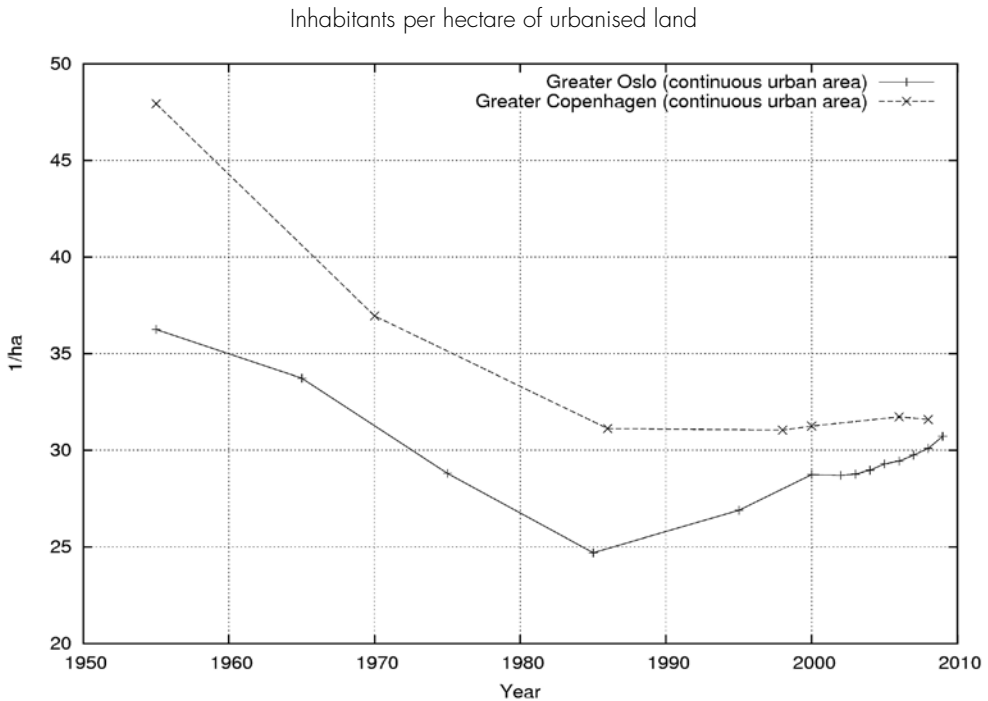


Figure 3 Changes in population density within the continuous urban areas of Greater Copenhagen and Greater Oslo during the period since the mid 1950s.

Sources: Statistics Norway, 2010b and 2010c; Riksrevisjonen, 2007; Statistics Denmark, 2008; AaU Spatial Data Library, 2009 and MOLAND project, 2010

areas (EEA, 2006, pp. 12 and 51). During the latest decade, this tendency has been reversed, at least within the continuous urban area of Copenhagen. For the Copenhagen Metropolitan Area as a whole, the size of the urbanised land increased by only 0.31% annually between 2000 and 2008, corresponding to a population density increase from 27.4 to 27.7 persons per hectare of urbanised land (i.e. by 0.9%). Within the continuous urban area of Copenhagen, the population density increased by 1.1% during the same period. In the parts of the metropolitan area located outside the continuous urban area of Copenhagen, development has predominantly taken place as spatial urban expansion. The considerable density increases that have taken place in Copenhagen and the surrounding municipalities nevertheless represent an important departure from the dominant trend within the metropolitan area until the 1990s.

Copenhagen has made considerable investments in a new Metro, but substantial road capacity increases have also taken place. Together with the low-density development in the outer areas this has contributed to a steady and rapid growth in car

traffic. On the other hand, the amount of bicycle travel has increased, facilitated by a continual improvement of a network that was probably already Europe's best in the 1980s.

Oslo was early to break a long-lasting trend of spatial expansion and has since the mid-1980s followed a clear urban containment policy (Næss et al., 2011). For the Oslo Metropolitan Area as a whole, the size of the urbanised land increased by 1.05% annually between 2000 and 2008. Although the growth in urbanised land was higher than in the Copenhagen Metropolitan Area, the density increase was higher in Oslo due to a much higher population growth. For the metropolitan region of Oslo as a whole, the population density within the urbanised land increased from 23.2 to 24.4 persons per hectare between 2000 and 2009 (i.e. by 5.3%). For the continuous urban area of Greater Oslo there was a population density increase in the same period of 6.9%, and as much as 24% over the period 1985–2009. As can be seen in Figure 3, this represents a clear breakage with trends until the mid 1980s. Within the municipality of Oslo, the density increase was substantial. Here, the urban population density increased by more than 11% from 2000 to 2009, and in its Inner Zone the population grew from 132,700 in 1989 to 180,400 in 2009, i.e. a population density increase of as much as 36% over these 20 years (Municipality of Oslo, 2009).

Although the municipality of Oslo has aimed at channelling most of its densification to 'brownfield' sites, some green areas within the urban area of the municipality of Oslo have been encroached on, for example in order to make space for new kindergartens or schools in districts where densification has resulted in population increases exceeding the capacity of the existing social infrastructure. During the period 1999–2004, the 'open-access areas' (i.e. areas without buildings, roads, railways, harbour facilities, farmland, graveyards, seas or rivers) within the continuous urban area of Greater Oslo were thus reduced by 5% (Engelien, Steinnes and Holst Bloch, 2005). Moreover, along with important improvements in the public transport system (a new metro ring, new streetcar lines and bus lanes, and more frequent departures for streetcar and metro trains) there has also been considerable expansion of the road capacity – a fact also responsible for some of the above-mentioned encroachments on the intra-urban green areas. Only very small extensions have taken place in the city's very modest network of bike paths. As in Copenhagen, the general level of mobility has been enhanced, but the shares of car drivers and travellers by other modes have remained more or less the same.

The higher population growth in the metropolitan area of Oslo than in Copenhagen is reflected in a considerably higher growth in the building stock, in particular in the period 1996–2002, when more than 80% more floor space was built per capita in the Oslo Metropolitan Area than in the Copenhagen Metropolitan Area. After 2002 the gap has been reduced, but still with 30% higher per capita construction in the Oslo than in the Copenhagen region.

**Table 2 Changes in the size of urbanised land, metropolitan population and urban population densities in the metropolitan areas of Oslo and Copenhagen from 2000 to 2008**

Metropolitan area Year	Oslo		Copenhagen	
	2000	2008	2000	2008
Size of urbanised land (km <sup>2</sup> ) within metropolitan area	416	451	630	645
Metropolitan population (millions)	1.051	1.162	1.807	1857
Urban population density (persons/ha of urbanised land)	23.21	23.97	27.43	27.66
Percentage of car-owning households	64	72	42	50
Regional per capita GDP index (1996 = 1000)	1177	1347	1107	1234

In the metropolitan areas of Oslo as well as Copenhagen, residential development during the last decade has taken place closer to the city centre, compared to the preceding decades. The shares of the metropolitan population living in the core municipalities of each region have thus remained fairly constant since the mid 1990s. In Copenhagen, the tendency to more central locations also applies to workplace development in general. In the Oslo Metropolitan Area, most of the growth in the total number of jobs during recent years has taken place close to main public transport lines in the part of the region outside the municipality of Oslo. However, for jobs occupied by persons with university education of four years or more, 70% of the job growth took place within the municipality of Oslo. Thus in both urban regions, the location of new white-collar workplaces has to a fairly high extent been in accordance with the Dutch 'ABC-principle' for environmentally sound location of workplaces<sup>4</sup> (Verroen et al., 1990).

The extent to which adopted land use plans actually shape the spatial development or are mere formalisations of a development that would have been produced by market forces anyway is of course a matter that can be disputed. The land use development that has taken place in the two case areas is, however, to a high extent in accordance with municipal land use plans and, as regards Oslo, also with national land use policy. In Copenhagen, the local traces of national planning policies are evident in the inner parts of the metropolitan area but less clear in the outer municipalities.

Tables 1 and 2 summarise how a number of spatial, demographic, economic and transport variables have developed over the periods 1996–2008 and 2000–2008, respectively.<sup>5</sup> Since relevant data are available for different time periods, the indicators for

4 According to the ABC principle, offices and other workplaces with many employees and/or visitors per area unit should be located to areas with high accessibility by public transport and non-motorised modes of travel but low accessibility by car, whereas freight-generating workplaces with few employees or visitors per area unit should be located to suburban areas with high accessibility for goods transport.

5 The figures in the table usually refer to the situation in the beginning of the respective years.

traffic growth and urban land expansion cover different time spans.<sup>6</sup> The analysis of traffic growth covers the period 1996–2008, divided into two equally long sub-periods. The analysis of growth in urbanised land covers the period 2000–2008. The indicator for traffic growth in the Oslo region (Statens vegvesen region øst, 2010) refers to the two counties of Oslo and Akershus, which contain 91% of the region's population. In the Copenhagen region, the indicator measures the growth in car traffic measured as average traffic volumes along 14 main roads within the geographical limits of the Copenhagen Metropolitan Area (Statistics Denmark, 2010b). Growth in urbanised land has been measured within the whole geographic demarcation of each region, thus including the main city as well as smaller urban settlements (Statistics Norway, 2010b; AaU Spatial Data Library, 2009).

As can be seen, the construction of transport infrastructure (road as well as rail) during the period 1996–2008 as a whole has been higher in the Oslo than in the Copenhagen region. This is partly attributable to the fact that the geographical extension of the Oslo region is larger (7017 km<sup>2</sup>, compared to 3111 km<sup>2</sup> in the Copenhagen Metropolitan Area). In the Oslo region, a considerable part of the transport infrastructure was built to connect Oslo's new airport at Gardermoen (located 50 km away from the city centre and opened in 1999) with the city. In the Copenhagen region, too, much of the construction of motorways and rail lines took place as part of a large-scale transport infrastructure project, namely the Øresund connection between Copenhagen and Malmö.

## The cities' environmental performance

Several types of impacts might be chosen as the base for indicators measuring the 'level of performance' of urban development, seen from the perspective of sustainable mobility. Below, we have chosen to focus on two important features, namely *traffic growth* and *growth in urbanised land*. Needless to say, traffic growth is associated with a number of negative environmental impacts such as local air pollution, noise, barrier effects, consumption of fossil energy sources, and greenhouse gas emissions. Although these impacts can be reduced through improved vehicle technology, traffic growth will reduce the positive impacts of such technological progress and maybe eventually outweigh it. Hitherto, this has been the situation in many cities and countries. Growth in urbanised land implies that previously undeveloped areas, such as farmland, forests or other natural areas, are lost in order to make space for urban development. Apart from impacts on food security, biodiversity and ecosystems, growth in urbanised land also entails a widening of the geographical urban space, with potential trip origins

6 Distinct from our data on growth in urbanised land within the continuous areas of Greater Copenhagen and Greater Oslo covering the period since the mid 1950s, available data on growth in urbanised land within the entire metropolitan areas of Copenhagen and Oslo cover only the periods since 1999 and 2000, respectively.

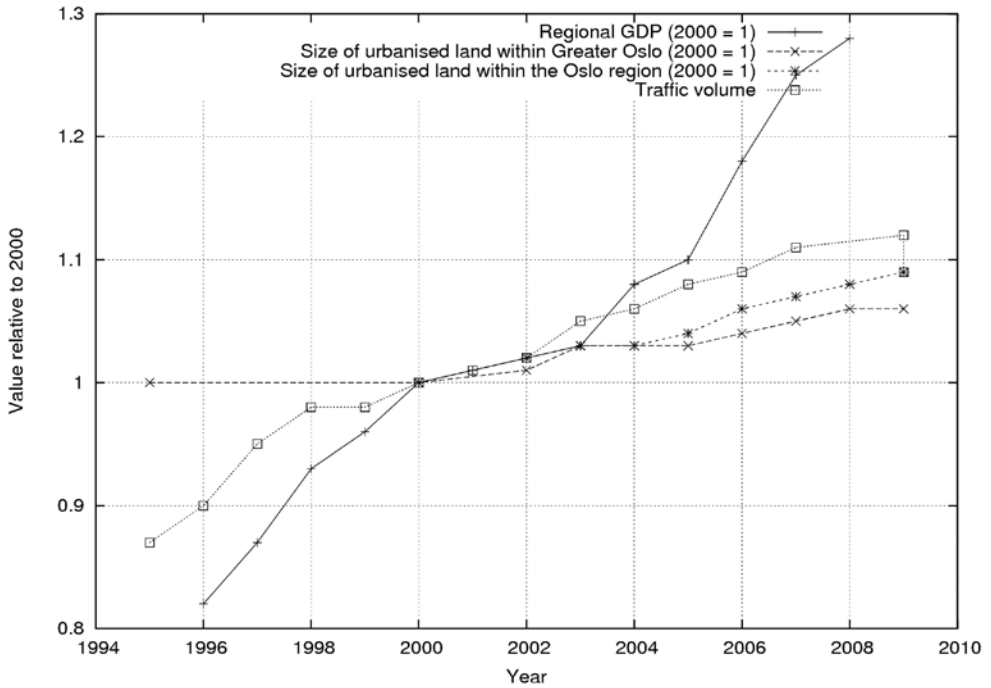
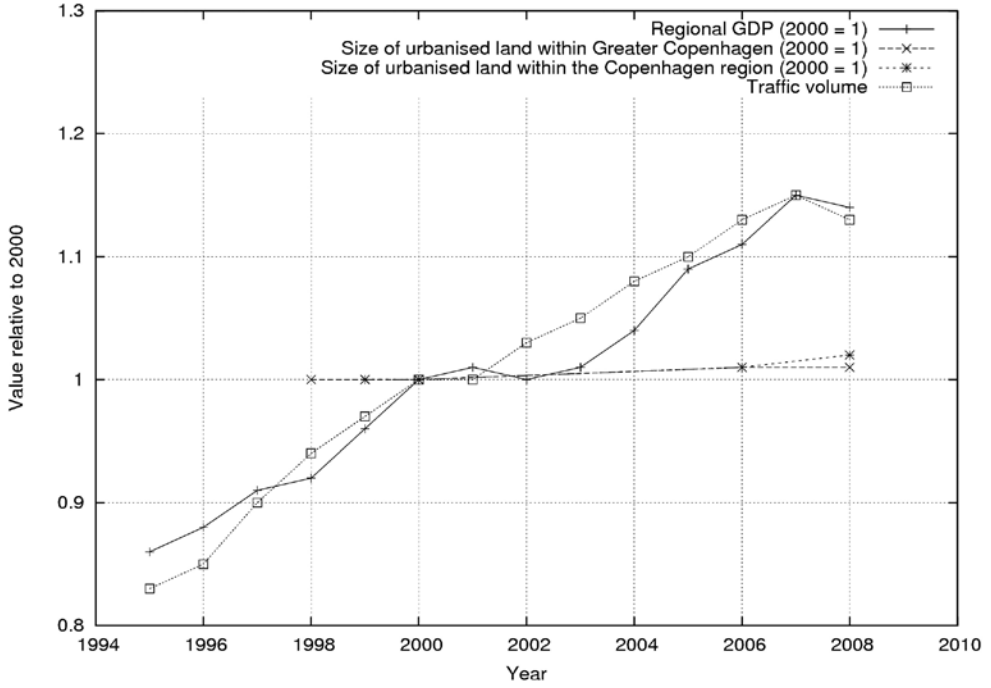


Figure 4 Changes in regional GDP, size of urbanised land and traffic volume since the mid 1990s in the Copenhagen Metropolitan area (top) and the Oslo Metropolitan Area (bottom).

and destinations located on average further away from each other than what would be the case if the urbanised land did not expand. Other things being equal, the urban region will therefore be more transport-requiring, the larger the growth in urbanised land is (Newman and Kenworthy, 1999; Næss, 1993; Næss et al., 1996).

Figure 4 shows how regional GDP, traffic growth and the size of urbanised land have developed since the mid 1990s in the Copenhagen Metropolitan Area (above) and the Oslo Metropolitan Area (below) (MOLAND project, 2010; AaU Spatial Data Library, 2009; Statistics Denmark, 2010c; Riksrevisjonen, 2007; Statistics Norway, 2010b; 2010d; Statens vegvesen region øst, 2010). Although the 1995 figure for the size of the continuous urban area of Greater Oslo is somewhat uncertain, the size of the urbanised land has increased at a considerably lower rate than the regional GDP in both regions, thus indicating a clear *decoupling* between economic growth and land consumption. In particular, this is true for the extension of the continuous urban areas of Copenhagen and Oslo, but also when land consumption is measured at a metropolitan scale. In the Copenhagen Metropolitan Area, the curve of traffic growth has followed regional GDP growth closely. In the Oslo Metropolitan Area, traffic has increased at a pace lower than regional GDP growth during the whole period, and especially since 2003 a clear gap in the growth rates of these two parameters can be seen.

An assessment of environmental impacts may measure impacts in absolute as well as in relative terms. If measuring in absolute terms, the assessment of the development of a parameter (e.g. emissions from traffic) is measured without any consideration of whether the number of inhabitants or the general affluence level has changed during the period in question. If measuring in relative terms, adjustment is made for such circumstances. Population growth has been fairly high in the Oslo Metropolitan Area (16.7% during the period 1996–2008). In the Copenhagen Metropolitan Area, the population growth has been considerably lower (5.4% over the same period). The growth in regional GDP has been higher in the Oslo than in the Copenhagen region (55% and 29.5%, respectively, from 1996 to 2008). Due to considerably higher population growth in the Oslo region, the difference between the two urban regions in per capita economic growth is, however, considerably smaller (35% in the Oslo region from 1996 to 2008, compared to 28% in the Copenhagen region). Since the financial crisis in 2008, GDP has decreased both in the Oslo and the Copenhagen region.

According to OECD (2002), the degree of decoupling between economic growth and negative environmental impacts can be measured by dividing a chosen decoupling indicator at the end of an investigated period by the same indicator at the beginning of the period. The decoupling indicator at a given time is measured as the environmental impact divided by GDP. Tapio (2005) has offered a framework for analysing the extent to which nations or regions have managed to obtain such decoupling. According to Tapio, *strong decoupling* refers to situations where there is economic

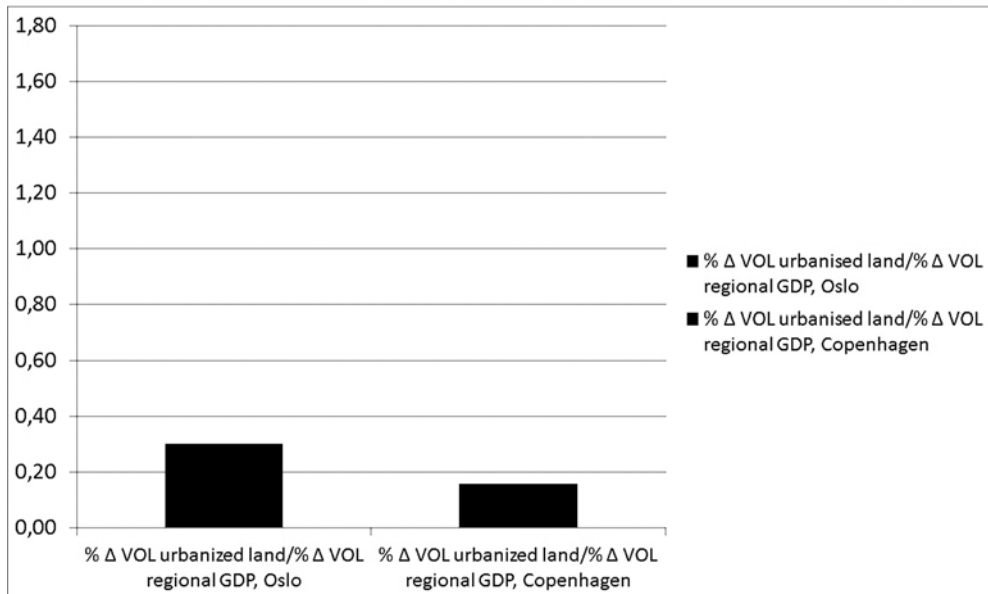
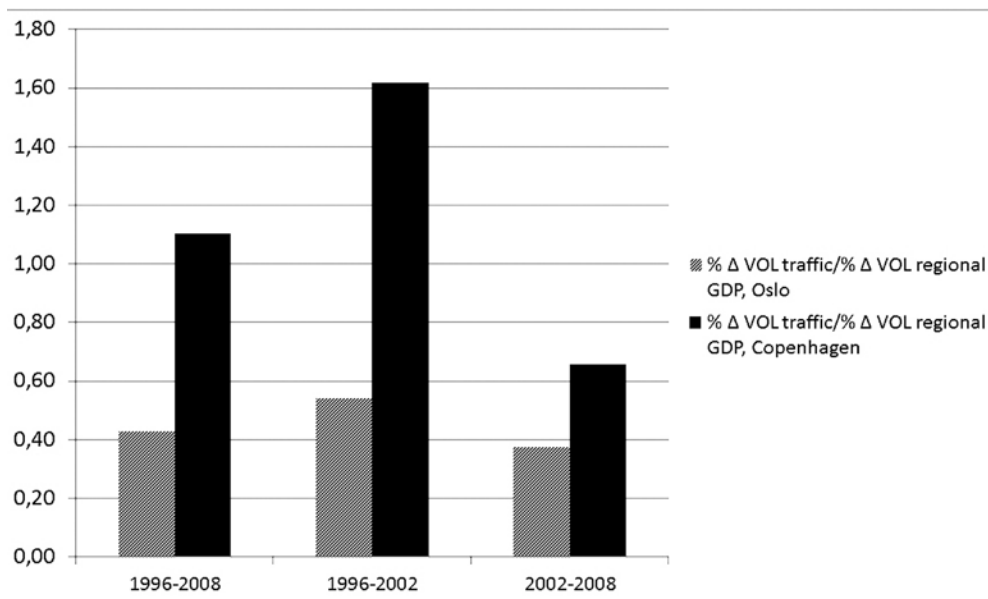


Figure 5 Traffic growth (to the left) and growth in urbanised land (to the right) in the metropolitan areas of Copenhagen and Oslo measured as proportions of regional GDP during the periods 1996–2008 and 2000–2008, respectively.



growth and the negative environmental impact variable is nevertheless being reduced. *Weak decoupling* refers to situations where the negative environmental impact variable grows at a rate at least 20% lower than the economic growth rate. *Expansive coupling* occurs when the growth in the environmental impact variable lies within the interval from 20% lower than the economic growth rate to 20% above this rate. If the negative environmental impact variable grows at a rate more than 20% above the economic growth rate, we are facing a situation of *expansive negative decoupling* (Tapio, 2005).

Figure 5 shows the extent to which traffic growth (above) and growth in urbanised land (below) have been decoupled from growth in regional GDP during the periods 1996–2008 and 2000–2008, respectively. For each of the above-mentioned aspects of urban development we have constructed three sets of more detailed indicators. In the first set, average annual growth (in traffic or in urbanised land) has been adjusted for *total* growth in regional GDP; in the second set, it has been adjusted for *population* growth; and in the third set for *per capita* growth in regional GDP. Table 3 shows

**Table 3 Rates of change in the size of urbanised land adjusted for economic growth and/or population growth**

	2000–2008
Oslo	
Annual growth in urbanised land adjusted for total regional GDP growth (%)	-2.09
Annual growth in urbanised land adjusted for population growth (%)	-0.41
Annual growth in urbanised land adjusted for per capita regional GDP growth (%)	-0.69
Copenhagen	
Annual growth in urbanised land adjusted for total regional GDP growth (%)	-1.41
Annual growth in urbanised land adjusted for population growth (%)	-0.10
Annual growth in urbanised land adjusted for per capita regional GDP growth (%)	-0.79

**Table 4 Traffic growth rates adjusted for population growth and/or economic growth**

	1996–2002	2002–2008
Oslo		
Annual growth in car traffic adjusted for total regional GDP growth (%)	-1.34	-2.42
Annual road traffic growth adjusted for population growth (%)	1.25	-0.03
Annual growth in car traffic adjusted for per capita regional GDP growth (%)	-0.48	-0.84
Copenhagen		
Annual growth in car traffic adjusted for total regional GDP growth (%)	1.19	-0.80
Annual road traffic growth adjusted for population growth (%)	2.39	1.10
Annual growth in car traffic adjusted for per capita regional GDP growth (%)	1.71	-0.49

the indicators for the extent to which population and economic growth have been decoupled from growth in the size of the urbanised land. The indicators for the extent to which population and economic growth have been decoupled from traffic growth can be seen in Table 4.

In both city regions, spatial urban expansion has been moderate and considerably lower than the rate of economic growth. Judged from Figure 5, decoupling between economic growth and growth in urbanised land has been particularly high in the Copenhagen Metropolitan Area, which may seem a bit surprising in the light of the stronger densification in Oslo (cf. Figure 3). Because the Copenhagen Metropolitan Area experienced a low population growth during most of the period, the construction of new dwellings was low, and the land take for residential development was also relatively low, in spite of economic growth. In Oslo, the high population growth resulted in a substantial increase in the number of new dwellings – an increase that would have been necessary even if the economic growth had been low. Moreover, the ranking between the cities also depends on the way in which the decoupling is measured. In Figure 5, the impact variable measuring the degree of decoupling between economic growth and land consumption is the incremental conversion of land into urban area during the period of investigation. In Table 3, we have instead used the total size of urbanised land as the basis for calculating the relationship between the volume of the regional economy and the size of urbanised land. Measured this way, Oslo shows the highest rate of decoupling (see below).

In Oslo as well as in Copenhagen, the size of the urbanised land has grown at a lower rate than the increase in population, hence the negative growth rates when adjusted for population growth. In particular, the growth in Oslo's urbanised land has been low compared to the population growth, reflecting a strong prioritisation of densification as the main strategy for urban development. In Copenhagen, densification has gradually replaced urban sprawl, albeit a bit later than in Oslo.

However, in both city regions, increasing affluence has been more important than increase in population as a trigger of growth in the building stock and the associated demand for building sites. This can be seen from the higher annual growth rates when adjusting for population growth than for GDP growth per capita. Adjusting for the total regional GDP growth, we see clear tendencies in both city regions toward decoupling between economic growth and growth in urbanised land. In the Copenhagen and Oslo city regions, the actual, annual growth in urbanised land has been 1.3 and 1.7 percentage points lower, respectively, than what would be expected if the growth in urbanised land per capita followed the GDP growth.

In Oslo as well as in Copenhagen, the decoupling between economic growth and per capita consumption of urbanised land has been absolute, not only relative. This is evident from the negative signs of the growth rates when adjusting for population growth. According to the typology of Tapio (2005), both city regions have shown

*weak decoupling* between growth in urbanised land and economic growth. Although the degree of decoupling does not satisfy Tapio's criterion for strong decoupling (in that case, the urbanised land would have to remain constant or be reduced), the degree of decoupling is still fairly high, especially in Oslo. It should be noted here that such decoupling is easier to obtain if the city at the outset has a low population density than if the starting point is one where densities are already high. The higher extent of decoupling between economic growth and land consumption in Oslo than in Copenhagen (where densities have traditionally been higher than in Oslo) must be seen in light of this.

Our data unfortunately do not allow for a quantitative comparison of the city regions' degree of decoupling between growth and land consumption in the years prior to 2000. However, as can be seen from Figure 3, Oslo reduced its spatial urban expansion to rates below the rate of population growth already in the second half of the 1980s. Since economic growth rates were higher than the population growth in this period too, it is safe to assume that Oslo's relative decoupling between economic growth and land consumption dates at least back to the late 1980s. In the Copenhagen Metropolitan Area, the 0.8% annual growth in urbanised land in the period from the 1980s to the 1990s reported by EEA (2006), combined with the region's low economic growth in the 1990s, shows that the tendency of decoupling between economic growth and land consumption for urban development did not appear until the turn of the millennium.

Whereas a considerable decoupling between land consumption for urban development and economic growth has taken place in both city regions, traffic development (and the trends in motor vehicle ownership, cf. Table 1) shows a different pattern. In both regions, road traffic has grown, although the growth rates vary considerably. Adjusting for economic growth, Oslo's traffic volume was reduced by 1.3% annually between 1996 and 2002 and by as much as 2.4% per year between 2002 and 2008. Over the whole 12-year period, traffic in Oslo Metropolitan Area increased by less than half the percentage of the GDP growth (25 and 55%, respectively). According to Tapio's classification, Oslo has thus shown a *weak decoupling* between traffic growth and economic growth. In Copenhagen, the traffic volume per capita has for the 12-year period as a whole grown at a rate slightly higher than the GDP growth. However, an important change has occurred during these years. In the first six years (1996–2002), traffic grew at a considerably higher rate than the regional economy, with an annual traffic growth of 1.2% when adjusting for regional GDP growth. During the period 2002–2008, traffic increased more moderately and at a rate lower than economic growth, resulting in an annual reduction of 0.8% when adjusting for GDP growth. The Copenhagen Metropolitan Area has thus moved from *expansive coupling* between economic growth and traffic growth between 1996 and 2002 to *weak decoupling* between 2002 and 2008.

Adjusted for population growth, Oslo's traffic growth is the lowest with 1.25% annual increase between 1996 and 2002 and a slight negative growth (−0.03% annually) between 1996 and 2002. In comparison, Copenhagen's car traffic has grown by 2.4% and 1.1% per year, respectively, in the two periods when adjusting for population growth. Compared to growth in GDP per capita, traffic growth has been negative during the whole 12-year period in Oslo, especially in its latest six years, whereas Copenhagen has seen a change from a strong positive growth (1.7% annually) during 1996–2002 to slight negative growth (−0.5% annually) over the subsequent six years.

This change coincides with a shift in Danish politics from a Social Democrat to a Conservative-Liberalist national government. There is, however, little reason to attribute the decoupling between economic growth and traffic growth in the Copenhagen Metropolitan Area to this shift. Changes in political priorities in land use and infrastructure development usually take several years to translate into different urban spatial structures and changed travel behaviour. The changes in national-government political priorities in Denmark since 2001/2002 are therefore likely to make their imprints mainly on the land use and transport infrastructure plans adopted during this period, and not so much on actual changes in urban structures and transport behaviour until now.

In the Oslo Metropolitan Area, the plans adopted in 1996–2002 and 2002–2008 show a high degree of similarity. All plans follow the densification strategy, and according to the most recent municipal plan for Oslo, the urban population density within the municipality will increase by 20% from 2008 to 2020. The combined investments in public transport improvements and road construction are also to be continued. In the Copenhagen Metropolitan Area, strong inter-municipal competition, combined with the availability of large vacant areas released for urban expansion in outer-area municipalities long ago, has until recently made it difficult for higher-level authorities to maintain the national objectives of decentralised concentration of office and residential development close to urban rail stations. In the Finger Plan 2007, which has the status of a National Planning Directive, a sharpened regulation of the scheduling of development within the urban zone areas, with first priority given to areas close to stations, has been introduced as a remedy to prevent scattered development all over the oversized developmental areas. The political adoption of this plan was much the result of strong efforts made by the former Minister of the Environment, Connie Hedegaard, who had shown a high interest in climate mitigation. However, in a recent national policy document on sustainable urban development issued by the subsequent Minister of the Environment, the focus has changed from urban densification to green urban space in the suburbs (Ministry of the Environment, 2008). Moreover, following the recommendations of a government-initiated Infrastructure Commission (2008), considerable road capacity increases are currently being planned in the Copenhagen Metropolitan Area, anticipating traffic growth of 70% from 2005 to 2030.

Unfortunately, we do not have metropolitan-scale data allowing us to measure the extent of decoupling for local environmental variables like air pollution and noise. However, available data indicate reduced concentrations of pollutants like sulphur dioxide, carbon monoxide, nitrogen dioxide, lead and benzene, at least during the 1990s. As can be seen in Table 1, the concentration of nitrogen dioxide pollution in the inner city areas of Copenhagen as well as Oslo decreased considerably from 1990 to 1996, largely due to legislation requiring new cars to be equipped with catalytic converters (which also put an end to the use of leaded gasoline). After 1996, the level of NO<sub>2</sub> concentration has remained relatively stable in both cities in spite of an increasing proportion of cars with catalytic converters. The effect of this technological innovation on NO<sub>2</sub> emissions is apparently being gradually counteracted by increased car ownership and traffic growth.

## **On their road to urban sustainability?**

As can be seen from the previous sections, there are many similarities but also some differences in the trajectories followed by the two city regions in their land use and transport infrastructure development since the mid 1990s. Below, the discourses among planners and policy-makers on urban development, the influence exerted by different actors, and barriers to environmental sustainability will be discussed as possible explanatory factors.

### **Discourses on urban development**

The dominant conceptions of sustainable land use strategies among planners have many traits in common. In the Oslo case, urban containment and efficient land utilisation has been considered important elements of sustainable urban development since the late 1980s. In the Copenhagen case, the focus has mostly been on development close to urban rail stations, i.e. a kind of decentralised concentration. Among planners and policy-makers in the Copenhagen Metropolitan Area there has also been a more pronounced counter-discourse advocating low-density decentralisation. Polycentric development has been part of the conception of sustainable urban development also in the Oslo region, but the emphasis there has been just as much on inner-city densification as on development at public transport nodes.

A key feature of the planning strategy in Oslo is a wish to save land. Norway has strict national policies for farmland conservation, and potential non-agricultural areas for urban expansion are often important recreational areas. The urban demarcation against the Marka forests has since World War II, maybe even longer, had the status of a planning doctrine (Faludi and van der Valk, 1994) guiding urban development in Oslo and its neighbour municipalities. Due to the rocky terrain surrounding the

city, urban spatial expansion has also been more costly in Oslo than in Copenhagen. In the Copenhagen Metropolitan Area, the Finger Plan has also had the status of a doctrine for urban development since its original adoption in 1947. However, although this plan presupposed the protection of 'green wedges' between the 'fingers', it was basically a plan for urban spatial expansion, concentrated along five main transport arteries. Considerable parts of the area between the 'fingers' were farmland, and they were thus, like the British Green Belts, to some extent only a sort of voids, without much user value for the urban population. The designation of these areas as areas for non-development was not backed by strong recreational interests, at least not in the outer parts. Nor has there been much emphasis on saving farmland, which is an ample resource in Denmark.

The transport-reducing effect of urban containment makes up an important part of the rationale for the compact city policy pursued in the Oslo Metropolitan Area during the latest decades. In the Copenhagen region too, relationships between land use and travel form part of the rationale for the finger-based developmental strategy. This strategy is in particular based on knowledge about the influence of neighbourhood-level urban characteristics (proximity to stations) on travel, whereas knowledge about the transportation impacts of proximity to or distance from the main city centre is not emphasised to the same extent.

Once commenced, Oslo's densification policy has required renewed investments in technical and social infrastructure in the inner city. This has again made inner-city living and inner-city job locations more attractive, leading to a higher population base facilitating further infrastructure improvements. The densification strategy has thus to some extent been self-amplifying, leading to positive feedback circles and to some extent path dependency. A similar process seems to gain momentum in Copenhagen too. In addition to zoning limiting the possibilities for spatial urban expansion, planners in both cities have made efforts to increase the attractiveness of inner-city living through 'leverage planning' (Brindley et al., 1996), incorporating cultural and recreational facilities, esthetic upgrading and traffic calming. In Copenhagen and especially in Oslo, such combined 'stick and carrot' policies have influenced housing preferences and drawn the attention of developers toward densification, and thus consolidated the popular and political support of inner-city revitalisation.

In both city regions, improving public transport has been a main strategy for sustainable mobility. Certain restrictions on the use of cars (road pricing, parking policies, environmental zones) have been proposed in both cities, but so far not much of this has been implemented. Moreover, in both cities, road construction has been part of the transport policy, partly justified by sustainability arguments. In Oslo, road tunnel building has been promoted as a way to lead traffic away from city centres and housing. In Copenhagen, the motivation for road building has mainly been to eliminate existing or projected future congestion.

In Norway, the concept of sustainable development has been interpreted mainly in accordance with the way it was used by the World Commission on Environment and Development (1987). In Denmark, the concept has to a higher extent been redefined in accordance with a neoliberal agenda focusing on the competitiveness of cities in the globalised economy. In Denmark too, however, there are spokespersons interpreting sustainability mainly as a challenge of reducing the environmental impacts of economic development. Still, the discourse on sustainable urban development in Denmark has – especially in the present century – had a strong focus on growth stimulation (so-called economic sustainability).

The cultural context may also have been more conducive to compact urban development in Oslo than in Copenhagen. In the Copenhagen Metropolitan Area, single-family homes are still the preferred dwellings for many inhabitants, and there is a weaker tradition for outdoor recreation in natural areas than in the other Nordic countries. In contrast, there is a strong tradition in Oslo of skiing and walking in surrounding forests, which implies popular support of urban containment. In addition, ‘café culture’ and urban living has gained increased popularity during the recent couple of decades (Hjorthol and Bjørnskau, 2005). This trend is also evident in Copenhagen, but the prevalence of ‘urban lifestyles’ is perhaps more of a novelty in Oslo than in Copenhagen.

### Influences of actors

In Norway, the compact urban developmental strategy followed by the municipality of Oslo has been supported by national planning authorities. In Denmark too, national planning authorities have attempted to prevent urban sprawl in the capital region and instead recommended urban development to take place close to urban rail stations in the fingers of the Finger Plan. They have, however, been less enthusiastic about densification in the municipality of Copenhagen, especially as regards workplaces. The municipality of Copenhagen has thus had to argue with the regional and national authorities for more jobs to be located within its limits. It is therefore only recently that growth in jobs and population within the municipality of Copenhagen has been accepted by national authorities. This is part of the explanation why the process of urban densification has until recently been less pronounced in the municipality of Copenhagen than in the municipality of Oslo. The densification strategy of the municipality of Copenhagen should, of course, also be seen in the light that the land reserves within the municipal borders are small and that dense and compact development is the only way to accommodate any substantial growth in the number of inhabitants and jobs.

In both city regions, transport infrastructure policies have generally been less conducive than land use policies to the goal of reducing the growth in car traffic. Different

sectors within public administration have pulled in different directions. The ministries of the environment have strongly promoted compact urban development and the location of development close to urban rail stations. Reducing traffic growth has been a main purpose of these policies. The national transport authorities in both countries, on the other hand, have promoted a higher mobility in general, supporting investments in public transport as well as highways. These differences between the two ministries may in part reflect different organisational cultures (Sørensen, 2001; Strand and Moen, 2000). Some interviewees characterise the professional culture within the ministries of transport and the Road Directorates as being clearly car-oriented. In the ministries of the environment, the staff of the planning department consists to a high extent of planners, geographers, political scientists, law scientists, etc., whereas in the ministries of transport economists have a much more prominent position. The latter tend to favour economic methods for project evaluation, and the recommendations based on such analyses may sometimes deviate from those based on adopted political goals.

In spite of widespread goals of reducing car travel, the municipalities have usually also lobbied toward national transport authorities for the realisation of local road projects. According to Osland and Longva (2009), a fragmented organisational structure and a funding system encouraging local mobilisation for state infrastructure funding tends to induce the municipalities to place less emphasis on goals of increasing the market shares of public and non-motorised modes. Whereas there has been some disagreement between different political parties on transport policy issues (with the left being more negative and the right more positive to road development), disagreement on land use issues follows party divides to a much lesser extent. For example, the development of low-density single-family house areas has hardly been a politicised topic in the Copenhagen Metropolitan Area. In the Oslo region, there has been a high degree of political consensus about the compact city strategy. The only political camp opposing this strategy is the right-wing liberalist Progress Party.

According to our interviewees, environmental organisations have not been very active in the discussions about land use development in either the Copenhagen or the Oslo region. In Denmark, some of the environmental organisations have focused on building houses of straw and living closer to nature, and have not been supporters of the idea of increasing urban densities. Much of the Danish debate on environmentally friendly housing has evolved around the concept of urban ecology, focusing on local self-sufficiency, waste and water management, and closed circuits of substances (Hoftun, 2002). In Norway, too, there has been a long-standing trend among environmentalists to oppose densification, because it often leads to loss of intra-urban green areas and sometimes makes up a threat to local environmental qualities (view, outdoor areas, etc.). Maybe as a result of this perspective on urban development, we do not find any strong opposition from environmental NGOs in either Norway or Denmark against car-dependent development projects such as out-of-town shopping facilities.



## Barriers to sustainability

In both metropolitan areas, competition between different municipalities for investments and taxpayers is mentioned by several interviewees as a barrier to sustainable urban development. In both regions, the core municipalities promote dense and transit-oriented development, whereas suburban and outer-area municipalities tend to use the possibility of offering spacious sites for development as a competitive advantage in the struggle for inward investments. Such competition for inward investment in regions where the functional city is divided between many municipalities is a well-known phenomenon described in urban theory and political economy literature (e.g. Logan and Molotch, 1996). Commercial developers have substantially oriented themselves toward development opportunities in the suburban municipalities, but in recent years increasingly also toward inner-city urban transformation, especially in Oslo. Admittedly, the interviews show several examples of how land owners and investors sometimes put pressure on politicians in order to have plans adopted that will allow forms of land use that are less than optimal seen from a sustainability perspective. Sometimes, this results in sprawl, but in the inner city of Oslo the pressure has instead led to higher densities than planned for, with loss of green space and poorer housing quality, especially for families with children.

The stronger emphasis on low-density development as an entrepreneurial strategy in the Copenhagen region than in the Oslo region may reflect the fact that rates of economic as well as population growth have generally been lower in the capital region of Denmark than in its Norwegian counterpart. Municipal politicians and civil servants in the Copenhagen Metropolitan Area may thus have felt a need to struggle to attract growth to a higher extent than in the Oslo region. In the Oslo region, fuelled by Norway's booming oil economy, growth has been taken for granted to a higher extent, and policies to stimulate growth have therefore been considered less urgent. Although there has been a tension between the very clear compact city strategy of the municipality of Oslo and the more lax developmental strategies followed by some of the municipalities in the surrounding county of Akershus, low-density development as an entrepreneurial strategy has been less prominent in the Oslo region. This difference between the Danish and the Norwegian context is perhaps even more pronounced when extending the scope to other major urban regions than the capital regions. In Norway, urban population densities (measured as the number of inhabitants per hectare of urbanised land) have increased in all larger city regions. This is far from the case in Denmark, where, for example, the main urban growth area of East Jutland is characterised by extensive urban sprawl with 1800 ha set aside for business development along the main motorway during the last five years (Bredsdorff and Østergaard, 2010). Another example is the spatial developmental strategy envisaged in the most recent municipal plan of Århus (Denmark's second largest city), which implies extensive leapfrog development in the form of five new greenfield settlements at 10–15 km

distance from the city centre. Such an urban developmental strategy could hardly be imagined in the contemporary Norwegian context.

Among our Copenhagen interviewees, several politicians from parties across the political spectrum as well as some civil servants mention how economic crisis tends to put growth-promoting policies on the top of the agenda. In times of crisis, growth is the most important goal for the decision-makers – and growth and sustainability seem to not be ‘compatible’ in the minds of the decision-makers. In periods when the economy is prosperous, policies to reduce the negative impacts of the growth get more attention, and environmental sustainability is more often mentioned as an objective. Urban developmental strategies aiming – in line with the ecological modernisation paradigm – at reducing the negative environmental impacts of development thus seem to gain higher priority in periods of growth. At the same time, the rising levels of consumption in these periods put additional pressures on the environment. This leads to the paradoxical situation that low-growth and high-growth periods tend to produce fairly similar extents of negative environmental impacts from urban spatial development, as long as the creation or maintenance of growth is seen as a superior political goal.

Lack of coordination is perceived in both city regions as the main barrier to sustainable urban mobility. In the Copenhagen case, there is a widely perceived lack of coordination between municipalities, ministries and transport forms. In the Oslo case too, our sources of evidence indicate lack of coordination between ministries, transport forms and to some extent also across municipal borders. The interviewees and the investigated plans and articles do not, however, say much about the possible reasons for the lack of coordination. Since lack of coordination is such a widely perceived problem, why are the necessary coordinating mechanisms not established?

Arguably, lack of coordination often exists because some actors do not want to take the interests of other entities into consideration. The explanations of lack of coordination must then be sought in power relations, e.g. between ministries. General neoliberal ideas of competition as conducive to efficiency, productivity and economic growth is probably also part of the explanation as to why there is no higher degree of coordination, e.g. of land use across municipal borders. Such strategies for local competitiveness have also been recommended by international agencies like the OECD, for example in a territorial review of the Copenhagen Metropolitan Region (OECD, 2009). In Denmark as well as Norway, downscaling urban governance into lower layers of administrative hierarchy has been pursued as part of liberal reforms of the planning system. Although certain regulations have been implemented in both countries to strengthen the possibilities for implementing national land use policies, our material indicates that considerably stronger coordination – horizontally as well as vertically – would be required in order to meet the requirements of sustainable mobility.

While lack of coordination is widely recognised as a main barrier to sustainable urban mobility, few actors in the two city regions question the desirability of growth in the building stock. In the Copenhagen and Oslo regions, floor area per capita is already among the highest in the world. Nevertheless, growth of the building stock – in absolute figures as well as in floor area per capita – has been taken as an *assumed good*. Sustainability efforts in urban land use policies have been framed as a matter of obtaining a (partial) decoupling between growth in the building stock and negative environmental impacts. To a high extent, growth in transport and mobility has also been taken as an unavoidable fact, with sustainability policies aiming at channelling as much of this growth as possible to public transport. Increased mobility is considered essential in order to increase opportunities for choice – among jobs, dwellings, products and services. Enlargement of the functional regions is thus an expressed political goal in both Denmark and Norway (Engebretsen and Gjerdåker, 2010). Cities may, through urban densification, attempt to provide increased opportunities for choice through proximity rather than mobility. The quest for ever-widening opportunities for choice and consumption is, however, hardly questioned. Obviously, this relates to the inherent growth dependency of a globalised and competitive capitalist economy: companies as well as cities are harassed to grow at a rate at least as high as their competitors in order not to lose momentum in the continual race for survival (Nadal, 2010).

## Concluding remarks

During the last few decades, the metropolitan areas of Copenhagen and Oslo have significantly reduced their consumption of land for urban development, and traffic on the road network has grown at rates lower than the economic growth rates. In particular, Oslo has pursued a strong urban densification strategy aiming to reduce car dependency and save valuable natural and agricultural areas. During recent years, densification in the central parts of the region has also accounted for an increasing part of the development taking place in the Copenhagen Metropolitan Area. However, despite objectives of increasing the market share of public transport and considerable spending on improved public transport, large investments have also been allocated to road construction in order to facilitate more car traffic.

Admittedly, the quantitative comparison of decoupling indicators only considers three points in time (1996, 2002 and 2008). It would of course have been preferential to look at decoupling over a greater number of points in time (e.g. 5-year intervals over a period of 20 years). However, data availability does not permit such an extension. For example, data on regional economic growth data do not go further back than the second half of the 1990s in Norway.

According to the theory of ecological modernisation, solutions to environmental

problems can be found within the context of existing political and economic institutions (Barry and Paterson, 2003). The way to achieve this is supposed to be through decoupling economic growth from environmental degradation. The densification policies and public transport improvements taking place in the Copenhagen and Oslo metropolitan areas are examples of ecological modernisation strategies within the field of urban development. However, the two cases also show that economic growth has, at best, only been weakly decoupled from traffic growth and land consumption for urban development. If a non-environmentally harmful growth were to be possible anywhere, it is likely that this must be in countries with a high degree of economic freedom of action, a high level of prosperity, as well as a high level of knowledge in the population. In this respect, the metropolitan areas of Copenhagen and Oslo might be considered 'critical cases' to the thesis that a non-environmentally harmful economic growth is feasible. So far, however, it looks as if no city region – either in Scandinavia or elsewhere in the world – wishes, or is able, to make such an experiment. This is hardly a coincidence.

Seen in this perspective, the lack of reflection among planners and decision-makers in both case studies about limits to decoupling growth from negative environmental impacts could be considered a barrier in itself to the achievement of an environmentally sustainable urban development.

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