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## On their road to sustainability?

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*Published in:*  
Town Planning Review

*Publication date:*  
2011

*Document Version*  
Accepted author manuscript, peer reviewed version

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*

Næss, P., Strand, A., Næss, T., & Nicolaisen, M. S. (2011). On their road to sustainability? The challenge of sustainable mobility in urban planning and development in two Scandinavian capital regions. *Town Planning Review*, 82(3), 285-316.

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# On their road to sustainability?

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

Petter Næss, Arvid Strand, Teresa Næss and Morten Skou Nicolaisen

This paper was originally published in *Town Planning Review*, volume 82, issue 3

### Abstract

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 as a barrier to sustainability.

Keywords: urban development, decoupling, sustainable mobility, compact city, planning discourse

### 1. Introduction

The theme of this paper 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 emphasized as the key strategy for achieving environmental sustainability. Such decoupling was, for example, emphasized by the World Commission on Environment and Development in their report *Our Common 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

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<sup>1</sup> 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).

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 & Kenworthy, 1999; Stead & Marshall, 2001; Næss, 2006, 2009 and 2010; Zegras, 2010). These relationships between urban spatial structures and travel make up an important part of the arguments in favor 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, Mogridge & Sandberg, 2001; Noland & 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 center structure
- road capacity increases
- 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 & 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 prioritizations 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.

## 2. 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 done within each case. Explanations of similarities and differences were thus based on a study of generative mechanisms and cross-cases comparison of these mechanisms, not 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 urbanized land, changes in population and workplace density, location of new development relative to the city center and public transport nodes, and the development of major transport infrastructure (urban highway and main public transport services). An important impact variable is the volume of motorized 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/CEMAT, 1995). Sources for data on actual urban development were statistics 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 utilized. 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 scrutinized (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 judgment 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 organizations. 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, twelve interviews were carried out and in Oslo eleven.

Several efforts have been made to secure a high validity and reliability of the research. The interviews were semi-structured and 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.

### 3. 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 through previous research established a network

for collaboration and were located in Denmark and Norway, respectively. They were thus already familiar with the urban contexts making up the case cities. There were, however, also theoretical reasons for choosing the metropolitan areas of Copenhagen and Oslo as cases. 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 characterized 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 likely to be present also among European cities with lower sustainability ambitions and achievements.

Like 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 below). Both Copenhagen and Oslo have been subject to changes in political and economic conditions during the latest 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 motorized 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 paper is equal to Greater Copenhagen as defined in the Danish Planning Act. In the beginning of 2010, 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 7.5% increase from 1996 to 2010. Like many modern European cities, Copenhagen Metropolitan Area has a trade and business structure 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 main land uses within Copenhagen Metropolitan Area.

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<sup>2</sup> 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 urbanized land within the so-called Capital Area defined by Statistics Denmark, plus the municipality of Høje Taastrup.

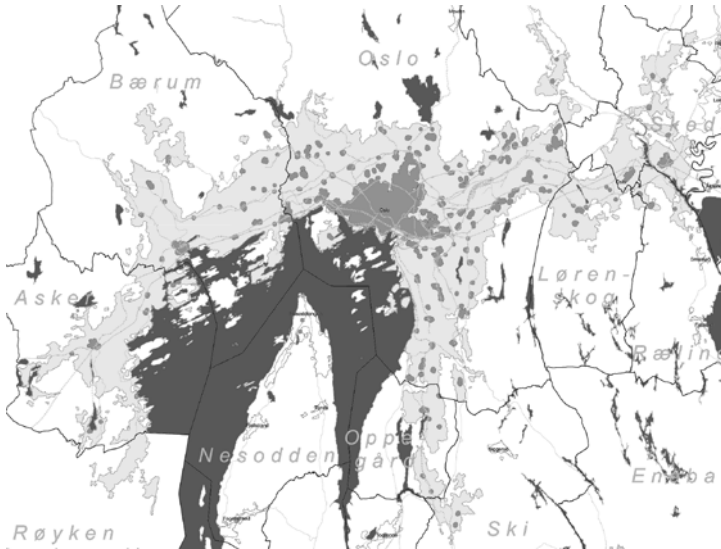
Figure 1. The continuous urban area of Copenhagen. The continuous urbanized area of Copenhagen is shown in gray. Major transport arteries (black lines) are also shown. Source: The Danish National Survey and Cadastre (2010).



In 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 nine surrounding municipalities in the County of Akershus. In 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, of which more than 90 % living in urbanized areas. The continuous urban area of Oslo as well as the metropolitan area has had 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 deindustrialization and today has a trade and business structure dominated by service and knowledge enterprises.

Figure 2 shows the continuous urban area of Oslo (in gray), based on urban area demarcations in 2005. Center zones are shown in a darker shade of gray.

Figure 2: The continuous urban area of Oslo. The continuous urbanized area of Oslo is shown in light gray, with center zones marked in a darker shade of gray. Urban area demarcations as of 2005. Municipal names and borders (dark lines) and major transport arteries (black lines) are also shown. Source: Statistics Norway (2009a).



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

#### 4. Actual spatial development

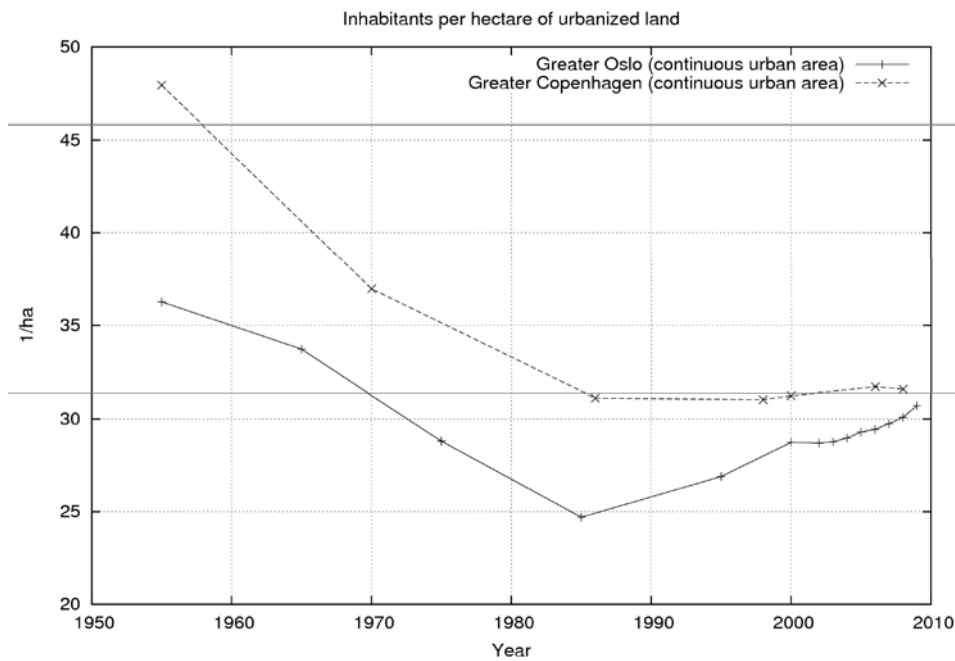
Worldwide as well as in Europe, urban dispersal has been a dominant trend since World War II (see, e.g., Bruegmann, 2005; Iamtrakul & Hokao, 2011). In many European city regions, spatial urban expansion has slowed somewhat down during recent decades compared to the 1950s and 1960s (Kasanko et al., 2006), but in the post-communist Eastern Europe urban sprawl has, on the other hand, 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 three first decades of this period. This coincides with high economic growth in Denmark as well as 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, the 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 reurbanization and density increase – or at least reduced sprawl – is also evident when looking at the metropolitan area scale.

<sup>3</sup> 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 c; Riksrevisjonen, 2007; Statistics Denmark, 2008; AaU Spatial Data Library, 2009 and MOLAND project, 2010.



Copenhagen Metropolitan Area has a long history of spatial urban expansion in the second half of the 20<sup>th</sup> century, in spite of low and for long periods even negative population growth in the decades prior to 2000. According to the European Environmental Agency (2006:12) the annual growth in built-up areas in 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 9<sup>th</sup> 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 areas (ibid.:12 and 51). During the latest decade, this tendency has been reversed, at least within the continuous urban area of Copenhagen. For Copenhagen Metropolitan Area as a whole, the size of the urbanized 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 urbanized 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 bike

travel has increased, facilitated by a continual improvement of a bike network that was probably Europe's best already 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.; 2010). For Oslo Metropolitan Area as a whole, the size of the urbanized land increased by 1.05% annually between 2000 and 2008. Although the growth in urbanized land was higher than in Copenhagen Metropolitan Area, the density increase was higher in Oslo than in Copenhagen due to a much higher population growth. For the metropolitan region of Oslo as a whole, the population density within the urbanized 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 channeling most of the densification to 'brownfield' sites, some green areas within the urban area of the municipality of Oslo were encroached on, e.g. in order to make space for new kindergartens or schools in districts where densification has resulted in population increases exceeding the capacity of existing social infrastructure. During the period 1999–2004 the 'open-access areas' (i.e. areas without buildings, roads, railways, harbor facilities, farmland, graveyards, seas or rivers) within the continuous urban area of Greater Oslo were thus reduced by 5% (Engelien et al. 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 responsible also for some of the above-mentioned encroachments on the intra-urban green areas. Only very small extensions have taken place of the city's very modest network of bike paths. Like in Copenhagen, the general level of mobility has been enhanced, but the shares of car drivers and travelers 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 Oslo Metropolitan Area than in 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.

In the metropolitan areas of Oslo as well as Copenhagen, residential development during the latest decade has taken place closer to the city center, 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 of more central locations also applies to workplace development in general. In 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. In both urban regions, the location of new white-collar

workplaces has thus 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 formalizations of a development that would anyway have been produced by market forces 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 summarize 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 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 urbanized 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 Copenhagen Metropolitan Area (Statistics Denmark, 2010b). Growth in urbanized 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 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 center 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.

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<sup>4</sup> 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-motorized 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.

<sup>5</sup> The figures in the table usually refer to the situation in the beginning of the respective years.

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

Table 1: Development of key demographic, socioeconomic, 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
Year						
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	1129	1295
Regional GDP per capita index (1996 = 1000)	1000	1181	1347	1000	1093	1228
National political regime during preceding 6-year period (C = center, 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		Conser- vative	Conser- vative		Soc.dem/ left	Soc.dem/ left

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

Metropolitan area	Oslo		Copenhagen	
	2000	2008	2000	2008
Year				
Size of urbanized 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 (pers/ha of urbanized land)	23.21	23.97	27.43	27.66
Percentage of car-owning households	64%	72%	42%	50%
Regional GDP index (1996 = 1000)	1177	1347	1107	1234

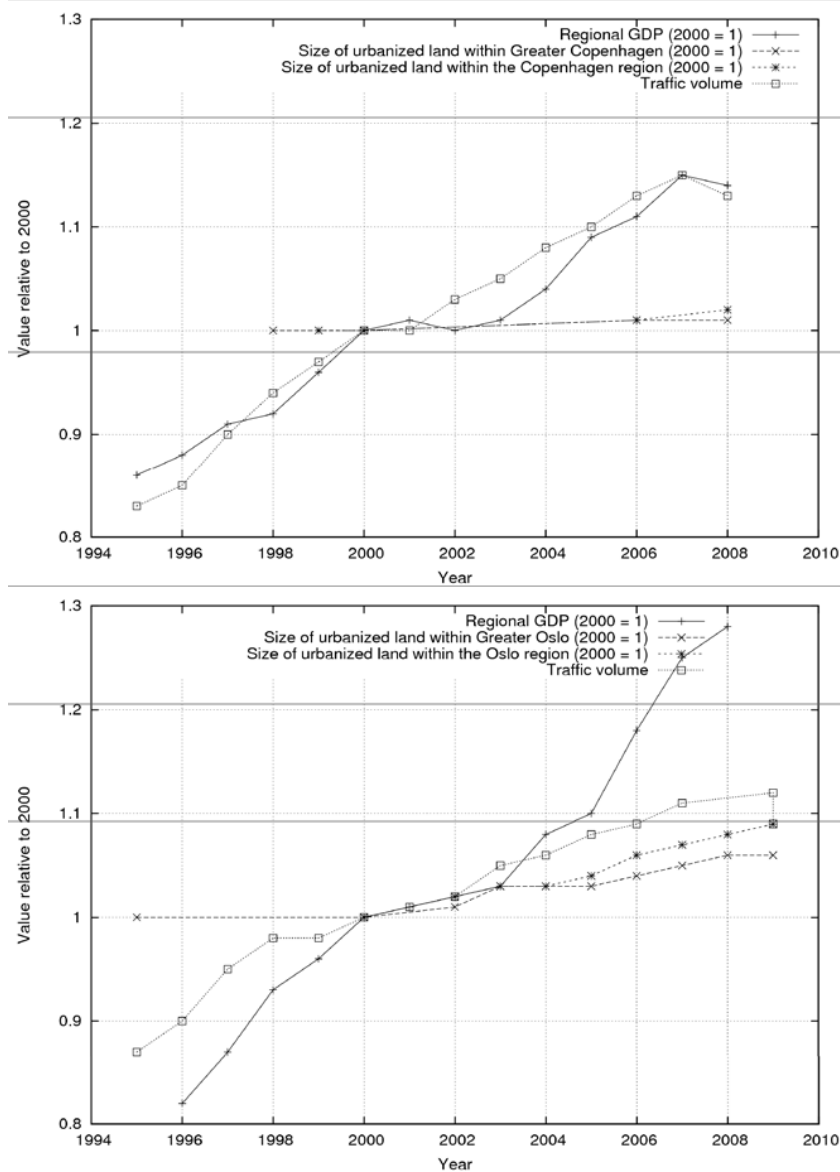
## 5. The cities' environmental performance

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 urbanized 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 urbanized 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 urbanized land also entails a widening of the geographical urban space, with potential trip origins and destinations located on average further away from each other than what would be the case if the urbanized land did not expand. Other things being equal, the urban region will therefore be more transport-requiring, the larger the growth in urbanized land is (Newman & Kenworthy, 1999; Næss, 1993; Næss et al., 1996).

Figure 4 shows how regional GDP, traffic growth and the size of urbanized land have developed since the mid-1990s in Copenhagen Metropolitan area (above) and Oslo Metropolitan Area

(below) (MOLAND project, 2010; AaU Spatial Data Library, 2009; Statistics Denmark, 2010c Riksrevisjonen, 2007; Statistics Norway, 2010b and d; Statens vegvesen region øst, 2010). Indicating a clear tendency of decoupling between economic growth and land consumption, the size of the urbanized land has increased at a considerably lower rate than the regional GDP in both regions. 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 Copenhagen Metropolitan Area, the curve of traffic growth has followed regional GDP growth closely. In 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.

Figure 4: Changes in regional GDP, size of urbanized land and traffic volume since the mid-1990s in Copenhagen Metropolitan area (above) and Oslo Metropolitan Area (below).

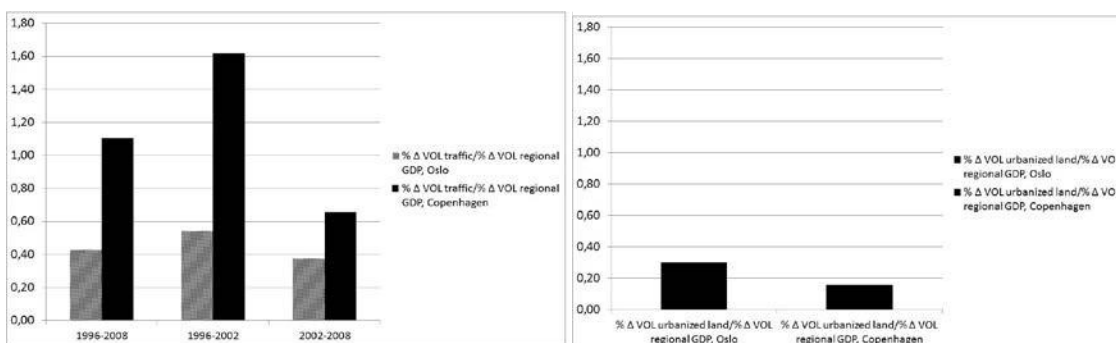


An assessment of environmental impacts may measure impacts in absolute as well as in relative terms. If measuring in absolute terms, the assessment of the development of a parameter (e.g. emissions from traffic) is measured without any consideration of whether or not the number of inhabitants or the 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 Oslo Metropolitan Area (16.7% during the period 1996-2008). In 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 1996-2008, 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 analyzing 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 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, *ibid.*)

Figure 5 shows the extent to which traffic growth (to the left) and growth in urbanized land (to the right) 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 urbanized 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 the indicators for the extent to which population and economic growth have been decoupled from growth in the size of the urbanized land. The indicators for the extent to which population and economic growth have been decoupled from traffic growth can be seen in Table 4.

Figure 5: Traffic growth (to the left) and growth in urbanized 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.



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 urbanized land has been particularly high in Copenhagen Metropolitan Area, which may seem a bit surprising in the light of the stronger densification in Oslo (cf. Figure 3). Because 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 3, 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 urbanized land as the basis for calculating the relationship between the volume of the regional economy and the size of urbanized land. Measured this way, Oslo shows the highest rate of decoupling (see below).

Table 3: Rates of change in the size of urbanized land adjusted for economic growth and/or population growth.

	2000-2008
<b>Oslo</b>	
Annual growth in urbanized land adjusted for total regional GDP growth	-2.00%
Annual growth in urbanized land adjusted for population growth	-0.33%
Annual growth in urbanized land adjusted for per capita regional GDP growth	-0.64%
<b>Copenhagen</b>	
Annual growth in urbanized land adjusted for total regional GDP growth	-1.37%
Annual growth in urbanized land adjusted for population growth	-0.05%
Annual growth in urbanized land adjusted for per capita regional GDP growth	-1.14%

In Oslo as well as in Copenhagen, the size of the urbanized 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 urbanized land has been low compared to the population growth, reflecting a strong prioritization 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 urbanized land. In the Copenhagen and Oslo city regions, the actual, annual growth in urbanized land has been 1.25 and 1.75 percentage points lower, respectively, than what would be expected if the growth in urbanized land per capita followed the GDP growth.

In Oslo as well as in Copenhagen, the decoupling between economic growth and per capita consumption of urbanized 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 obtained weak decoupling between growth in urbanized land and economic growth. Although the degree of decoupling does not satisfy Tapio's criterion for strong decoupling (in that case, the urbanized 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 Copenhagen Metropolitan Area, the 0.8% annual growth in urbanized land in the period from the 1980s to the 1990s reported by EEA (2006) indicate, combined with the region's low economic growth in the 1990s, that the change in the degree of decoupling between economic growth and land consumption for urban development did not appear until the turn of the millennium.

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

	1996-2002	2002-2008
<b>Oslo</b>		
Annual growth in car traffic adjusted for total regional GDP growth	-1.29%	-2.41%
Annual road traffic growth adjusted for population growth	1.23%	-0.03%
Annual growth in car traffic adjusted for per capita regional GDP growth	-0.47%	-0.90%
<b>Copenhagen</b>		
Annual growth in car traffic adjusted for total regional GDP growth	1.14%	-0.75%
Annual road traffic growth adjusted for population growth	2.37%	1.09%
Annual growth in car traffic adjusted for per capita regional GDP growth	1.68%	-0.40%

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 obtained 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 1.14% 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 0.75% when adjusting for GDP growth. 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 1.2% 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 (-0.4% 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 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 behavior. 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 behavior until now.

In 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 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 decentralized 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 has 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 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 sulfur 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.

## 6. 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 utilization has since the late 1980s been considered important elements of sustainable urban development. In the Copenhagen case, the focus has mostly been on development close to urban rail stations, i.e. a kind of decentralized concentration. Among planners and policy-makers in Copenhagen Metropolitan Area there has also been a more pronounced counter-discourse advocating low-density decentralization. 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 & van der Valk, 1994) guiding urban development in Oslo and its neighbor municipalities. Due to the rocky terrain surrounding the city, urban spatial expansion has also been more costly in Oslo than in Copenhagen. In Copenhagen Metropolitan Area, the Finger Plan has since its original adoption in 1947 also had the status of a doctrine for urban development. 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. Neither 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 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 neighborhood-level urban characteristics (proximity to stations) on travel,

whereas knowledge about the transportation impacts of proximity to or distance from the main city center is not emphasized 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 revitalization.

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 centers 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 globalized 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 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, 'cafe culture' and urban living has gained increased popularity during the recent couple of decades (Hjorthol & 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 during the most recent years 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 organizational cultures (Sørensen, 2001; Strand & Moen, 2000). Some interviewees characterize 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 favor 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 realization of local road projects. According to Osland & Longva (2009), a fragmented organizational structure and a funding system encouraging local mobilization for state infrastructure funding tends to induce the municipalities to place less emphasis on goals of increasing the market shares of public and non-motorized 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 politicized topic in 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 organizations have not been very active in the discussions about land use development in neither the Copenhagen nor the Oslo region. In Denmark, some of the environmental organizations 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 neither Norway nor Denmark against car-dependent development projects like 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 & Molotch, 1996). Commercial developers have to a high extent 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 Copenhagen Metropolitan Area may thus to a higher extent than in the Oslo region have felt a need to struggle in order to attract growth. In the Oslo region, fueled by Norway's booming oil economy, growth has to a higher extent been taken for granted, 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 urbanized 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 characterized by extensive urban sprawl with 1800 hectares set aside for business development along the main motorway during the latest five years (Bredsdorff & 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 center. 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 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 modernization 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 periods 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, however, not say much about possible reasons for the lack of coordination. Since lack of coordination is such a widely perceived problem, why are 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 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 recognized 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. Growth in transport and mobility has also to a high extent been taken as an unavoidable fact, with sustainability policies aiming at channeling as much as possible of this growth 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 & Gjerdåker, 2010). Cities may, through urban densification, attempt at providing 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 has to do with the inherent growth dependency of a globalized 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).

## 7. Concluding remarks

During the latest 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 accounted for an increasing part of the development taking place in Copenhagen Metropolitan Area too. 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 for do not go further back than the second half of the 1990s in Norway.

According to the theory of ecological modernization, solutions to environmental problems can be found within the context of existing political and economic institutions (Barry & 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 modernization 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” as to the thesis that a non-environmentally-harmful economic growth is feasible. So far, however, it looks as if no city region - neither in Scandinavia nor 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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