ECONOMIC GROWTH, URBAN DEVELOPMENT AND ENVIRONMENTAL SUSTAINABILITY

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Abstract

The paper discusses the prospects of decoupling growth in the urban building stock and in the availability of options for jobs and service facilities from negative environmental consequences. Compact and dense urban development combined with improved public transport is often conceived as conducive to that end. Using the Norwegian capital of Oslo as an example, the paper shows some of the achievements but also limitations of this approach. Oslo has since the mid-1980s followed a clear urban containment policy. Still, growth in the building stock has only been partially decoupled from traffic growth and land consumption for urban development, and the densification has increased the number of people living in areas exposed to noise, air pollution and traffic accidents. Area reserves where densification can take place with small environmental effects will gradually be exhausted. Climate change adaptation may pose further limits to densification. Full decoupling between building stock growth and negative environmental impacts over a long period of time thus seems implausible. In a longer term, environmental sustainability might involve removal of the least environmentally friendly buildings, urban districts and infrastructure to compensate for new construction, and in some cities even shrinkage of the total building stock.

1. The urban decoupling agenda

Nearly 25 years have passed since the UN World Commission on Environment and Development put the issue of sustainable development on the international agenda as a common challenge for all nations. According to the Commission, the key tenet of a sustainable development is to meet basic human needs – especially the needs among the world's poor – in a way that sustains the possibilities for future generations to meet their own needs (WCED, 1987:43). Based on this understanding of the concept, important challenges of a sustainable urban development in wealthy nations are to mitigate climate change, limit energy consumption, reduce pollution, protect natural areas and arable land, and provide a safe and healthy environment for its citizens, in particular the most vulnerable groups. There is, however, a clear tension

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between these concerns and the widespread goals of city authorities of enhancing economic growth.

Cities – and the urban regions to which they belong – are large spatial concentrations of dwellings, other buildings, and infrastructure. Contemporary economic growth of cities is closely associated with growth in the volume of all these elements. The growth entails a process of urbanization (migration to major urban regions, where the most growth-generating businesses usually prefer to locate) as well as per capita growth in the size of the built environment. In the poor countries of the world, urban economic growth may still play such a progressive role (although the ways in which the benefits are distributed is often highly skewed). However, with increasing affluence levels, the costs of growth have become more and more evident, compared to its benefits (Mishan, 1967; Jackson, 2009). In the 1970s, the report Limits to Growth published by the Club of Rome (Meadows et al., 1972) triggered a wave of skepticism and criticism against growth.

In the 1980s, this growth criticism receded while a belief in green technological inventions as the key to sustainable economic growth won through, supported by the theory of ecological modernization (Huber, 1985; Mol & Spargaaren, 2000). In the dominating debates on sustainable development, decoupling economic growth from negative environmental impacts has thus been highlighted as a main avenue to achieve environmental sustainability. (OECD, 2002). For urban development, a main challenge of decoupling is to find ways of accommodating 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.

In the recent few years, the assumptions of the ecological modernization paradigm have, however, been increasingly challenged by critics who from different perspectives argue that the quest for economic growth in affluent countries should be replaced by policies aiming at zero-growth or even de-growth (Jackson, 2009; Spangenberg, 2009; Martinez-Alier et al., 2010). This literature has, however, generally not paid much attention to the relationships between economic growth, urban development and environmental sustainability.

2. Densification as decoupling

According to the European Environmental Agency (2006), the urban population in Europe grew by 33% between the mid-1950s and 2000. During the same period, the area covered by European cities grew by 78%, corresponding to an increase in urbanized land per capita by 34% on average. In most cities the growth in the volume of the building stock has been higher than the growth in the area covered by the city. Higher buildings have replaced lower ones, and in-

fill development has taken place on vacant sites within existing urban area demarcations. However, in most cities, there has also been considerable outward urban expansion where previously undeveloped land in the surroundings of the city has been converted into sites for urban development.

The stronger growth in the volume of the urban building stock than in the number of inhabitants is partly due to a substantial reduction in the average household size. For example, in Denmark, the average number of household members was nearly 3.5 in the 1950s, dropping to 2.51 in 1981 and further down to 2.16 in 2009. Thus, today there are considerably more households – and hence also dwellings – per 1000 inhabitants than there used to be 'in the old days'. Instead of becoming on average smaller, as one might expect from the decreasing number of household members, the average dwelling size has grown. There has been a substantial increase in the per capita housing consumption, measured in floor area. This growth has to a very limited extent been problematized in the debates on sustainable consumption.

As can be seen in Figure 1, floor area per capita in Denmark and Norway has increased to nearly twice and a half times as much as in 1960 (second homes not included). The growth in the total building stock is even higher than the growth in residential floor area. A similar development has been seen in many other European countries.

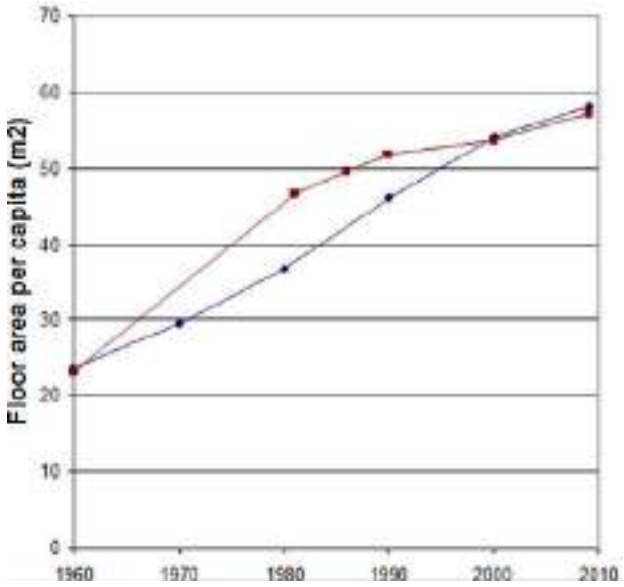

Figure 1: Changes in Residential Floor Area per Inhabitant Since 1960 in Denmark (red) and Norway (blue)[2]

[2] Sources: Røpke (2000), Statistics Denmark (2010) and Statistics Norway (2010a).

During the recent 15-20 years, urban sprawl has stagnated in many West European countries (Kasanko, 2006). Some North European countries, notably Norway and Sweden, have witnessed a clear change from urban sprawl to urban densification during the most recent decades (Statistics Norway, 2011a; Statistics Sweden, 2009). It should be noted that urban densities were at the outset not very high in these countries, so the physical opportunities for densification have therefore been larger than in the more compact south European cities.

A number of studies have shown that low-density suburban development increases the need for motorized travel (Newman & Kenworthy, 1999; Næss, 1993; Næss, Sandberg & Røe, 1996; Næss, 2006). It is difficult and expensive to provide high-class public transport services in low density urban districts. Combined with road construction in the advent of future demands for road capacity, urban sprawl has contributed to the creation of highly car-dependent cities.

Compared to urban sprawl, densification can bring important benefits in terms of the protection of natural landscapes, arable land and biodiversity, in particular if the densification can be channeled to 'brownfield' sites such as derelict or under-utilized industrial areas, obsolete harbor areas and parking space. Multifamily houses require less energy for space heating and cooling per square meter than detached single-family houses (Høyer & Holden, 2001; Mark & Wolfe, 2007), and less material for the construction of the buildings themselves, sewers, cables and access roads (Burchell et al., 1998). And not the least, compact urban development can provide accessibility to facilities through proximity instead of by means of high mobility, thus combining important environmental and social aspects of sustainability. In particular, densification in the inner and central parts of a city or metropolitan area is favorable, seen from the perspective of reducing energy use and emissions from transport (for an overview of evidence from Nordic urban contexts, see Næss, 2012). For the above reasons, densification is considered by many urban planners as a key strategy for decoupling and 'smart growth' (Commission of the European Communities, 1990, Smart Growth Network, 2012).

Some planners have believed that decentralization of jobs to the suburbs would reduce commuting distances, since suburbanites could then be employed at workplaces close to their residential neighborhood. However, in contemporary specialized and high-mobility societies, people do not choose jobs (or recruit workers) mainly from within their local district. For example, in a study in Oslo, employees at the most peripheral workplaces had the longest mean commuting distances among the whole sample. Together with the influence of workplace location on travel modes, energy consumption for journeys to work was therefore found to be on average three times as high among employees of the

most peripheral than among the most central workplaces (Næss & Sandberg, 1996).

3. Oslo as a case of ecological modernization

The urban development of the Norwegian capital Oslo may serve as an illustration of the possibilities and limitations of obtaining a decoupling between growth in the building stock and negative environmental consequences (Næss, Næss & Strand, 2011; Næss et al., 2011; Næss, 2011). Oslo received the European Sustainable City Award in 2003 and was ranked third among 30 cities evaluated for the European Green City Index in 2009. Oslo thus has a reputation for being among the forerunners on the path toward urban sustainability.

In Norway, the political attention to sustainable development has been strong since the late 1980s. Professionals and decision-makers at that time formed strong discourse coalitions promoting a more space-efficient and less transport-demanding urban development. A long-lasting period of spatial expansion in Norwegian cities came to a halt in the 1990s, particularly in the largest urban regions. In Oslo, the reurbanization trend began even earlier. As can be seen in Figure 2, the population density within the continuous urban area of Greater Oslo increased by as much as 27% over the period 1985-2011. During the latest half of this period, Greater Oslo increased its number of inhabitants within the continuous urban area from 755,000 in 1998 to 907,000 in 2011 (i.e. by 20 %), with an increase in urbanized land of only 7 %.

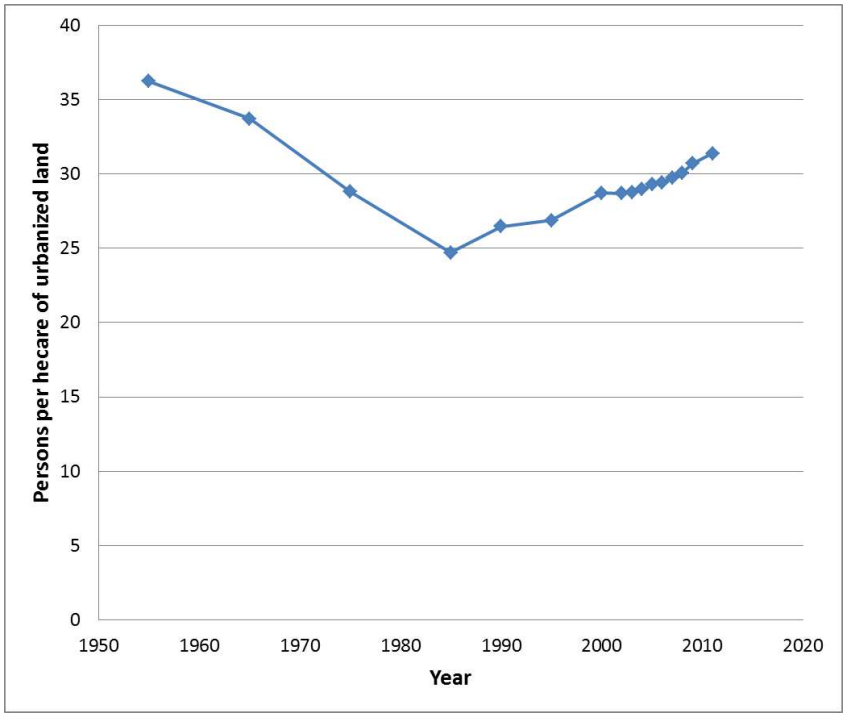

Figure 2: Changes in Population Density within the Continuous Urban Area of Oslo during the Period from 1955 to 2011.
Sources: Statistics Norway, 2011a and b; Riksrevisjonen, 2007.

Within the so-called Inner Zone of the municipality of Oslo, now comprising around 200,000 inhabitants, population density grew by 39% over these two decades. There has also been an overall population density increase for all urban settlements of Oslo Metropolitan Area seen together, although the peripheral settlements have combined densification with some development of dwellings and workplaces on previously undeveloped land. In spite of the latter, the number of inhabitants per hectare of urbanized land within the region as a whole (including 1.2 million urban inhabitants in 2011) grew by 7.5 % over the years 2000-2011. Figure 3 shows how the urban population density has developed within the inner zone of Oslo, the municipality of Oslo, the continuous urban area and within the entire Oslo region since 1999/2000.

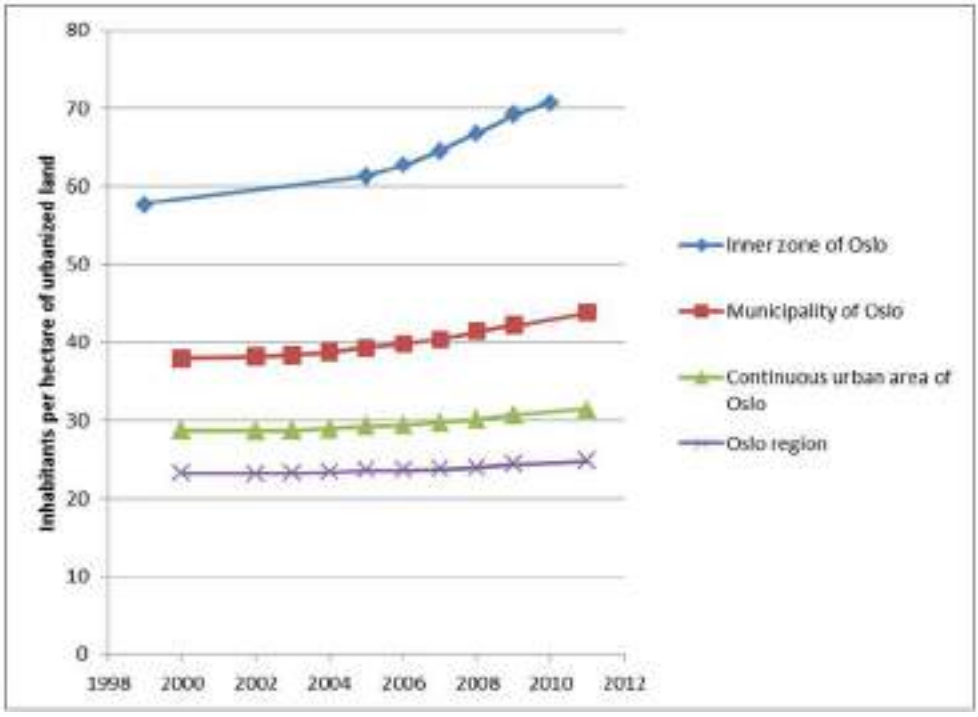

Figure 3: Changes in Population Density within the Inner Zone of Oslo, the Municipality of Oslo, the Continuous Urban Area and within the Entire Oslo Region since 1999/2000.
Sources: Statistics Norway, 2011a and Municipality of Oslo, 2010.

For Oslo Metropolitan Area as a whole, most of the employment growth during recent years has taken place in the counties outside the municipality of Oslo, usually close to main public transport lines. However, for jobs occupied by employees with university education of at least four years, 70% of the job growth since 2000 has occurred within the municipality of Oslo, especially in the inner districts. According to the Dutch "ABC-principle" for environmentally sound location of employment (Verroen et al., 1990), it is especially this type of jobs that should be located centrally in order to reduce car commuting.

4. A partial decoupling

Compared to current urban development in most European cities and to its own development in the postwar period until the mid-1980s, Oslo has managed to combine high growth in population and building stock and low encroachments on natural and cultivated areas. Traffic growth has also been moderate, especially since the turn of the century. During the twelve years from 1996 and 2008, road traffic within Oslo Metropolitan Area increased by 24.5%, with a growth of 11.5% in the period 1996-2002 and 8.5% from 2002 to 2008. These figures may not seem very impressive unless the rapid population growth is taken into consideration. Adjusted for population growth, traffic increased by

1.2% annually from 1996-2002, while there was a weak negative growth (-0.03% annually) over the years 2002-2008. (Statens vegvesen region øst, 2010.)

Figure 4 illustrates how regional GDP, traffic growth and the size of urbanized land in Oslo Metropolitan Area have developed since the mid-1990s (Riksrevisjonen, 2007; Statistics Norway, 2010b and c; Statens vegvesen region øst, 2010). The size of the urbanized area has increased at a considerably lower rate than the regional GDP, indicating a clear tendency of decoupling between economic growth and land consumption. Especially the extension of the continuous urban area has been decoupled from economic growth, but also land consumption measured at a metropolitan scale. Traffic has also increased more slowly than regional GDP during the whole period, and in particular since 2003 there is a clear gap in the growth rates of these two parameters.

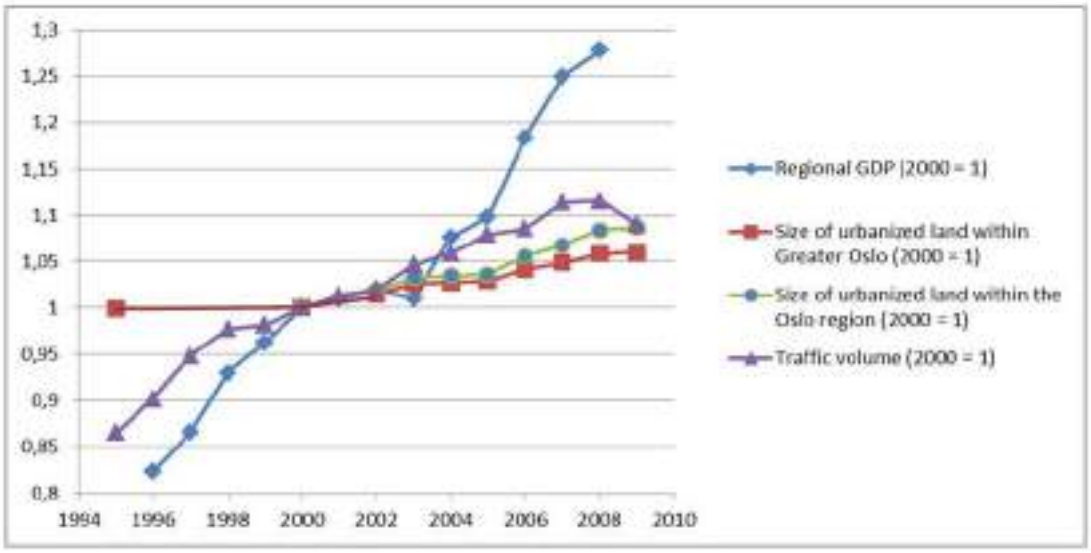

Figure 4: Changes in Regional GDP, Size of Urbanized Land and Traffic Volume since the Mid-1990s in the Oslo Metropolitan Area.

However, slowing down the growth in car traffic is not sufficient to bring about environmentally sustainable mobility. In Oslo, continual road capacity increase has worked against the fulfillment of the sustainability targets. While a new Metro ring has been opened, streetcar services have been improved and new express bus lines have been established, new multi-lane roads have also been constructed. Partly, road building has been motivated by a wish to lead traffic through tunnels away from city centers and housing. But most of the new tunnels have had more lanes than the surface roads they replaced. The purpose of this road capacity increase has been to combat congestion. Such 'predict and provide' infrastructure development will hardly contribute to reducing

greenhouse gas emissions and other negative impacts of urban road traffic (Strand et al., 2009).

5. Environmental justice dilemmas

While Oslo's urban densification has reduced the conversion of natural areas into building sites, it has reduced the intra-urban open-access areas within the continuous urban area of Greater Oslo. For example, there was a 5% reduction of such areas over the five-year period 1999 – 2004. Partly, this was a result of transport infrastructure construction, but green areas also had to yield to new kindergartens or schools in districts where densification caused population growth beyond the capacity of existing social infrastructure. Together with the rapid inner-city population growth, this has diminished the availability of open-access land per resident in these districts.

Moreover, inner-city residential densification will, other things being equal, increase the number of inhabitants exposed to the higher levels of noise and concentrations of air pollution typically found in the inner parts of metropolitan areas. In Oslo, levels of mortality and coronary infarcts are higher among inner-city dwellers than among suburbanites, and this difference is also present when controlling for age, income, education, and unemployment (Statistics Norway, 2005; Municipality of Oslo, 2009).

Regarding traffic accidents (Røe & Jones, 1997), noise (Kolbenstvedt & Hjorthol, 1987), as well as local pollution, the location of developmental areas has its impacts on the distribution of burdens and benefits between the city's own inhabitants. Metaphorically, as illustrated by Krier (1996), the suburbs are 'bombarding' the inner city with cars and their associated environmental problems. If the construction of new residences takes place in the outer parts of the urban area, those who move into the new suburban dwellings will benefit from a local neighborhood less polluted and less exposed to traffic accidents than the urban average, while themselves contributing to an increased overall amount of transport burdening residents living closer to the city center with more through traffic, noise, air pollution and a higher risk of accidents.

Low-density suburban development thus leads to increased polarization by aggravating the local environmental problems facing those inhabitants who are at the outset exposed to the least satisfactory local traffic situations, while providing a sheltered situation for those who move into the new suburban residences. Compared to a more dispersed urban structure, high urban density decreases the city's overall amount of traffic and its contribution to air pollution, and inner-city densification contributes to a less unequal distribution of traffic-related environmental nuisances, since the suburbs will then 'bombard' the city center with fewer cars. On the other hand, high density concentrates the (although reduced) traffic volume and its related local

environmental impacts. The concentration of local air pollution and noise in inner-city areas shows that there is a need for additional policy measures that can lower the amount of local traffic more radically than what is attainable solely through urban containment.

6. Limits to densification and building stock growth

As the densification process goes on in areas where the construction of new buildings can take place with small negative environmental impacts, such area reserves will gradually be exhausted. Subsequent growth in the building stock must then be located to areas where the construction requires the conversion of natural areas or agricultural land. Importantly, many of the sites where densification has taken place without encroachments on natural areas or farmland have become available because manufacturing industries have moved from Oslo (like most other cities in wealthy countries) to developing countries with lower labor costs and less restrictive environmental regulations. Global-scale relocation processes resulting in large encroachments on nature in newly industrialized developing countries have thus been a precondition for the partial decoupling between growth in the building stock and negative environmental impacts achieved in some European cities.

Densification on sites made vacant due to the moving of manufacturing industries to countries with lower wages is an example of picking the 'low-hanging fruits', where it is relatively easy to obtain a reduction of environmental impacts per unit produced (e.g., dwellings or office space). The (spatially delimited) decoupling resulting from such picking of 'low-hanging fruits' and export of polluting, energy-intensive and land-consuming industries to poor countries is, however, temporary. After some decades, no more polluting industries will be left to out-locate, and the technologically and socially easiest achievable efficiency gains will already have been made.

A high rate of growth in the building stock and technical infrastructure may also make it an even more challenging task to combine climate change mitigation and adaptation strategies in urban land use. Although it is possible to design adaptation measures as well as urban densification strategies in ways minimizing conflicts between mitigation and adaptation, the difficulty in setting aside sufficient intra-urban pervious surfaces while containing new construction of buildings within the existing urban area demarcations will of course be higher, the larger is the increase in the building stock.

Buildings are seldom, if ever, constructed with environmental protection as a main purpose. Instead, construction takes place to accommodate growth in the number of households, jobs etc. and in the floor space per resident or employee. As noted by Høyer & Holden (2001), larger dwellings are also associated with higher consumption of other items like furniture, electronic appliances etc.

Increase in the building stock can at best be made environmentally friendly in relative terms (by choosing resource-efficient solutions), not in absolute terms (Høyer & Næss, 2001). In order to make omelet, you have to crack eggs. As already mentioned, fewer environmental 'eggs' will normally be cracked by densification than by urban sprawl. Densification still has its negative environmental and health impacts.

According to the theory of ecological modernization, environmental problems can be solved within the context of existing political and economic institutions by decoupling economic growth from environmental degradation (Barry & Paterson, 2003). Oslo's densification and public transport improvements are examples of ecological modernization strategies within the field of urban development. However, the Oslo case shows that economic growth has only been partly decoupled from traffic growth and land take for urban development. If economic growth without negative environmental consequences were to be possible anywhere, this would most likely be in societies with a high level of prosperity, a high degree of economic freedom of action, as well as a high level of knowledge among the citizens. Oslo metropolitan area has a higher score than most other metropolitan areas worldwide on all these criteria. In this respect, Oslo might be considered a "critical case" where the thesis that a non-environmentally-harmful economic growth is feasible could be tested. So far, however, it looks as if no city region - neither in Scandinavia nor elsewhere in the world – wishes, or is able, to implement more than a partial decoupling between growth and negative environmental impacts.

In the Nordic as well as other European countries, studies have been conducted to investigate the potential for reducing the energy consumption and environmental load per unit produced by 'factor four', 'factor ten' and even 'factor twenty', i.e. down to 25%, 10% and 5%, respectively, of present levels. When the resource to be economized on is undeveloped land, such rates of reduction will only be possible if it is accepted that important characteristics of the 'products' are changed. Among other things, it would require a complete halt in the construction of detached single-family houses in urban areas. Replacing all development of new single-family home neighborhoods with the construction of apartment buildings in the inner cities would, however, be highly controversial. In the long run, it is also dubious whether this would be sufficient to make continual growth in the housing stock environmentally sustainable.

Similar lines of thought could be pursued regarding the construction of other elements of the physical urban development, such as the construction of transport infrastructure, energy supply systems, and sewage systems. Especially investments in transport infrastructure usually give large direct intrusions into the natural environment. Moreover, infrastructure can of course not be recycled in the same way as the products we throw away as consumers.

According to Høyer (1997), the decisive ecological limits for a further growth in the global mobility are therefore set by the tying-up of resources that must take place in the infrastructure.

This leads us to the question of whether it can at all be in accordance with an environmentally sustainable and globally just development to increase the building stock substantially beyond its present size in rich countries like the Scandinavian ones. Population growth, in-migration to the largest urban regions, and changes in the composition of households imply that there will still be a need to increase the number of dwellings. Moreover, despite the overall high Scandinavian housing standards, some people still live in substandard dwellings. Historically, the housing standard among low-income groups has been substantially elevated as part of a general increase in housing consumption, e.g. as a result of moderate-price dwellings becoming vacant when people who can afford it move into new high-standard dwellings. As evident from the preceding sections, such a continuous, general increase in consumption is problematic in an environmental and natural resources perspective. It is also an inefficient way of improving the residential standard among the population groups experiencing the poorest housing conditions (Bysveen & Knutsen, 1987). If we want to meet the need for improved housing standards among these groups while limiting the overall growth in housing consumption per capita, a policy of 'selective improvement' will instead have to be pursued.

As can be seen above, growth in the urban building stock inevitably tends to increase the environmental load, although the environmental pressure can be reduced significantly by means of environmentally friendly urban planning principles and building design. At the same time it is difficult to envisage a society where there is general economic growth but no growth in the building stock (Harvey, 2010). In Norway, the category 'dwellings, lightning and heating' accounted for 29% of household expenditures in 2007 (Statistics Norway, 2009). If we want general economic growth, non-growth within the building sector would require even higher growth within other sectors. Such a shift of growth from buildings to other sectors of society would, however, not necessarily lead to reduced environmental impacts (Xue, 2012). In many of the other sectors there are similar difficulties in decoupling growth from negative impacts as in the building sector. Not the least, this applies to the transportation sector, where CO2 emissions and other environmental impacts have increased steadily in all European countries, despite the fact that climate change mitigation has been high on the agenda (Tapio, 2005). .

7. A de-growth urban planning agenda

In the European environmental discourse, the perspective of de-growth has gained increasing attention during later years. According to this perspective, the

volume of consumption in the EU countries and other wealthy nations is already higher than what can be sustained in a long term if vital natural resources and environmental qualities are to be maintained and people in poorer countries are to be allowed to reach the same consumption level as in the wealthy North (Martinez-Alier, 2009; Spangenberg, 2010). In the Scandinavian countries, residential floor area per capita is currently nearly three times as high as it was sixty years ago, and there has also been a substantial growth in the stock of non-residential buildings. A long-term continuation of such growth in the building stock will put an increasing pressure on the natural environment. There has actually been a tendency of reduced growth rates in residential floor area per capita in Norway and Denmark (Figure 1). Partly, this reflects a strong increase in the cost of housing per m2 of floor area. In Oslo, housing costs per m2 increased threefold from 1993 to 2005, reflecting changes in the financing conditions and land values rather than technical standard improvement. But the declining tendency may also indicate that the consumption of floor area is approaching some saturation level. If so, further growth in households' purchasing power will be channeled to other items, for example holiday flights. Less money spent on housing will then not contribute to reduced environmental load, but rather increase it.

As long as the purchasing power grows, reduced growth in the consumption of one category (such as housing) tends to be compensated by increased growth in the consumption of other items. Such 'rebound effects' have a tendency of reducing or offsetting the environmental gains from energy- or material-saving technologies or reduced consumption of one particular type of commodity, since the money thus saved can be spent on other types of consumption that are not necessarily environmentally neutral (Nørgaard, 2009).

A number of environmental, social and distribution-ethical reasons indicate that the per capita size of the building stock and technical infrastructure in Scandinavian cities has reached a level of sufficiency. From a sustainability perspective, we should instead of quantitative growth give priority to qualitative improvements of the building stock, such as environmentally friendly building-technological solutions, area-effective and flexible layout of the rooms, and a high esthetic quality. Improved housing conditions for the small proportion of the population who still live in substandard dwellings should be realized through selective residential construction directed towards the housing needs among these groups. The rest of the population – the large majority of Scandinavians – would hardly suffer any hardship from continuing their present level of housing consumption. Measures to enhance a better utilization of the existing building stock in cities should also be high on the agenda, including policies to encourage a subdivision of the largest residences into more units, and facilitation of co-housing schemes (Lietart, 2010).

In a longer term, the question of reducing the volume of the building stock and the size of the urbanized land may enter the agenda in cities in affluent countries. In particular, this might be relevant in cities where the number of inhabitants is stable or declining. If the total building stock is not to increase, the construction of new and more environmentally friendly buildings through densification should be combined with the abolishment of some of the environmentally least favorable built environments, such as the most car-dependent single-family home areas and office parks. This could open up possibilities for nature regeneration projects and a larger coherence of the natural areas and landscapes surrounding the city. In a situation with a deliberate de-growth in the economy, a dismantling of several of the most resource-consuming and unfavorably located built structures might become relevant.

In a shrinking total economy, there is a risk that low-income people will be locked in continual or even worsened poverty. Redistribution of wealth from rich to poor population groups will be necessary, if degrowth shall be socially sustainable and gain public support (Martinez-Alier 2009; Spangenberg 2010). Needless to say, such a development would require radically changed political prioritizations and a much higher extent of political influence on societal development than under current, predominantly market-led conditions. It is difficult to imagine how such a societal development can at all be possible within the confines of an economic system driven by competition between individual actors aiming for capital accumulation (Harvey, 2010).

A decision to support de-growth strategies – a planned and voluntary reduction of consumption levels, working hours and the general busy-ness – is thus far beyond the agenda of the present society. However, if our cities are to become truly environmentally and socially sustainable, such a trajectory would arguably be necessary. The environmental load of the existing building stock, infrastructure and consumption in general exceeds the ecological footprint that would be ecologically sustainable and in accordance with a just distribution globally. Technological improvement can only to some extent reduce the negative environmental impacts. The efforts to develop more environment- and human-friendly cities should therefore not be limited to the creation of smarter building designs and urban planning solutions for a growing building stock. We must also dare to raise our view and ask which needs the construction of ever bigger dwellings, shops, offices, other buildings, and roads actually serve to meet – and which political-economic changes the prioritization of better built environments instead of bigger built environments would require.

8. References

Burchell, R. et al, 1998. The Costs of Sprawl – Revisited. Washington: National Academy Press.

Bysveen, T., Knutsen, S., 1987. Vacancy chains initiated by out-migration: a study of the housing market in Oslo. Housing Studies, 2, pp. 202-212.

Commission of the European Communities, 1990. Green paper on the Urban Environment. Luxembourg: Office for the Official Publications of the European Communities.

European Environmental Agency, 2006. Urban sprawl in Europe: The ignored challenge. EEA report No. 10/2006. Copenhagen: European Environmental Agency.

Harvey, D., 2010. The Enigma of Capital. London: Profile Books.

Huber, J., 1985. Die Regenbogengesellschaft. Ökologie und Sozialpolitik. Frankfurt am Main: S. Fischer.

Høyer, K. G. & Næss, P., 2001. The Ecological Traces of Growth. Journal of Environmental Policy and Planning, 3, pp. 177-192.

Høyer, K. G. & Holden, E., 2001. Housing as basis for sustainable consumption. Int. J. Sustainable Development, 4, pp. 48-58.

Høyer, K. G., 1997. Sustainable development. In: D. Brune, D. Chapman, M. O. Gwynne & J. M. Pacyna, eds. The Global Environment. Science, Technology and Management, 2, pp. 1185-1208. Weinheim: Wiley-VCH

Jackson, T., 2009. Prosperity without growth. London: Sustainable Development Commission.

Kasanko, M. et al., 2006. Are European cities becoming dispersed?: A comparative analysis of 15 European urban areas. Landscape and Urban Planning, 77, pp. 111-130.

Kolbenstvedt, M. & Hjorthol, R., 1987. Bytrafikk, bomiljø og helse. Resultater fra NTNF-programmet Trafikk og miljø's førundersøkelser på Vålerenga/Gamlebyen i Oslo 1987. Oslo: Institute of Transport Economics.

Krier, L., 1996. Architecture choix ou fatalité. Paris: Norma.

Lietart, M., 2010. Cohousing's relevance to degrowth theories. Journal of Cleaner Production, 18, pp 576-580.

Martinez-Alier, J.; Pasqual, U.; Vivien, F.-D. & Zaccai, E., 2010. Sustainable de-growth: Mapping the context, criticisms and future prospects of an emergent paradigm. Ecological Economics, 69, pp. 1741-1747.

Mishan, E. J., 1967. The Costs of Economic Growth. London: Staples Press.

Mol, A. P. J. & Spaargaren, G., 2000. Ecological modernisation Theory in Debate: A Review. In: A. P. J. Mol & D. A. Sonnenfeld, eds. Ecological Modernisation Around the World, pp. 17-49.

Municipality of Oslo, 2010. Statistisk Årbok 2010. Oslo: The Municipality of Oslo, Development and improvement authority.

Næss, P. & Sandberg, S. L., 1996. Workplace Location, Modal Split and Energy Use for Commuting Trips. Urban Studies, 33, pp. 557-580.

Næss, P., 1993. Transportation Energy in Swedish Towns and Regions. Scandinavian Housing & Planning Research, 10, pp. 187-206.

Næss, P., 2006. Urban Structure Matters. Residential Location, Car Dependence and Travel Behaviour. London/New York: Routledge

Næss, P., 2011. Economic growth, urban development and environmental sustainability. In: F. D. Moccia, ed. Living in the ecologic city-Abitare la Città Ecologica. Naples: CLEAN.

Næss, P., 2012. Urban form and travel behavior: experience from a Nordic context. Forthcoming in Journal of Transport and Land Use, 5.

Næss, P.; Strand, A.; Næss, T. & Nicolaisen, M., 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, pp. 287-317.

Næss, P.; Næss, T. & Strand, A., 2011. Oslo's farewell to urban sprawl. European Planning Studies, 14, pp. 113-137.

Næss, P.; Sandberg, S. L. & Røe, P. G., 1996. Energy Use for Transportation in 22 Nordic Towns. Scandinavian Housing & Planning Research, 13, pp. 79-97.

Newman, P. W. G. & Kenworthy, J. R., 1999. Sustainability and Cities. Overcoming Automobile Dependence. Washington DC/Covelo, California: Island Press.

Nørgaard, J. S., 2008. Avoiding Rebound Through a Steady-State Economy. In: H. Horace Herring & S. Sorrell, eds. Energy Efficiency and Sustainable Consumption: The Rebound Effect, pp. 204-223. Basingstoke: Palgrave Macmillan.

OECD, 2002. Indicators to Measure Decoupling of Environmental Pressure from Economic Growth. Paris: OECD.

Røe, P. G. & Jones, K., 1997. Bystruktur og trafikkulykker. Hvilke byplanforhold har betydning for ulykkessituasjonen i norske byer? Oslo: Norwegian institute for urban and regional research.

Røpke, I., 2000. Forbrug. In: J. Holten-Andersen, et al., eds: Dansk naturpolitik - viden og vurderinger. Copenhagen: Naturrådet.

Smart Growth Network, 2012. Smart Growth Principles. Available at http://www.smartgrowth.org/principles/comp_design.php [Accessed May 8, 2012.]

Spangenberg, J. H., 2010. The growth discourse, growth policy and sustainable development: two thought experiments. Journal of Cleaner Production, 18, pp. 561-566.

Statens vegvesen, region øst, 2010. Trafikkregistreringer i Oslo og Akershus 2009. PROSAM-rapport 185. Oslo. Road Directorate.

Statistics Denmark, 2010. Bygningsbestandens areal efter areal, område, anvendelse og tid. Available at http://www.statistikbanken.dk/statbank5a/default.asp?w=1280 [Accessed January 19, 2010.]

Statistics Norway, 2005. Forventet gjenstående levetid for kvinner og menn på utvalgte alderstrinn. 2002-2004. Bydeler i Oslo. Available at http://www.ssb.no/ssp/utg/200506/03/tab-2005-12-08-01.html [Accessed March 11, 2010.]

Statistics Norway, 2009. Focus on Household Consumption: Figures from the Survey of Expenditure. Available at http://www.ssb.no/english/subjects/05/02/forbruk_en [Accessed May 2009.]

Statistics Norway, 2010a. Boliger, etter bruksareal, tid og statistikkvariabel. Available at http://statbank.ssb.no/statistikkbanken/ [Accessed January 19, 2010.]

Statistics Norway, 2010b. Bruttonasjonalprodukt etter makrostørrelser, tid og statistikkvariabel. Bruttonasjonalprodukt Fastlands-Norge, markedsverdi. Available at http://statbank.ssb.no/statistikkbanken/
[Accessed October 7, 2010.]

Statistics Norway, 2010c. Bruttoprodukt, etter region, næring, tid og statistikkvariabel. Available at http://statbank.ssb.no/statistikkbanken/
[Accessed March 9, 2010.]

Statistics Norway, 2011a. Tettsteder. Folkemengde og areal, etter kommune. 1.januar 2011. Available at http://www.ssb.no/beftett/tab-2011-06-17-01.html
[Accessed June 17, 2011.]

Statistics Norway, 2011b. Folkemengde og areal i tettsteder. Kommune. 1. januar 2011. Available at http://www.ssb.no/beftett/tab-2011-06-17-02.html
[Accessed June 17, 2011.]

Statistics Sweden, 2009. Tätorternas landareal, folkmängd och invånare per km2 2000 och 2005. (Spatial extension, population and inhabitants per km2 in urban settlements.) Available at
http://www.scb.se/Pages/ProductTables___13001.aspx.
[Accessed December 8, 2009.]

Strand, A.; Tennøy, A.; Næss, P. & Steinsland, C., 2009. Gir bedre veger mindre klimagassutslipp? Oslo: Institute of Transport Economics.

Tapio, P., 2005. Towards a theory of decoupling: degrees of decoupling in the EU and the case of road traffic in Finland between 1970 and 2001. Transport Policy, 12, pp. 137-151.

Verroen, E. J.; Jong, M. A.; Korver, W. & Jansen, B., 1990. Mobility profiles of businesses and other bodies. Delft: Institute of Spatial Organisation TNO.

WCED (World Commission on Environment and Development), 1987. Our Common Future. Oxford/New York: Oxford University Press.

Xue, J., 2012. Potentials for Decoupling Housing-related Environmental Impacts from Economic Growth. Ph.D. thesis. Aalborg: Aalborg University.