

Sustainable urban housing – Can urban form affect the way of travelling?

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Abstract

Great challenges connected to urbanisation, climate change and global warming are leading us towards a new planning paradigm, requiring that we develop new planning approaches. Urban areas contribute to an increasing energy consumption and transport. Increasing emissions from transport is an important topic we have to deal with. The Municipality of Trondheim together with The Norwegian University of Technology and Science (NTNU) and SINTEF have established a research project on carbon neutral housing settlements. This project is exploring how urban form can contribute to a more carbon neutral housing settlement through reduction of car traffic, favouring public transport, cycling, and walking.

Studies tell us that in dense built central areas people are disposed to walk and use cycle to a higher extent than in suburban areas. On the other hand there is a segregation of the population in the city which affects transport needs. Mostly young and elderly people are living in central parts while families with children are moving out from city centres to suburban areas. This pattern influences transport choices.

We aim at examining these patterns in order to understand implications for planning. This is done by studying how urban form and land are influencing the distribution of households, their choice of mode of transport, and the associated environmental impact.

Keywords: Housing, Sustainable Urban Development, Urban planning, Transport

Environmental challenges to urban planning

During the last decades urbanisation has been dramatic. This has given urban planners and politicians challenges they have not faced before. For the first time in history, more than half of the world's population is living in urban areas, in Norway more than 80%. In a global context the development is heading towards an urban population of 70% within 2050. This will be a great challenge for the environment since the urbanisation process causes serious environmental impacts. Cities are a great consumer of energy and more than 70 % of all greenhouse gas emissions in the world come from urban areas (UN-Habitat 2009).

Car transport has increased during the last decades, which has clearly negative impacts on the quality of our environment and contributes significantly to emissions of green house gasses. Urban planning of the recent decades allowing for urban sprawl with shopping centres and new housing settlements located on the urban fringe clearly increased the demand for car travel and consequently greenhouse gases emission. Increasing urban sprawl also means reduction of productive agricultural area, biological diversity and valuable natural and cultural heritage.

Future urban development is facing great challenges regarding health, environmental issues, transport, land use, housing politics, and economical issues. All these issues are essential for keeping up good living conditions also for coming generations. The future growth and transformation of our cities have to be in accordance with a long-term sustainable perspective. A crucial question is how we will enable the cities to reduce the consumption of resources and the emission of greenhouse gases, plus to provide the conditions for a good urban life. This includes among other challenges also discussions on new ways of designing urban form. The "cities of the future" need to develop new urban structures and to a greater extend transport systems that encourage walking, cycling, and the use of public transport.

Planning sustainable cities

In the city of the future the public transport system will be the backbone of the urban structure and means developing a dense and functional urban form in connection with the public transport system. New urban constructions should mainly be erected within existing building zones. In many ways this urban form breaks with the urban structure that has been common in urban planning since the introduction of the private car which resulted in extensive network of roads, sprawling land use with shared functions.

We have to transform existing cities into more sustainable structures where cities should grow without increasing urban sprawl, achieving higher density without reducing the qualities of green structures, existing cultural environment and the qualities of the urban fabric, its morphology and typology.

In a sustainable city we cannot go on travelling in the same way. This is easy to state but difficult to achieve, since the ability to move around is an integral part of peoples` lives and modern society and the need and demand to travel will not diminish. From a long term perspective it is important to acknowledge that urban planning has an influence on creating or reducing the demand for transportation. (Holden et al. 2009). Transport in the cities should no longer be based on car travel. The structure should be transformed in order to integrate environmental-friendly transport in a better way with working places, services and residential areas located so that walking, cycling and public transport seem natural (Vibe et al. 2005).

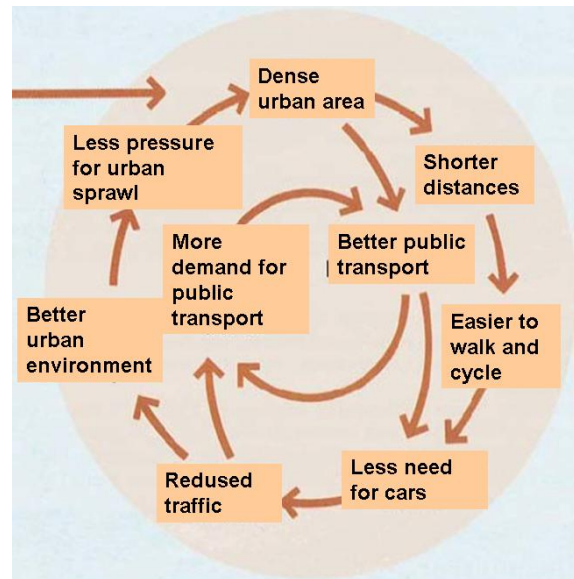


Figure 1: Relationship between land use and transportation ((Kittang 2010) based on Ministry of the Environment 2000)

Contradictions and interferences

These are important targets for a sustainable urban planning program, but in reality we find many contradictions between different goals. There is a strong relation between different parameters, and when we deal with one, it influences the others. For example will introducing parking restrictions influence the possibility to have a car at its disposal and reduce the possibility to choose the private car as a mode of transport. But such restrictions will also influence choices of where to live and influence the distribution of the population within the different areas of the city (Eiksund and Relling 2009).

Developing a compact city is also an indisputable way of reducing the distances between working places, urban service and residential areas. Compact cities can promote walking and cycling and improve the traffic basis for public transport. But it will probably also prevent families with children from moving there. They often prefer to live in less density urban areas.

A sustainable city with a diverse social, cultural and commercial urban content, should gather the urban service that are used by the broad public and that provide many working places in the city centre, thus they can be easily served by public transport. On the other hand we also wish a broad offer of different commercial, social and cultural activities in local communities. These will however compete with the city centre.

Some of these relations are illustrated in the figure below and are studied in a research project at Brøset, Trondheim

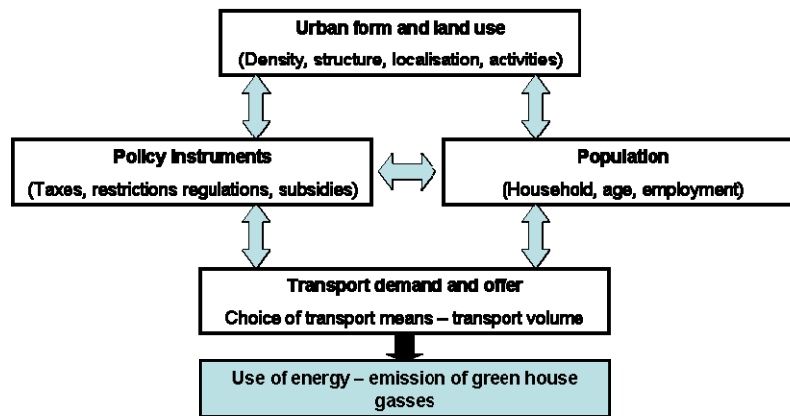


Figure 2: Relations between different parameters of urban development.(Kittang 2009)

“Brøset – Towards a carbon neutral settlement in Trondheim”.

The local authorities of Trondheim, together with The Norwegian University of Science and Technology, NTNU - Faculty of Architecture and Fine Art and the research company SINTEF are carrying out the research project “*Brøset – Towards a Carbon Neutral settlement in Trondheim*”. A part of this project examines how planning and urban design can contribute to reduce the environmental impact from transportation. A common strategy is to improve public transport, to restrict the use of private cars and to improve the conditions for and encourage the use of non-motorized transport.

Brøset is a 35 hectare site located 3 kilometres outside the centre of Trondheim. Despite this moderate distance to the centre, the area is characterised by a suburban nature. Brøset has been chosen by the Trondheim local authorities as a location for a new neighbourhood that combines low energy demand with a socially sustainable living environment. Sustainability is defined in a holistic way, including low energy demand and healthy materials as well as social and economic issues.

Brøset will have approximately 1200 housing units (3 – 5 per decare) which is rather dense compared to the neighbouring areas (Trondheim kommune 2009). Designing a settlement that enables people to lower their carbon-footprint is not only a matter of technology, material and energy use, but includes as well lifestyle, housing patterns and transportation. One of the goals for development of the Brøset area is to make it easy and obvious for the residents to choose other modes of transportation than the private car. The urban development of Brøset will be a case study on how urban form might influence people’s choice of mode of transport.



Figure 3: The Brøset area

The ambitious objective for the research project is to develop Brøset as a future-oriented and carbon neutral neighbourhood. One of the main target areas is transport and land use, and how urban planning and urban form can contribute to a reduction of environmental impact from transport. In Trondheim transport stands for more than 40 % of all green house gas emissions in the city (Trondheim kommune 2009). A reduction of emission from transport is therefore an important task in this project. We need more understanding and knowledge about the populations' way of travelling connected to offers of transportation and urban form. What actions should be taken regarding the development pattern on the level of neighbourhoods and townships to reduce the demand for transport in urban areas and transfer more traffic to walking, cycling and public transport and other possible environmental friendly ways of travelling?

Aspects of the built environment that previous research has found to influence travel behaviour, include distance, destinations, residential density, accessibility, street grid layout, connectivity of walk and cycle paths, land-use mix, block sizes and proportions of building (Engebretsen 2003; Scheurer 2001; Thomsen and Manum 2009).

Land use and density.

We also want to examine the connection between urban form and household characteristics and what transport demand this generates. The findings will indicate which policies we should apply to achieve the goal of reducing motorised transport. High density in urban areas results in short distances for daily tours and can reduce the need for motorised transport. High density increases the possibility for walking and cycling. Dense cities provide also a better basis for public transport with increased frequency. On the other hand we know that compact cities are not very popular among families with young children who have a tendency to move to less dense areas. Even if empirical data confirms the connection between urban structure and transport, this example indicates that transport choices are complex decision making processes, and there are also other aspects than urban form that are important to consider

The Trondheim local authority has conducted a study on the connection between housing structure, typologies and population development, especially the distribution of households with children (Eiksund and Relling 2009). This study shows that the population distributes on different types of houses. Families with children from 1 - 5 years live mainly in semidetached houses. Characteristic for this housing type is the connection to the garden plus the size of the house. Detached and semi detached houses have also more space and more rooms than housing blocks. These are important aspects for families with children when choosing a house. With increasing number of floors as for instance in housing blocks, the number of families with small children decreases significantly.

The average size of housing in urban areas has become smaller within the last decades. In the central part of the city we find smaller and more expansive houses. Families with children therefore often move from central parts of cities to suburban districts in order to buy bigger and cheaper houses. This is accompanied by increasing use of the private car.

Population characteristics

While introducing higher density in existing central areas, families with children are moving to suburbia or to surrounding communities where the prices are lower, while elderly people and young people without families stay in central parts (Eiksund and Relling 2009). This has great consequences for the demographic development of those central areas, the transport system and also for provided infrastructure. For instance schools in the central areas of the town lack pupils, while schools in suburban areas do not have sufficient capacity.

This pattern of segregation also influences transport offer since families with children are more prone to travel by car. When they move away from the city centre, the use of car will be even more important,

while elderly people and young people are not so depending on using private cars. This indicates a connection between urban form and travelling behaviour but also that phase in life and family situation is important (Meland 2006; Vibe et al. 2005).

The challenges for urban planning and for developing concepts for the new neighbourhood at Brøset are obvious. Should we choose a development concept that might not be attractive to families with children, but only for elderly people, households without children and young people? Half of the households in Trondheim consist of 1 – 2 persons. The segregation of the population has also dramatic consequences for the city life.

Strengthen public transport

We believe that one of the biggest challenges in developing this carbon-neutral neighbourhood is to improve the public transport network. In some part of the town there is already a sufficient offer of public transport and most of the bus lines from different parts of the city are passing through a so called “public transport-bow” (see picture below), which aims at serving the most important living and working areas. The development of Brøset is not connected to this bow and will thus not have a good connection to public transport. This will cause problems in convincing people to use public transport instead of the private car, if the situation is not improved significantly.

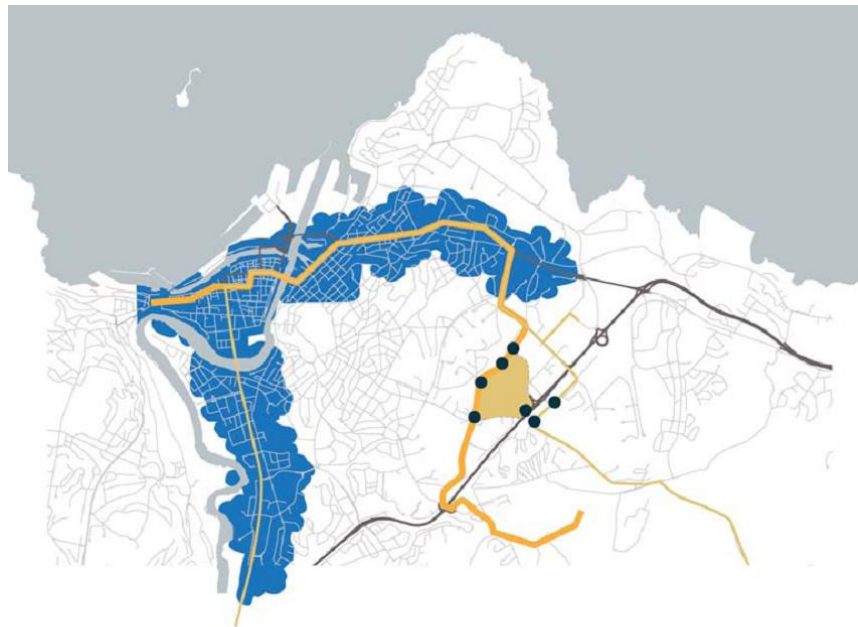


Figure 4: The “bow of public transport” (blue) and the location of Brøset (yellow)(Trondheim kommune 2009)

Can parking restrictions influence transport choices?

In the city centre of Trondheim more than 43 % of all tours were done by foot according to a study of travelling behaviours made in 2001(Tretvik 2001). In the less dense area outside the centre where this new developing area is located, only 15% of the tours were walking tours. The percentage of car travel in

the city centre was according to same survey 18 %, while 53 % of the tours in the Brøset area were car trips

It is important to recognise that parking restrictions in the city centre make it expensive and difficult to have a private car. This is probably an important aspect influencing the choice of means of transport.

If we would introduce parking restrictions and determining that very few of the inhabitants in this new residential area have the opportunity to own a car, we can risk that families who are depending on their private car for driving children to kindergarten, to sports and other leisure activities will move to other parts of the town or the region where use of private cars is more accepted and adapted (Meland 2006; Vibe et al. 2005).

This implies also that Brøset must provide the necessary infrastructure, such as kindergarten and school, which make the parents less dependent on driving their children. Land-use mix and local services are important to be available within a short distance. This will give the residents the opportunity to choose different modes of transport, even if they are families with young children. We have to find ways to influence travel behaviour, and in this context the wish for comfort should not be underestimated. Therefore it is important to keep in mind that cycling, walking, and public transport should be perceived as comfortable alternatives to car use.

Reflections

In many cities in Europe local authorities try to develop a “green neighbourhood” as an environmental show case, inspiring other cities how to handle the environmental challenges. This is also the case in Trondheim. But from our point of view, the task of developing a carbon neutral settlement in an undeveloped suburban area and with a weak connection to the public transport net raises a lot of questions:

- How can a satisfactory basis for public transport be established at Brøset without constructing a very dense and compact community?
- How can we make the city more compact without causing that families with children will move to other communities?
- How can we change travel habits from private cars to cycling, walking and public transport without introducing heavy restrictions on parking that makes this neighbourhood less attractive for real estate developers?
- How can we develop a diverse city without making an unfortunate competition with other local communities?

If the municipality of Trondheim wants to develop Brøset as a show case for sustainable urban development, it will be necessary to make some radical political choices:

- Parking restrictions cannot be limited to Brøset. Brøset must just be a starting point to consider parking policies also for other central and residential areas. Strong parking restrictions need to be implemented all over the town, in relation to supermarkets, in residential areas and at public areas. This will establish basis for an improved public transport network all over the town and will be a positive outcome for the city's development on a general level.



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- Parking restrictions and restrictions on car ownership must be compensated with a frequent and fast public transport, a good net of cycling roads, car pools etc.
- The land use and the typology in the neighbourhood must be attractive with a balanced mix of high-rise buildings and areas with lower buildings and semi-detached houses.
- It must be a diverse community with a good offer of private and public service to reduce the demand for transport.

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