

# Mega transport project financing in Sweden and Denmark – does financing outside the normal channels have sustainability implications?

Authors: Fredrik Pettersson\*, Ida Sundberg and Dr. Jamil Khan

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\* Corresponding author. PhD Student at the Faculty of Engineering, Environmental and Energy systems studies at Lund University, Sweden. Contact: fredrik.pettersson@miljo.lth.se, phone nr +46462228641 or +46737156358

## Introduction

Since the early 1990s several high profile mega transport projects have been constructed in Sweden and Denmark. Today the importance of new investments in transport infrastructure continues to be a very central concern, and many of the projects currently being debated are certainly gigantic in terms of costs as well as impacts on the transport system. The main justifications for investments in new projects may be very different, but altogether it can be asserted that the demand for new investments in infrastructure greatly exceeds the available means allotted through the national state budgets, and thus the question of alternative financing models remains a very important one.

Given the gigantic costs associated with many of the projects constructed since the 1990s, a crucial factor enabling the implementation of these projects has been financing models allowing for the raising of the necessary capital without having to go through the normal channels of direct budget capital. Several different models have been tried including the following: projects based on user fees financed by state guaranteed loans; projects financed by long term state guaranteed loans to the national road and rail administrations; co-financing agreements between local/regional public actors and the state; one Public Private Partnership (PPP) project and one project financed by land sales. While the financial set up for these large scale projects most often are discussed exclusively in terms of economic performance, this paper will broaden the scope and explore the idea that the financial model also can have implications related to the quest for a more sustainable transport sector. An underlying assumption here is that projects of this magnitude are powerful agents of change with significant potential to influence the development of the transport sector. The scope of the research presented here is limited to include three of the models described above; user fee financing by state guaranteed loans, a Build Operate Transfer style PPP and financing through land sales.

Building on three case studies of implemented projects in Denmark and Sweden, the research presented in the paper aims at exploring the role of the financing in terms of implications for the process of achieving a more sustainable transport sector. The aim is to identify aspects in the financial agreements concerning these projects that can be conceptualised as having an impact on the sustainability of the transport sector, in positive as well as in negative terms.

## Research approach

The intention with the research presented in this paper is to discuss the connection between certain features of the financing models of a number of projects and different dimensions of

sustainability associated with the general transport system. As such we attempt to identify and explain how the financing models of the projects under study impact the transport system and urban and regional development in certain ways and how this can be understood in terms of sustainability impacts.

The analysis mainly relies on data generated from three case studies carried out by the authors' in Sweden and Denmark. The case studies, The Oresund Link, The Arlanda Air Rail Link and The Metro all provide different examples of financing outside the normal means allocated for infrastructure investments in Sweden and Denmark. The majority of data consists of secondary data obtained from documents and previous research; to a lesser extent primary data from interviews are also used.

The point of departure for the research presented in this paper is the question posed in the title; does financing outside the normal channels have sustainability implications? This question also implies a sub question relating to the nature of these implications. Finally in some instances we also briefly discuss the possibilities to remedy the identified sustainability challenges.

## **Definition of concepts**

The concept alternative financing model is in need of some elaboration to provide a clear definition and a historical and political context. For this end the historical and political background of alternative financing in Sweden will be drawn upon. It should however be noted that two of the projects under study are partially (the Oresund Link) and entirely (the Metro) embedded in a Danish context. This might implicate that from a Danish perspective there might be certain deviations from, or additions to what is described below. None the less we regard the Swedish background as sufficient to provide the most important points.

Traditionally infrastructure investments in Sweden have been treated as investments financed by the state.<sup>1</sup> This means that investments are paid for right away using state revenue allocated through the budgets of the national road and rail administrations. (RR 2000) In the late 1980s a number contextual factors and political decisions did however pave way for alternative financing of road and railway project. One important factor behind these decisions were an increasing emphasis on mobility based on economic considerations, for instance increasing importance awarded to freight transport as well as increasing individual mobility for greater access to job opportunities. Another important political decision was the EU membership application implying that that the physical connections to the European mainland were awarded great importance. On the whole, the role of transport infrastructure as a promoter of economic growth became a dominant feature on the political agenda during the 1990s. By some politicians the 1990s was even heralded as "the decade of infrastructure". (Tonell 2000) The increasing focus on the transport system was reflected in large increases in infrastructure investments allocated through the state budget, especially during the grave economic recession in the early 1990s. (RR 2000)

Despite these large increases in investments the government established that the demand for new roads, railways and public transport widely exceeded the available funds. Already in 1988 the government established that it was important to try new ways of funding infrastructure projects in order to allow for an earlier implementation of urgently needed

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<sup>1</sup> Sections of the railway network built and owned by private interest during the 19th century are exceptions.

roads. (RR 2000) This resulted in the Parliament approving the possibility for municipalities and private enterprises to fund investments via advances to the Swedish Road Administration (SRA). In a string of decisions between 1989 and 1991 the SRA was awarded the right to lend money through the National Debt Office and act as surety for co-owned companies. The possibility to partly or entirely fund investments by user fees was also introduced. Additionally further possibilities for alternative funding were provided by a Parliament decision in 1991 allowing additional funding (outside the allocated budget grants) to co-financed infrastructure projects.

Eventually all these new possibilities were tried and the case studies (described below) all provide different examples of this. It has been argued (RR 2000) that one consequence of this is the existence of two parallel planning processes for infrastructure. For the planning period 1998 – 2007 the state budget grants allocated for infrastructure through the budgets of the road and rail administrations' amounted to SEK 190 billion, while another SEK 50 billion worth of investments carried out with alternative financing models were not included in the funding framework.

Apart from making use of funds made available through other channels than the state budget another common denominator for several of the financing models mentioned above is that the full cost for the investment is spread out over a number of years. Another characteristic in common for the projects under study is that they in their national contexts imply varying degrees of institutional invention.

As such our definition of the concept alternative financing model is - an infrastructure financing model implying an institutional invention in that parts of the (or the entire) investment is financed with funds made available outside the normal state budget channels while still implying a long term financial commitment (of varying degree) by the state.

What is implied by the concept of sustainability in terms of a sustainable transport system is also in need of some reflection. Sustainability is a problematic concept since it lacks a clear definition (see for instance Gunder 2006 and Low & Gleeson 2006). But although the meaning of the concept of sustainability is often far from lucid it is at least clear that a number of current trends related to the transport sector are viewed as undesirable and problematic from several perspectives. Environmental effects of fossil fuel combustion, energy security, congestion, accidents, health effects, landscape segmentation, and unequal access to transport are some examples of issues that both on an individual basis as well as considered as a whole, exemplify the complexity of the challenges facing the current transport system. In turn these challenges can to varying degrees be conceptualised and understood in terms of their ecological, social and economic dimensions. Given this complexity a full analysis accounting for all the possible impacts that could be included in the concept of sustainability is beyond the scope of this paper. The main interest in this paper regards aspects that can be conceptualised as concerning environmental and economic dimensions of sustainability. As such we try to explore the nexus between the infrastructure financing models under study and general performance of the projects, both in light of project specific goals as well as nationally established goals (e.g. the Swedish environmental quality goals, which on a national level are used as a sustainability indicator).

## The projects

This section includes a brief presentation of the individual projects and the main features of their financing models.

### The Oresund Link

The Oresund Link is a road and railway project linking Malmö, the third largest city in Sweden to Copenhagen, the capital of Denmark. Additionally the Link provides Copenhagen international airport, situated halfway between the two cities, with efficient road and rail connections. Construction commenced in 1995 and the coast-to-coast section was opened for traffic in July 2000. Altogether the project is estimated to have cost around DKK 30 billion (price level of the year 2000). The project includes a 16 km coast-to-coast section consisting of a bridge, an artificial island and a tunnel. Additionally, upgrades and connections of the existing road and rail infrastructure in Copenhagen and Malmö respectively constituted a major part of the project. Roughly two thirds of costs are can be allocated to the coast-to-coast section and one third to connecting infrastructure. (OC 2008a)

From a Swedish perspective the Oresund Link was one of the first infrastructure projects to be financed outside the state budget. The agreement between the two governments from 1991 stipulated that the construction of the link and the connecting infrastructure should not burden the state budgets of the two countries. The financing model agreed upon was a user fee charge model where up front costs would be met by loans on the national and international credit markets. Ownership of the project is shared equally between the two states through the Oresund Consortium. The loans for the coast-to-coast section of the link are the responsibility of the Oresund Consortium and the two states are acting as guarantors through their main financial institutions (the Swedish National Debt Office and Denmark's National Bank). The construction of the connecting land infrastructure on the Swedish side was financed by loans taken by SVEDAB directly from the Swedish National Debt Office. On the Danish side loans for the connecting land infrastructure were taken by A/S Öresundsförbindelsen. (OC 2008b)

A central element of the financing model is that the loans taken by SVEDAB and A/S Öresundsförbindelsen for the connecting infrastructure will be repaid with the revenues the Oresund Consortium extracts from the road and rail traffic once the loans for the coast-to-coast section of the link has been repaid. Given the high initial financial costs in the form of interest rates this model entails it is expected that the first payments to the owner companies will be made in 2018. SVEDAB's only source of income until this stage is reached is a standard fee paid by the Swedish National Rail Administration for usage of the railroad on the link. SVEDAB will thus continue to finance operations by lending money and it is expected that the loan will peak at some SEK 8 billion before the surplus from the Oresund Consortium will be available to pay of the debt. (OC 2008b & SVEDAB 2010)

Meanwhile the running costs for the owner companies are financed through loans and capital infusion from the national road and railway administrations of respective country. The costs for maintenance of the connecting road and railway infrastructure is for instance carried out by the national road and railway administrations and paid for by state budget grants. (RR 2000)

## The Arlanda Rail Link

The Arlanda Rail Link project connects Stockholm central station to Arlanda Airport. It also connects to the existing railway network north of the airport. The Arlanda rail link was the first infrastructure PPP in Sweden. The chosen model implies that some sections of the project were delivered as a Build-Operate-Transfer (BOT) project while some sections were entirely financed by public capital. Construction commenced in 1995 and the rail link opened for traffic in November 1999.

The publicly financed sections of the project includes an upgrading of two to four tracks on a section between the Stockholm central station and the airport; a new section of railway connecting the airport to the trunk line north of the airport; a new underground station at the airport; upgrading of the tracks and platforms at Stockholm central station. The sections financed by private capital, which essentially can be characterised as providing a shuttle service to the airport includes: a new section of railway connecting to the trunk line south of the airport; two new underground stations at the airport and rolling stock for the shuttle service. Due to some sections of the project being financed privately it is not entirely clear how much the total cost amounted to, but a rough estimate amounts to some SEK 6 billion. (Nilsson et al. 2008) It is estimated that private capital has financed about 40 % of total investment costs. (VTI 2004)

The BOT arrangement meant that a private consortium called the Arlanda Link Consortium (in the operations phase called A-Train) consisting of a group of Swedish and British companies implemented and funded the construction of the sections mentioned above. When the project was completed, all the stationary inventories were handed over to the state, through its company A-banan Project AB. In exchange A-train was given monopoly on using the railway for 45 years. The agreement guarantees A-train all the incomes from the shuttle-passengers. In addition, A-train has the right to charge other train companies for using the section of Arlanda rail link constructed with private capital. Today this essentially means that the Arlanda rail link is owned by the Swedish state but that a private actor has monopoly on operating the railway. (Wiven-Nilsson 1995); (RiR 2004)

## The Metro

The Metro is a driverless urban railway system in Copenhagen. The first three stages of the system are now completed including the construction of more than 22 kilometres of new railway track, about half of which in tunnels. Future plans include the construction of two more lines expected to be commence around 2015. Construction commenced in 1994 and the first section of the Metro, providing a new connection between the Copenhagen city centre and Örestad, opened in 2002. Örestad is a major development area on the island Amager situated between the Copenhagen international airport and the city. Total cost for the first section of the Metro is estimated to DKK 6, 7 billion. (Vuk 2005)

The Metro project and the development plans for Örestad are closely intertwined. The development programme for Örestad concerns 310 hectares in a previously undeveloped 600 m wide and 5 kilometre long corridor stretching south from the edge of the city halfway across the island of Amager. Örestad is one of the biggest development projects in Danish history, and it is expected that development will continue for several decades. The 1991 agreement to build the fixed link between Copenhagen and Malmoe led to increased interest for developing the western areas of Amager. In 1992 the parliament passed the Örestad act

which established the principles for the development of the area, which in essence meant that the development of Örestad and the Metro system were merged by way of proposing a financing model implying that the Metro would be financed by income generated from land sales in the development area. This model meant that the Örestad Development Corporation (ÖDC), a public company owned by the Danish State and the City of Copenhagen, raised loans to finance the building of the Metro which will be repaid by income generated from land sales in Örestad and ticket revenue on the Metro. (Khan et al 2008)

According to Majoor & Jörgensen (2006: 187) the rationale underpinning the financing model for the Metro "... was the use of profits from publicly controlled land speculation to be (pre-) invested in a 'common' good, namely the ... metro". Thus the financing model can be characterised as a form of endowment funding. (Enoch et al 2005). This meant that the idea was to capture land value increases in the development area, (partly following from the increased accessibility brought about by the construction of the Metro) and use these to finance a new public transport system that eventually would benefit large parts of the city. Moreover, this would be possible without burdening the state budget which was important in light of political considerations and the general economic situation at the time of decision. (Majoor & Jörgensen 2006)

## **Analysis**

For the Oresund Link the most important aspect of the financing model with connections to sustainability is the link between generated income and traffic volumes. There are two dimensions to this connection, the first is that car traffic using the coast-to-coast section generates the majority of income, the second aspect is that train traffic pays a flat fee for crossing the Link. In terms of sustainability impacts we argue that these connections are both negative and positive.

In general, what we view as the most problematic aspect of this set up is the heavy dependence on income generated from road traffic. In 2007 two thirds of total income was generated from road traffic. (OC 2008a) The dependence on income from road traffic is a result of the financing model agreed upon by the two states. This agreement stated that in order to ensure rational and appropriate railway traffic the national railway administrations in each country would pay a flat annual fee (amounting to SEK 300 million per year in the price level of 1991) for using the Link. The rates for road traffic on the other hand were left to the Oresund Consortium to establish. It was however stipulated that the rate for crossing the Oresund by ferry between Elsinore and Helsingborg (in the northern part of the straight) should be used as one point of departure for the rates on the Oresund Link. (Swedish Government 1991)

In essence the financing model can be viewed as an attempt to subsidise rail traffic with income generated from road traffic. This means that the financial strength of the project rests on the premise that substantial increases in traffic volumes are necessary in the near future in order to meet the long term liabilities towards banks and financial institutions providing the capital for the Oresund Link as well for the connecting infrastructure project in Denmark and Sweden. During the first years of operation the project traffic volumes were below the estimates and therefore the economic viability of the project was also questioned (see for instance Lyck 2002). The development during the latter half of the first decade of operations

has however been successful in terms of growth in traffic volumes and the current volumes are above estimates made before the opening for traffic. Despite this development it should be noticed that income generation has not increased as much as the increase in traffic volumes would imply. This is a result of an actual lowering of the income generated per car by way of introducing a differentiated pricing scheme in order to incite car commuting across the Link. (OC 2005)

The main sustainability implication of this financing model is in our view that the fulfilment of the financial obligations are premised on an increase of traffic volumes from the 19 400 vehicles per day (AADT) in 2008 to around 40 000 vehicles per day in 2025. (OC 2008a) We regard this as a clear example of a development that is problematic in view of other national and regional commitments towards goals related to environmental sustainability, most notably regarding goals of a reduction of CO<sub>2</sub> emissions but also regarding other transport related emissions such as NO<sub>x</sub>. If discussing the issue as a matter of traffic volumes on the coast-to-coast section only, it is not very likely that increasing emissions from a 100 % increase of traffic volumes during the next 15 years can be off-set by technological development such as energy efficiency improvements or wide spread changes of energy carrier. In a wider perspective it is also important to notice that the financial set up with fares on the coast-to-coast section subsidising the construction of important new sections of the regional road network not subject to user fees implies an impact on regional traffic volumes much larger than the current addition of some 19 400 vehicles crossing the coast-to-coast section of the Link every day.

A from a sustainability perspective more positive aspect of the financing model is related to the financing mechanism entailing that fees from road traffic effectively works as a subsidy of train traffic. According to Lyck (2002) the subsidy can be conceptualised in terms of the railway infrastructure part of the project constituting 65 % of total costs while the income from railway traffic roughly generates a third of the total annual income. It can also be argued that the financial model encourages a system for the pricing of journeys across the Link that constitutes another form of cross-subsidising for public transport. This is due to the fact that fares for this trip are higher than for trips of corresponding length in Denmark and Sweden. Given that the train operators pay a flat rate to the national railway administrations the higher ticket price for this section of the railway network implies an additional income for the train operators. In this sense the extra income generated on traffic across the Link can either be conceptualised as a subsidy to other unprofitable sections of the public transport system, or as a boost to the revenue of the train operators. According to Lyck (2002) it should be viewed as an additional support of the public transport system.

It is also relevant to mention the wider effects on the regional transport system. The completion of the Oresund Link implied the introduction of an entirely new regional train system and the backbone of this new system was the introduction of a new train type adapted to deal with the different technical aspects of the railway systems in the two countries. The new integrated system has added significant capacity to the public transport system (perhaps above all in southern Sweden). During the last 10 years travel by public transport in Scania measured in number of trips has increased by 73 %. The increase in passenger kilometres during the same period is amounting to 120 %, and longer trips by train are an important part of the explanation. (Skånetrafiken 2009) Although there is no clear casual relationship between the general increase in travel by public transport and the financing model of the Oresund Link, it is still clear that the rational of maximum rail usage underpinning the financing deal has acted as an important driver for a regional integration of the train system.

Nonetheless, in our view the reliance on income generated by road traffic on the coast-to-coast section of the link entails that the financial model is associated with a fundamental flaw from a sustainability perspective. The necessity to achieve substantial increases of road traffic volumes in order to fulfil financial obligations sits very uneasy with other regional and national goals related to the environmental dimension of sustainability. Additionally another aspect is the vulnerability of the project to constraints on car traffic brought about for instance by drastically increasing energy prices or from political decisions. In light of recent reports by the IEA there seem to be some indications that a financing model dependent on income from road traffic may be associated with an element of risk given the mounting insecurities regarding energy prices in the next two decades. (IEA 2009) Given the relatively high user fees for road traffic it would probably be the case that drastically increasing energy prices would affect traffic volumes across the Link much more than traffic volumes in general and as such we argue that the financing model also is associated with a sustainability challenge of an economic dimension.

An important question arising from this condition is if actions on behalf of the Oresund Consortium and/or the owners (i.e. the two states<sup>7</sup>) could help to remedy this flaw. These actions could for instance include the introduction of a pricing scheme accounting for certain aspects related to performance from an energy and environmental perspective, e.g. the lowest fares would only be applicable to vehicles classified as eco-cars. If a pricing scheme of this nature was introduced the negative aspects of the Oresund Link's dependency on increasing traffic volumes could perhaps partly be off-set while at the same time the vulnerability to fluctuations on energy prices could be lessened. If successfully achieved such a strategy could turn the project into a forceful driver for a regional transition to a more energy efficient vehicle fleet while at the same time lessen the risk implied by the financing model's reliance on road traffic. More research is clearly needed in this area. Both regarding estimations of to which extent such a mechanism could influence the transition of the regional vehicle fleet, how a common definition of eco cars across the national boundaries could be established, as well as the possibilities to introduce such a scheme from project management perspective.

### The Arlanda Rail Link

What we perceive as the most important connection between the financing model and sustainability in the case of the Arlanda Rail Link is linked to airport emissions and the way the responsible authority is trying to deal with this issue. The background is that the permission to build a third runway at the airport (in operation by 2001) was conditioned by an introduction of an emission cap regarding CO<sub>2</sub> and NO<sub>x</sub> for all airport activities. Additionally the permit also stipulated that a railway connection between Stockholm and the airport should be built. According to the emission cap emissions levels 10 years after opening the third runway are not allowed to exceed the levels of 1990 and this means that the main problem concerns CO<sub>2</sub> (the current levels of NO<sub>x</sub> are well below the limit). A very important aspect of the emission cap is that it also includes transport to and from the airport, which now amounts to more than half of the total CO<sub>2</sub> emissions included under the cap. The majority of remaining emissions are generated by planes landing and taking off. Despite an increase of three million passengers between 1990 and 2007 emissions from airplanes (during the landing and take off cycle) has been reduced by 15 %. During the same period emissions from road transport to and from the airport has increased by 30 %. Altogether this led to the emission cap being exceeded by 3 000 tonnes for the first time in 2007. This development is now threatening a continued expansion of the activities at the airport since the emission cap will be

legally binding by 2011. If the airport exceeds the limits after 2011 the Civil Aviation Administration (who owns and operate the airport) will face legal proceedings for breaking the environmental code. (ARN 2008a; DN 2008; LFV 2008)

The current situation has led the Civil Aviation Administration to establish an action plan for reducing emissions from ground transport. In this action plan the importance of increasing the modal share of public transport is stressed. In order to stay below the allowed limits it is estimated that the modal share for public transport need to increase from 45 % today to somewhere between 60 – 90 % (depending on the development of passengers using the airport). (ARN 2008b) While the opening of the Arlanda Rail Link in 1999 implied a big improvement for the accessibility to the airport by public transport it has so far had little effect on the modal share for public transport to and from the airport. The effect so far seem to have been a slight reduction of the share for taxis and private cars and a somewhat bigger reduction of the share for busses. Train ridership accounts for around 25 % of the modal share, busses for around 20 % and taxis and private cars for almost 55 %. These figures have been rather stable since the opening of Arlanda Rail Link. (RR 2004 & ARN 2008b)

We argue that an important reason for the limited effect on the distribution of modal share is found in the financial and organisational model for the project which grants far reaching rights to A-train as operators on the rail link. One such linkage is the setting of ticket prices which is wholly regulated by the private company. Today the price for a return ticket (from Stockholm central station and back) with the Arlanda express cost more than twice as much as a ticket with a bus operator servicing the same route or the cost for driving to and from the airport. For two passengers a taxi is cheaper and the price of the train ticket is also comparable to parking the car for one week at the airport. (ARN 2008b) The setting of prices is a clear indication that business profitability is dominant at the expense of welfare economic considerations. From a business perspective the strategy chosen by A-train has proved successful, after a slow start revenues have now picked up and the project is turning a profit. (Nilsson et al. 2008) But from a welfare economic perspective, especially given the emission cap for the airport, the price setting is clearly sub-optimal and in our opinion this can be viewed as problematic from a sustainability perspective.

The agreement between the state and the private company also awarded far reaching powers to the private company regarding the usage of tracks and the underground stations at the airport. These rights are used to protect the private company from competition on the route between Stockholm Central station and the airport. One example of this is the right to charge other train operators fees for dropping off and picking up passengers at the airport and for using the section of the tracks constructed with private capital. Another example is the height of the platforms at the stations serviced by the Arlanda express which are lower than normal Swedish standard which implies that only the rolling stock used by the private company can be used on this route. As a result of the financing model there is thus both a contractual and a physical element of the project that protects the private company from competition, which from a welfare economic perspective leads to a distorted pricing level for using the train while it simultaneously creates a barrier for integration of the regional train network. (RR 2004) Additionally, it can also be argued that the BOT style project resulted in a solution with an exclusive focus on passenger transport. In light of the conditions stipulated by the emission cap this is clearly a disadvantage in terms of the possibilities to handle freight at the airport since it means that the integration between air and rail transport is severely restricted. (Cars et al 2009)

In our view this provides a good example of an adverse effect of this financing model from a sustainability perspective. The financing model has led to sub optimal project performance from an environmental perspective in that the expected decrease in ground transport to and from the airport has been absent. Additionally the underused railway capacity on the route and the lack of regional integration also implies an obstacle to a more integrated, effective regional railway system which is an important element needed to ensure a sustainable development of the regional transport system. This effect on regional integration provides a striking contrast to the Oresund Link where the mechanisms of the financing model seem to have promoted regional integration rather than slowing it down.

## The Metro

The connection between the financing model of the Metro and sustainability impacts is in some respects quite clear. The very idea to construct an effective public transport system through a previously undeveloped area for which the ownership of land and development rights are in the hands of a public actor does clearly sound like an ideal situation from a sustainability perspective. Additionally the objectives for the Metro, to reduce car traffic and increase the share of public transport in Copenhagen, while simultaneously act as a driver for urban development in a manner corresponding strongly on the planning ideals of Transit Oriented Development (TOD) sits well within a sustainability planning rhetoric. (Gospodini 2005) According to Vuk (2005) there is also some evidence towards the first two objectives being fulfilled. The introduction of the Metro has changed, and will continue to change travel patterns and habits in the Copenhagen area dramatically. As such it seems pretty clear that the project as such can act as a forceful driver in terms of increasing the sustainability of the transport system.

But the financing model as such does also imply some aspects that can be perceived as questionable in terms of the effects of the overall transport system. Firstly, the intertwining of the construction of the Metro and the development plans for Örestad are not wholly unproblematic. Majoor & Jörgensen (2006) point to the fact that the alignment across a strip of land that will take decades to develop is rather paradoxical given that the area only a few kilometres east is densely populated and characterised by a lack of sufficient public transport access to the inner city. So while future development in the Örestad development corridor will indeed be served by a first class public transport system it is not equally certain to what extent the current population in existing urban areas at Amager will benefit from the project. According to Vuk (2005) the impact on modal changes for traffic between Amager after the construction of the Metro is characterised by a small shift from car to Metro, and a large shift from bus to Metro. In relative terms car traffic (measured as number of persons travelling by car) decreased by approximately 4 % in 2004 relative to 2002, while the corresponding figure for bus traffic was around 40 % as a result of the Metro. Moreover, it can be asserted by the figures presented by Vuk (2005) that the Metro has resulted in an overall increase of trips made by public transport in Copenhagen. There is however not any clear evidence that the travelling habits of the population of Amager has been greatly affected by the Metro. The overall increase in public transport is more likely deriving from trips induced by the development in Örestad accounts for a majority of this increase. Vuk (2005) states that one reason for the big decrease in people travelling by bus in the monitored area was radical alterations to the bus services in order to accommodate for the Metro. This could in fact mean that the opening of the Metro implied decreasing accessibility to public transport in some areas of Amager earlier served by busses. As such we argue that it is not self evident that the introduction of the Metro should be viewed as a wholly beneficial from a sustainability

perspective. The role played by the financing model in this respect is that while it clearly managed to deliver a much needed addition to the public transport system it is not totally clear that the solution and alignment provided was optimal in terms of actual transportation needs.

Apart from the concerns voiced above it should also be noticed that the endowment funding based on land sales, and thus in the extension speculation on the property market, is associated with rather serious financial risks. In the early stages of the project land sales were slow, especially concerning expensive office plots (one explanation for this was competition related to development activity in other parts of the city, most notably the regeneration of an old port area closer to the inner city). (Majoor & Jörgensen 2006) The slow start for land sales in addition to a two year delay and massive cost overruns for the Metro implied that the financial backbone of the whole project was in jeopardy. A consequence of the slow start for development was also that ticket revenue was well below expectations (the estimated levels of ridership were substantially higher than the outcome). At this point the Danish state did however step in and decided to relocate some important public functions to the northern part of the area (e.g. parts of the university and the Danish state broadcasting corporation). The development on the Copenhagen housing market during the first half of the last decade did also help to improve the situation. Drastically increasing housing prices in the Copenhagen area until 2006 made housing development an interesting business option and as a result the plans for the area were altered in order to allow for more housing (resulting in a more mixed use development which incidentally also could strengthen the sustainable profile of the project). The sale of land for housing development has however not been as profitable as sales of office plots would have been. Additionally prices on the Copenhagen housing market peaked in 2006 and have since decreased by approximately 35 %. (CAB 2009) As such it can be argued that development in Örestad fuelled an unsound speculative housing market resulting in an over supply of a certain type of housing (exclusive and expensive apartments) and eventually in a rather drastic price collapse for the entire housing market in Copenhagen. This will also have consequences for future development in Örestad since housing development probably has lost some attractiveness from a profitability perspective.

## **Results and discussion**

The analysis has shown that there are mechanisms in the three financing models under study that have implications for the transition to a more sustainable transport system. The financing models imply a strong focus on profitability (from user fees and land sales) in all three cases and one consequence of this may be that project specific goals collide with, or make other politically established goals for the transport sector harder to fulfil. In the case of the Oresund Link and the Arlanda Rail Link this is for instance exemplified by the mechanisms of the financing models implying that the projects may make it harder to achieve established goals regarding CO<sub>2</sub> emissions. In the case of the Metro it is rather clear that it will add much needed capacity to Copenhagen's public transport system on a regional level. On the other hand it is not obvious that the intertwining of the Örestad development plans and the Metro in a joint financing model has resulted in an optimal solution in terms of existing transportation needs on the island of Amager.

There are also interesting differences regarding the financing models in terms of the projects individual contributions towards regional integration of the transport system. The mechanisms of the financing models of the Oresund Link and the Metro seem to fit well with efforts aimed at increasing regional integration. One point in case is the flat rate for train traffic on the Oresund Link which implies an important form of cross-subsidising for public transport. It is

also interesting to notice that the railway of the Oresund Link and the Metro system today work as an integrated system with transfer possibilities at two stations (Copenhagen International Airport and Örestad). This provides quite a striking contrast to the Arlanda Rail Link where the financing model has resulted in some solutions that by way of physical as well as contractual obstacles hold back a regional integration of the transport system.

Finally, in all three cases the alternative financing models have provided headroom for investments in times of restricted means (politically and/or economically). For the projects under study the alternative financing models has provided a way of implementing the projects despite strained budgets or as a way of breaking political deadlocks. But the analysis also show that there may be some problems with harmonising the long term goals of an infrastructure project based on business rationality with a transport system largely premised on welfare economic considerations. In the case of the Metro it is also worth pondering on the role the financing model has played in a wider economic perspective. One interesting question in need of more research is for instance if, and if so how, and to what extent the Metro and the Örestad development plans has contributed to the development of an unsound housing market in Copenhagen? That an infrastructure financing model may have implications of this kind implies a need to increase the understanding of the complex interactions between these megaprojects, the overall transport system as well as society at large.

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