Swedish infrastructure policy and planning
Conditions for sustainability

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Miljö- och Energisystem

AKADEMISK AVHANDLING
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Abstract
Sustainability has been on the agenda for decades. Yet it is not evident that the development we are witnessing can qualify as sustainable. Departing from an understanding of the adoption of sustainability as an ongoing, unfinished process the thesis explores conditions for sustainability in Swedish transport infrastructure policy and planning. The study covers decision processes of three mega-projects (the Öresund Link, the Southern Link and the Arlanda Rail Link), one regional infrastructure plan and a historical view on infrastructure policy and planning from the 1950s. The study is based on 43 qualitative interviews with people involved in infrastructure policy and planning, and official documents such as infrastructure plans and transport policy bills.

Based on a theoretical understanding of the linkage between infrastructure and sustainable mobility the concepts avoid, shift and improve are used to interpret the conditions for sustainability in policy and planning. The research is presented in three empirical themes: Theme I explains linkages between changes in transport infrastructure, policy, and planning practices through a transition theory perspective. This part of the study highlights how sustainability has been introduced in policy and planning in parallel to other objectives. It shows that despite demand reduction being stated as the key principle of infrastructure planning both road and rail investments keep increasing, and despite climate objectives being awarded high priority investments in transport infrastructure are not expected to lead to emission reductions. Theme II explores in more detail how conflicts between different objectives were managed in a regional planning process. Transferring road transport to rail is framed as the solution to conflicts between environmental objectives and increasing mobility, but funding restrictions limits the viability of this option. Theme III shows how the introduction of user fee funding models increases the complexity of the governance context. In the case of the Arlanda Link the funding model limited the possibilities of contributing to a shift to rail. In the case of the Öresund Link the funding model has played some part in contributing to a shift to rail, but since project economy relies on road transport revenue there is also a desire to increase road transport volumes.

It is concluded that there is a strong normative commitment to sustainability in policy and planning objectives, but with a limited practical impact; time based accessibility is a dominant perspective; and that shift strategies are caught in a permanent funding shortage.

Key words
Transport infrastructure, sustainability, policy, planning
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Conditions for sustainability

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My family and friends. Your support and encouragement was worth more than I can express on paper

To Josefin, Molly and Felicia
Abstract

Sustainability has been on the agenda for decades. Yet it is not evident that the development we are witnessing can qualify as sustainable. Departing from an understanding of the adoption of sustainability as an on-going, unfinished process the thesis explores conditions for sustainability in Swedish transport infrastructure policy and planning. The study covers decision processes of three mega-projects (the Öresund Link, the Southern Link and the Arlanda Rail Link), one regional infrastructure plan and a historical view on infrastructure policy and planning from the 1950s. The study is based on 43 qualitative interviews with people involved in infrastructure policy and planning, and official documents such as infrastructure plans and transport policy bills.

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Theme II explores in more detail how conflicts between different objectives were managed in a regional planning process. Transferring road transport to rail is framed as the solution to conflicts between environmental objectives and increasing mobility, but funding restrictions limits the viability of this option.

Theme III shows how the introduction of user fee funding models increases the complexity of the governance context. In the case of the Arlanda Link the funding model limited the possibilities of contributing to a shift to rail. In the case of the Öresund Link the funding model has played some part in contributing to a shift to rail, but since project economy relies on road transport revenue there is also a desire to increase road transport volumes.

It is concluded that there is a strong normative commitment to sustainability in policy and planning objectives, but with a limited practical impact; time based accessibility is
a dominant perspective; and that shift strategies are caught in a permanent funding shortage.
Populärvetenskaplig sammanfattning


Men vad innebär då hållbarhet när det gäller utvecklingen av transportsystemets infrastruktur och vad menas med förutsättningarna för hållbarhet i policy och planering? Hållbar utveckling är ett omtvistat ideal, inte minst när det gäller hur det ska förstås i förhållande till utvecklingen av transportsystemet. Den komplexa och mångdimensionella problembild som definierar det ohållbara transportsystemet
innebär också att det inte finns någon universallösning på problema. Men man kan säga att det i stora drag finns ett samförstånd kring problembilden.


Enligt den litteratur som används som teoretisk utgångspunkt i avhandlingen så finns det en ganska tydlig bild av att hållbar utveckling som ideal (eller mål) i infrastrukturpolicyn och planering bör utgå från att minska behovet av transporter; använda existerande infrastruktur så effektivt som möjligt; verka för att flytta över transporter till mindre energi- och resurskrävande transportslag; tillgodose behov av förflyttning på ett resursnåligt och rättvist sätt (mellan olika sociala grupper oavsett ålder, kön, fysiska och ekonomiska förutsättningar samt mellan nuvarande och framtida generationer).

Sammantaget innebär detta att en omställning till ett hållbart transportsystem nödvändiggör ett förändrat fokus för planeringen och ett annat förhållningssätt till hur vi tänker kring transportsystemets utveckling. Hur och på vilka grunder vi väljer och prioriterar infrastrukturinvesteringar är en viktig faktor och en nödvändig förändring är att fokus behöver flytta från bilism och vägtransporter till gång-, cykel- och kollektivtrafiksobiemen. Detta innebär en stor utmaning då de institutioner och aktörer som dominerar transportsystemets planerings- och beslutsprocesser under en lång tid präglats av ett synsätt där ökande mobilitet i allmänhet, och ökande biltrafik i synnerhet, setts som ett mål i sig. Att ”frigöra rörligheten” genom infrastruktur som medger mer och snabbare transporter har kommit att bli synonymt med ökande välfärd och ekonomisk tillväxt.

I avhandlingen studeras frågan om förutsättningarna för hållbarhet i infrastrukturpolicy och planering genom tre fallstudier av beslutsprocesser för stora
infrastrukturinvesteringar (Öresundsbron, Södra Länken och Arlandabanan); en regional infrastrukturplaneringsprocess i Skåne; samt en studie av infrastrukturpolicy och planering med ett historiskt perspektiv. Studierna är utförda genom intervjuer med beslutsfattare och analyser av policy och planeringsdokument. Genom detta angreppssätt belyses frågeställningen ur flera perspektiv som presenteras som tre teman i avhandlingen. Det första temat ger en bild av hur samspelet mellan institutionella faktorer, generella samhällstendenser och utvecklingen av transportsystemets infrastruktur skapat vissa förutsättningar för hur hållbarhetsagendan i svensk infrastrukturpolicy och planering utvecklats. Det andra temat belyser hur konflikter mellan olika mål hanteras i en regional infrastrukturplaneringsprocess. I avhandlingens tredje tema undersöks hur effekterna av de marknadsorienterade finansieringslösningar som använts i Öresundsbron och Arlandabanan kan förstås ur ett hållbarhetsperspektiv.


Hållbarhet har kommit att definieras på ett sätt som premierar lösningen av lokala, samtida problem på ett sätt som skjuter andra problem på framtiden. De stora, systemgenomgripande förändringarna som finns implicit i begreppet hållbar utveckling kan ännu inte skönjas i någon större utsträckning.
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1. Introduction

“We’re generally critical of highways… we regard them as bad... If we look at Stockholm, it’s said that that emissions of greenhouse gases are to be reduced drastically by 2030. But at the same time the current plans will… lead to an 80% increase in road traffic by 2030. This doesn’t make sense to us, and not to anyone else either. It’s very simple maths – this is not sustainable!”
(Interviewee 25, politician Stockholm)\(^1\)

“The whole idea of the construction of the Southern Link [tunnel] was to do with sustainable development. It was to relieve the southern part of inner Stockholm from all the traffic… that previously ran… straight through… They wanted to force it out and take it underground. Which of course led to exactly what was intended, namely that traffic volumes and consequently particle emissions and other [emissions] have been reduced on the main streets [of the inner city]. That was the whole idea of the Southern Link, the same as that of [other highway tunnel projects in the Stockholm region]”.
(Interviewee 24, politician Stockholm)

Investments in infrastructure are controversial and typically generate intense debate. High costs, far-reaching consequences, and differing views on what kind of problems the investments are supposed to solve are not uncommon. Consequently decision processes fraught with conflict are key characteristics of transport infrastructure policy and planning processes.

\(^1\) For reasons explained in more detail in Chapter 3 all interviewees in the thesis are anonymous. In Chapter 3.3 the data used in the thesis, including the interview study is described, with an overview of the organisation and position of each interviewee.
The general focus of the thesis concerns conditions for sustainability in Swedish infrastructure policy and planning. Since sustainable development, or sustainability itself, is a contested concept, conflicting views and opinions on what is, or ought to be, sustainable are a central concern. This is illustrated by the two quotes above. In the first case, sustainability is framed as primarily concerning the emissions of greenhouse gases and ultimately the long-term effects of global climate change. In the second case, sustainability is framed primarily as a matter of relieving the inner city from congestion and reducing local air pollution and noise. Both interviewees express a very confident view of what sustainability is (or is not), and exemplify very different views as to what sustainability means in relation to infrastructure investments and the development of the transport system.

This raises important questions about the use of the concept of sustainability. Can for instance the opposing claims made by the two interviewees above both be considered as valid and legitimate interpretations? Or does it mean that one of the interviewees is simply wrong? Does sustainability indeed mean something, and that this ‘something’ can be used as the yardstick determining whose view of sustainability is correct? If so, how can we determine what counts as sustainable and what does not when it comes to transport infrastructure policy and planning?

The two quotes illustrate that questions concerning sustainability are often inherently normative, i.e. there are no simple right or wrong answers. On the other hand, it also emphasises that if sustainability is to be ‘something’ it is necessary to have some kind of normative/positivistic fundament to judge it against.

Suspicions that the term ‘sustainable development’ is used as a rhetorical catchphrase and, as Gudmundsson & Höjer (1996: 269) put it, thereby “…merely end up acting as a lubricant to the very development it was meant to challenge…” has been a central concern for a long time. In a similar vein, Low & Gleeson (2006) and Holden (2007) paraphrase a previous debate amongst planning theorists addressing the risk that like planning, the concept of sustainability has become an empty signifier meaning “everything and nothing”.

But with this being said, it is important to keep in mind what Gudmundsson & Höjer (1996) expressed above: sustainable development is essentially about challenging one type of development with another type of development. This means that conflicts and
clashing interests concerning the level and distribution of economic growth, and the extent and intensity of environmental impacts as a result of economic activity, lay at the very core of sustainable development.

One starting point for this thesis is that the lack of political as well as scientific agreement on how to define sustainable development in relation to transport (Holden 2013) makes it an interesting and important research topic. In general terms, the research in this thesis is concerned with understanding conditions for sustainability in transport infrastructure policy and planning. Posing a question about conditions is the same as posing questions about the background, the points of departure, and the given circumstances. This implies understanding of the adoption of sustainable development in society in general, and in infrastructure policy and planning specifically, as an ongoing, unfinished social process necessarily involving clashing interests (Høyer 1999: 142).

The conditions for sustainability in transport infrastructure policy and planning are therefore approached as a complex tapestry spun in the dynamics between past decisions, previous and now prevailing views, norms and knowledge production practices, political-administrative organisation, economic, social and technological development and tendencies, changes in mobility patterns and spatial structure of society, and the development of the transport infrastructure.

This thesis aims to be one contribution to understanding the conditions for sustainability in transport infrastructure policy and planning by focusing on some particularly important issues that will be developed in the following chapters.
1.1. Aim, research questions and structure of the thesis

The overarching aim of the thesis is to analyse conditions for sustainability in transport infrastructure policy and planning in Sweden.

This aim will be pursued through a theoretically informed analysis of three main themes, which can be formulated as the following three research questions:

- Which drivers and co-evolutionary processes explain the changes in road and railway networks and infrastructure policy and planning in Sweden from 1950 to 2010, and what does this mean in terms of synergies and conflicts with the emerging sustainability agenda?

- How is the conflict between (environmental) sustainability goals and ambitions to facilitate increasing mobility managed in a regional infrastructure planning process?

- What are the sustainability implications of user fee funding models in two large transport infrastructure projects in Sweden?

These questions address a number of highly prioritised and politically relevant issues associated with Swedish transport policy making, planning and research.

To pursue the aim and provide an answer to the question, the thesis is structured as shown in Figure 1: Chapters 1-3 explain the theoretical and methodological points of departure. Chapters 4-6 address the overarching question through an analysis structured into three empirical themes, each of which poses different questions and uses different theoretical and analytical approaches to explore the conditions for sustainability in infrastructure policy and planning in Sweden. Finally, Chapter 7 provides a summary of the findings of the empirical analysis and switches back to the main question.
In Chapter 2 the theoretical framework of the thesis is developed and explained. There are two theoretical levels in the thesis. The overarching level theorises the linkages between mobility, sustainability and infrastructure policy and planning. The second operational level uses different theoretical perspectives to allow more specific questions concerning conditions for sustainability in Swedish infrastructure policy and planning.

The overarching theoretical level is established through a review of literature on sustainability mobility. This review has a focus on operationalised definitions of sustainable mobility, spotlighting what this literature says about how infrastructure policy and planning should ideally be conducted to promote sustainable development.

This overarching theoretical level is used as a point of reference in the three empirical themes and the synthesis. The overarching level therefore provides theoretical perspectives of infrastructure policy and planning and sustainable development, while the operational level applies different analytical approaches to empirically study the conditions for these ideals to become a reality.
Chapter 2 ends with a brief introduction of the analytical approaches applied in each of the three empirical themes. The motivation for choosing these analytical approaches and their relation to the overarching framework is discussed. A more detailed account of each theoretical framework is then provided in the empirical themes (Chapters 4-6).

In Chapter 3 the details of the qualitative research design, the research process, and the material and methodologies used in the thesis are discussed. Most of the data collected for the thesis was conducted as a part of the Omega project, which was an international research programme aiming to achieve a better understanding of the planning, delivery and appraisal of mega-transport projects. The Omega project involved cases studies of more than 30 transport projects in ten different countries. A central characteristic of the data collection process was that it involved case studies of three pre-selected projects in Sweden (the Öresund Link, the Arlanda Rail Link and the Southern Link); and interviews with key stakeholders involved in decision-making and planning processes of these projects was the main methodological approach common for all case studies.

These conditions at the outset of the PhD project are important to explain since they were formative in the research process. During the research process, the scope and aim of the thesis developed beyond the original aims of the Omega project, although data from the three mega-project case studies still form an important part of the thesis. The interviews conducted also contained questions that were not only connected to the specific projects but concerned infrastructure policy and planning in general. During the course of the study, the case studies of specific projects and the interview study were supplemented with extensive analysis of key policy and planning documents.

The three empirical themes are presented in Chapters 4-6 and can broadly be described as follows:

Theme I provides a long-term overview of dynamics of change in the national road and railway infrastructure systems. A multi-level perspective framework, drawn from the field of transition theory, is applied in an analysis of processes of change and

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2 More information on the findings of the Omega project can be found in UCL (2012). The case studies and the interview study are presented in more detail in Chapter 3.
linkages between the development of transport infrastructure, mobility levels and patterns, changes to formal and informal institutional structures, and wider societal processes of change. Topics covered include content of infrastructure policy and planning, e.g. policy objectives, key guiding principles, and knowledge practices, changes in formal roles and regulation, societal changes, and changes to the national road and railway systems.

Theme II provides a study of how conflicts between environmental objectives and economic objectives are managed in a regional infrastructure planning process. A discourse theoretical framework is applied to investigate the links between concepts, framings of problems and solutions, and the knowledge production practices underpinning the planning processes.

Theme III spotlights the funding models of two of the mega-projects, the Öresund Link and the Arlanda Rail Link. Here a comparative analysis is made of the funding arrangements, with the aim of exploring how ‘market solutions’, in this case two different types of user fee funding models, influence the conditions for sustainability. The main question posed is: what are the linkages between funding models based on user fees and sustainability?

The final chapter of the thesis (Chapter 7) presents a summary of the three themes and discusses what the findings mean for the conditions for sustainability in Swedish infrastructure policy and planning.

1.2. Conceptual clarifications

This section provides explanations of three core concepts of the thesis – infrastructure, policy and planning – and defines how they are used in the thesis. These definitions also delimit the scope of the thesis and explain the motivation for the analytical approach chosen, i.e. the choice of theoretical and analytical strategies for the study. Transport infrastructure policy and planning is broadly defined as decision-making processes that concern investments in land transport infrastructure.
1.2.1 Infrastructure

The word ‘infrastructure’ can refer to a number of substantially different things, such as services and artefacts linked to various functions considered as necessary in a modern society. It can also have a more abstract meaning where it is used to describe the underlying base of a system or an organisation (Høyen 1999).

The concept of transport infrastructure as used here denotes physical objects such as roads, rails, ports and airports “…that support and limit the other components in the transport systems” (Gudmundsson & Höjer 1996: 274).

Transport systems are considered to be socio-technical systems comprising elements such as vehicles, propulsion energy, infrastructures, as well as individuals and organisations using the system and organisations maintaining, overseeing and developing different elements of the system (cf. Geels 2012).

While these general definitions of infrastructure and transport systems are used throughout the thesis, further limitations are introduced through the analytical approach and empirical scope. This is because the thesis is mainly concerned with policy and planning processes for land-based transport infrastructure of the Swedish transport system.

1.2.2 Policy and planning

The concepts policy and planning are used as analytical lenses to distinguish between processes of intervention, with different purposes, at different levels of the political and administrative system.

The concepts of planning and policy have been used interchangeably, and the literature on policy and planning is far too expansive and rich to review in any detail here. The account below should not be viewed as an attempt to provide an exhaustive perspective of theories of and in policy and planning (cf. Faludi 1973). Instead it should be viewed as a pragmatic approach limited to providing the most important characteristics of the concepts and how they are used in the thesis, departing from a selective reading of literature, most of which has a transport angle.
While policy can be defined in various ways, a basic distinction to make is to contrast policy and a policy. Rodrigue et al. (2009: 287), defines policy as “[a] set of principles that guide decision-making or the processes of problems’ solutions”.

Rodrigue et al. (2009: 288) further defines public policy as: “… the means by which governments attempt to reconcile the social, economic and environmental goals and aspirations of society…” This means that a policy or several policies can be part of the means (i.e. policy instruments) of fulfilling societal goals and aspirations. In contrast, policy can be understood as a wider concept that also includes the process of establishing principles, guidelines and objectives.

Premfors (1989: 9) provides a subtly different definition that captures more clearly both the ends and means dimensions of policy. He writes that public policy is a set of explicitly expressed guidelines for an activity and the measures that are taken to implement the guidelines. Premfors also provides an analogy of policy as a chain of decisions; the individual links (decisions) form a chain (policy).

These examples provide a platform for establishing what is meant by policy in the thesis. Transport infrastructure policy is defined as: chains of decisions establishing principles and guidelines for the development of the road and rail networks in Sweden and the proposed measures of how to implement these principles and guidelines. Making plans for the development of the road and rail networks and planning and implementing specific projects can be part of these proposed measures.

The word planning and the phenomena it refers to can be used in almost infinite ways depending on who is planning and for what purpose. Individuals, households, public organisations and private companies all engage in activities that involve something we can label planning. This ranges from ‘making plans for the weekend’ to ‘financial planning’ to ‘public transport planning’. Of course, the degree of formality and complexity of these activities and the outcomes they produce vary greatly depending on who and what the plans are made for (Nyström 2003: pp. 49). A common element for all these varying activities would be that it involves some sort of preparation for the future through making decisions in the present (Bjur et al. 1985: chapter 1).

In this respect there are strong similarities between planning and policy-making as decision-making activities. The view of policy as a process of establishing guidelines
and objectives and prescribing which measures to implement can also be described as future-oriented decision-making.

However, important distinctions can be made between the concepts. One way of distinguishing is exemplified by Faludi (1973: 1): “Planning is the application of scientific method – however crude – to policy making. What this means is that conscious efforts are made to increase the validity of policies in terms of the present and anticipated future… What it does not mean is that planners take over in the field of politics.”

This can be seen as quite an instrumental view of planning, where it is approached as a rational procedure for decision-making, or “… a purposive process keyed to preferred, ordered ends…” (Davidoff & Reiner 1962: 11). This places neat distinctions between policy and planning as discrete phases of decision processes, with clear lines of responsibilities between actors involved in decision-making. Others, like Lindblom (1959), contend that this type of rational-comprehensive decision-making is severely undermined by limitations in resources (e.g. information, intellectual capacity, money and time) when it comes to dealing with complex problems. Consequently, means and ends are typically chosen simultaneously, or they can be impossible to separate, and objectives and aspirations develop constantly. Accordingly, this collapses the neat order between policy and planning as sequences in decision-making.

Without probing any deeper into this topic, it can simply be noted that there are problems in trying to distinguish between policy and planning by trying to define ‘who does what, when, and by what means? ’ None the less I agree with Rodrigue et al. (2009: 287) who argue that policy and planning “… represent separate parts of an overall process of intervention”. I see this as a useful distinction from which to proceed. To reiterate, the point here is that the concepts are used as analytical lenses to distinguish between processes of intervention, with different purposes, at different levels of the political and administrative system.

Policy processes refer to interventions where legislative bodies such as the national government and parliament play a key role – whereas planning processes refer to interventions where administrative and executive bodies play a key role. ‘Key role’ means that these actors are formally responsible for running the process, and for producing some kind of results as an outcome of the processes. Outcomes may be
policy documents establishing the desired future end state(s), explicitly expressed guidelines and principles, suggestion of means to achieve the ends including policy instruments aimed at influencing the use of infrastructure, plans for new infrastructure, and implementation of specific projects.

Importantly, this should not be taken as a simplistic view where planning is what planners do, and policy is what policy-makers do. Nor should it be viewed as implying a strict hierarchy where policy decides the conditions for planning in a unidirectional mode. The dynamics between actors and processes are understood as being much more complex. They are characterised by feedback loops between collection and analysis of information to describe historical patterns, explanations for the current situation, the establishment of desirable future end states, the framings of problems, the suggestions of suitable means to achieve the desired end-states, experiences from previous planning, and implementation of plans and projects.

These are continuous processes conducted by various actors at different levels of the political and administrative system, in which various private organisations and actors also have different means of influencing the development.

This view on policy and planning motivates the analytical approach, i.e. the theoretical frameworks and methods chosen to study the conditions for sustainability in transport infrastructure policy and planning. In brief, the point of departure is that conditions for sustainability are affected both by perceptions among politicians and planners (e.g. framings of problems and desired end-states) as well as more structural factors, such as characteristics of the planning system (allocation of resources, i.e. authority, money, past decisions, methods used for gathering and analysis of information).
2. Theoretical framework

In this Chapter the theoretical framework of the thesis is developed and explained. There are two theoretical levels in the thesis. The overarching level theorises the linkages between mobility, sustainability and infrastructure policy and planning. The second operational level uses different theoretical perspectives to allow more specific questions concerning the conditions for sustainability in Swedish infrastructure policy and planning.

2.1 Overarching level – an ideal vision of infrastructure policy and planning for sustainable development

In the following sections (2.1.1 to 2.1.7), an account is provided of some theoretical approaches to understanding and operationalising the concept of sustainable development, with a specific focus on applying it in the domain of transport. The review presented here draws extensively (but not exclusively) on the work of Gudmundsson & Höjer (1996), Høyer (1999), Gudmundsson (2003 & 2004), Banister (2005 & 2008), and Holden (2007). These authors have all made significant contributions to addressing the concept of sustainable development in relation to transport.

In sections 2.1.1 to 2.1.3, the main characteristics of sustainable development are summarised, discussing the main ideals expressed by the concept and establishing some key principles for making it operational in relation to transport.

This is followed by sections 2.1.4 to 2.1.6, which address the concepts of accessibility and mobility and how the development of mobility can be understood from a sustainability perspective. The ‘unsustainability’ of current mobility and the relation to traditional perspectives on welfare and mobility is discussed.
The chapter concludes with section 2.1.7, with a specific focus on what can be drawn from the literature on sustainable mobility about transport infrastructure policy and planning.

### 2.1.1 Sustainable development as an ideal

The concept of sustainability has become firmly established since the 1987 WCED report *Our Common Future*. Few definitions have been more often referred to than the notion of “...sustainable development, which implies meeting the needs of the present without compromising the ability of future generations to meet their own needs.” (WCED 1987: 8). Today, some 25 years after *Our Common Future* was presented, the popularity of this description can hardly be overstated.

Holden (2007: 10) maintains that “…safeguarding long-term ecological sustainability, satisfying basic needs and promoting inter- and intra-generational equality” are four main ideals expressed through the concept of sustainable development in *Our Common Future*.

It is often said that the ideal nature of sustainable development puts it on a par with other contested but persistent ideals expressed through concepts such as justice, democracy and liberty (Holden 2007).

Since sustainable development is a contested ideal, a key issue at stake is how to navigate relativistic conceptions where ‘anything goes’ and universal definitions inconsiderate of different cultural and social contexts (Høyer 1999: 143). A common approach to this problem is to highlight some key characteristics of what should characterise sustainable development, while allowing for some flexibility when operationalising the concept. Such approaches are suggested by Gudmundsson & Höjer (1996), Høyer (1999), Holden (2007), and Holden et al. (2013).

The most basic way of describing sustainable development is to say that it implies an understanding of the need to address environmental and development issues at the global level, taking into account both current and future generations (Høyer 1999).
This debate predates *Our Common Future* by several decades and was originally driven by a concern over resource depletion and mounting environmental problems. While local and regional environmental impact and concerns about resource depletion were by no means new, Høyer (1999) emphasises that fundamental aspects of the sustainability debate were that environmental issues were viewed from a global perspective and involved a shift in focus from resource to recipient limits. Holden (2007: 4) describes this as “…the idea that there are limits to the human occupation of this planet.”

Another important point made by Høyer (1999) is that sustainable development should be understood as both a descriptive and a normative concept. The origins of the term ‘sustainability’ is found in ecological science, and ecological sustainability can be defined as “… the conditions that must be present for the ecosystem to sustain itself over the long term” (Holden 2007: 26). While in most cases these conditions cannot be definitively defined, the kind of knowledge claims here are often rooted in a natural science perspective concerning the ability to provide scientifically, objective descriptions of the nature of reality.

In contrast, the development aspect of the concept is essentially of a normative nature. It refers to goals of a social character that raise “… ought to-issues and not only are-issues” (Høyer 1999: 180). Ought to-issues are normative since they must be related to certain values, in this case values such as basic human needs, inter- and intra-generational equality and justice.

The inter-generational aspect of sustainable development collapses the boundaries between current and future generations by expressing concern for the impact of current consumption and production patterns. The intra-generational aspect addresses concerns of equality and justice regarding the current distribution of resources.

Litman (2013) argues that this means that the intergenerational dimension also implicitly addresses intra-generational dimension; “…if future equity and

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3 Similar ideas, albeit with a much more ethnocentric perspective, underpinned the thinking of Thomas Malthus in the early 19th century regarding the relationship between population growth and the availability of food. *The Limits to Growth* by Meadows (1972) widened the scope by introducing a resource and energy use perspective that since has been widely influential.
environmental quality are concerns, it makes little sense to ignore equity and environmental impacts occurring during this generation. Thus sustainability ultimately reflects the goals of equity, ecological integrity and human welfare regardless of time or location.” (Litman 2013: 19).

Obviously, bridging the gap between this kind of hyper-idealistic, utopian vision and practice is no small feat. Consequently, it is no surprise that there are many different approaches to operationalising sustainable development.

2.1.2 Key principles of sustainable development

The task of operationalising the ideals underpinning sustainable development raises important questions, and has been an extensively researched topic in recent decades. Operationalising involves trying to provide answers to questions such as how to define critical loads and carrying capacity of the earth’s life support system, how to define basic human needs, inter-generational and intra-generational equality and, last but not least, how to bring about the necessary changes (Gudmundsson & Höjer 1996: 271). These are questions that span multiple research disciplines including natural science, economics, philosophy, and political science.

Ecological economics and the writings of authors such as Daly (1991) has been one influential source for attempts at operationalising sustainable development. For example, Gudmundsson & Höjer (1996), Höyer (1999), Banister (2005), Holden (2007), and Holden et al (2013) all explicitly use the ecological economics perspective as a starting point.

A basic assumption from an ecological economics perspective is that nature provides natural capital which, like human capital (e.g. knowledge and skills) and man-made capital (e.g. machinery, buildings, and money), has to be maintained by considering re-investment, depreciation and policing (Gudmundsson & Höjer 1996).

A key concern when operationalising sustainable development is the exchangeability between different forms of capital, especially between natural capital and man-made capital. A distinction can be made between broad versus narrow, and between weak and strong conceptions.
Narrow sustainability emphasises long-term ecological sustainability at the expense of the development aspect, whereas broad sustainability includes political, social, economic and cultural issues (Høyer 1999). It is also possible to identify a spectrum of positions that signify important differences, ranging from very weak, weak, strong, and very strong sustainable development.

Weak sustainability essentially corresponds to a traditional economic perspective where growth and development are understood as being synonymous. Very weak sustainability is characterised by a view of capital stocks as entirely interchangeable; reductions in natural capital are compensated by increases in man-made capital (Gudmundsson & Höjer 1996: 272). In weak sustainability some restrictions on economic activities using natural capital are imposed, but this is largely motivated by an anthropocentric perspective and a concern over the ability of ecosystems to meet human needs (Holden 2007: 30).

At the other end of the spectrum is an ‘ecocentrist’, or very strong, conception where ecological sustainability and development are pitted against each other and viewed as fundamentally irreconcilable (Gudmundsson & Höjer 1996: 272). This perspective implies absolute limits to human development and no forms of natural capital are substitutable by man-made capital.

Gudmundsson & Höjer (1996), Høyer (1999), Banister (2005) and Holden (2007) all start from a position between these extremes and argue for a ‘broad and strong’ conceptualisation of sustainable development where both sustainability and development are considered. According to this position, some forms of critical natural capital (e.g. the climate system, and certain ecosystems) cannot be replaced by other forms of natural or man-made capital (Holden 2007: 31). This is based on an understanding of the need to apply the principles of uncertainty when dealing with impacts on complex ecosystems and the irreversibility of damaging some forms of natural capital (Høyer 1999).

Additionally, the ‘broad and strong’ approach acknowledges the importance of development, but it does not prescribe it primacy over ecological sustainability. According to Holden (2007: 29) this corresponds to the intentions expressed in Our Common Future.
The approach adopted and used in this thesis applies Gudmundsson & Höjer’s (1996) understanding of the concept, which means that sustainability and development represent different dimensions. “Development represents increase in quality of life and social equality. Sustainability represents long-term survival of systems that provide foundations for development.” (Gudmundsson & Höjer 1996: 272).

According to this conception, sustainability is about preserving natural capital stocks and preserving the option value of human capital and man-made capital for future generations. Option value refers to preserving the capacity of future generations to produce a similar level of well-being as today, and to guarantee “… the opportunities for future generations to lead worthwhile lives” (UNDP 1994, cited in Gudmundsson & Höjer 1996: 273). This essentially means that current resource consumption practices should not limit the possibilities of future generations.

Development is perceived as improving quality of life for individuals and ensuring a fair distribution of life quality. Quality of life can in the broadest sense be understood as “…the well-being of individuals belonging to the present generation…” (Gudmundsson & Höjer 1996: 273). Quality of life can be measured in numerous ways, such as life expectancy, literacy, education, standard of living and freedom. Distribution of quality of life is about a fair distribution of limited resources (Gudmundsson & Höjer 1996) as well as a fair distribution of burdens that arise from using resources (Høyer 1999).
2.1.3 Sustainable development and transport

Gudmundsson & Höjer (1996) arrive at four principles that provide conceptual foundations for sustainable development in transport policy:

1. Safeguard a natural resource base within critical loads, levels and usage patterns.
2. Maintain the option value of the capital base (natural, human and man-made capital) for future generations.
3. Improve the quality of life for individuals

Gudmundsson & Höjer (1996: 273) note that a fundamental challenge is that a transport system uses natural resources without producing any, yet is of critical importance for producing, expanding and distributing the human and capital stocks of society. This is to say that transport generates important conditions for development (level of and distribution), yet fundamental challenges from a sustainability perspective. Mobility, both the options it creates and the problems it causes, is at the core of this dilemma.

The next sections address the concepts of mobility/accessibility, the general trends regarding the phenomena they represent, and the problem of these trends from a sustainability perspective. In section 2.1.6 further explanation is given about how the four principles outlined above can be understood in relation to transport.

2.1.4 Accessibility/mobility

The concept of mobility as used in the thesis covers both the actual movement of people and commodities and the potential for movement.

Mobility is understood as a means to achieve accessibility, so accessibility is the ulterior purpose of mobility (Gil-Solá 2013: 41). Essentially, accessibility is about freedom of choice, or having options. These options allow individuals to socialise and participate in activities, such as work, service, shopping and leisure (Vilhelmsen 1990; Gil Solá 2013). Accessibility for enterprise and business can similarly be perceived as
options allowing participation in markets. It is about gaining access to customers and resources (Høyer 1999: 14-15).

This understanding of accessibility and mobility provides the connection to the four principles of sustainable development in transport policy outlined in 2.1.3. Accessibility influences the quality of life (principle 3); accessibility is not evenly distributed (principle 4); mobility produces a number of consequences of a negative character with regard to natural resource bases (principle 1); and accessibility and mobility potentially have both negative and positive consequences in maintaining options for future generations (principle 2) and quality of life (principle 3).

Accessibility is not exclusively determined by geographic mobility – it can also be achieved through other forms of mobility, e.g. virtual, or social mobility. When accessibility depends on geographic mobility, the spatial organisation of society, i.e. the localisation and distance between functions, is one important factor (Høyer 1999: 13-14).

According to this understanding, accessibility as a factor influencing quality of life depends on mobility resources (Vilhelmson 1990: 3) and geographical proximity (Gil-Solá 2013).

Mobility resources at individual level depend on and vary according to age, gender, physical condition, and socio-economic status (Vilhelmson 1990: 23; Gil-Solá 2013). Access to a car is one example of differences in individual mobility resources as a key determinant for differences in actual mobility (Vilhelmson 1990).

Mobility resources at societal level include the physical and political administrative structures necessary for mobility to take place. This includes capacity for conducting and implementing transport infrastructure policy and planning. In itself, the transport system infrastructure is an important part of societal-level mobility resources and influences both actual and potential mobility. As Givoni and Banister (2013: 3) note: “Infrastructure as such does not generate movement… it only allows it to take place. Mobility can therefore be seen as being situated between the demand for transport and the infrastructure that allows this demand to be realised”. In this respect, the way societal-level mobility resources are applied not only allows mobility, but also allows
it to take place in certain forms. The distribution of quality of life related to accessibility is therefore influenced by how societal mobility resources are used.

This means that there is a complex dynamic between individual- and social-level mobility resources, the spatial organisation of society, the aggregate patterns and levels of mobility, and the four principles of sustainable development outlined in 2.1.3.

Vilhelmson (1990: 1-3) describes how wealthy nations (such as Sweden) have witnessed a similar general trend concerning the dynamics between what he refers to as individual mobility lifestyles and the spatial organisation of society.

Pre-industrial societies are characterised by geographical stability, where life is adjusted to local conditions, and activity patterns remain close to dwellings. A high degree of self-sufficiency and low degree of economic specialisation is typical (Vilhelmson 1990: 1).

Geographical commuting is a mobility lifestyle typical of industrialising societies. Here daily activity patterns (and the aggregate level of geographical mobility) is expanded in a one-dimensional, repetitive way, driven by the interplay between urbanisation, economic specialisation, and the spread of access to more mobility resources (such as bicycles, trains and cars). Increasing travel speeds increase the range, and mobility is generally linked to productive purposes, such as commuting. Typically this is also a gendered type of mobility, with substantial differences between the mobility patterns of men and women (cf. Gil-Solá 2013). ‘The commuting man’ symbolically expresses the gist of this type of society.

Societies in a late stage of industrialism are characterised by geographical flexibility. This signifies highly mobile lifestyles dependent on mobility for all purposes, productive as well as reproductive. The driving forces for this include more non-routine work travel due to a shift towards a service economy, more women joining the labour force, thereby increasing their level of mobility, and longer and more frequent leisure trips due to shorter working hours, longer holidays and increasing levels of income. Typically there is a convergence of gendered mobility patterns (i.e. women travel more like ‘the commuting man’) and the use of cars and aircraft is more frequent and intensive (Vilhelmson 1990: 2).
At individual level, the types of mobility lifestyles described above co-exist simultaneously in a given population. In forms of dominance, i.e. influence on aggregate volumes of mobility, they are contingent on the distribution of and access to mobility resources, both at individual/household level and societal level (Vilhelmson 1990: 3).

A consequence of this development is that accessibility in terms of proximity is replaced by accessibility in terms of time (Gil-Solá 2013: 40). The general trend is one where increasing range is equal to increasing options. Consequently, in societies where the dominant mobility lifestyle is characterised by geographical flexibility, the access to *motorised mobility resources* has become a determining factor for accessibility (Vilhelmson 1990). This also means that accessibility through self-powered mobility decreases. Illich (1973: 13) describes this as “… motorized vehicles create remoteness which they alone can shrink”. The strong increase in motorised mobility facilitating the change from geographical stability to flexibility is a core challenge of sustainable development. This influences the quality of life, as well as the resource use principles of sustainable development outlined in section 2.1.3.

Vilhelmson (1990) only discusses these trends from a passenger mobility perspective and mainly puts emphasis on individual mobility resources. Since the definition of mobility used in the thesis is broader and also covers commodities, it can be noted that the tendencies described above apply to freight mobility as well. Increasing globalisation contributes to more spatially extensive production, logistics and consumption patterns. This strengthen the image of geographical flexibility at the core of current mobility trends (Holden 2007: 50).
A final important remark is that there is no neutrality in the relationship between the transport system, the level of mobility and the four principles of sustainable development. As Høyer (1999: 122) puts it:

“…mobility does not occur in a societal vacuum. We cannot have any mobility volume in a combination with any type of society. Similarly, mobility has no environmental neutrality; consequently we cannot have any mobility volume with any type of environmental state. The idea of the societal and environmental neutrality of… mobility prevails in many contexts.” (Høyer: 1999: 139).

The total volume of actual mobility in a geographically flexible society is conditioned on the availability of fast motorised means of transport and the supply of sufficient infrastructure capacity.

### 2.1.5 Mobility according to the traditional welfare perspective

A key challenge for sustainable development is that, according to a traditional welfare perspective, increasing mobility has been strongly linked to increases in welfare, to the extent that mobility and welfare have become regarded as synonymous (Vilhelmson 1990: 65).

![Figure 2 The traditional conception of the mobility-welfare feedback loop, based on Wilhelmsson (1990: 64)]

Vilhelmson (1990: 64-66) describes how this has been interpreted as an empirically observed causal feedback loop (see Figure 2) between mobility and welfare, strongly
influencing traditional perspectives on welfare. Accordingly general transport policy perspectives, as well as infrastructure policy and planning, has developed in a context where mobility is viewed as something worth stimulating and facilitating since it increases welfare, at individual level, as well for society as a whole (Vilhelmsen 1990: 65).

The traditional perspective equating mobility and welfare is one factor helping to cause a number of unwanted effects, often discussed in terms of unsustainable mobility. The next section goes on to discuss how this can be understood from the perspective of the four principles of sustainable development outlined in section 2.1.2.

2.1.6 Unsustainable mobility

While there is no common understanding of what ‘sustainable mobility’ implies, how it is to be achieved, or even how to know when it is achieved – there is widespread agreement on the unsustainability of current transport trends (Gudmundsson 2004: 62).

Unsustainable mobility is often discussed in relation to mobility, encompassing environmental, economic and social issues posing a complex set of challenges. These challenges can further be defined by geographical level, from local to global, and by time scale (inter-and intra-generational).

According to sources reviewed in this chapter, the main challenges of sustainable mobility can be summarised as in Figure 3. Note that the allocation to topical dimension and geographical level is quite arbitrary, and several types of challenges span temporal, topical and geographical boundaries. (Banister 2005: 3; Gudmundsson 2003). The arrows in the figure illustrate how some topical dimensions can be viewed as challenges at several geographical levels.
Clearly, Swedish infrastructure policy and planning is only linked to some of these challenges, and the ambition is not to provide a full account of all challenges. Instead emphasis is on explaining linkages to how infrastructure policy and planning could ideally contribute to meeting some of the challenges by departing from the sustainable development principles presented previously in the chapter – 1. safeguarding natural resources; 2. maintaining option value for future generations; 3. improving quality of life for individuals; and 4. equality in distribution of quality of life.

A first cut is to exclude global level perspectives on safety and accessibility. Meeting basic mobility needs in developing countries, global inequalities in accessibility, health- and-safety and other problems contributing to differences in mobility-related quality of life aspects are important in a wider sustainability perspective (cf. Holden 2007), but they are not relevant to this study.

In terms of what the challenges mean in relation to mobility, there seems to be most agreement on violations of principle 1. Here the most obvious challenges are typically well mapped out and understood, although there is no consensus on the actions required to address them. For principles 2 to 4 there is probably less agreement on the
state of play – concerning both knowledge on the current status and how to interpret the trends. Furthermore, the implications for addressing these principles in transport infrastructure policy and planning are not evident. A first step here is to outline the core challenges for the four principles, and then the main implications relevant to infrastructure policy and planning are addressed in section 2.1.7.

1. **Safeguarding natural resources:**

There is plenty of evidence indicating that current mobility levels and patterns contribute to various types of ecosystem critical loads being exceeded (Høyer 1999). Some types of causal links between emissions caused by motorised mobility (e.g. CO₂, NOₓ, SO₂, and O₃) and climate change, eutrophication and acidification are well documented (Gudmundsson 2003). Indirectly, these environmental problems also pose a threat to biodiversity (Høyer 1999).

These problems ensue directly from energy use for actual mobility, as well as indirectly from resource and energy use facilitating potential mobility (e.g. energy and resource use for manufacturing vehicles and infrastructure). Globally, direct energy use in the transport sector accounts for about 24 % of total greenhouse gas (GHG) emissions, most of which caused by the combustion of fossil fuels for road transport (Givoni & Banister 2013).

The use of resources for manufacturing vehicles and transport infrastructure is substantial, and accounts for 20-40% of global use of steel, cement and aluminium (Holden 2007: 5). Consequently, a substantial amount of GHG emissions in the industry sector result from facilitating potential mobility. This challenge will not be lessened by an expected massive increase in vehicle manufacturing in coming decades.

The importance of embedded and indirect energy use in the transport sector is one challenge with direct implications for transport infrastructure development. A study by Jonsson (2005) estimate the embedded energy use in Swedish transport sector to some 70 TWh per year. This means that more energy is used for construction, operation and maintenance of infrastructure, manufacturing of vehicles and fuel production than what is consumed directly by the entire Swedish passenger car fleet in one year.
Other indirect effects of mobility include barrier effects from infrastructure and local pollution from resource and energy extraction. Banister (2005: 12) further highlights the impact on water resources through surface run off, oil spillage and permanent changes to water systems due to construction of infrastructure. According to Høyer (1999: 182) this can be seen as various forms of environmental encroachment caused by motorised mobility.

2 Maintaining option value

This principle raises general concerns about whether future generations will be able to lead worthwhile lives. More specifically it also concerns the mobility resources of future generations. The current dependency and level of use of non-renewable energy is one challenge that may imply an infringement on the possibilities of future generations in several ways (Gudmundsson and Höjer 1996).

Secondly, this principle also concerns how to use societal-level mobility resources. Gudmundsson and Höjer (1996:278) discuss what preserving the option value of human and man-made capital could entail in terms of transport system investments. The components of the transport system, infrastructure, vehicles, etc. are parts of the human and man-made resources and contribute to the development of man-made capital stocks.

However, they conclude that estimating, calculating or defining a critical value of “…transport capital necessary for sustaining society…” is highly difficult (Gudmundsson and Höjer 1996:278). They therefore infer that we can only speculate on how to approach the topic of transport system investments for preserving the option value for future generations.

Their argument is that there are two main perspectives; one where maintaining and increasing transport system investments is viewed as beneficial for future generations, and one where it leads to “…a ‘social trap’ of mobility…” (Gudmundsson & Höjer 1996: 278, quoting Berkes and Folke 1994).

According to the first perspective it is assumed that transport systems will remain important for enhancing human capital (e.g. knowledge, technological skills, and exchange of ideas). This implies an approach confirming the validity of the traditional
perspective on welfare and mobility (outlined in 2.1.5). According to the second perspective, a continuous expansion of the transport system would lead to “...increasing capital resources... tied up to maintain mobility... with decreasing marginal returns to society” (Gudmundsson & Höjer 1996: 278). Similar points are made by Høyer (1999), Åkerman (2011) and Givoni & Banister (2013). The second perspective poses a rather radical challenge to the traditional welfare/mobility approach.

3. **Improve quality of life for individuals**

Mobility has potentially both positive and negative impacts on the quality of life for individuals. Measuring how quality of life is linked to mobility can be approached both as a subjective metric (Boschman and Kwan 2008), and aggregated into metrics for groups of people (cf. Khisty 1996).

Apart from being a necessity for accessing options, mobility is also linked to a fundamental aspect of human nature encompassing the wish to move freely (cf. Vilhelmson 1990; Høyer 1999). The capacity for geographical mobility is therefore an important quality of life aspect.

The key challenge in affluent, highly mobile societies is how to facilitate individual wishes to improve quality of life through more motorised mobility while minimising negative impact on the quality of life of others (both currently and in the future). It is not obvious that increases in motorised mobility are unconditionally linked to improved life quality.

The ‘social trap of mobility’ discussed by Gudmundsson and Höjer (1996) under principle 2 has been addressed by others as the flipside of mobility. Rootlessness and alienation are mentioned by authors such as Vilhelmson (1990) and Schiller et al (2010) as detrimental side-effects on quality of life in highly mobile societies. Similarly, Åkerman (2011) talks about structurally enforced mobility.

The main point is that increasing mobility can have both positive and negative effects on the quality of life for individuals, perceived as a subjective metric (Haugen 2012; Boschman & Kwan 2008).
On a more general level motorised mobility has impacts on quality of life aspects that can be aggregated to various levels, e.g. demographic cohorts or socio-economic groups in the population. Local pollutants from cars and lorries (e.g. CO, NO$_x$, particulate matter, VOC and ozone), noise and vibration from all types of major motorised transport systems have direct and detrimental health effects and reduce the quality of life (Banister 2005: 16).

Additionally, studies have found a correlation between commuting and indirect negative health effects such as poor sleep and stress (Hansson et al 2011). Further indirect detrimental health effects are caused by sedentary life styles in combination with motorised mobility in highly mobile societies. Excessive levels of motorised mobility and lack of self-powered mobility are contributing to increases in welfare diseases such as obesity and cardiovascular disease (Boschman and Kwan 2008).

4. *Equality in distribution of quality of life*

Despite massive increases in mobility, it has not increased for everyone (Holden 2007: 6) and, in highly mobile societies, there are significant differences in individual mobility. Vilhelmson (1990: 73) for instance shows that in the mid-1980s, 10% of the Swedish population accounted for more than half of the average daily mobility.

Equality in welfare distribution is a highly normative subject. Infrastructure policy and planning interventions are bound to have impacts on the distribution of mobility-related quality of life aspects. Boschman and Kwan argue that equality should be understood as referring to some kind of notion of ‘fairness of distribution’. This understanding acknowledges that not everyone in society has similar needs (Kwan and Boschman 2008).

Khisty (1996) argues that implicit and explicit conceptions of equality have important impacts on decision-making for infrastructure, and states that it is important to consider both welfare impacts for society as a whole and distributional impacts (e.g. according to socio-economic groups, gender, age, etc.) While the implications for infrastructure policy and planning are not exactly straightforward it could suggest that contributing to reducing disparities in accessibility between different socio-economic groups, as well as gender-, and age-based inequalities ought to be of importance.
To summarise what can be deduced from considering the four principles, it is clear that there is no solid ground for assessing exactly what sustainable development ideally could mean in infrastructure policy and planning. In general, the ‘negatives’ generated by mobility are easier to measure (e.g. emissions and pollution from energy and resource use). The ‘positives’ are often taken for granted through heuristic short cuts, e.g. equating mobility and welfare increases. Quality of life and equality in distribution of mobility/accessibility are important aspects of sustainable development, but are inherently normative and hard to measure.

Nonetheless, there are some important overall points that specifically address infrastructure policy and planning. Considering the 1st principle means that infrastructure policy and planning should help to reduce environmental pressure, both locally and globally, now and in the future. The 2nd principle raises questions about assuming that the benefits of facilitating further motorised mobility increase by expanding infrastructure capacity. Considering the 3rd and 4th principles means acknowledging that improving the quality of life for individuals through increases in mobility should not come at the expense of general quality of life aspects (e.g. increasing inequality in accessibility between different social groups and negative health impacts).

There are differences in how to interpret the implications of including a quality of life perspective. Haugen (2012: 74) suggests that since it seems like many people want to drive more, facilitating this wish is important to improving quality of life. Consequently, it could be assumed that facilitating increases in motorised road transport would remain an important task for improving quality of life for individuals. In contrast, arguments about ‘social traps of mobility’ (Gudmundsson & Höjer 1996) or ‘structurally enforced mobility’ (Åkerman 2011) imply that reductions in motorised mobility would not lead to reductions in quality of life. Consequently, other approaches to infrastructure policy and planning (e.g. demand management) could facilitate improvement of the quality of life.

Broad approaches to sustainable development in infrastructure policy and planning imply that all four principles should be considered. Considering the principles does not involve specific guidance for policy and planning objectives, but it does suggest the inclusion of a number of necessary topics and indicates a general direction of change.
One consequence is a questioning of several well-established approaches to infrastructure policy and planning in practice. Based on the literature on sustainable mobility, three broad approaches can be identified regarding how transport infrastructure policy and planning ideally could contribute to sustainable development. This will be discussed in the next section.

2.1.7 Infrastructure policy and planning for sustainable mobility

“The sustainable mobility approach requires actions to reduce the need to travel (less trips), to encourage modal shift, to reduce trip lengths and to encourage greater efficiency in the transport system.” (Banister 2008: 75)

Despite the lack of consensus on what sustainable mobility implies, there seems to be agreement on a number of actions for moving towards sustainability as outlined by David Banister above.

Different authors use different terms for the approaches (or do not use them explicitly). Holden (2007: 67) argues that there are three main approaches: the efficiency approach, the alteration approach and the reduction approach. Banister (2008) uses terms like substitution, modal shift, distance reduction and efficiency increases. Givoni & Banister (2013: 8) introduce the terms avoid, shift and improve, which are used here since they conveniently convey the broad picture of the linkages to infrastructure policy and planning. The categories partly overlap and are often interdependent (Holden 2007: 70).

Avoid: Reducing total volumes of mobility. In pure form this would mean measures aiming to reduce the number of trips, i.e. substituting geographical mobility by non-travel activity (Banister 2008: 75). Potentially, geographical mobility could be substituted by virtual mobility, e.g. social interaction, or access to various forms of public service or online shopping (ibid.). In practice avoid approaches have to involve imposing measures limiting the demand for road transport by car and lorry (Holden 2007: 70). The integration of transport and land-use planning can play an important part in reducing road transport demand by counteracting sprawling urban and regional structures. Reducing road transport can also be achieved through various forms of actions influencing norms and behaviour associated with mobility. This can include
restrictions, such as fuel taxes and distance based charges, or softer forms of influence such as information campaigns.

**Shift:** *Altering prevailing mobility patterns* (Holden 2007: 69). This approach means shifting to less energy-intensive modes of mobility. It means more public transport for motorised passenger mobility, and more self-powered mobility generally. Shift approaches typically also call for the integration of land use and transport planning. At urban level, the approach also implies distance reductions, since shorter distances between destinations are often required for shifting to public transport and non-motorised travel. This is, for instance, a central idea in ‘compact city’ and ‘transit oriented development’ approaches (Schiller et al 2010). In an urban context, Banister (2008: 75) argues for the need to reverse the transport planning hierarchy to prioritise the pedestrian, cyclist, and public transport user above the car driver. Shifting road freight to rail, inland waterways, and coastal shipping can also be important, providing these alternatives are more energy-efficient (Høyer 1999).

**Improve:** *Reducing negative impacts of current levels and prevailing patterns of mobility.* This approach covers a wide range of actions, often including both actions aimed at improving vehicles as well as actions improving existing infrastructure. Holden (2007: 69) distinguishes between adopting existing efficient technology and developing new technology. Banister (2008: 75) describes it as ensuring the best available technology in vehicles and aiming for increased load factors in both passenger and freight transport. Høyer (1999) makes a similar point in stressing the need to make efficient use of existing infrastructure by, for instance, including the use of (new or better) information technology to make use of road and rail networks more efficient. More controversial, but increasingly common, is the introduction of economic incentives, such as road tolls and congestion charges.

A review by Holden (2007: 44-59) reveals that there are different opinions about the effects and feasibility of different measures. There is for instance disagreement whether vehicle energy efficiency improvements actually will reduce emissions or be off-set by increasing mobility. There is also disagreement about the causal links between land use, urban structures and mobility patterns. A key issue at stake is the public acceptability for reducing road transport (cf. Banister 2005; 2008). According to the review made by Holden (2007) most authors arrive at the conclusion that a mix
of technology and efficiency improvements policies, modal shift polices and demand reduction policies are necessary.

What do improve, shift, and avoid mean specifically for infrastructure policy and planning?

Høyer (1999: 189) arrives at seven categories of measures, listed in order of importance below, to reduce or solve problems caused by transport. He argues that “…the higher we come on this ladder… the more we reach of the core of a concept of sustainable mobility”. Banister (2005: 16), with a focus on urban sustainable mobility, also lists seven ‘basic objectives’. Figure 4 illustrates both consistency and differences between how these two authors allocate different types of measures and actions to the three main approaches.

<table>
<thead>
<tr>
<th>Høyer’s “ladder”</th>
<th>Banister’s “basic objectives”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reductions in mobility</td>
<td>Decrease the need to travel</td>
</tr>
<tr>
<td>Reductions in infrastructure</td>
<td>Avoid</td>
</tr>
<tr>
<td>Transfer between modes</td>
<td>Shift</td>
</tr>
<tr>
<td>Increase load factors</td>
<td>Improve</td>
</tr>
<tr>
<td>Use of alternative energy</td>
<td>Reduce noise</td>
</tr>
<tr>
<td>Increased energy efficiency</td>
<td>Increase efficient use of vehicle stock</td>
</tr>
<tr>
<td>Purification of emission</td>
<td>Improve safety</td>
</tr>
<tr>
<td></td>
<td>Improve attractiveness of cities</td>
</tr>
</tbody>
</table>

Figure 4 Examples of avoid, shift, improve measures, based on Høyer (1999) and Banister (2005)

The figure illustrates that infrastructure policy and planning can play an important role in all three approaches, but it is more important for shift and avoid approaches. The importance of strategic policy and planning issues increases at the higher rungs of the ladder. Approaches to policy and planning at the higher rungs are also, as Givoni & Banister (2013) point out, at odds with key practices and ways of thinking in the prevailing ‘transport planning paradigm’.

There are differences between how general increases in mobility are viewed. Høyer (1999: 189), conceiving further increases in motorised mobility as impossible to
reconcile with what he defines as necessary reductions in energy and resource use, argues for a decrease in infrastructure capacity. He proposes that strategies commonly deployed at urban level (aimed at reducing, and slowing down traffic) should be employed at regional level to achieve reductions in aggregate levels of mobility. There seem to be some differences between Høyer’s objective of “reductions in mobility” and Banister’s (2008) objective to “decrease the need to travel”.

Banister (2008: 73) argues for agglomerations of polycentric cities served by efficient public transport. This exemplifies a softer approach to one that advocates reducing car and lorry use in urban areas, and a shift to public transport, walking and cycling in cities, and public transport for inter-urban travel. However, in Givoni & Banister (2013: 277), the reduction of infrastructure supply is raised as a policy option “…hardly ever considered”.

Similar nuances in avoid approaches are exemplified by the following authors (cited in Holden 2007). Tengström (1999) argues for stabilising present levels of motorised mobility and reduced car use. Similarly, Edinger & Kaul (2003) talk about decelerating the increase in individual motorised mobility and Whitelegg (1993) proposes a phased reduction of the dependence on motorised mobility. This illustrates that there can be different interpretations of what an avoid approach would involve and why it is motivated. Views differ on the potential of improve and shift approaches for tackling, for example, CO2 reduction challenges.

It can be concluded that addressing the four principles of sustainable development could have important implications for transport infrastructure policy and planning. Some nuances in how to treat this challenge can be found in the literature, for example Gudmundsson & Höjer who write that:

“… investing heavily to reinforce existing transport systems may in the end prove to be a highly costly and even socially destructive way of safeguarding access to future generations to what they want or need. Obviously, to what extent this will actually prove to be the case we cannot say. But this… suggests that less physically demanding lifestyles, modes of access and systems of movement should be seriously considered as alternatives.” (Gudmundsson & Höjer 1996: 278)
The quote explicitly refers to how to address the option value of future generations. A consequence of this ‘cautious’ conception is that avoid and shift approaches are awarded priority. It also implies a low-cost strategy to facilitate modal shifts.

Åkerman (2011) also explicitly addresses the role of infrastructure investments in achieving a development of mobility consistent with the objective of the ‘two-degree target’ (keeping global concentrations of GHG below 450 ppm). Åkerman (2011: 34) concludes that that “a key aim is to reduce the length of trips”. Infrastructure investments play an important role and Åkerman argues for robust policy strategies, avoiding detrimental lock-in effects and according to this view:

“There are several reasons for avoiding, or at least postponing, investments in new infrastructure that lowers the cost (in terms of money and time) of the more energy-intensive and polluting modes of transport, e.g. car, air and truck. The main reason is that… infrastructure capacity for these modes is already sufficient to handle the transport volumes that are consistent with achieving the two-degree target.” (Åkerman 2011: 41).

Åkerman (2011) therefore argues for combining avoid and shift approaches. Arguably, it can also be viewed as an approach where avoid is dependent on investments to allow a shift.

Høyer (1999) forcefully argues against any type of measure that will lead to increasing the aggregate volume of mobility. According to this view there is a risk of ‘programmatic over-investments’, thereby releasing potential mobility, increasing average levels of mobility and consequently a relative reduction in the use of capacity, both in established and in new systems. A lower capacity use leads to relatively higher energy consumption, from which increasing GHG emissions and other environmental impacts follow (Høyer 1999: 56-57 & 66).

Obviously, the conclusions drawn by Høyer (1999) and Åkerman (2011) regarding the necessity to reduce motorised mobility levels in consideration of principle 1 issues are not uncontroversial.

To reiterate and summarise the points made in section 2.1, on the basis of a broad and strong conception of sustainable development, it can be argued that infrastructure policy and planning should take the global perspective into account (for example, by aiming to lessen global environmental problems), consider inequalities in accessibility
within the population, and aim for converging intra-generational accessibility without exacerbating local environmental problems.

However, as the review has shown, there is no clear guidance as to what this would mean at a more applied level, i.e. as a yardstick for the conditions for sustainability in infrastructure policy and planning. But it suggests that if sustainable development is to be more than an empty slogan there needs to be some kind of application of concept that acknowledges the necessity of avoid, shift and improve approaches. Importantly, there should also be some kind of indication of impacts on the practical outcomes of policy and planning. This highlights the importance of reviewing recent and current policy and planning practices, and interpreting the extent to which this is in line with the considerations outlined here.
2.2 Operational level – analytical approaches to studying conditions for sustainability in policy and planning

The point of departure for the operational level analytical approaches is that conditions for sustainability in transport infrastructure and planning depend on both structures and actors. The outlook of adopting different approaches to infrastructure development (outlined in 2.1) depends on a wide number of interrelated factors, such as historical context (path-dependencies both in technologies, policies and plans), administrative conditions, and the views of decision-makers involved in policy and planning.

Three analytical approaches drawing on different theoretical fields are used to empirically explore the conditions for sustainability in infrastructure policy and planning through different temporal and geographical perspectives, and according to different levels of actor/structure relationships.

In Theme I, transition theory and the multi-level perspective (MLP) framework is used to analyse the historical development of transport infrastructure policy and planning in Sweden and the ways in which sustainability concerns have entered the stage and interrelated with other concerns. In Theme II, a discourse theoretical approach is used to analyse the relationship between the (potentially competing) goals of expanding mobility and environmental concern in regional transport planning in southern Sweden. In Theme III, some concepts drawn from governance theory and sustainable transport planning literature are used to analyse how alternative funding models affect the outcomes of two major transport infrastructure projects in Sweden from a sustainability perspective.

In this section the three analytical approaches are briefly introduced. In the subsequent chapters (4-6) covering the three themes, the theories will be described in more detail and applied to the empirical cases.
2.2.1 Transition theory and the multi-level perspective

The multi-level perspective (MLP) has emerged as an influential approach to study long-term and complex processes of change, or transitions, of socio-technical systems (Grin et al 2010: 18). A transition implies shifts from one socio-technical system or configuration to another. Transitions span several decades and require multiple and interlinked changes such as innovation and adoption of technical artefacts, and new practices, changes in regulative, governance and cognitive frameworks. Transition processes involve interactions between multiple actors, such as businesses, user groups, scientific communities, policy makers, social movements and lobby groups (Grin et al 2010).

The MLP has been developed to answer questions about the dynamics of stability and change in transitions (cf. Geels 2002; Geels 2007 and Geels 2012). The MLP combines elements from other theories (e.g. evolutionary economics, science and technology studies, sociology and neo-institutional theory) (Geels 2004; Grin et al 2010: 18; Geels 2012: 2). It is a process theory, explaining outcomes as the result of temporal sequences, the timing of, and chains of events.

The MLP framework consists of three analytical levels that help to understand the dynamics of transitions: niches, regimes and landscape. Transitions occur when interaction within and between, trends, processes and actors at the different levels “…strengthen each other in one and the same direction” (Grin et al 2010: 131). The MLP provides a descriptive framework for describing the types of change, and the dynamics of change taking place in transitions (Geels & Schot 2007).

In Theme I the key concepts of the MLP framework are explained further (landscape, regime, niche, and transition pathways) and then used to structure the analysis. The MLP is used to provide a broad and long-term overview of important changes concerning both the physical development of the road and rail transport systems, and how this interrelates with key changes in the ways of thinking about infrastructure (cognitive and normative changes), as well as changes in the ways of doing things (formal and regulative changes).
2.2.2 Discourse theory

In Theme II a discourse theoretical point of departure is used in an analysis of the reciprocal relationship between the process of framing problems and solutions, the resolving of clashing interests, and the techno-rational decision-support tools used in infrastructure planning. This analytical approach allows for a more detailed analysis of what some of the changes outlined in Theme I mean in more recent planning practice.

The regional planning process studied in Theme II is approached as a “… constant discursive struggle over … the boundaries of problem categories, the intersubjective interpretation of common experiences, the conceptual framings of problems, and the definitions of ideas that guide the ways people create the shared meanings which motivate them to act” (Fischer & Forrester 1993: 2).

More specifically, in Theme II this approach is applied to analyse two central concepts, regional expansion and environmentally friendly transport, and the implications the framings of these concepts have from a sustainability perspective.

2.2.3 Governance and sustainable transport concepts

In Theme III the funding models of two major infrastructure projects, the Öresund Link and the Arlanda Rail Link, are used as empirical sources for an analysis of how the impacts of these funding arrangements can be conceptualised from a sustainability perspective. The funding arrangements are approached as governance innovations (More & Hartley 2008). Two concepts drawn from the literature on sustainable transport, pricing signal and functional integration, are used to analyse the design of the financing mechanisms, the rationality of pricing strategies and the impacts of the funding model on integration with the existing transport system (cf. Hull 2005; Preston 2010).
3. Materials and methodology

Studying policy and planning means studying processes and events, involving a wide array of actors, taking place over time, usually with an interest in gaining insights into how things ended up in a certain way.

This chapter explains the characteristics of the research process, the empirical methods used, and how the data has been collected and analysed. The methodology can be described as a qualitative study with a case study approach. The elements of the study include decision-making processes for three mega-transport projects, one regional infrastructure plan, a national transport policy, and planning with a focus on transport infrastructure.

The key methods for data collection were interviews and document analysis. The study was based on 43 semi-structured interviews and various official documents such as transport policy bills, infrastructure plans and other documents produced in policy and planning processes, previous research, and newspaper and media material. Qualitative content analysis was used as a method for analysing interviews and documents.

3.1 Inductive research process with a case study approach

A main characteristic of the research process forming the basis of this thesis is that there was no clear research question at the outset of the data collection process. This is a typical trait of inductive, qualitative, case study-based research approaches (Merriam 1994). However, an important point of departure for the research presented in this thesis is that the inductive approach was also governed by certain preconditions, including the choice of the three mega-projects as objects of study and interviews as a key methodology for collecting data.
The research process was guided by being part of an international research project (the Omega project) studying decision-making in 30 large infrastructure projects in ten countries. In Omega projects were chosen according to certain selection criteria, the most important being that it was a completed road or rail project with a minimum cost of USD 500 million, and located in an urban area.

This meant that when the research commenced only a few Swedish projects qualified. Some others could have qualified, but the leaders of the Omega project had a strong interest in the three chosen projects (the Öresund Link, the Southern Link and the Arlanda Rail Link). Consequently, when I took up my PhD position, the issue of case selection was already determined.

From a research design perspective this has a couple of important implications. Firstly, the study on decision-making processes for the three mega-projects was initiated before there was a clear idea of what specific aim and research question the thesis was addressing. To some extent this means that the aim, research questions and analytical approaches in the thesis are a result of the pre-determined choice of study objects and interviews as a key methodological approach, rather than the other way around. Secondly, conducting a large number of interviews was an explicit aim of Omega. Consequently, the extent of the interview study was determined by commitments to Omega rather than a deliberate methodological strategy.

However, while the overarching interest in Omega revolved around what characterises a successful mega-project, each national research team was free to focus on specific topics of interest. This allowed me to pursue my interest in sustainability and infrastructure policy and planning, and led to a gradual expansion of the empirical scope by including a regional planning perspective and a historical perspective to national level transport infrastructure policy and planning.

The research approach corresponds to that of Merriam (1994: 29), whose definition of qualitative case study research is an approach characterised by combining descriptive and interpretative analytical ambitions and an emphasis on discovering new relations, investigating the meanings of concepts, and bringing in new perspectives (ibid: 24).
A case study approach to research is also a method well adapted to combining data from documents and interviews (Yin 2003: Ch. 1). In the thesis the empirical approach relies on combining qualitative and quantitative secondary data (e.g. various official reports, material from media and previous research) with the primary qualitative data collected in the interviews. However, the approach is better described as being inspired by qualitative case study research design rather than a case study as such.

3.2 Elements of the study

For the sake of clarity, the elements of the study are presented in three separate sub-chapters (Boxes 1-5). However, in reality there has been overlap, both in temporal order and in terms of substance between data collection and analysis.

3.2.1 The three mega-projects

In many respects, the decision-making processes of the three mega-projects are seminal in the Swedish context and well suited to the scope of the thesis. Since they were intensely debated, decided upon and implemented during a time when sustainability was coming to the fore of the policy agenda, the decision-making processes of the three projects provides an excellent temporal and spatial context to understanding the emerging sustainability agenda as one of several co-evolutionary processes. While the ‘mega-aspect’ of these projects by definition makes them unique in some sense, they also epitomise several key issues in recent decades (including the management of conflicts between economy and ecology and an interest in new solutions for funding infrastructure). The decision-making processes in these projects therefore provide an opportunity to gain insights into the dynamics between the two analytical levels of policy and planning. The planning of projects of this magnitude is contingent on, and sometimes part of, policy making.

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4 See Appendix 2 for maps.
The Öresund Link

**Type of project and brief background:** The Öresund Link is a SEK 30 billion road and rail link consisting of a bridge, an artificial island, a tunnel and connecting land infrastructure joining Malmö in Sweden with Copenhagen in Denmark via Copenhagen international airport.

Ideas for a fixed link across the Öresund date back to the 19th century. The proposal for a combined road and rail link between Malmö and Copenhagen originate from a mid-1980s report. The agreement to build the link was signed by the Swedish and Danish governments in 1991, but the formal environmental permission in Sweden was not cleared until 1994. Construction commenced in 1995 and the link was inaugurated in July 2000.

A public enterprise owned by the Swedish and Danish states raised money for construction through state guaranteed loans. The loans are repaid with income generated from user fees for cars and trains on the coast-to-coast section of the link.

**Main actors involved in and key characteristics of the decision process:** The project was very controversial. The decision process had a high political profile and was characterised by central level government involvement, including a successive row of ministers of communication, staff at the ministry of communications and ministry of the environment. Since the project was so controversial it incited heated debate in the entire country (and in Denmark as well). While the formal decisions were made by national level politicians other organisations and actors also played important roles. Apart from staff at the ministries the National Road and Rail agencies were also deeply involved. Additionally, other actors without formal influence over decisions played important roles, either by lobbying for the project (including the ScanLink consortium, the South Swedish Chamber of Commerce and regional and local politicians and civil servants), or by being opposed to the project (including formalized and non-formalized actor networks of politicians, labour unions and various NGO’s).

---

**Box 1** The Öresund Link
The Southern Link

**Type of project and brief background:** The Southern Link is a SEK 8.2 billion motoway tunnel forming a 6 km section of a proposed ring-road around central Stockholm. The Southern Link provides municipalities in the Eastern Stockholm region with access to the inner city and the national highway network.

Proposals for a ring road around central Stockholm date back to the 1930s. In the 1960s a plan was developed with roads at surface level, but only one section west of the city centre was built. In the mid-1980s the plan of a ring road was revived, the main difference was the proposal to build in the remaining sections in tunnels.

The Southern Link was one project in "the Dennis agreement", an infrastructure deal for Stockholm including road and rail investments exceeding SEK 28 billion (price level of 1991). (Isaksson 2001) The agreement was signed in 1991 but political support fell apart in 1997, partly due to conflicts over the funding model based on road tolls. The Southern Link was the first of a series of major road projects to be built. Construction commenced in 1998 and was completed in 2004.

**Main actors involved in, and key characteristics of the decision process:** Central government politicians, regional and local politicians and civil servants in Stockholm (Stockholm County Council, the City of Stockholm and Nacka municipality), and civil servants at the Road Agency. It was a highly controversial project from a local/regional perspective.

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**Box 2 The Southern Link**

The Arlanda Rail Link

**Type of project and brief background:** The Arlanda Rail link is a SEK 4.5 billion rail project connecting Stockholm central station and Arlanda international airport. It includes new railway tracks and underground stations at the airport and upgrading of the national trunk line north of Stockholm.

Proposals of connecting central Stockholm and Arlanda airport were made in the late 1970s and alternatives were discussed throughout the 1980s. In 1991 the environmental permit for building a third runway at the airport was conditioned on the grounds that a railway connection was built. Construction commenced in 1995 and the project was completed in 1999.

The Arlanda Rail Link became symbol project for involving the private sector in infrastructure funding. It is the first and so far only Public-Private-Partnership rail infrastructure project in Sweden. It was designed as a Build-Operate-Transfer contract. A private consortium designed, funded and constructed some sections of the projects. When completed, ownership of the infrastructure was handed over to the Swedish state. In return the private consortium gained a 40 year concession guaranteeing the rights to ticket revenue on the shuttle service, and the right to charge other train operators for using the tracks and the station at the airport.

**Main actors involved in and key characteristics of the decision process:** The unconventional funding model required a lot of involvement of staff at the Ministry of Communications. A special unit was created at ministry level to negotiate with the private consortium. Additionally staff at the Civil Aviation Agency and the Rail Agency was involved. The original deal was signed only days before the government was ousted in the 1994 elections and the incoming government (Social Democrats) re-negotiated and signed a new agreement in 1995.

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**Box 3 The Arlanda Rail Link**
3.2.2 Regional infrastructure planning in Skåne

Increasing theoretical insights into the nexus between development of mobility patterns and sustainability issues at stake led to a growing interest in regional level infrastructure planning. The surge in mobility in recent decades, and the role of infrastructure in the accessibility/mobility dynamics, inspired a specific study of regional level planning.

**Box 4 Regional infrastructure planning in Skåne**

**Geographical context:** Infrastructure planning process for the region of Skåne in Southern Sweden, conducted 2007 – 2010

**Background:** The regional infrastructure plan is developed as a part of the process of developing a national infrastructure plan. The planning process is usually preceded by a transport policy bill (the infrastructure proposition) establishing the economic limits of the plans and the balance between investments in the road and railway networks. With a 4 year interval the Government gives directives to the responsible authorities to commence “the measure planning process” which results in 21 regional and one national infrastructure plans covering a 12-year period.

**Economic framework:** In total the national plan included SEK 217 billion for new investments. The regional plan for Skåne contained investments of SEK 4 billion. (ROS 2010).

**Main actors in the planning process:** The Region of Skåne, the National Road and Rail Agencies and the 33 municipalities in Skåne.
3.2.3 National infrastructure policy and planning in a historical perspective

This element of the study expanded the temporal scope of the thesis, to increase understanding of the dynamics between infrastructure policy and planning, also in a historical perspective.

The big picture is traced through an inquiry of previous research on, and first hand analysis of, a successive row of decision processes at national level from (roughly) 1950 – 2010.

Decisions addressed includes:

The 1958 road plan for Sweden
The 1963 traffic legislation
The 1970 Road plan
Transport policy bills 1979, 1988, 1998, 2008 and connected decisions on infrastructure

Box 5 National infrastructure policy and planning in a historical perspective

3.3 Data collection

This section describes the types of empirical data collected in the various elements of the study. The interview study, described in detail below, spans all five elements. In addition all five elements draw extensively on official documents and previous research where relevant.

Interviews are a useful method of gathering data when we cannot observe actions (e.g. if they took place in the past, or were a one-off event), or the way people interpret their surroundings. To get this kind of information, we may need to ask people involved what they know, how they think and what they want (Merriam 1994: 86). A typical characteristic of interviewing as a data collection process is that the information is co-constructed by the researcher and the interviewee (Kvale 1997).
A document is widely defined as a written source produced with another purpose than the research project at hand. From a qualitative research perspective, a document can be understood as information collected through other means than interviews and direct observation (Merriam 1994: 117).

Documents often provide easily accessible, stable, non-intrusive (unlike interviews) sources of information. It is however important to judge the reliability of documents. Usually the study of documents is a key to acquiring a historical understanding of the empirical context of a study (Merriam 1994: pp. 117).

Documents used in this thesis include various official reports, previous research, traditional media (newspaper articles), and internet sources.
3.3.1 The interview study

The interview study comprised 43 semi-structured interviews with persons involved in infrastructure policy and planning. In Tables 1 to 3 the interviewees are divided into three categories based on the position and organization the interviewee represented (or in some cases used to represent): central government level, regional and municipal level, and other.

<table>
<thead>
<tr>
<th>Date of interview</th>
<th>Position/Ministry</th>
<th>Referred to as interviewee</th>
</tr>
</thead>
<tbody>
<tr>
<td>080124</td>
<td>Senior civil servant at the Ministry of communications (MoC)</td>
<td>1</td>
</tr>
<tr>
<td>080311</td>
<td>Minister of Communications, MoC</td>
<td>2</td>
</tr>
<tr>
<td>080316</td>
<td>Political advisor at the MoC</td>
<td>3</td>
</tr>
<tr>
<td>090428</td>
<td>Civil servant at the MoC</td>
<td>4</td>
</tr>
<tr>
<td>090415</td>
<td>Senior civil servant at the MoC</td>
<td>5</td>
</tr>
<tr>
<td>090417</td>
<td>Civil servant at the MoC</td>
<td>6</td>
</tr>
<tr>
<td>090514</td>
<td>Senior civil servant at the MoC</td>
<td>7</td>
</tr>
<tr>
<td>090528</td>
<td>Minister of Communications, MoC</td>
<td>8</td>
</tr>
<tr>
<td>090604</td>
<td>Civil servant at the MoC</td>
<td>9</td>
</tr>
<tr>
<td>090608</td>
<td>Minister of Communications, MoC</td>
<td>10</td>
</tr>
<tr>
<td>090630</td>
<td>Political advisor at the Ministry of the Environment</td>
<td>11</td>
</tr>
<tr>
<td>090711</td>
<td>Civil servant at the MoC</td>
<td>12</td>
</tr>
<tr>
<td>090902</td>
<td>Civil servant at the MoC</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 1 Interviewees at central government level

Table 1 gives an overview of the 13 interviews at central government level. The interviewees include politicians and officials, e.g. three former Ministers of Communications (the Cabinet post today called Infrastructure Minister) and ten former State Secretaries, political advisors and other officials at the Ministry of
Communication, the Ministry of Enterprise and Energy\(^5\) and the Ministry of the Environment.

As Table 1 indicates all but one of the interviews at central government level involved people at the Ministry of Communications (see footnote 6 for further information). The heavy focus on persons at the Ministry of Communications was not completely intentional. It is partly an effect of a ‘snowball’ sampling approach (Kvale 1997) for contacting interviewees; the sample illustrates how people at the Ministry of Communications referred us to other people at the Ministry whom they considered important for our study.

The interviews conducted at central government level were mainly motivated by the persons being involved in the decision-making processes in the Öresund and Arlanda Links projects. In some cases the interviewees had been involved in decision-making on both projects. In general, all interviews frequently veered ‘off topic’ and we talked about, for example, other projects currently discussed in the media as well as much broader perspectives on transport and infrastructure policy and planning.

The planning and decision phases of the three projects took place in the 1980s and 1990s. Many persons involved in the actual planning and decision-making processes were no longer involved in transport and infrastructure planning. Consequently, we also decided to approach persons currently active in transport planning and policy making.

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\(^5\) The Ministry of Communications was abolished in 1998 when responsibility for transport and infrastructure policy was transferred to the Ministry of Enterprise and Energy. In Table 1, the term Ministry of Communications is used throughout although some interviewees were employed by the Ministry of Enterprise and Energy (or in some cases had worked at both ministries).
The interest in regional level planning also led to 15 interviews with persons who were, or had been, active as politicians, planners and other officials at regional or municipal level (see Table 2).

Table 3 shows interviewees involved in planning and implementation (e.g. in project management organisations) and people who were opposed to the projects, or who lobbied for them outside the political system (e.g. representatives of the Swedish Society for Nature Conservation, and the South Swedish Chamber of Commerce), as
The interviews proved valuable in gaining an understanding of the topic in that they provided insight into how conditions for sustainability are influenced by the views of decision-makers.

Table 3 Interviewees from other organisations

<table>
<thead>
<tr>
<th>Date of interview</th>
<th>Organisation/position</th>
<th>Referred to as interviewee</th>
</tr>
</thead>
<tbody>
<tr>
<td>080128</td>
<td>Representative of the Swedish Society of Nature Conservation</td>
<td>29</td>
</tr>
<tr>
<td>080411</td>
<td>Representative of the Chamber of Commerce and Industry of Southern Sweden</td>
<td>30</td>
</tr>
<tr>
<td>080417</td>
<td>Representative of the Öresundsbro Consortium</td>
<td>31</td>
</tr>
<tr>
<td>081126</td>
<td>Representative of SVEDAB and the Rail Agency</td>
<td>32</td>
</tr>
<tr>
<td>090513</td>
<td>Senior civil servant at the Rail Agency</td>
<td>33</td>
</tr>
<tr>
<td>090529</td>
<td>Civil servant at the Road Agency</td>
<td>34</td>
</tr>
<tr>
<td>090610</td>
<td>Senior civil servant at the Rail Agency</td>
<td>35</td>
</tr>
<tr>
<td>090611</td>
<td>Senior civil servant at the Rail Agency</td>
<td>36</td>
</tr>
<tr>
<td>090612</td>
<td>Senior civil servant at the Road Agency</td>
<td>37</td>
</tr>
<tr>
<td>090615</td>
<td>Juridical advisor at law firm</td>
<td>38</td>
</tr>
<tr>
<td>090702</td>
<td>Civil servant, formerly at the Rail Agency and later at the Regional Public Transport Authority in Stockholm</td>
<td>39</td>
</tr>
<tr>
<td>090818</td>
<td>Senior civil servant at the Civil Aviation Agency and later at the Road Agency</td>
<td>40</td>
</tr>
<tr>
<td>090907</td>
<td>Senior civil servant at the Swedish National Debt Office</td>
<td>41</td>
</tr>
<tr>
<td>090923</td>
<td>Academic</td>
<td>42</td>
</tr>
<tr>
<td>090923</td>
<td>Civil servant at the Road Agency</td>
<td>43</td>
</tr>
</tbody>
</table>

well as one academic, a representative of the Civil Aviation Agency, and several from the Road and Rail Agencies.  

The interviews proved valuable in gaining an understanding of the topic in that they provided insight into how conditions for sustainability are influenced by the views of decision-makers.

---

6 In April 2010 the Road and Rail Agencies were merged with some other public authorities involved in the development of the transport system to form a single, multi-modal Transport Agency.
Importantly, the sample is not aimed at being a statistical representation of people involved in Swedish infrastructure policy and planning; the sample is biased, for example from a political or geographical perspective.

3.3.2 Documents

The use of documents as a source of data was different in the three empirical themes. Theme I drew extensively on official policy documents produced in major transport policy decision processes. This included transport policy bills, infrastructure bills, and other documents produced in these processes. The homepage of the Swedish Government Offices was an important source, with various types of document available (Government bills, committee reports, official government reports etc.) in digital form going back at least to the 1990s.

In Theme II the main sources were documents produced by the Region of Skåne in infrastructure planning processes spanning roughly 2004-2010. This included the finished planning documents (regional transport infrastructure plan) and various documents produced as a part of these processes, such as the Strategic Environmental Assessment report of the 2010-2021 plan, and various PMs.

Theme III involved some documents produced at national level. Documents produced by management organisations, such as the Øresundsbro Konsortiet, A-train, and Arlanda International Airport were also used.
3.3.3 The interview process

Of the 43 interviews, 27 were conducted by me, four by telephone and the rest face-to-face. The remaining 16 interviews were performed by a project assistant. The approach can be classified as semi-structured interviews with open-ended questions (cf. Kvale 1996).

All interviews were recorded and then transcribed. They varied in length – the shortest was 26 minutes and the longest 1 hour and 20 minutes, while a typical interview lasted between 45 minutes and 1 hour. The first interview was carried out in January 2008 and the last in December 2009.

The transcriptions were sent to the interviewees for reading and approval, which in some cases resulted in changes to the original transcript. This included minor corrections of language, where the interviewee felt that the colloquial nature of the transcription distorted or obscured the meaning of what he or she wanted to say. In other cases it involved deletion of information that they considered to be sensitive (e.g. beliefs, or value statements concerning other people).

Early in the process a decision was made that all interviewees were to enjoy full anonymity. The main reason was that some of the questions (see Appendix 1a and 1b) asked interviewees to make evaluative and normative statements that could come across as sensitive given their professional roles and positions. The hope was that, by guaranteeing anonymity, the respondents would feel confident to more freely share their perceptions and experiences. While some interviewees explicitly gave permission to use their names a decision was made to let all interviewees remain anonymous. This also means that I have tried to describe positions within organisations in a manner that will not reveal identity.

In terms of interview questions, a specific approach of the Omega project was to distinguish between interviews performed early, and interviews performed later in the research process (see Appendix 1a and 1b for a comparison of the questionnaires). The motivation for this approach was that the interviews performed early in the research process should not be biased by the preconceptions of the researcher. The questions used at this stage of the interview study were designed to be very open, to allow
interviewees to reflect freely on what they considered to be pivotal events during the decision-making process of the project in which they were involved.

In comparison, interviews performed later in the research process used an interview guide with much more specific questions, including questions designed to test hypotheses developed during the early phases of the interview study. These later interviews also included questions on aspects of the three projects and the regional infrastructure planning process.

Of the 43 interviews, 18 were conducted using the first questionnaire (Appendix 1a) and the remaining 25 used the second questionnaire (Appendix 1b). It should however be emphasised that, while the questions were different in the two interview guides, in reality the interviews were carried out in a much more flexible way and the respondent's position, relationship to a specific project, or current topics discussed in media influenced the course of the conversation and the questions discussed.

### 3.4 Qualitative content analysis of interviews and documents

Qualitative content analysis can be described as an interactive process of screening, combining, reducing and interpreting information from primary and secondary sources (Merriam 1994: 129-135). In general the approach is similar for analysing both interviews and documents – it is a parallel process of interpreting, constructing categories, and capturing and structuring information (Merriam 1994: 129). The analytical tool of the method is to actively pose questions to the material. Kvale (1996: 184) describes this as the researcher being involved in an “…imagined dialogue with the text, unfolding its horizon of possible meanings”.

However, there are practical differences between analysing information collected through interviews, and analysing information from documents.
3.4.1 Analysing documents

A systematised text analysis is an appropriate method when the researcher wants to understand the big picture in the text or search for unstated meaning. Text analysis requires the researcher to intensively read the text by actively posing questions to the text material. The questions are either answered by referring directly to the manifest message, or indirectly by the researcher interpreting the latent message of the text (Esaiasson et al. 2007).

The theoretical frameworks applied in the empirical chapters of the thesis led to the identification of different categories used when analysing the various documents. For example, the MLP framework applied in Theme I meant posing questions about changes in regime rules. Here both previous research and national level policy documents were used as sources of information. The discourse theoretical approach in Theme II resulted in questions concerning framing of problems and solutions being posed to documents produced in the regional planning process.

3.4.2 Analysing interviews

The practical process of analysing interviews is different to analysing documents. More specifically, an intertwined three-stage model based on Kvale (1997) was used to analyse the interviews. The three stages are meaning categorisation, meaning concentration and meaning interpretation.

In transcribed form, the interviews resulted in more than 500 pages of text so, in the first step, the transcriptions were coded according to certain categories. The categories included statements linked to the three empirical themes of the thesis. This step of meaning categorization resulted in chunks of text that allowed a horizontal reading of statements from different interviewees referring broadly to the same themes (cf. Kvale, 1997: 174 pp.).

This was followed by what Kvale (1997: 175 pp.) calls meaning concentration. Here the coded pieces were analysed and grouped according to a subset of issues and topics that are considered in the various sections of the thesis. This also included writing comments about the statements and reducing the statements to shorter phrases that capture key themes and recurring, similar statements from different interviewees.
In some instances this stage also revealed where different respondents made contradictory claims, sometimes regarding facts but more often opinions. Consequently, the horizontal reading brought out visible similarities as well as conflicting opinions and paradoxical statements in the interviews.

In the third step, meaning interpretation, some statements were singled out as being either particularly interesting for the topic or for managing to express or convey something that many respondents alluded to. Kvale (1996: 201) describes this as going “…beyond what is directly said to work out structures and relations of meaning not immediately apparent…” This means that statements from the interviews were interpreted and re-contextualised within broader frames of reference.

However, it is important to point out that, even if this stage is referred to as meaning interpretation, the interpretation and analysis occurred continuously in all three stages, but performed different functions in the three stages.

Interpretation and analysis in the first step, meaning categorisation, is largely self-explanatory. The interpretation of the second stage is in line with what Kvale (1997: 193) calls self-understanding, meaning that interpretation is limited to the respondent's self-understanding as perceived by the researcher. This is done by reducing the content (de-contextualizing) of statements to short sentences that, according to the researcher’s interpretation, expresses what the interviewee says in a concentrated form.

In the third stage, the statement is re-contextualised by choosing certain statements of particular interest that are interpreted and compared with other statements (from interviews as well as secondary sources). This constitutes an intertwined fabric of empirical presentation and analysis. To some extent, the third step is a kind of interpretation that corresponds to what Kvale (1997: 193) calls theoretical understanding, i.e. the interpretation of statements connects to some kind of theory of society.
3.5 Empirical strategy for presenting the analysis

The empirical strategy for presenting the results of the thesis is in line with what Nylén (2005: 53) refers to as a narrative approach. According to Nylén (2005: 53), a key element of a narrative approach (or method) is that the “…social reality [is] organized by people's stories”. By analysing and interpreting these stories, the researcher can create new narratives, so that stories from the field are analysed and interpreted by the researcher to provide a new narrative of the field (Nylén 2005: 48 & 53).

The goal is to create a research-driven story that covers more material than that reported in the empirical representation. The idea is to create a story, or narrative, about different themes, which Nylén (2005: 50) defines as “... the overarching questions that run through different stories…”

This means that not all interviews are referred to in the empirical chapters. The interviews are used interchangeably throughout the empirical themes: to obtain information on past actions and events and to obtain insight on how the interviewees interpret their surroundings.

3.6 Qualitative case study research design and generalisation

Finally, it is also worth emphasising that the research approach is qualitative, i.e. the questions posed are of a qualitative nature, as are the methods used to answer them. Consequently, the ambitions for scientific contribution and degree of generalisation of the results should be understood within this tradition (cf. Nylén 2005: 10). The goal of the thesis was to produce results that are analytically, and not statistically generalisable (Yin 2003: 10-11). The main ambition was to deepen the understanding of the conditions for sustainability in Swedish infrastructure policy and planning.
4. Theme I: Infrastructure, policy and planning 1950-2010 – a transition theory perspective

“The overall objective of transport policy is to ensure a cost-efficient and long-term sustainable provision of transport for citizens and business in the entire country.” (Swedish Government 1998: 16)

“Planning for a sustainable transport system includes efficient travel and transport chains, and facilitates sustainable regional expansion and climate-friendly choices.” (Swedish Government 2009: 7)

“...the government is now raising the level of ambition and is investing 522 billion during the next plan period. This represents an... increase of nearly 20 percent compared with the previous National Plan...” (Swedish Government 2012a)

Since 1998 sustainable transport has become a key objective of Swedish transport policy. The open nature of the concept means that it is far from evident what the implications of adopting sustainability are for infrastructure policy and planning. The quotes above illustrate that sustainability in relation to infrastructure is linked to other concepts, such as cost-efficiency, regional expansion and climate-friendly choices. The final quotation also illustrates that expanding the transport infrastructure is often viewed as an obvious necessity.

7 All quotations from official documents and interviews in the thesis are translated by the author.
The point of departure in this chapter is that it is important to understand how sustainability has emerged as one of several co-evolutionary topics to be established on the transport policy agenda, and how this implies certain conditions for sustainability in infrastructure policy and planning. The analytical approach is drawn from transition theory, particularly the multi-level perspective (MLP) framework, and the focus is on aggregate, long-term patterns describing interdependencies between changes in technical systems, mobility patterns, policy and planning agendas and practices.

The aim of this part of the study is to explore the drivers and co-evolutionary processes that explain the changes in road and railway networks and infrastructure policy and planning in Sweden since the 1950s, and what this means in terms of synergies and conflicts with the emerging sustainability agenda. This is tackled by asking four questions: 1) What changes have we seen in the road and railway networks? 2) How can these changes be understood in relation to changes in infrastructure policy and planning? 3) What are the drivers for change? 4) What are the implications of the sustainability agenda emerging in this context?

The MLP framework is introduced and adapted for the study in section 4.1, while the analysis using the MLP framework is carried out in sections 4.2 to 4.5. In section 4.6 the results of the analysis are summed up and related to the overarching theory on sustainability in infrastructure policy and planning.

### 4.1 The MLP framework adapted for the study

The MLP framework is structured on three levels: the socio-technical landscape, socio-technical regimes, and niches. It has typically been used for studies of technology and innovation, often with a focus on emerging large technical systems (Geels 2002). Here the framework is used to unravel broad patterns of change and interdependencies between road and railway infrastructure, mobility patterns and levels, and infrastructure policy and planning. This means that there is less focus on emergence of new technical artefacts, and more emphasis on changes in ways of thinking and ways of doing things (i.e. changes in regime rules). The MLP is used in a slightly adapted version inspired by Geels (2007) and Raven (2007). The concepts of
landscape, regimes and niches are used as analytical tools to unravel complex dynamics of change, but emphasis is on process tracing of incremental regime innovations (Geels 2002: 1260). Building on Geels (2007), an insider/outsider dynamics is added to the framework, and drawing on Raven (2007) some typologies of multi-regime interaction are added.

4.1.1 Landscape

The socio-technical landscape in the MLP is defined as the external context in which the regimes and niches are embedded. The landscape can include infrastructure\(^8\), the spatial organisation of society, political ideologies, societal values, beliefs, the media landscape and macro-economic trends, globalisation, paradigm shifts and changes in culture (Geels 2007 & 2012: 3; Grin et al. 2010: 131).

Changes at this level are highly autonomous processes driven by trends and events beyond direct and total control by individual actors, or networks of actors (Grin et al. 2010: 24). Landscape-level factors can have different temporal and spatial characteristics, such as long-term universal trends, more geographically limited phenomena (e.g. urban and regional spatial development patterns), and rapid external shocks (e.g. wars, sudden economic meltdowns, natural or man-made disasters) (Grin et al. 2010: 24 & 131). Landscape developments have to be translated by regime actors in order to lead to changes in socio-technical systems (Raven 2007: 2206).

\(^8\) Geels (2012) defines infrastructure as an element of the regime, used to explain the inertia of the regime.
4.1.2 Regimes

According to Geels (2012: 3), the socio-technical regime should be understood as an “…interpretive analytical concept…” allowing investigation of the ‘deep structures’ (both tangible and intangible) in which the actors in a socio-technical system are embedded. The concept includes organisations and actor networks as well as regulations, norms, values, shared perceptions, established procedures and routines.

The regime level is crucial for explaining stability and change in established socio-technical systems. Established systems are stabilised by roles, routines, ways of thinking, and ways of doing things (Geels & Kemp 2007: 443). In the MLP this is perceived as a semi-coherent set of rules that guide the activities of actors (Geels 2002: 1260 & Geels 2004). These rules are sometimes referred to as ‘the grammar’ of the regime (Geels 2007). The coordinative effect of rules is to create stability, and the consequence is incremental changes along certain trajectories (Geels & Kemp 2007).

In the study an analytical simplification is introduced by distinguishing between the overarching infrastructure regime (referring to the whole system, transport infrastructure policy level) and the road regime and the railway regime (referring to the operational level of planning). A main ambition of the analysis is to describe and order the temporal sequence of changes and to develop an understanding of the interplay between changes in the regime rules and the development of the infrastructure system.

A distinction can be made between cognitive, normative and formal/regulative rules. (Geels 2004; Grin et al 2010: 20). There is no uniform and exact definition of the rules, but they are often defined along the following lines.

Cognitive rules include taken-for-granted belief systems, guiding principles, problem definitions and search heuristics (Geels 2007; Grin et al 2010: 20). Geels (2004: 904) elaborates and explains that cognitive rules influence views on what constitutes the nature of reality, and provides frames through which meaning is made (such as concepts, words, myths and signs). Cognitive rules are underpinned by certain practices and procedures for establishing knowledge, often shared by many actors. (Grin et al 2010:42). In the analysis, cognitive rules refer to problem agendas, guiding principles, and the main practices for establishing knowledge.
Normative rules can be defined as values, norms, role expectations, duties, rights, policy goals (Geels 2004), and sense of identity (Geels 2007). Here, a more narrow definition is employed, and normative rules are operationalised as infrastructure policy and planning objectives.

Formal/regulative rules constrain behaviour and regulate interactions (Geels 2004) and can include laws, standards, and regulations (Geels 2007) and governance systems (Geels 2004). In the analysis, formal rules refer to the relationship between actors (allocation of resources such as money and authority) and regulative rules refer to national level laws, and regulations. The emphasis is on describing changes in rules that influence the conditions for sustainability.

Rules are often overlapping and interdependent, e.g. regulative rules guide formal relationships, and normative rules guide the cognitive rules and vice versa.

Consequently the concept of socio-technical regime as used here denotes a patchwork of regimes. The dynamic between the incumbent or dominant regimes, other subaltern regimes, niche actors and other outsiders is an important driver for transitions, and explains both stability and change of large technical systems (Geels 2007).

4.1.3 Niches

The niche level in the MLP typically refers to radical novelties, often technologies developed by actors not part of the regime. The actors or network of actors in the niche hope that their novelties will eventually be adopted at regime level (Grin et al. 2010). The incumbent regimes aim to maintain the status quo, meaning that novelties implying drastic changes will be resisted, either actively by regime actors or passively through lock-in mechanisms in regime structures (i.e. formal, cognitive and normative rules) (Geels 2012: 2). Implicitly it is assumed that niches are competing with existing socio-technical systems and regime practices and ultimately aim to replace incumbent regimes, but it has also been acknowledged that symbiotic niche innovations can be adopted to solve particular problems of the regime (Geels 2007: 134).

Niches can also emerge at regime level, empowered or regime niches, and challenge the dominant regime (Grin et al. 2010: 134). Following the characteristics of the topic studied here the notion of empowered niches is highly relevant. Given the strong
position of the state and the public sector in the infrastructure regime, any notion of breaking down, or replacing existing regimes is likely to imply minor, incremental changes over time of configurations of actors and legislation (formal/regulative rules) and practices (cognitive rules), rather than radical shifts.

In this study the concept of niche is used as an analytical tool describing how novelties such as new ideas, perspectives, techniques and methods aimed at influencing the regimes are promoted. The analysis also focuses on whether or not the novelties proposed are adopted or resisted by the regimes and how this influences, or fails to influence, the development.

### 4.1.4 Transition pathways

Previous research using MLP has found that transitions, i.e. changes from one socio-technical system to another or the configuration of existing socio-technical systems, can occur in different ways. Geels & Schot (2007) introduced a typology of different pathways of transition processes, based on variations in timing and nature of multi-level interactions. Here three of the typologies will be used: transformation, reconfiguration, and technological substitution.

The typologies were developed to nuance the emphasis in previous research on emergence and stabilisation of socio-technical systems. Typically this was viewed as a technology-driven process of substitution where niche innovations of technical artefacts compete for a dominant market position. Technological substitution is therefore an example of a technology-driven transition pathway. Here, ideas about selection and retention based in evolutionary economics, linkages and interaction between landscape, niches, and regimes are key explanations for a type of change where one system is replaced by another (e.g. Geels 2002).

This type of transition pathway typically ends in momentum, a concept referring to a stage in which large technical systems display a direction and rate of growth indicating self-reinforcing characteristics. Momentum and directionality stem from the alignment of numerous social and technical elements, and indicate that the system has become deeply embedded in society, resulting in many linkages between firms, regulatory bodies, departments in educational institutions and research laboratories, user practices, markets, etc. (Geels 2007: 124 referring to Hughes 1987 and 1994).
Geels (2007) focuses on changes occurring in existing large technical systems. This is viewed as a different type of change process where “the new grows out of the old” (Geels 2007: 131). Instead, transformations and reconfiguration pathways are more driven by shifts in regime rules, and indicate a shift in direction rather than radical shifts of technological trajectories (Geels & Kemp 2007: 453). In transformation and reconfiguration processes, the niche level plays a lesser role (Geels 2007). In transformation pathways, landscape development and conflicts between regime actors and outsiders are important and lead to gradual adjustments of regime rules. Reconfiguration pathways have similar characteristics, but differ in that elements and linkages, the basic architecture of the regime, experience substantial change (Geels & Schot 2007). In the analysis the three typologies of transition pathways are used to describe the broad characteristics of the changes taking place.

4.1.5 Multi-regime interaction and insider/outsider dynamics

Two more dimensions, multi-regime interaction and insider/outsider dynamics, are added to the MLP framework to describe additional mechanisms that trigger changes in socio-technical systems

Raven (2007: 2199) introduces four different types of relationships that describe multi-regime interactions. Competition occurs when regimes start to fulfil similar functions and struggle for market shares (Raven 2007: 2206, exemplified by the Dutch waste regime beginning to compete with the electricity regime by producing electricity from waste incineration); symbiosis occurs when regimes reap mutual benefits from each other; integration occurs when previously separate regimes become one; and finally spill-over refers to transfer of experience from one regime to another (e.g. the copying of what is perceived as a successful organisational structure from another regime). These concepts are used in the study to categorise the relationship between the road and railway regimes at different stages in the transition pathways.

The last dimension added is insider/outsider dynamics based on Geels (2007). This is added to emphasise that actors entirely outside the regimes, not actively aiming to become part of the regime (which is what distinguishes outsiders from niche-actors) have an important role in transitions.
Regime outsiders can voice criticism in relation to negative outcomes produced by regime practices such as environmental effects; Geels (2012) also mentions the UK fuel tax protests as an example. This kind of feedback can be important in changing regime rules and triggering wider change processes in existing technical systems. A further distinction can be made between different types of outsider groups, such as societal pressure groups (aiming to influence public opinion and policy makers) and external professionals, such as scientists and engineers bringing in new knowledge (Geels 2007: 132).

4.1.6 Delimitations

Admittedly it is not possible to capture all dimensions of change taking place at all the levels of the MLP, and cover all perspectives. The aim is to outline processes of change that are of key importance to conditions for sustainability. It is not a detailed study of changes in party politics or environmental legislation. The temporal limits of the study should be viewed as indicative rather than definitive. Events and processes taking place before 1950 and after 2010 are also included.

In the analysis, various secondary sources and to some extent the interview study are used to describe and analyse the dynamics between changes at different scales and different dimensions of the regime.
4.2 Mapping the big picture (1950 – 2010)

Like many other industrialised countries, the Swedish transport system underwent drastic changes between 1950 and 2010. The most striking feature is the surge in road-based motorised mobility and a parallel qualitative expansion of the road network.

However, two broad trends in the quantitative indicators can be discerned in Tables 4 & 5 and Figures 5 - 7. Firstly, there has been a transition to an ‘auto-society’ (cf. Lundin 2008), which was most intensive between 1950 and 1970 but which is still ongoing. Secondly, the railway network underwent a reverse development, with diminishing volumes and the closing down of tracks until the 1990s, when a renewed interest in railways spurred a strong increase in spending on railway construction. In the two last decades there has been a relative increase in public transport volumes and a massive increase in spending on both roads and railways.

This is interpreted as a transport system for motorised mobility in momentum, but a change in the technological trajectory has occurred. The transition to auto-society is understood as a technological substitution pathway where road transport replaced the railway as the dominant mode of transport. The challenging of regime practices supporting auto-society began already in the 1960s. The pathway was first transformed when increasing outsider protests against road building, closure of railway lines and various landscape pressures momentarily halted the substitution pathway during the 1970s. The increases in spending and changes in mobility patterns in the last two decades have been paralleled by significant changes in the regime rules, and this is understood as a re-configuration pathway unfolding and gathering momentum. The conditions for sustainability in this re-configuration pathway are explored by using the MLP to structure the analysis in the following way.

Section 4.2 outlines general transport system changes, such as mobility levels and patterns, the extent and quality of the road and railway networks, the amount of money spent on developing infrastructure, and wider changes at landscape level such as the aggregate macro-economic trend. Section 4.3 describes the transition to auto-society (1950-1970) in more detail. Section 4.4 describes how problems are re-articulated and regime rules are challenged (1960-1990). Section 4.5 focuses on the re-configuration pathway (1990-2010) and outlines the most important changes of cognitive, normative and formal rules taking place since the 1990s. Section 4.6 provides a discussion of
what the historical perspective means as conditions for sustainability in infrastructure policy and planning.

4.2.1 Changes in mobility levels and patterns and the infrastructure systems

In the early 1950s motorised travel in Sweden amounted to some 8 km/capita/day, half of which was by public transport, and the other half by car (Vilhelmson 1990: 24). In 2006 average daily per capita mobility was 42 km (Frändberg & Vilhelmson 2011: 1259), and modal distribution for cars amounted to 85% of total passenger-kilometres travelled.

The real explosion in car-based mobility took place between 1950 and 1970 and sowed the seeds of key current sustainability challenges. Energy use for domestic, land-based transport increased from around 15 TWh in 1950 to around 50 TWh in 1970 (SPBI 2013), and in 2011 transport energy use amounted to some 90 TWh (Swedish Energy Agency 2013).

Consequently CO2 emissions from the transport sector have increased and emissions from land-based, domestic transport (roughly 19 million tonnes of CO2 in 2011) today account for more than 40% of national green-house gas emissions. Emissions from passenger cars has decreased by 9 percent compared to the 1990 levels, despite increases in transport volumes. This is explained by more energy-efficient cars and increasing use of biofuels. However, this decrease has been offset by emissions from heavy duty vehicles increasing by 44 percent during the same period (Swedish Environmental Protection Agency 2013).

The dramatic increases in mobility have not been equally distributed; there are systematic differences in mobility patterns and levels between different groups (according to age, gender, and socio-economic status) in the population (Vilhelmson 1990). In recent decades gendered mobility differences has displayed an ‘upwards convergence’, where the levels and patterns of mobility for women follow a similar

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9 Domestic trips only, excluding air travel.
trend of more and longer travel (Gil Solá 2013). Gendered differences in mobility are still systematic and substantial (Frändberg & Vilhelmsen 2011).

Since the 1990s some important changes in mobility patterns can be noticed. There has been a significant relative increase in public transport volumes by rail (see fig 7) and stabilisation of increases in car use (see Fig 5). However, despite the relatively strong increase in passenger rail volumes there is little sign of convergence in the gap between car and rail volumes.

<table>
<thead>
<tr>
<th>Year</th>
<th>Nr of cars (including trucks)a)</th>
<th>Cars/1000 persons b)</th>
<th>Road network (km)c)</th>
<th>Paved roads (km)d)</th>
<th>Motorways (km)e)</th>
<th>Railway network (km)f)</th>
<th>Double tracks (km)g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>337,407</td>
<td>36</td>
<td>90,409</td>
<td>5,215</td>
<td>0</td>
<td>15,516</td>
<td>680i)</td>
</tr>
<tr>
<td>1960</td>
<td>1,315,768</td>
<td>159</td>
<td>93,481</td>
<td>8,196</td>
<td>54</td>
<td>15,219</td>
<td>1,112j)</td>
</tr>
<tr>
<td>1970</td>
<td>2,432,231</td>
<td>283</td>
<td>98,050</td>
<td>26,381</td>
<td>376</td>
<td>12,203</td>
<td>1,167k)</td>
</tr>
<tr>
<td>1980</td>
<td>3,064,531</td>
<td>347</td>
<td>97,614</td>
<td>57,852</td>
<td>809</td>
<td>12,006</td>
<td>1,167l)</td>
</tr>
<tr>
<td>1990</td>
<td>3,911,000</td>
<td>419</td>
<td>98,548</td>
<td>69,819</td>
<td>1,032</td>
<td>11,193</td>
<td>1,205m)</td>
</tr>
<tr>
<td>2000</td>
<td>4,373,000</td>
<td>450</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>11,037</td>
<td>1,556n)</td>
</tr>
<tr>
<td>2010</td>
<td>4,927,973o)</td>
<td>461o)</td>
<td>98,400o)</td>
<td>n/a</td>
<td>1,860p)</td>
<td>11,022q)</td>
<td>1,826r)</td>
</tr>
</tbody>
</table>

a) Statistics Sweden (2008a)
b) Ibid.
d) Ibid.
e) Ibid
f) Statistics Sweden (2008b)
g) Statistics Sweden (1955)
h) Statistics Sweden (1969)
i) Statistics Sweden (1979)
j) Statistics Sweden (1989)
k) Statistics Sweden (1995)
l) Statistics Sweden (2001)
m) Trafikanalys (2012)

Table 4 Numbers of cars, car density, and road and rail infrastructure, 1950 – 2010.
At a more disaggregate level Frändberg & Vilhelmson (2011) identify a trend with stagnating, and even falling daily and long-distance domestic mobility (among some cohorts of the population) and a countetrend with increasing international travel and strong increases in air travel.

Table 4 and Figures 5 and 6 illustrate important changes taking place. From 1950-1970 the total number of cars as well as car density increased strongly (Table 4), and road transport became the dominant mode of transport for passengers and freight (Figures 5 and 6). This development was paralleled by a drastic alteration to the road transport network (Table 4). While the total length of the road network\(^\text{10}\) increased modestly, in relative terms the qualitative improvements were massive.

At the beginning of the 1950s, less than 5% of the road network was paved, but this proportion had increased to 25% within twenty years. More than 500 bridges and 600 viaducts had been built (Castensson 1991: 235). In 1953 the first motorway was

\(^{10}\) The figures for the road network provided in table 4 only concern the state road network. There is another 41 600 km of municipal roads, 74 500 km of private roads with state subsidies and a large number of private roads.
completed and by 1970 some 376 kilometres of the road network was of motorway standard. State spending on roads quadrupled from SEK 1.18 billion in 1948 to SEK 4.7 billion in 1968\textsuperscript{11} (Statistics Sweden 1959 & 1969).

While the road network expanded in extension as well as importance, the opposite applied to the railway network. In 1950 the total length of the railway network was approximately 15,500 kilometres (see Table 4) and accounted for a majority of passenger travel (Figure 5). Increasing car use, dwindling customer potential and deregulation of freight transport resulted in some 3,000 kilometres of railway being closed down between 1950 and 1970. By 1970 road transport was totally dominant for passenger transport. However, the railway remained important for freight transport and, while its importance declined in relative terms (Figure 6), there was a slight increase in tonne kilometres until 1970.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{plot.png}
\caption{Freight transport in Sweden 1950-2010, based on data from Trafikanalys (2012a).}
\end{figure}

\textsuperscript{11} Prices adjusted for inflation.
The massive increase in road-based mobility and the parallel change of the infrastructure networks display the typical traits of the technological substitution pathway and a socio-technical system in momentum (Geels & Schot 2007). In section 4.3 it will be shown how landscape, regime and niche dynamics and multi-regime interaction contributed to this development.

Compared to the drastic changes taking place from 1950 and until the early 1970s, the 1970s and 1980s were characterised by an incremental qualitative upgrading of the road network and the continuing closing down of railways. Section 4.4 considers how this development can be viewed as an interlude when landscape development and outsider protests lead to a challenge of the regime rules. Together this was building up pressure for change in the transition pathway.

Figure 7 Relative changes in car and rail passenger transport 1990-2010, based on data from Trafikanlys (2012a).
In 1988 the amount of money invested in roads was at the lowest level since the early 1950s. The figures for the early 1990s in Table 5 illustrate a very different picture, with a dramatic increase in road investments as well as substantial investments in the railway for the first time in decades.\(^\text{12}\)

Spending on roads increased steeply, from around SEK 3 billion/year in the late 1980s to SEK 7 billion/year in the mid-1990s. For railway investments the increase is even more drastic. From virtually no investment in new railways for decades, investment levels suddenly increased significantly and kept expanding throughout the 1990s and 2000s. The column ‘Roads and streets’ in Table 5 also shows substantial increases in spending on road infrastructure at local government level.

\(^{12}\) Note that the figures in Table 2 are based on different sources and may not be fully comparable.
The dramatic increases in spending are explained both by a continued incremental upgrading of existing systems and the implementation of a number of mega-projects (of which the Öresund Link, the Arlanda Rail Link and the Southern Link are three examples). Large-scale infrastructure packages in the three main metropolitan regions is another explanation (cf. Isaksson 2001 and Falkemark 2006). It has been argued that

<table>
<thead>
<tr>
<th>Year</th>
<th>Roads and streets, Local &amp; Regional level a)</th>
<th>Road Agency a)</th>
<th>Railwaysa)</th>
<th>Totala)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>n/a</td>
<td>2,6b)</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>1990</td>
<td>n/a</td>
<td>3,8b)</td>
<td>1,8c)</td>
<td>n/a</td>
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<tr>
<td>1992</td>
<td>n/a</td>
<td>5,1c)</td>
<td>1,8d)</td>
<td>n/a</td>
</tr>
<tr>
<td>1993</td>
<td>n/a</td>
<td>7,4d)</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>1996</td>
<td>1,5</td>
<td>7,2</td>
<td>8,6</td>
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<td>1998</td>
<td>1,9</td>
<td>7,4</td>
<td>6,8</td>
<td>16,1</td>
</tr>
<tr>
<td>2000</td>
<td>2,6</td>
<td>5,1</td>
<td>4,4</td>
<td>12,1</td>
</tr>
<tr>
<td>2002</td>
<td>3,8</td>
<td>8,1</td>
<td>5,6</td>
<td>17,5</td>
</tr>
<tr>
<td>2004</td>
<td>3,5</td>
<td>9,7</td>
<td>9,6</td>
<td>22,8</td>
</tr>
<tr>
<td>2006</td>
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<td>8,5</td>
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<td>23,8</td>
</tr>
<tr>
<td>2008</td>
<td>5,8</td>
<td>9,7</td>
<td>13,4</td>
<td>28,9</td>
</tr>
</tbody>
</table>

a) SIKA (2008) unless otherwise stated. Figures based on b) to f) are adjusted to the price level of 2008.
b) Statistics Sweden (1992)
c) Statistics Sweden (1994)
d) Statistics Sweden (1995)
f) Swedish Government (1990)

Note: References e) and f) are based on budget proposal, not actual investments.

Table 5 Road and railway investments 1988-2008, SEK billion (not including re-investments and maintenance).
the 1990s was viewed as the ‘decade of infrastructure’ among politicians and decision makers (Tonell 2000). Judging by the subsequent development this has morphed into a permanent state.

In section 4.5 it will be explained how the change in recent decades can be viewed as a transition pathway. It begins with a transformation when the regime was challenged, and then morphs into a re-configuration pathway driven by a rearrangement of regime rules through interactions between landscape and regime levels, regime outsiders and road and railway regime interactions.

### 4.2.2 Landscape – trends and drivers

The transition to auto-society took place during a phase of exceptionally stable economic growth. During the 1970s the co-evolution of several processes resulted in a new political and economic context. In contrast to the era of unprecedented growth between 1950 and 1970, the 1970s was characterised by recurring recessions brought about by energy crises and increasing global competition. Important industries such as the shipyard and textile industries were forced out of business or relocated abroad, and so demand for freight transport decreased temporarily. Increasing global competition continued to put strong pressure on domestic industries, which resulted in a structural shift of the economy with far-reaching consequences. The closing down or relocation abroad of important industries influenced the economic, social, and spatial fabric of society while simultaneously leading to new mobility patterns as well as new ways of thinking about infrastructure investments.

In the 1980s and 1990s, the economic volatility of the 1970s continued – from stagnation in the early 1980s, to boom time in the late 1980s, to a deep recession and financial crisis (see Figure 8). In 1991-1993 growth was negative and unemployment rose to about 9% of the workforce, compared to 1.5% in 1989. After falling to around 6% in 2008, unemployment in 2013 was approximately 9% (Statistics Sweden 2013).
The 2008 financial crisis resulted in the largest decline of GDP in Sweden in a single year; in 2009 GDP shrank by 5%. Since then there has been a recovery, with high growth rates in the last few years (Swedish Government 2013).

Several other landscape trends and processes have been important in the transition dynamics.

A general radicalisation of the political climate in the 1960s and 1970s and growing environmental awareness triggered changes in regime rules such as increasing formalisation of public participation and environmental concern. Sustainability and sustainable development were made official policies by the Swedish government in 1997, when the reigning Social Democrats declared its visions of “the green welfare state” (Lundquist 2000).

Since the 1980s a combination of domestic and international events and processes opened up for a continuous wave of liberalisation and deregulation. Domestic factors include recessions and budget deficits, while international factors include the collapse of the Eastern bloc, the end of the Cold War and the 1995 EU accession. The EU accession added new supra-national governance context, such as through the increasing emphasis on projects designated priority status according to the Trans-European Network. New approaches to funding infrastructure (illustrated by projects

Figure 8 GDP development 1950 - 2004, annual growth and 5-year average, source Swedish Government (2013).
such as the Öresund and the Arlanda Rail Links) during this era are linked to these different events and processes in various ways.
4.3 Technological substitution – the transition to auto-society (1950 – 1970)

From a transition perspective, the swiftness and scope of the change of the transport system during this 20-year period is quite spectacular, and has attracted a lot of attention from researchers. Sannerstedt (1979), Modig (1991), Kaijser (1994), Blomkvist (2001), Blomkvist (2004), and Lundin (2008) identify several important tendencies and characteristics illustrating important facets of this transition.

The stage for the transition was set by dynamics between landscape, regimes and niches in the decades preceding the 1950s. Since the 1920s, the infrastructure regime had moved towards centralism and the transport sector had become increasingly regulated. Niche actors, such as the Swedish Road Federation, played an important part in framing problem agendas. In combination with recessions and WWII, this triggered changes in the regime. At the beginning of the 1950s, the state had consolidated its position and was in control of a large share of the road network and the entire railway network (cf. Kaijser 1994). This consolidation process had big differences in terms of outcomes for the road and railway systems.

4.3.1 The consolidation & rise of the road regime

Niche-regime interaction was important in several reforms of the road regime that set the stage for the transition to auto-society. In the decades preceding WWII, organisations such as the Swedish Road Federation and the Royal Automobile Club managed to place lack of central organisation as a key issue on the problem agenda (Blomkvist 2001). The upkeep of roads had traditionally been a responsibility of local landowners (often farmers) who by law were forced to maintain roads on their property. Beginning in the 1920s, a number of reforms were made gradually leading to a system shift where costs for maintenance of roads were allocated to motorists through taxes and levies (Kaijser 1994: 152-153). During the war years of the early 1940s, a government report recommended the creation of a state-controlled public road network, and in 1944 most of the public road network (with the exception of
roads in larger cities) was brought under the control of the Road Agency\textsuperscript{13} (Kaijser 1994: 154).

The rapid increase in road traffic and the organisational restructuring of the Road Agency increased both the need and the possibility for centralised planning, and in 1958 the first national road plan was presented (Kaijser 1994: 155). The plan established a nationwide network of trunk roads and highways very similar to the American paragon the \textit{Inter-State Highway System}. Like its role model it also established the principals of traffic engineering as the fundamental methodology and ideology for road building. The introduction of traffic engineering was keenly advocated by the Swedish Road Federation, which successfully lobbied authorities and universities to adopt the new techniques (Blomkvist 2004).

\section*{4.3.2 The consolidation and decline of the railway regime}

The increasing amount of cars in the pre-WWII decades also influenced the railway regime in several ways. The development of the railway network from the 1850s was characterised by the state building and operating the main network (although with some exceptions) – while private actors developed regional and local networks (Kaijser 1994).

The system with the trunk lines of the network operated by the state and private actors running the regional and local rail lines became unstable by the 1930s when increasing car traffic amplified the competition for railway operators. The local, privately-operated networks were the first to encounter economic problems (Kaijser 1994: 147 & 150). In 1939 the Swedish Parliament decided that the Swedish State Railways (SJ) should take control over all private railways and a consequence of this was increasing economic difficulties for SJ. These economic difficulties would remain a key transport policy issue with important consequences for the development of the infrastructure systems in the decades to come.

\textsuperscript{13} The organisation has changed name several times since 1944 but, to maintain consistency the Road Agency is used to denote all the incarnations.
A 1963 transport policy decision signified a major shift in the competitive conditions between road and railway transport, when protective measures formerly favouring the railway were removed (Sannerstedt 1979). Another important consequence of this decision was reduced obligation for SJ to maintain traffic on non-profitable railway lines. SJ seized the opportunity to close down substantial sections of the rail network, most of which were run by private actors prior to 1939. The remaining network was further divided into two parts; a ‘commercial network’ ran on business principles, and a ‘deficit network’ subsidised by the state (Wedin 1982: 11-12).

4.3.3 Mapping the key changes in the infrastructure regime 1950 – 1970

In terms of interaction dynamics between the road and rail regimes, this era is characterised by what Raven (2007) refers to as competition. The road regime displaced the railway regime as the incumbent in the infrastructure regime, and the competitive nature of the road and rail regime interaction contributed to the technological substitution pathway.

In broad terms it can be argued that the transition to auto-society in the 1950s and 60s was facilitated by landscape, regime, and niche dynamics. The following factors are important in explaining the road expansion: a general belief in planning, experts and a positive view on auto-society; market liberal transport policy, and corporatist characteristics of the political system.

Firstly, a general ‘planning optimism’ permeated Swedish post-war society. Planning was viewed as something positive and experts were trusted to provide objective, scientifically grounded and rational solutions to conflicts (Blomkvist 2001: 133 & 141-143). One consequence for the infrastructure regime was that planning matters were transferred from politicians to experts, mainly concerned with technical aspects of road planning. This techno-rationalism was formative in the 1958 Road Plan, where concepts originating in the new science of traffic engineering established ‘free-flow’ and ‘predict and provide’ as key guiding principles. Another formative perspective developing during the 1960s was the view of road safety as a matter of separation of transport modes and flows and building “systems forgiving for the users” (Lundin 2008). In combination this had a strong influence on the development of the transport infrastructure as well as the spatial development of society (Hagson 2004).
Secondly, the car as a cultural artefact had changed status from being viewed as a toy for the elite to a utility (Hagman 2009). In the visions of the future, the car was viewed as a positive, democracy-enhancing force (Gullberg 1990: 65). At regime level these conceptions were reflected in a general view among planners and decision-makers that the tendency towards a greater car density was both desirable and unstoppable. The future probability of 650 cars/1 000 individuals was neither seen as unrealistic, nor as excessively problematic as long as measures were taken in time to develop the infrastructure and to adapt the city centres (Lundin 2008).

The prosperous 1950s also meant that new ways of thinking came to the fore. Deregulation, competition and commercial viability became key words expressing a normative shift toward liberalisation, market forces and less state involvement. The allocation of costs between different modes of transport became established as a key issue in the transport policy problem agenda (Melin 2000: 86). Profitability became a key guiding principle in the development of the railway network.

This had important implications for the infrastructure regime in general. Hasselgren (2013) talks of two different essential transport policy principles with varying influence since the 1950s: the full-cost coverage versus the social marginal cost perspectives. The full-cost coverage principle meant that state budget expenditure caused by a certain mode of transport should be covered by taxes and fees from the same mode of transport. In contrast the social marginal cost perspective implies a wider view on costs not limited to the effects on the state budget (this is further discussed in section 4.4.1). With the 1963 Transport Policy Bill the full-cost recovery principle was established.

It has been argued that the 1950s and 60s were characterised by a mix of tendencies where the emphasis on liberalisation and market-based transport policies in the 1963 Transport Policy Bill against the backdrop of planning optimism, expert rule and a belief in the strong state stand out as almost paradoxical (Sannerstedt 1979; Lundin 2008; Blomkvist 2001).

One explanation to this paradox is that industry policy preferences determined the transport policy. The support to a profitable and competitive industry was the overriding goal which led to a transport policy that was very focused on liberal
reforms (Wedin 1982: 324). The reforms, above all full-cost coverage as a guiding principle, had consequences in terms of increasing road transport, decreasing railway transport and the closure of railway lines.

The corporatist state through strong executive agencies dominated the regime. According to Melin (2000), the state administration and the political system in this era were characterised by close ties between high-level officials within the administration ranks, leading politicians and representatives from trade unions and private enterprises that were represented in various bodies within the political and administrative structure. The Swedish Road Federation had close ties to the domestic car industry and other organisations well connected in the dominant regime, so it was easy to gain support for and disseminate the principles of traffic engineering (Blomkvist 2001).

4.4 Interlude – problems are re-articulated and regimes are challenged (1960 – 1990)

During this period the infrastructure regime is challenged in three important ways that initiate a transformation of the transition pathway. The regime is challenged but in terms of the configuration of actors and the main tendency of the development of the infrastructure it remains intact. Firstly, the new economic context implied a much stronger focus on the costs (and benefits) of building new transport infrastructure compared to the primarily techno-rational approach of the 1950s and 60s. Secondly, the negative sides of auto-society, such as pollution, congestion, accidents and the consequences of adapting historic city centres to car traffic, became increasingly evident and triggered responses from regime outsiders (Gullberg 1990: 65 & Lundin 2008: 279). Thirdly, the discontinuation of railway services and closing down of tracks lead to increasing protests in affected regions.

In combination these challenges triggered a number of changes resulting in a shift of the transition pathway unfolding and gaining momentum in recent decades.
4.4.1 The marginal cost perspective, ‘cost efficiency’ and CBA

Cost Benefit Analysis (CBA) and the view on efficiency in public spending it denoted was becoming established as an important practice in many societal sectors in the 1960s. In the realm of infrastructure investments it has been very significant (Thoresson 2011; Hultén 2012). During the 1960s it became apparent that implementing the 1958 Road Plan according to the traffic engineering doctrine would be too costly, and attempts were made to find ways of calculating the effects of road projects.

Initially the analyses were exclusively concerned with measuring traffic effects, e.g. travelling times, vehicle wear and the likelihood of accidents. A new national plan was presented in 1970 (Swedish Government 1970) which, although leaning heavily on the previous plan, was an attempt to establish principles for prioritising between projects and for deciding on the technical standard of roads. This signalled a new focus within the road regime which can be described as a shift from functionality to efficiency.¹⁴

The 1970 plan can be viewed as an example of how regime rules are challenged from within and adjusted through the adoption of new perspectives. If traffic engineers managed to naturalise concepts such as ‘free flow’ and ‘predict and provide’, the economists were equally successful in introducing ‘cost efficiency’ and ‘social marginal cost pricing’ as key guiding principles.¹⁵ However, adopting CBA as a knowledge production practice implied a further strengthening of the techno-rational planning approach at regime level rather than a fundamental challenge of prevailing rationalities (see Thoresson 2011 and Hultén 2012).

In 1979 the Parliament adopted a new transport policy where social marginal cost pricing was established as an overarching policy objective. This was a clear break with the full-cost recovery principles that prevailed during the 1950s and 60s (Wedin 1982).

¹⁴ Thanks to Yngve Boye for pointing this out when commenting on an earlier version of the manuscript.

¹⁵ For the remainder of this thesis, ‘marginal cost pricing’ and ‘the marginal cost perspective’ are used as translations of the words ‘samhällsekonomisk prissättning’ and ‘samhällsekonomiskt synsätt’. ‘Cost efficiency’ is used as a translation of the Swedish word ‘samhällsekonomisk effektivitet’.
4.4.2 Environmentalism and public participation

In parallel with a more radical political climate, citizen influence and environmental issues became important issues. The focus on problems caused by motoring was at first centred on the massive spatial transformations taking place when cities were adapted to the car.

During the 1950s and 60s many cities were heavily modified in intense urban renewal processes intended to pave the way for new housing and roads. This soon led to protests and in 1962 the first city environmental group was formed in Stockholm. By the early 1970s some 30 city environmental groups existed in Stockholm alone. Similar groups, opposing urban renewal processes and the continuous adaption to auto-society, were also forming in other parts of the country (Tengström 1990: 39). There were several examples of protesters successfully stopping planned thoroughfares and other traffic-enhancing plans in various cities. Noise and air pollution were central concerns, along with questioning of the spatial effects of adapting society to the car (Tengström 1990: 39-41).

Lundin (2008: 279 pp) describes how the critique against the reigning regime was posed as a challenge of the expert dominance and the techno-economic rationality of the planning methods. In a contemporary comment Anell et al. (1971) argued that the supposedly objective, rational and scientific facts produced by the reigning planning ideology (which they viewed as a combination of traffic engineering principles, CBA and a liberalisation of transport policy) were inherently biased towards road investments and other measures cementing auto-society. Instead, the authors argued for a more participatory and emancipatory planning. This can be viewed as an early example of a counter-discourse to the so far largely positive view on the effects of auto-society as well as the regime practices that contributed to its development.

To some extent the actions taken by regime outsiders such as environmental groups influenced the problem agenda at regime level, and the tendency to acknowledge the negative effects of motoring continued during the 1970s. However Lundin (2008: 281) argues that the influence should not be overemphasised; it did not lead to a general and broadly supported critique of auto-society. The number of cars and road transport volumes continued to increase during the 1970s, as did the qualitative upgrading of the road network and state expenditure for road investments. Over time, the regime rules
were adjusted and increasingly formalised procedures aimed at ensuring environmental consideration and public participation were established. A significant change was introduced in 1987 when the law on road building made Environmental Impact Assessment mandatory (Hedlund & Kjellander 2006).

Whereas the 1979 transport policy indicated a beginning environmental awareness, the new overarching objective of the Transport Policy Bill of 1988 – “…to provide citizens and businesses in the different parts of the country with satisfying, safe and environmentally friendly transport services at the lowest possible cost” (Swedish Government 1988: 21) – signals that environmental concern had become an important normative rule. Monitoring and keeping track of emission levels (sulphur, carbon monoxide, nitrogen oxide, noise, etc.) were now established cognitive practices and parts of the normative rules through quantified transport sector emission reduction targets. An important change following from this was that bypasses redirecting traffic around cities became a key strategy in road planning (Swedish Government 1988: 51 pp).

This means while as Lundin (2008) points out auto-society has not been fundamentally challenged, there were important influences on infrastructure decisions. What appeared to be a rational solution in the late 1960s and early 1970s was, by the mid-1980s, no longer an option (Interviewee 15). Both the Öresund Link and the Southern Link illustrate how environmentalism and public participation implied important cognitive shifts influencing the technical design of the projects.

For the Öresund Link the major difference compared to earlier proposals was the inclusion of a railway link. In a 1973 agreement signed by the Swedish and Danish states, the link was planned as a motorway bridge. During the course of the eighties the inclusion of the railway in the highly controversial project became part of a compromise solution to appease the environmental resistance (cf. Falkemark 1999; 2006 and Blomkvist & Jacobsson 2002;). One of the interviewees involved in the investigation phase of the Öresund Link offered this reflection: “In retrospect… it is lucky [that the 1973 agreement was not implemented] because [the implemented project] was a better transport policy solution… compared to just a motorway link … [which] felt like a very 1960s solution.” (Interviewee 2)
Increasing organisation of outsider protest is also important in explaining why the Southern Link was designed in the form it took. Advanced plans for a ring road around Stockholm were developed during the 1950s and 60s. However, due to the increasing opposition to road expansions programmes (in combination with a number of other factors, such lack of money, a temporary unexpected population decrease and diminishing road transport volumes) the plans were shelved during the 1970s (Skirfors 1999). By the mid-1980s the ideas were revived, but now it was suggested that the remaining sections should be constructed as urban motorway tunnels. Faced with local opposition this became “…a solution that was perceived as natural…” (Interviewee 28).

The success of building the Southern Link has established urban motorway tunnels as a new infrastructure technology (establishing tunnel design standards, technical systems for traffic control in tunnels, air quality control systems, fans, and tunnelling construction techniques). There has been a similar development in the railway sector, where several large-scale tunnel projects have been carried out. Several more road and rail tunnels are currently in construction or in design and planning phases.

4.4.3 Protest against closing railways

In the 1979 transport policy process, the consequences for the railway system of the liberal reforms in 1963 was a central issue. The closure of unprofitable railway lines was increasingly framed as a matter of regional policy, and the negative effects on the sparsely populated parts of the country were receiving more attention (Sannerstedt 1979).

In the decades to come, this in combination with other tendencies, such as growing environmental awareness, devolution of authority to regional level, and increasing emphasis on the importance of infrastructure, would interact to change the configuration of regime and the direction of the transition pathway.

In the 1988 Transport Policy Bill (Swedish Government 1988), issues emerging during the 1960s and 1970s, such as traffic safety, environmental impacts, transport system efficiency and impacts on regional development, were important normative rules, formalised in transport policy objectives. A key rationality of the 1988 bill was that the railway should be given the opportunity to play an important role as a
competitive, environmentally friendly and energy-efficient means of transportation. To unlock this potential a number of changes were made, re-configuring the infrastructure regime. For the railway this implied a major shift compared to the previous period characterised by the discontinuation of services and the closure of lines. Substantial investments were made in railway tracks and new rolling stock (e.g. SJ’s X2000 express trains and modern regional trains brought into operation by regional public transport authorities) in combination with a far-reaching reconfiguration of the railway regime. It has been argued that this signalled a “second railway revolution” (Nicolin 1995). A more detailed account of how the infrastructure regime was re-configured is provided in in section 4.5.1.

In combination the three challenges outlined in 4.4.1 to 4.4.3 had important implications, including a more balanced view on mass motoring and protest against the regime practices leading to road expansions and the closure of railways. The shift from full-cost recovery to marginal cost pricing and cost efficiency as dominant principles for infrastructure investments has been important, since it facilitated reformations of the railway regime that eventually led to new investments in railways.

However, the view of the transport system as a ‘transport market’ where competition should reign was firmly established (Wedin 1982: 336). This led to an adaption of regime rules framing environmental issues according to the market failure perspective where the role of the state was to correct these failures. In turn this meant that the inclusion of ‘non-monetary’ costs (e.g. environmental damage from emissions and injuries from traffic accidents) in CBA became a dominant perspective for the inclusion of environmental and sustainability issues in infrastructure policy and planning (cf. Melin 2000: 99).

“You became the Minister of Communications at a time when there was a lot of focus on infrastructure and many of the major projects that since have been built in Sweden were decided then. Do you have any comment about why it became such a focus at that time?” (Interviewer)

“One reason was of course that we began to realise that we have to transfer a lot more transport to rail, and all the major links I was involved in making decisions about were in one way or another concerned with improving the conditions for rail… But we not only got the agreement on the Svealand Line, the Mälar Line and the Arlanda Line…. we also had an energetic manager at the Road Agency who did not miss any opportunities to get in touch. He pushed the issue of seeing the big picture of traffic flows very strongly. Opening up bottlenecks in the road system… That kind of thinking emerged during this time and it was probably growing traffic volumes and research that paved the way for this.” (Interviewee 8, former Minister of Communications)

“… today, infrastructure planning is carried out differently. Instead of looking at each mode of transport… [emphasis is on]… how each mode of transport can work together. How to solve environmental problems is included as a goal in this… it has evolved tremendously in recent years… you work in a completely different way, with environmental aspects as a prerequisite…” (Interviewee 11, political advisor, Ministry of the Environment)

The quotations above show that there have been substantial changes to the way infrastructure planning is conducted in recent years. Interviewee 11 says that the adoption of environmental and sustainability issues have involved changes in the cognitive, regulative/formal and normative rules of the infrastructure regime. However, as the exchange with interviewee 8 highlights, this is but one aspect in a complex web of intertwined processes of change involving a reconfiguration of the rules of the regime.

In the following section it is argued that the kind of thinking emerging during this time initiated a transition pathway where the direction of the technological trajectory was changed. Compared to the transition to auto-society in the 1950s and 60s, the changes have been less radical. In Geels’ terminology it displays the characteristics of a
reconfiguration pathway, where linkages and elements of the regime are changed (Geels 2007: 131). The following sections explain how various processes co-evolved to contribute this transition pathway.

In brief the new trajectory of the technological pathway displays the following characteristics: the revival of the railway in parallel to a continuous incremental upgrading of the road network; and an emphasis on mega-projects as ‘grand solutions’, not only for transport system problems, but also for stimulating the economy in various ways.

Increasing spending on infrastructure is a main characteristic, particularly significant since the mid-1990s. This has also spurred an interest in new solutions for funding (of which all three mega-projects included in this study are examples). The drivers for change include structural shifts, the end of the Cold War, and Sweden joining the EU, while at the same time environmentalism and sustainability are coming to the fore. Changes of the infrastructure regime rules have been triggered both from within, by regime actors interpreting and reacting to trends and events at landscape level, and through pressures from regime outsiders, such as by bringing in new perspectives, or protesting against the outcomes of regime practices. In recent years the state of the infrastructure systems has become a key issue on the policy agenda.

Consequently the rules of the infrastructure regime of 2010 were quite different compared to 1980; changes concern formal/regulative, normative as well as cognitive rules. The following sections will examine some of these changes in more detail. A key point concerning sustainability emerging in this context is that proposals aiming to reduce transport demand, or alter investment levels in favour of less motorised mobility, have so far had limited impact.

In sections 4.5.1 to 4.5.3 important changes to the formal rules are outlined. Section 4.5.4 considers how infrastructure for growth has been established as a key cognitive rule of the regime. A more detailed account of how sustainable development has entered the regime rules through the adoption of new transport policy objectives, new legislation, and new practices is given in sections 4.5.5. to 4.5.7. In section 4.5.8 the increases in spending and the build-up of a maintenance deficit is addressed. Section 4.5.9 maps the main changes of the regime rules from 1990 to 2010.
4.5.1 The railway is resurrected, the infrastructure regime is deregulated

The vertical separation of the railway sector following the 1988 Transport Policy Bill was a significant change in the formal rules of the infrastructure regime. The State Railways was divided into a commercial enterprise (keeping the name SJ) responsible for the operation of rail transport and a Rail Agency with responsibility for the infrastructure. The division of the railway network into a ‘commercial’ and a ‘deficit’ network (introduced in 1963) was abandoned as the Rail Agency assumed formal responsibility for the railway network. This provided a solution to the problem of commercial viability for the State Railways and prepared the ground for subsequent reforms of the railway regime.

Subsequent reforms have contributed to a shift from inter-modal competition to intra-modal competition through a continuous dismantling of the railway as a public monopoly. This is done, for example, through the introduction of procurement processes for local and regional public transport services in 1990, and the opening up of the railway freight market for competition in 1996 (Seko 2011-). The most recent change introduced in 2012 implies further increases in competition for contracts in local, regional and inter-regional public transport (Trafikanalys 2012).

Since the 1990s, the old state-controlled railway regime has successively been parcelled into smaller units and new actors have been added. There have also been important changes aimed at increasing competition in the construction industry through corporatisation and in some cases privatisation of public organisations, both in the road and railway regime. Whereas both the road and rail agencies previously had in-house production units, these have successively been turned into separate consultancy and construction companies. One interviewee expressed this as the role of the executive agencies changing to becoming “… clients on the construction market.” (Interviewee 4).
4.5.2 Intermodal and decentralised planning

Investment planning for railways required close cooperation between municipalities, regional actors, regional public transport authorities, SJ, the Rail Agency, and the Road Agency (Swedish Government 1988: 121). The new configuration of the regime has emphasised the need for co-ordination and co-operation between different actors across traditional sector boundaries. In 2010 the road and rail agencies were merged into the Transport Agency, which was responsible for long-term planning of the transportation system for all modes of transport and for construction, operation and maintenance of state roads and railways.

Decentralisation has been achieved through a series of changes to the formal and regulative rules that increase the capacity and responsibilities of regional level actors to influence planning and decision-making. This indicates a shift in power from executive agencies to regional authorities (both political and administrative). One indicator of this shift is the increasing amount of money allocated for regional investments. According to the 1988 proposal, investments in ‘county transport facilities’ 16 would amount to some SEK 970 million/year by 1990 (not adjusted) (Swedish Government 1988: 4). In 1998 this had increased to roughly SEK 3 billion/year (Swedish Government 1998). The increasing regional influence is noticeable both in terms of control of more money, but more importantly through increasing influence of planning agendas.

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16 This included sections of the regional road and railway networks, as well as public transport facilities. (Swedish Government 1988)
4.5.3 Direction planning, measure planning and investment packages

In the 1998 policy bill a formal distinction was introduced between ‘direction planning’ and ‘measure planning’. Direction planning refers to the process where the government presents an infrastructure Bill to the parliament. This determines the transport policy objectives, economic limits for, and balance between investments in the road and railway network over a twelve-year period. The executive agencies (since 2010 the Transport Agency) together with regional authorities then produce a “measure plan, proposing projects improving the transport system and fulfilling national transport policy objectives.

In a simultaneous process, 21 regional and one national transport infrastructure plans are established. Consequently, there has been a gradual change in the formal rules by distinguishing between policy and the planning processes. However, the boundaries between investment planning as politics and as an instrumental planning process are less clear than this distinction indicates. The measure planning process also includes a stage where the government specifically selects projects that must be included (Eliasson & Lundberg 2012). Furthermore, the negotiations of large-scale infrastructure packages and individual mega-projects, co-funded by the state, regional and local-level government, outside or parallel with the measure planning process, or by alternative funding models, has become a central feature (cf. Isaksson 2001, Falkemark 2006, and Hultén 2012).

4.5.4 Infrastructure for growth and regional expansion

The long-term pressure from structural shifts affecting Swedish industry and economy beginning in the 1970s implied that the growth-promoting effects of transport infrastructure were increasingly emphasised in public and political debates. This was not a new argument per se, and certainly not exclusive to Sweden (cf. Høyer 1999 and Farell 1999). In Sweden several different processes interacted to add urgency and legitimacy to arguments for a renewed and intensified interest in infrastructure investments.
The sudden and deep economic crisis in the early 1990s intensified arguments about infrastructure investments, as both part of a traditional Keynesian repertoire to counter recessions and a more long-term strategy for economic competitiveness, highly influenced by the agglomeration economy thinking (cf. Krugman 1991).

The end of the Cold War was a disruptive change in the geopolitical landscape. Followed by the 1995 EU accession, this brought new perspectives to policy and planning agendas. Interviewee 8 recounted, “…we decided to apply for membership in the EU in 1991… Then we had to physically realise the European vision.” Realising the European vision through infrastructure investments became an important guiding principle and put more emphasis on international dimensions of accessibility, such as by stressing the importance of access to international airports and access to the newly opened eastern European markets (Interviewee 10).

A combination of new agglomeration economy arguments for regional competitiveness and traditional industry policy arguments about improved international transport routes are forming a prominent part of the current policy agenda. Regime outsiders have been important in this development by bringing in new perspectives on infrastructure investments.

Actor constellations, such as the European Roundtable of Industrialists (ERT), were lobbying heavily for improved transport infrastructure in the early 1980s. The rationale was to maintain European competitiveness by enabling industries to apply just-in-time production strategies in globalised logistics and production chains, so it was primarily a freight transport perspective. The core of the argument was that infrastructure investments would compensate for Scandinavia’s peripheral location in relation to the emerging single European market. Several major infrastructure projects constructed in Sweden since the 1990s (e.g. the Öresund Link) were mentioned in the 1984 ERT report ‘Missing Links’ (Falkemark 1999: 70-71). This perspective has since gained further legitimacy through the designation of several of these missing links as prioritised projects in the EU Trans-European Networks programme (Swedish Government 2008: 36).

Blomquist & Jacobsson (2002) argue that a ‘cluster of ideas’ concerning regionalisation, agglomeration economy and international freight transport came to form the core of the infrastructure for growth as an influential contender on the policy
agenda. These ideas are parts of broader landscape trends and were introduced and gained acceptance in many parts of the Global North around this time.

The findings of Allan Aschauer’s (1989) seminal study arguing for decreased total public spending and increased public spending on transport infrastructure had a strong impact in Sweden (Hultkrantz 2002). In Sweden other actors had also developed similar ideas strongly emphasising the role of infrastructure investments at the core of agglomeration economics and a key to supporting successful (i.e. competitive) regional metropolitan growth centres. One example is the Swedish economist and futurologist Åke E Andersson, who has been influential in arguing for a vision of a post-industrial, post-modern society where transport infrastructure investments are framed as being about more than just transporting people and goods (cf. Andersson1988; Andersson & Strömquist 1989). According to Andersson: “A continuous expansion of the infrastructure will sooner or later cause an almost revolutionary structural shift of the economic, and hence the political and cultural social systems.” (Andersson 2009: 96, my translation.)

Blomquist & Jacobsson (2002) show how this kind of thinking became important in the debates about the Öresund Link in the late 1980s. Whereas the traditional industry policy arguments about the importance of more freight transport capacity were criticised on environmental grounds, actors such as the Chamber of Commerce were emphasising the broader societal vision about a new (trans-national) regional political economy (as conceived by Andersson and colleagues). Thinking about agglomeration economies is at the core of this vision, and it was argued that the fixed link would function as a booster of the regional economy and initiate a long-term transformation of society. This frame of mind has posed a challenge to marginal cost perspective by raising new perspectives on the benefits of infrastructure that are hard to capture with CBA (Jansson & Nilsson 1989).
Regional expansion

“Fast and frequent regional passenger transport should be one of the most important measures to facilitate commuting and thereby contribute to a sustainable regional expansion.” (Swedish Government 2006: 55)

An illustration of how agglomeration economy thinking has become established as a cognitive rule influencing the transport policy agenda is the concept of regional expansion. It is a concept capturing the response to landscape processes such as the structural shifts of the economy, the spatial transformation of society and the resulting changing mobility patterns. Essebo (2013: 27) writes that the concept “… ties in with several buzzwords from new economic geography, such as cluster, nodes, proximity, innovation, transnational integration and regionalism…”

Exactly where the concept originated from and when it started to become used is not clear. Judging by the content of policy bills it was becoming established on the national transport policy agenda in the early 2000s. While it was not mentioned at all in the 1998 Policy Bill and only referred to in a few instances in the 2001 Infrastructure Bill, it is a frequently used concept awarded high priority in more recent bills (e.g. Swedish Government 2006 and 2008).

The increasing emphasis on regional expansion is examined in more detail in Theme II, but some brief notes on its influence will be explained here. One example is drawn from the 2010-2021 National Plan where the effect of the plan is estimated to contribute to an ongoing trend toward longer work-related travel. Average length for work trips by car without the plan is expected to increase from 17 km to 18 km; the estimated effect of the plan is a further increase to 18.3 kilometres. It is suggested that this indicates that the plan supports the ongoing regional expansion (Transport Agency 2010a: 112). The main point is that the plan contributes to increasing the length of work trips, and this is framed as a positive outcome and in support of the ongoing regional expansion processes.

It has been argued that emphasis on creating new possibilities for commuting was also an expression of a change in perception regarding commuting among local level politicians and planners. Commuting was previously viewed as a sign of weakness, signalling a municipality not self-reliant in terms of work force, or local enterprises in trouble. But this view has gradually changed and today improved communication possibilities are viewed as a key factor for economic growth by business
representatives as well as by politicians at all levels of the political system (SALAR 2008: pp. 9).

The three mega-projects illustrate nuances in how structural shifts became an important aspect in infrastructure policy and planning. The analysis of policy documents and the interviews suggests that the influence of structural shifts on transport infrastructure policy and planning can be categorised in three broad, partly overlapping categories of arguments for infrastructure investments:

*Infrastructure as a catalyst for economic growth*, e.g. the Öresund Link. This is also exemplified by the Arlanda Rail Link where apart from providing a railway connection between Stockholm Central Station and the airport, the regional effects of the project were also emphasised.

*Infrastructure for serving new transport and mobility patterns* due to changes in land use as a consequence of structural changes. This is mainly illustrated by the Southern Link where industries closing or moving away from the eastern fringes of the Stockholm region facilitated housing development, which in turn increased the transport demand towards the inner city and emphasised the need for new infrastructure.

*Infrastructure for serving new patterns of international transport and travel* due to globalised production chains and consumption patterns (e.g. the Öresund Link and the Arlanda Rail Link.)

Obviously, but importantly, these kinds of arguments mean that infrastructure investments increasing motorised mobility are viewed as key means of countering the effects of structural shifts.
4.5.5 The institutionalisation of environmental issues and sustainability

Sections 4.5.5 to 4.5.7 focuses on explaining how sustainability has entered the infrastructure regime rules through the introduction of environmental legislation, new policy objectives, and new planning practices.

The 1999 establishment of the Environmental Code and the adoption of the national environmental quality objectives were changes aimed explicitly at promoting sustainable development. The Environmental Code resulted in more structured regime rules formalising the channels of interaction and public participation in decisions on infrastructure. It means that Environmental Impact Assessment is a key element of the project permission granting processes and since 2004 the EU-directive on Strategic Environmental Assessment of plans and programmes has been in place. Section 4.5.7 comments briefly on the impacts of Strategic Environmental Assessment in national planning so far.

The 15 national environmental quality objectives (EQOs) adopted by the Swedish Parliament in 1999 (with a 16th objective added in 2005) is another change influencing cognitive as well as normative dimensions of the regime rules. The EQOs are not legally binding but exemplify a management by objectives approach to environmental policy making. The EQOs are used both to describe the quality needed to ensure an ecologically sustainable development in the long term, as well as indicators of the present state of the Swedish environment (Government Offices of Sweden 2013).

The intention with the EQOs is to resolve the most pressing environmental problems within the time frame of a generation, which is defined as until 2020 (apart from the objective related to CO₂ where the time frame is set to 2050). Five of the objectives are usually considered to be directly dependent on the development in the transport sector: Reduced climate impact, Natural acidification only, Zero eutrophication, Clean air and A good built-up environment. Several of these objectives are linked to the development of transport infrastructure. The development of the EQOs is followed by the monitoring of a variety of different indicators for the individual objectives. Infrastructure planning is assumed to contribute to fulfilling the EQOs (Swedish Government 2008).
These changes suggest that environmental concern has become deeply embedded in society and that the environmental dimension of sustainable development is included in cognitive, normative as well as regulative rules of the infrastructure regime rules.

4.5.6. Deciphering sustainability - transport policy objectives and monitoring frameworks

Sustainable development coming to the fore of the infrastructure policy and planning agenda is illustrated by the present dual overarching transport policy objective introduced in 1998 (in the Transport Policy Bill aptly named *Transport Policy for Sustainable Development*) (Swedish Government 1998). The overall goal of “… a cost-efficient and long-term sustainable provision of transport for citizens and businesses in the entire country”\(^ {17} \) has remained unchanged since it was introduced. The structure of sub-objectives, such as accessibility, transport quality, regional development, safety, the environment, gender equality, and accessibility for disabled and elderly transport has developed gradually, as have the monitoring frameworks for assessing goal achievement.

In 2009 a simplified structure comprising two equal sub-objectives was introduced (see Figure 9); the functionality objective (based on operationalised definitions of accessibility) and the consideration objective (based on operationalised definitions of safety, environment and health) (Swedish Government 2009).

The changes in transport policy objectives highlight two important aspects of the normative rules. Firstly, sustainability and cost efficiency are expected to be compatible and equally important objectives; and secondly, sustainability is expected to be achieved through the pursuit of the sub-objectives.

\(^ {17} \) “… en samhällsekonomiskt effektiv och långsiktigt hållbar transportförsörjning…”
Still, exactly what sustainable development entails as a normative rule for infrastructure policy and planning is not clear. When reviewing the main planning and policy documents for the 2010-2021 planning process (e.g. Swedish Government 2008, and Transport Agency 2010a), it is noticeable that the concept of sustainability is used habitually, but there are no clear definitions of what it refers to. The meaning of the concept seem to be implicit but taken for granted. It is typically used in discussions relating to climate, the environment more generally, and urban areas (Swedish Government 2008; Transport Agency 2010a).

Figure 9 Swedish transport policy objectives and definitions, Swedish Government (2009).
The Swedish government agency for transport analysis is monitoring the development of the policy objectives. In their annual monitoring report they note that “In the absence of a description of what a sustainable transport system could look like, no attempt is made to determine if the system at a given time is sustainable, the judgment only considers if the development goes in a sustainable direction, i.e. a direction that does not undermine the prospects in the long term.” (Trafikanalys 2013: 26, emphasis in original).

The Functionality Objective

<table>
<thead>
<tr>
<th>Clarification</th>
<th>definition</th>
<th>(A selection of) types of indicators</th>
<th>Assessment of development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger transport and infrastructure quality</td>
<td>increased reliability, security and comfort of passenger transport</td>
<td>New infrastructure investments</td>
<td>Negative</td>
</tr>
<tr>
<td>Transport system impact on international competitiveness of business and industry</td>
<td>Improved quality of business and industry transport to strengthen international competitiveness</td>
<td>The global competitive index, the logistics performance index</td>
<td>Neutral</td>
</tr>
<tr>
<td>Regional and international accessibility</td>
<td>Improved accessibility within and between regions and between Sweden and other countries</td>
<td>Accessibility by car, accessibility by public transport, airport accessibility</td>
<td>Positive</td>
</tr>
<tr>
<td>Gender equality</td>
<td>The methods, implementation and results of transport policy contributes to an equal society</td>
<td>Gendered differences in travel patterns, access to cars, and drivers licenses</td>
<td>Neutral</td>
</tr>
<tr>
<td>Accessibility for people with disabilities</td>
<td>The transport system is designed to be accessible for people with disabilities</td>
<td>Special transportation service, adaption of public transport vehicles and stations</td>
<td>Neutral</td>
</tr>
<tr>
<td>Children’s ability to use the transport system</td>
<td>Improve the possibilities for children to safely use the transport system on their own</td>
<td>Safety improvements</td>
<td>Neutral</td>
</tr>
<tr>
<td>Public transport, walking and cycling</td>
<td>Improve the conditions to choose public transport, walking and cycling</td>
<td>Modal distribution of short trips, supply of public transport</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

Table 6 The functionality objective, clarifications, definitions and indicators, Trafikanalys (2012).
Tables 6 and 7 provide an overview of how the sub-objectives in turn are broken down into various clarifications, defined and monitored through different indicators.

In the monitoring of the transport policy objectives, the development of climate emissions, safety and accessibility improvements are discussed as the main parameters for assessing sustainability. In the 2012 report an attempt was made (for the first time) to assess the development of the indicators in relation to the overarching objectives. According to the assessment there is no clear indication that the direction of change is one leading towards sustainability (Trafikanalys 2012 & 2013).

The monitoring framework highlights a number of points. The assessment framework with clarifications, definitions and numerous indicators is highly complex and contains a very broad range of indicators covering issues such as reliability, accessibility, equality, the possibility for children to use the transport system, access for disabled, safety and environmental quality objectives. Many indicators used for
measuring accessibility are based on travel time measures. The clarifications of road safety aspect are based on clearly defined quantified indicators (which have been developed in the safety strategy of the ‘zero vision’).

In the EQOs the objective of reduced climate impact has a prominent position, but the definition of what it means for the transport sector is quite vague. Two things are noticeable about the clarification regarding other environmental quality objectives. Firstly, it has not been possible to make an overall assessment, as the objectives are judged to be too different and there is no clear trend showing development. Secondly, it is concluded in the annual report that operationalising the clarification concerning the transport sector contributing to reducing ill-health has not been possible (Trafikanalys 2013).

**Climate objectives**

The 1998 Transport Policy Bill introduced a significant change of the normative rules by introducing a quantified CO₂ interim emission reduction target. This established that transport sector carbon emissions in Sweden by 2010 should be stabilised at the levels of 1990 (Swedish Government 1998: 27). In 2009 this was replaced by “The transport sector shall contribute to reaching the environmental quality objective of reduced climate impact by gradually improving energy efficiency in the transport system. By 2030 Sweden should have a vehicle fleet independent of fossil fuels.” (Swedish Government 2009: 2). How this objective should be understood and what it means in terms of infrastructure investments has been debated in recent years.
As Table 8 shows, there are different objectives, both at national and at EU level; the Swedish commitments are more ambitious than EU-level objectives. Figure 10, taken from a 2012 Transport Agency report, illustrates how emissions are expected to develop assuming current transport model forecasts of increases in transport volumes and assumptions based on established demands for vehicle performance standards and fuels. Emissions are expected to be stabilised at the current level until 2030 and then increase. In the report it is concluded that technology improvements and the shift to other renewable fuels are important but inadequate. Reaching the objectives necessitates another approach to the planning of society and the transport system, and the introduction of policy instruments to reduce car traffic and stabilise current volumes of road freight transport (Transport Agency 2012: 14). It also concluded that in the short term (2030 perspective) infrastructure investments will make little difference, but it will be of fundamental importance in the long run.

A similar point was made in the recent final report by the Government Commission on Fossil-free Road Transport. In the report, it is argued that while “…the impact of measures such as infrastructural changes…only becomes evident over the long term, these structural changes are of crucial importance to the overall design of the transport system.” (Official Reports of the Swedish Government 2013: 11)
One proposal in the report was to introduce a new environmental quality objective for urban areas. This states that increases in the volume of passenger transport in urban areas should be absorbed by public transport, cycling and walking in order to reduce car traffic (Ibid: 15). Another conclusion is that “…vigorous measures focusing on public transport, the railways and intermodal transport solutions will be needed in order to boost the competitiveness of these transport systems and achieve both climate objectives and other goals in society.” (Ibid: 16). Finally the Commission notes that the most recent national infrastructure plan does not encourage progress towards the climate objectives, and that the plan is based on a forecast of transport volumes that is not compatible with these objectives (Ibid: 17).
4.5.7 Sustainability in planning practice – Strategic Environmental Assessment and the four-step principle

Since the adoption of the Strategic Environmental Assessment (SEA) directive in 2004 (Directive 2001/42/EC), it is mandatory to include SEA in all plans and programmes with significant environmental impact established by national authorities. This means that transport infrastructure plans at regional as well as national level must now include an environmental assessment statement. A second novelty of more informal character is the four-step principle which is assumed to be the key guiding principle in planning. Both SEA and the four-step principle are assumed to be of central importance for adopting sustainability in planning.

Since the adoption of the SEA directive two national planning processes have been conducted, one for 2010-2021 and the current 2014-2025 plan. It is explicitly stated that the purpose of the SEA process is that infrastructure planning shall contribute to achieving the environmental quality objectives, specifically the objective of reduced climate impact (Swedish Government 2012b: 3).

The outcomes in both cases have been plans that fail to contribute to any substantial emission reductions. The SEA for the 2010-2021 plan (in)famously predicted that the result of SEK 217 billion worth of investments over 10 years would be an increase of CO2 emissions by 0.014% (Environmental Protection Agency 2009: 4). This prediction has been criticised for the seemingly absurd precision, as well as for being based on the assumption of the introduction of controversial transport policy measures such as heavy goods vehicle distance-based taxation and substantial fuel tax increases. It has been argued that the SEA process was based on assumptions of the introduction of measures aimed at reducing transport demand that very probably underestimated the environmental impacts of the planned investments (Environmental Protection Agency 2009). As stated in the SEA statement of the currently ongoing planning process: “It cannot be shown that the proposed plan with certainty means a reduced climate impact. The contribution from the expansion of the transport system is estimated to be of such a size that the proposed plan does not contribute to goal achievement.” (Transport Agency 2013: 32).

18 The 2014-2025 plan will formally be adopted in the summer of 2014. The SEA statement was released in 2013.
In a comment to the 2010-2021 plan, the Environmental Protection Agency argues that the experiences of the first SEA process indicate that the directive has failed the expectations of introducing a sustainability perspective in infrastructure planning (Environmental Protection Agency 2009). One explanation is the distinction made between the policy process (direction planning) and the planning process (measure planning). This means that the SEA process is only a part of the planning process where choices of a strategic nature already have been made. One example is that the government directives for the planning process 2010-2021 established that 50% of available investment funds were earmarked for road investments (Rail Agency et al. 2009: 13). In addition a large number of investments were ‘named objects’, meaning that they have been included in plans for a long time and implementation is merely a matter of finding available funds. These conditions restrict the strategic potential of SEA quite dramatically.

**The four-step principle**

In recent years the four-step principle has been established as an important guiding principle in infrastructure planning. Based on an approach developed by the Road Agency in the late 1990s, it was introduced in national level policy around the time of the 2001 Infrastructure Bill (SIKA 2005). Today the Transport Agency maintains that the four-step principle is the fundamental principle permeating all the different activities they are involved in. The four-step principle highlights the importance of considering a wide set of policy options such as economic policy instruments and integrated transport and land use planning to solve transport system problems (Swedish Government 2008a: 89).

The four steps are defined as:\[19\] i) ‘Think differently’: according to this step it is fundamental to “… first and foremost consider actions that influence the need for transport and modal choice.” The aim is to”… reduce transport demand or shifting transport to less space-consuming, safer or more environmentally friendly modes of transport.” (Transport Agency 2012: 12); ii) ‘Optimise’: this step refers to “… measures that result in a more efficient use of existing infrastructure.”; iii) ‘Rebuild’:

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\[19\] Unless otherwise stated all quotes in this section are taken from Transport Agency (2014a)
this means considering possibilities of limited conversions of existing infrastructure;
iv) ‘Build’: “The fourth step is carried out if the needs cannot be met in the three previous steps. It means new investments and/or major reconstruction measures.”

Importantly, it is argued that “… sustainable travel puts emphasis on the first two steps, which are about processing attitudes and to highlight and promote sustainable travel choices.”

The first step clearly indicates that there is a need for ‘avoid’ approaches. This has been made explicit in publications by the Transport Agency in their work with developing various background reports (e.g. Road Agency 2004). Figure 11 illustrates how the ‘transport-lean society’ has been introduced as a concept comprising measures aiming to reduce car use as a means of reducing carbon emissions. This
highlights that there is a well-developed understanding of the necessity of demand reductions as a part of achieving the climate objectives

To sum up, sections 4.5.5 to 4.5.7 show how sustainability has entered the regime rules through transport policy objectives, monitoring frameworks and new practices. There is a seemingly robust support for a broad palette of measures including avoid, shift and improve approaches in infrastructure policy and planning. But it also illustrates that these normative rules and cognitive practices seem to have had limited impact on the outcomes in terms of investments so far. The next section (4.5.8) will show how investments have increased in recent years.

### 4.5.8 Increases in spending and maintenance deficits

A striking feature of the past two decades is the increases in investments in both road and rail.

The long-term plans developed in the late 1980s suggested quite moderate investments. Throughout the 1990s and the 2000s, proposals for investments increased gradually and continually. The Transport Policy Bill of 1998 suggested roughly SEK 100 billion worth of new investments (SEK 30.5 billion for investment in national trunk roads, 36 billion for investments in trunk railways and 32 billion for investment in regional transport infrastructure.20) (RR 2000). In subsequent years the political interest in infrastructure has continued and politicians have competed to outbid each other as infrastructure proposals have increased in magnitude. In 2001 a new ten-year plan for infrastructure was presented, including investments of SEK 100 billion for railways alone. This meant that more money was allocated to railways than to roads (proposed road investments added up to SEK 69 billion) (Swedish Government 2001). It also meant that proposed investment levels increased by 70% in a matter of a few years.

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20 It should be noted that these figures do not fully include the expected investment costs for the Öresund Link, the Southern Link, the Arlanda Rail Link and a few other, smaller road projects, since it was expected that all of these would be funded outside the normal investment planning process. Thus another SEK 50 billion worth of investments were expected to be carried out with “alternative funding” from 1998-2007 (RR 2000).
In 2004 another infrastructure bill was presented proposing additional increases in infrastructure investments (Swedish Government 2004). This development has continued with the ‘near-term initiative’ in 2008, proposing an a SEK 10 billion boost to investment grants over two years and a new long-term investment plan of SEK 217 billion for 2010-2021 (Swedish Government 2008a & 2008b). Finally, the most recent Transport Policy Bill presented in 2012 proposed SEK 282 billion for new investments from 2014-2025 (Swedish Government 2012a).

This is an illustration of ‘politics of outbidding’ where politicians in successive governments have competed in showing willingness to increase investments. It does not mean that new investments have tripled since 1998, but there is no doubt that actual investment has increased strongly since 1990 (see Table 5, p. 73). The continual incremental upgrading of road and railway networks, the implementation of mega-projects and infrastructure package deals for the three main metropolitan areas have contributed to increased spending at national-, regional- and local-level government.

This also illustrates that the adoption of environmental legislation in planning, climate policy objectives, the four-step principle and Strategic Environmental Assessment, has not resulted in any reduction in funding for the construction of new roads. On the contrary in fact – road investments have increased throughout the period and exceeded SEK 9 billion in 2008. Railway investments the same year amounted to SEK 13 billion (SIKA 2008). In contrast, state spending on walking and cycling infrastructure in 2011 totalled SEK 211 million; less than 1% of total investments (Trafikanalys 2012: 31).

In parallel to this increase in spending on new infrastructure projects, the state of the existing road and rail networks have deteriorated. Already in the mid-1990s concerns were raised that new investments were prioritised over nurturing the existing system. The 1998 Transport Policy Bill was preceded by a parliamentary committee with the assignment to evaluate existing and develop new transport policy proposals, and develop a proposal for investments in infrastructure for the period 1998-2007. The proposals for infrastructure investments included two main points: a substantial shift in resource allocation from expansion to maintenance of the road and railway networks and a 50% reduction in road investments. The committee warned of a
mounting ‘maintenance deficit’ resulting from the rapid expansion of investment levels, but it had no effect on the allocation of resources (Melin 2000).

The same tendency continued over the next ten years. Hultén (2012: 223 pp.) for instance shows how the government shifted resources from maintenance to investment budgets in the 2010-2021 measure planning process so that it could meet more demands for ‘regionally urgent’ projects. However, before the plan was even finalised the snowy and cold winter of 2010 in combination with the relatively strong increases in railway transport volumes and badly maintained tracks resulted in major disruptions in rail services. Media headlines about ‘the railway chaos’ were abound. Similar scenes took place the following winter, helping to firmly establish the ‘maintenance deficit’ as a key issue on the problem agenda. In March 2011 the Transport Agency launched the Capacity Enquiry. The subsequent report identified a need for an additional SEK 50 billion (in addition to existing investment proposals) for retaining the capacity in the existing network until 2020 (Transport Agency 2012: 42).

4.5.9 Mapping key changes in the infrastructure regime 1990 – 2010

This section sums up the main trends of the period and the most important changes in the infrastructure regime between 1990 and 2010. This is done by first outlining the broad trend in regime dynamics, followed by an overview of the changes to the rules of the regime with important implications for sustainability. A discussion of how to understand the development as conditions for sustainability is held in section 4.6.

Using Raven’s (2007) terminology, the following broad pattern of changes in regime interaction dynamics can be discerned. Compared to the type of competitive relationship between the road and railway regimes in the 1950s and 1960s, the emphasis towards inter-modality and intra-modal competition signalled a more symbiotic regime interaction dynamics.

Spill-over dynamics have also been present in that the approach to new railway investments was modelled on the ‘marginal cost approach’ developed in the road regime in the preceding decades. The new, vertically separated railway regime was based on the structure and methods in the road regime.
This symbiotic interaction and spill-over subsequently prepared the ground for the integration dynamics resulting in the merging of the road and rail agencies into a single Transport Agency in 2010.

At the same time the formal rules (defined as the relationship between actors and allocation of resources such as money and authority) have increased in complexity. There are more actors involved (through de-regulation) and new forms of interactions (through the splitting of previous parts of the state agencies into public enterprises). There has also been a shift towards decentralised decision-making through the regional devolution of planning.

A key change of the normative rules, (defined as infrastructure policy and planning objectives), has been the introduction of the dual overarching objective of a cost efficient and long-term sustainable transport system.

The changes to the cognitive rules (which refer to the problem agendas, guiding principles, and the main practices for establishing knowledge) can be described by pointing to the concepts becoming established on the policy and planning agendas. Concepts such as infrastructure for growth, regional expansion, environmentally friendly transport, a fossil-independent vehicle fleet and the maintenance deficit convey interacting and often conflicting ways of defining the problem agendas in the infrastructure regime.

The ambition of facilitating the potential mobility of people and goods has become established as a key guiding principle expressed through concepts such as infrastructure for growth and regional expansion. At the same time the four-step principle is a competing guiding principle suggesting that the need for transport must be reduced.
4.6 The historical context as conditions for sustainability in transport infrastructure policy and planning

The questions posed in this chapter were: 1) Which changes have we seen in the road and railway networks?, 2) How can these changes be understood in relation to changes in infrastructure policy and planning? 3) What are the drivers for change? 4) What are the implications of the sustainability agenda emerging in this context?

Questions 1 and 2 are addressed in section 4.6.1, and questions 3 and 4 in section 4.6.2.

4.6.1 Which changes have we seen in infrastructure networks, policy and planning?

Looking at the period 1950-2010 there has been one clear transition in the transport system: the transition to auto-society which took place from 1950-1970. This has been contested, but also consolidated since then. The most important change in recent decades is the increases in spending, both on rail and road infrastructure, illustrating how the systems for motorised mobility display the characteristics of socio-technical systems in momentum. The speed of change is visible in the continuous expansion, upgrading and sinking of resources (material, energy and money) into the road and railway networks. The contrast with less than 1% of money for investments in cycling and walking infrastructure compared to total spending on new investments in 2011 tells us a lot about the direction of change.

Since 1990 more than 800 km of road have been upgraded to motorway standard (see Table 4). During the last decade more than 25 000 km of road has been upgraded to 2+1 roads\(^\text{21}\) (På väg 2013a). In addition there has been a continuous incremental upgrading of roundabouts, motorway access ramps and bypasses leading traffic around cities and towns.

\(^{21}\) Dual carriageway roads where lanes are separated by a wire rail, combined with stretches of three lanes to allow overtaking of slower vehicles.
In the railway network, 800 km of double tracks have been added, grade separated intersections and tunnels have been built.

At the same time the maintenance deficit suggests that there is a tendency towards new ‘high-tech’ infrastructure in some parts of the system. Examples are urban road and railway mega-projects, such as the tunnel systems of the Southern Link and the coast-to-coast section of the Öresund Link. In contrast, much of the ‘low-tech’ infrastructure is deteriorating from a lack of maintenance and re-investments.

When considering the long-term temporal perspective it is clear that perceptions of what to consider rational and suitable in infrastructure planning have changed several times. An important change in the long term is the view of infrastructure, from being developed to facilitate the increasing use of road transport, or discontinued to facilitate commercial viability of the state railways, to the interlude of protests against auto-society and the closing of railways, and to the more recent widely accepted notion of infrastructure as a panacea to facilitate growth. From the period 1990-2010, sustainability has entered as a core aim in transport policy and policy goals envision a new transition towards a sustainable transport system. The question is whether such a transition is currently ongoing.

Judging by the actual developments in terms of infrastructure investments and emissions, the prospects are not all that encouraging. The increased investments in rail could point in the right direction but, viewed in light of road investments increasing at the same time, this development can hardly be seen as a clear focus on shifting road transport to rail.

Looking at ongoing changes in cognitive and normative rules the answer is more complex: we can see several ‘cracks in the regime’. This expression is drawn from Geels’ (2012) study of transport system transitions in the UK and the Netherlands. Geels argues that the dominant ‘auto-mobility regime’ is showing important signs of destabilisation, such as the saturation of growth in road transport demand, and cities adopting car-restricting measures (e.g. car-free zones, parking charges, congestion taxes, and converting road lanes to bus and cycle lanes). Similar tendencies can be seen in Swedish cities, the most evident example is the introduction of congestion
taxes in Stockholm (in 2006) and Gothenburg (in 2013). Still it is not evident whether these ‘cracks’ will lead to a more general impact on infrastructure policy and planning.

Geels (2012) further argues that another indication of destabilisation is the disbanding of the predict-and-provide paradigm in favour of demand management and less interest in road expansion programmes. As yet, there is no conclusive evidence of this being the case in Swedish infrastructure policy and planning. The characteristics of road expansion programmes may have changed, but we can actually observe that spending has increased. There is no clear evidence that the predict-and-provide paradigm has been abandoned in favour of demand management.

However, the call of the four-step principle to think differently and the explicit request to first and foremost consider actions that influence the need for transport does clearly indicate a change in thinking. This is further exemplified by the ongoing debate on the future growth of transport volumes, such as the work going on within the Transport Agency on interpreting the climate policy objectives as actually requiring a reduction in road transport volumes. While there is little to suggest that this interpretation is enjoying much support as yet, an important point is that whereas criticism of auto-society previously came mainly from regime outsiders, such as protest groups, environmental NGOs, or from ‘green’ politicians, this might be a sign this view is gaining foothold, at least within some fractions of the regime. This could indicate that an empowered niche is forming within the regime. The extent to which this will have any effect on policy and planning remains to be seen.

In general we can see a tendency towards more cognitive rules competing for primacy of interpretation, and a number of contradictory trends in policy and planning can be discerned, such as growing emphasis on environmental concern and sustainability, and facilitating mobility through investments. Another contradictory trend is the continuous tension between more political influences (both at central and regional level) and greater influence of decision-support frameworks such as CBA and SEA.
4.6.2 What are the drivers of change and the implications for the emerging sustainability agenda?

A main point being made in this chapter is that there is not one single driver in the transition processes; instead several parallel processes have been co-drivers of change. The following four categories are suggested to cover drivers for change with important implications for the emerging sustainability agenda: i) the cluster of ideas about international competitiveness, regionalisation and infrastructure investments as a driving force for economic development; ii) environmentalism and public participation; iii) the shift from full-cost coverage to the marginal cost perspective as a basic principle for infrastructure investments; iv) deregulation and marketisation.

The implications for the emerging sustainability agenda are discussed in order below.

The cluster of ideas about international competitiveness, regionalisation and infrastructure investments as a driving force for economic development

One important implication of the increasing emphasis on infrastructure for growth is greater political interest in infrastructure. Hultén (2012) describes the general development of the infrastructure planning paradigm as a shift from “technocratic rationalism” to “investment pragmatism”. In broad terms this can be viewed as a shift from infrastructure planning as a technocratic, ‘scientific’ exercise conducted by planners and other civil servants in the executive agencies to a key area of politics where the negotiation of financing agreements between different levels of government plays a key role.

However, this does not mean that ‘science’ is not playing a role – instead there is increasing competition between and within various disciplines (such as between different fields of economic research, environmental research, technology studies, research on transport and land use planning, etc.) for establishing specific perspectives on the problem agendas. Actors in the regime make use of different knowledge in a discursive struggle among different policy expertise, between experts and decision-makers, and decision-makers at different levels in the planning system (cf. Rein and Schön 1993: 9).

In the discursive struggle a number of key concepts, for example regional expansion and environmentally-friendly transport, are used to describe problems and express the
desired end-states to which the infrastructure investments are expected to contribute. This means that sustainability is interpreted differently by different actors and adapted to other interests and objectives (particularly economic development). This is developed in Theme II in relation to regional infrastructure planning in southern Sweden.

**Environmentalism and public participation**

The growing environmental awareness, the formalisation of public participation and the subsequent institutionalisation of environmental concern in policy and legislation has had considerable impact on planning practice in the design and construction of individual infrastructure projects, but less impact on overarching strategies for planning and investing in the transport system infrastructure.

Building tunnels and bypasses are common solutions to reduce local problems of noise and air quality. It also seems as if regime adaptation, such as through the establishment of formalised rules for public participation in project planning, has channelled protests from regime outsiders into more manageable forms. Compared to the protests against road expansion projects from 1970s to the mid-1990s major (road) infrastructure no longer seems to generate any major opposition.

While environmental concern and sustainability are now highly formalised aspects of the normative and regulative rules, the outcomes of the infrastructure planning processes are plans that increase CO₂ emissions. This suggests that solving current, local problems are prioritised above long-term global problems.

**The shift from full-cost coverage to the marginal cost perspective as a basic principle for infrastructure investments**

The shift from the full-cost coverage to the marginal cost perspective was imperative for the shift from a diminishing railway sector to new investments. However, from a sustainability perspective there are important consequences of assuming the marginal cost perspective and using CBA to determine the optimal efficiency of infrastructure investments. Addressing environmental externalities through infrastructure investments is not very likely to come across as a cost-efficient alternative. The arguments claiming that general policy instruments (typically economic) are more cost efficient for influencing the use of the transport system are indisputable. However, this view also legitimises a development where incremental, either detrimental or positive, environmental impacts of infrastructure are neglected by invoking the superior cost
efficiency of general policy instruments. A premise that might be missing in this argument is that there must be public acceptance for policy instruments, and investment in infrastructure may in the long run create or restrict possibilities for introducing different types of policy instruments.

The marginal cost perspective is not hegemonic, and studies have shown a limited connection between CBA results and road investments (Eliasson & Lundberg 2012). In a study of the 2010-2021 planning process it was shown that the order of prioritisation based on CBA results established by the executive agencies in the planning process were side-stepped by political intervention. The government included some projects not originally included, which resulted in other projects being omitted from the plan (Eliasson and Lundberg 2012). Another example is a recent report identifying a number of ‘system failures’ in Swedish infrastructure policy and planning (Nilsson 2013). Here it is argued that the system failure is illustrated by governments of varying political majorities deciding to implement very large investments alongside the work carried out by the planning agencies.

An important question is what the result would be if cost efficiency was followed more stringently as a guiding principle. It is noticeable that Nilsson (2013) in his review discusses a number of large-scale railway investments as “non-profitable” examples. Eliasson & Lundberg (2012: 44) conclude that the Government’s intervention reveals a “rail bias”. Another example is found in a remittal comment to the 2008 policy bill where VTI22 argues that the results from available CBAs indicate that there should be a shift from investments in rail to investments in road (Swedish Government 2008a: 74).

This lends further support to the well-known claims in sustainable transport literature (cf. Whitelegg 1993 and Banister 2008) that the use of CBA leads to outcomes that are contradictory to sustainability objectives. A main point to be made here is that one important condition for sustainability is that the marginal cost perspective and cost efficiency has a strong tradition and position in Swedish infrastructure policy and planning (cf. Eliasson & Lundberg 2012, Thoresson 2011). In the context of

22 VTI is The Swedish National Road and Transport Research Institute, an independent research institute in the transport sector.
expanding infrastructure investments, the marginal cost perspective and CBA as an important decision tool has contributed to a lock-in in terms of road investments having a systematic profitability advantage.

**Deregulation and marketisation**

Deregulation and marketisation has contributed to making the governance context more complex. For the railway sector the lack of coordination between the numerous public and private actors in the regime has frequently been put forward as a core problem explaining the lack of reliability. It has been argued that the dilapidated and poorly maintained rail infrastructure is proof that the reductions in spending expected to follow from deregulating the railway sector have come with a hidden price, revealing itself in recent years (cf. Seko 2011). An important implication for the sustainability agenda is that it develops in parallel to an ongoing process of commercialisation of the infrastructure regime as well as the public transport sector. The extent to which this generally helps or hinders a transition towards a sustainable transport system is not clear. One important question concerns what the increasing commercialisation in infrastructure provision means in terms of governance arrangements and whether it can be steered in a sustainable direction. Some facets of this issue will be analysed in more detail in Theme III in relation to the Öresund Link and the Arlanda Link.

When interpreting these tendencies with the help of the concepts avoid, shift, and improve (introduced in Chapter 2.1.7) the following is suggested. The prospects of introducing avoid approaches in light of the strong emphasis on infrastructure as facilitator of growth are seriously limited. While shift approaches are at the core of the policy agenda, this comes with the provision that heavy investments are made in both rail and road networks. Improve, in the sense of nurturing and maintaining the capacity of the existing infrastructure, has become a core issue in recent years. But this also comes with the provision that the expected mobility increases necessitate further capacity expansions of both rail and road networks.

The mounting maintenance deficit of the railway system can be interpreted as illustrations of challenges to come. This begs the question of whether we are on a fixed course at high speed down an expansive and expensive policy path or whether the recent development indicates a swerve in direction from expansion to maintenance.
This discussion will be revisited in the concluding chapter of the thesis after the exploration of managing conflicts in regional infrastructure planning in Chapter 5 and the foray into mega-project funding models and sustainability implications in Chapter 6.
5. Theme II: A discourse-theoretical perspective on resolving conflicting interests in infrastructure planning

“…metaphors, allegories that seduce the mind. Now it’s to connect, and this also applies to these main roads, they will connect regional centres and so on. What’s positive about that? A regional centre should be independent, why should you have to go between them then? What do you mean exactly? All these values and positively charged words, it's very controlling...” (Interviewee 42, Academic)

“The visions of sustainable development, including what you can read in the new regional plan, for example. There are some amazing words, they’re just stacked up. Does this make it easier to judge [the] success [of an infrastructure project]? I don’t think so... words are one thing and but what is done in reality is another.” (Interviewee 42)

As described in Theme I, decisions on transport system investments today are made in a complex process characterised by the involvement of a wide range of actors, a multiplicity of policy objectives and the use of various techniques and methods for evaluating the impacts of the investments. A consequence of this increasing complexity is that there are many different expectations regarding the outcome of the planning process. Consequently, the management of conflicting interests is a fundamental aspect of infrastructure planning.

A number of techno-rational methods, such as cost-benefit analysis and strategic environmental assessment, are applied in the planning process to resolve conflicts between clashing perspectives in a structured and rational manner. However,

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23 A previous version of Theme I is published in Pettersson (2013)
infrastructure planning is also a process in which language and argument play a central role. As the analysis in Theme I showed, the language used in transport and infrastructure policy is permeated with concepts linked to various policy objectives, including regional expansion, cost-effectiveness, climate-efficiency and, of course, sustainability and sustainable transport.

An interesting point is made by interviewee 42 in the two quotes at the beginning of this chapter. In the first quote the importance of metaphors, allegories and positively charged words linked to the ideas of regional expansion is emphasised. In contrast, in the second quote, sustainability is dismissed as just ‘words’ with no impact on what is happening ‘in reality’.

This raises an interesting question; why is one concept more influential or powerful than another in terms of how its meaning is translated into ‘real impact’? Simply using concepts as rhetoric is clearly one part of the explanation. However, a central argument in this section of the thesis is that words and concepts must be supported by the production of knowledge to play a role beyond rhetoric in decision-making.

Also implicit in this argument is that, while the development of the transport infrastructure system is shaped by the world views of decision-makers, there is also a reciprocal relationship – the world views of decision-makers are shaped by the processes and techniques used to develop information and knowledge about what needs to be done and why this is desirable.

This section of the thesis attempts to improve understanding of how two frequently used concepts influence regional level infrastructure planning. These concepts are *regional expansion* and *environmentally friendly transport*. As described in Theme I, regional expansion is a concept that encompasses ideas about infrastructure as a catalyst for economic growth and emphasises facilitating mobility by increasing commuting options. Environmentally friendly transport\(^{24}\) is obviously a concept that denotes the ideas about resolving the environmental problems caused by transport.

\(^{24}\) *Miljövänligt*, or *miljöanpassat transportsystem* in Swedish.
In effect this means that the question posed is how the conflict between environmental concern and increasing mobility is managed in the planning process.

The analytical approach to answering the question is to view the planning process as a “… constant discursive struggle over … the boundaries of problem categories, the intersubjective interpretation of common experiences, the conceptual framings of problems, and the definitions of ideas that guide the ways people create the shared meanings that motivate them to act” (Fischer & Forrester 1993: 2).

In line with this approach the emphasis of this study is the reciprocal relationship between the process of framing problems and solutions, the resolution of conflicting interests, and the techno-rational decision-support tools used in infrastructure planning.

The aim is to analyse how the use of the two concepts influences the planning process by illustrating the interplay between these concepts, the framings of problems, suggested solutions, the use of certain knowledge-producing practices, and the outcomes of the planning process.

The analysis is based on two main empirical sources, the interview study and various planning documents produced in, or underpinning, the planning process for regional infrastructure planning in Skåne (Box 4). The interview material is based on 9 interviews (interviewees 14 – 22) with persons involved in the study of the regional planning process in Skåne. In the analysis quotations are only used from three of the interviews: interviewee 18, a planner in Malmö, interviewee 20 a politician in Malmö, and interviewee 22, a planner at the regional level. The quotations were singled out in the analysis stage either because they provided important information about the planning process or because they clearly expressed opinions that many interviewees argued or alluded to.

In section 5.1 the theoretical framework is described, and section 5.2 sketches the properties and main actors involved in the regional planning process used as empirical source in the analyses. In sections 5.3 and 5.4 the two concepts are analysed by applying the theoretical framework, and the results are contrasted and discussed.
5.1 Planning and discourse theory – theoretical framework

While there is no generally accepted definition of what discourse means it can in a broad sense be understood as a certain way of talking about, and understanding the world (Winther Jørgensen & Phillips 2000). Applying this approach to infrastructure planning and talking about an infrastructure planning discourse therefore highlights the importance of language and how knowledge is produced.

Language is imperative since knowledge about the world is mediated and expressed in words. Our knowledge of the world is a result of how we categorise knowledge in different social and interactive processes. This knowledge production process can be viewed as a continuous struggle for establishing communal perceptions (Hajer 1995: 53). A certain view of the world implies certain options and courses of action being viewed as natural while others are ruled out, and so the social construction of knowledge has concrete effects (Winther Jørgensen & Phillips 2000: pp. 11-12).

The concept of discourse as used here should be understood as an analytical construction allowing an investigation of certain parts of meaning and knowledge production processes in infrastructure planning (Winther Jørgensen & Phillips 2000: pp. 136-137). Hajer (1995: 60) defines discourse as “…ideas, concepts, and categorisations… produced, reproduced and transformed in a particular set of practices… through which meaning is given to physical and social realities.”

An important part of the analysis in Theme I concerned how ideas, expressed through various concepts and categorisation, were introduced as important cognitive guiding principles of the transport and infrastructure policy agenda. The analysis in this chapter is aiming for a higher level of detail and to add some more concrete examples of the step from guiding principles to planning practice.

The planning discourse as defined here refers to practices in the infrastructure planning process functioning as an intermediate stage between the more or less abstract ideas expressed in the concepts and the outcomes of the planning process, resulting in suggestions for how to develop the transport system infrastructure.
A theoretical framework is used to structure the analysis and illustrate how the concepts imply certain ways of framing planning objectives. A key aspect of establishing planning objectives is the framing of problems through problem-setting stories, which also includes suggestions for solutions to the problems. The planning objectives and problem-setting stories are in turn linked to what is considered as legitimate knowledge and evaluation methods. Together, this process of framing influences the outcomes of the planning process by suggesting some options while ruling out others.

5.1.1 Framing

While not explicitly mentioning the concept of discourse, a similar language and argumentative based approach is applied by Tennøy (2010) in a study on the lack of integration of transport and land use planning. According to Tennøy,

“[h]ow the problem is framed influences the choice of alternative strategies and means that are considered, how these are evaluated, what counts as evidence, what are seen as legitimate methods, and thus the alternatives and means that are recommended and implemented…” (Tennøy 2010: 218).

Tennøy builds on Rein and Schön (1993: 148) who emphasise the importance of problem-setting stories, since “… problem-setting stories…link causal accounts of policy problems to particular proposals for action and facilitate the normative leap from ‘is’ to ‘ought’.”

Another aspect of framing and establishing problem-setting stories is addressed by Basmajian (2010: 106) who in a study of a regional planning process in Atlanta (USA) examines “…how the idea of growth shaped the decision-making framework”. In this case the emphasis on accommodating (as opposed to guiding) metropolitan regional growth in combination with the use of a specific quantitative planning model had a fundamental influence on the outcome of the planning process and the subsequent development of the region.

Basmajian’s study shows how the use of the planning model in combination with the growth-accommodating policy context resulted in a plan projecting the low density ‘urban sprawl’ development that later materialised. Urban sprawl in this instance was not a result of lack of regional planning (which is often used as an explanation of
urban sprawl as a phenomenon); instead the use of the seemingly impartial planning model and the importance of controlling the production of knowledge stand out as important explanations.

A key point highlighted by Basmajian’s study is the importance of “… the crucial groundwork of “… planning – gathering and organizing a vast body of information, processing the information, and then projecting that information into the future…” (Basmajian 2010: 110) The emphasis on growth in the regional planning organisation that controlled the knowledge production process directed information gathering and processing and thereby shaped the planning discourse, and consequently the outcome of the planning process.

The ‘groundwork of planning’ constitutes a key aspect of framing by establishing what counts as legitimate knowledge and evaluation methods. Another example of this is provided by Isaksson (2001) who showed that protestors against road expansion projects in Stockholm gradually had to adopt the language of the planning discourse. Where they initially appealed to radical ideas about how to change society towards an environmental vision, they gradually started using established planning discourse terminology such as cost-effectiveness to influence the planning process. This illustrates the importance of knowledge production practices in establishing what counts as legitimate arguments and what does not.

An important point based on the work of the authors mentioned above is that the relationship between concepts, problem-setting stories and information gathering is highly reciprocal. On the one hand, the focus of information gathering and processing is guided by what is defined as a problem and, on the other, the definitions of problems and solutions rely on the available information.

Influence on the planning discourse and consequently the outcome of the planning process therefore depends on the reciprocal relationship between gathering knowledge about the world and defining the problem (often expressed through the use of concepts denoting a certain way of understanding the world), which in turn justifies certain actions and not others.

The analysis is structured in two main sections based on the elements of the framework: Frames and Outcomes. The Frames section draws attention to linkages
between the concepts and the framing of problems through the problem-setting stories. The Frames section also explains the interplay between the framing of problems and the establishing of legitimate knowledge production and evaluation methods.

The Frames section covers regional expansion and an environmentally friendly transport system separately, while the Outcomes section discusses how the two concepts influence the planning discourse, how the conflict between environmental concern and increasing mobility is solved, and the effects on the outcomes of the planning process.

To sum up, the framework is applied to explain how the problem-setting stories and knowledge-producing practices relating to two important concepts, regional expansion and environmentally friendly transport, influence the infrastructure planning discourse and the outcome of the planning process in various ways. The aim of the analysis is to illustrate how the abstract ideas, denoted by the concepts (as described in Theme I), are operationalised and how this influences the outcomes of the planning process.

### 5.2 The planning context: actors and processes of the planning system

“Throughout Sweden, very intensive work is now [going] on [with making] new long-term infrastructure plans, so the transport agencies and all the regions in Sweden are working on this. This is a huge, coordinated process where the state has the initiative. Much of the money comes from the parliament and they set the rules, set the timing and so on…” (Interviewee 22)

This section provides an overview of important actors, structures and processes in the planning system to outline who influences the planning discourse and through which means.

As stated by interviewee 22 above, infrastructure planning is a highly complex process in which different actors have different means at their disposal to exert influence. Central level government (i.e. Parliament, the Government and the concerned Ministries) are of course important since they set the ‘rules of the game’, including the level of spending, the resource allocation between different types of infrastructure, the
amount of money for regional level investments, and the general transport policy principles expressed through policy objectives.

However, this does not mean that ‘the state’ (i.e. the Parliament, the Government and the executive agencies) are hegemonic. As described in Theme I, devolved decision making and increasing involvement of local and regional level actors have been a key transport policy ambition for several decades.

Despite the increasing emphasis on the regional level, the planning system is characterised by a separation of functions in terms of policy, permit and financing processes and frameworks, which leaves regional level actors rather powerless in terms of financial and legal scope. Most notably, the separation between land use and infrastructure planning, and between financing and permit-granting processes means that municipalities control considerable legal powers regarding land use planning and permit-granting processes, while financial resources for infrastructure funding are concentrated at the national level\(^{25}\) (Cars et al 2009).

However, the role of regional planning organisations in the planning process is to implement national policy goals at regional level, and coordinate the needs and wants of trade and industry, municipalities and citizens with the national infrastructure plans made by the transport agencies. This coordinative role highlights the importance of framing through interaction with various players and different knowledge production processes.

“In this [planning process], there is a lot of analytical work with various forms of assessments, traffic economic analyses, impact assessments and so on. We’re also trying to create this connection between infrastructure investments and how they are related to integration… Or how they are related to the development programme in Skåne… and other policy, environmental policy [for example]… Besides the analytical parts it’s very much about interaction… anchoring, listening to different actors. How do the municipalities in Skåne view these issues? How does the business community view this? How do the government agencies

\(^{25}\) The lack of integration between various actors and processes in the planning system has been recognised as a problem and a number of reforms are proposed at the time of writing. The text below describes the situation in 2013.
view it? Then we try to piece this together so the political decisions can be made.”
(Interviewee 22)

Consequently, despite being restricted from a financial or legal perspective, regional level planning is important, not least since the lack of formal and economic power increases the importance of argumentation, language and knowledge production processes. Consequently, as interviewee 22 implies above, the regional planning discourse is interesting since it involves many actors, from local to national level. It represents a compromise of interests established in a discursive struggle over which problem-setting stories and which knowledge-producing practices to consider relevant.

5.3 Analysis

In this section the theoretical framework is applied. The first step is to examine how the planning objectives linked to the concept of regional expansion interact with specific framings of problems and certain knowledge production practices (section 5.3.1). A similar analysis is then made of the concept of environmentally friendly transport (section 5.3.2). This is followed by a discussion about the potential conflicts in these different framings, how this affects the planning discourse, and the concrete outcomes of the planning process, in section 5.4

Quotes from the interviews are interspersed with examples from the regional infrastructure plan of Skåne to illustrate and explain how the two concepts are framed and how the conflict between environmental concern and increasing mobility is managed.
5.3.1 Framing regional expansion

Starting on a general level, an obvious but important point concerning regional expansion is the role of infrastructure as a means of reducing ‘the friction of distance’. This highlights the importance of reducing travelling times as a key proxy for measuring regional expansion.

In the regional plan a continued regional expansion aiming to expand the geographical boundaries of the labour market is emphasised as a crucial challenge. Regional expansion as a planning objective is defined as integration of labour markets within Skåne, integration with the Danish labour market in the Copenhagen area, and integration with the surrounding Swedish regions. (ROS 2010: 28) These objectives imply certain ways of framing the problem of the transport system based on a number of problem-setting stories.

Problem setting stories

A dominant narrative in the problem-setting stories concerns a strong increase in transport volumes in recent decades, leading to a situation where several road and railway sections are close to maximum capacity. Additionally, the importance of anticipating future bottlenecks is stressed (ROS 2010: 15-16 & 22).

A central premise is expectations of a 20% increase of road transport volumes by 2020, causing concerns given the strained situation in some parts of the network (ROS 2008a: 11). A strong increase in rail travel in recent years is also put forward as an example demanding drastically increased investment levels (ROS 2008a: pp. 46). The need to increase capacity of the public transport system was further emphasised by interviewee 22:

“…public transport travel is increasing very rapidly. Rapidly enough for it to be difficult to respond to. So even though we are investing in public transport, it’s still crowded, both in the trains and on the tracks, and also for bus services in major population centres. So the capacity of the public transport system is a pretty important issue if we see it in a relatively short term, perhaps the next ten years.”

The concept of regional expansion plays a central role in these problem-setting stories. In the regional plan it is argued that:
“… Greater integration is needed between local labour market areas. The larger cities have considerable commuting hinterlands, while smaller cities have relatively local labour markets. Tying these labour market areas closer together makes trade and industry more competitive and gives more flexibility to the labour market. It is important that cities with relatively limited and vulnerable labour markets can expand their commuting hinterlands” (ROS 2010: 17).

Two obvious, but nonetheless crucial points are to be made here. Firstly, mobility increases in the problem-setting stories is essentially viewed as something positive. Bringing about increases in mobility by facilitating the latent mobility of the labour force is the key for achieving the regional expansion effects.

Secondly, the emphasis on increasing commuting distances and volumes in turn necessitates capacity increases of the transport system (ROS 2008a: pp. 46). The general spirit of the plan is captured in this quote: “Traffic thrombosis is not here yet, it can be avoided by wise and timely investments” (ROS 2010: 25).

What is important here is that the expected traffic thrombosis is partly a result of policies aimed at achieving the regional expansion effects. The emphasis on the positive effects of mobility increases in the problem-setting stories constitutes a dominant framing in the planning discourse that makes some measures or choices appear natural, while simultaneously ruling others out.

To sum up, according to this framing transport system, investments are crucial for the future for the region by way of job creation, freedom of choice regarding place of living and work and competitiveness in relation to other regions. Simultaneously this produces the view of a transport system facing serious capacity problems, which poses a threat to economic prosperity. The challenges of the transport system are framed mainly as a matter of promoting (or preventing) economic growth depending on whether or not investments facilitating mobility increases are made.
Knowledge production and evaluation methods

This framing is underpinned by a specific set of knowledge production and evaluation practices combining spatial representations of commuter flows between labour market areas, mapping of time-based accessibility, and the use of cost-benefit analysis (CBA).

The development of local labour market areas as defined by Statistics Sweden is an important knowledge production practice linked to regional expansion. A local labour market area is defined as a group of municipalities where the target of commuting flows across the municipal borders is mainly directed towards one municipality within the group. When daily commuting increases above a certain level between previously separate local labour market areas they are merged into a single area. In 1970 Sweden had 187 local labour markets but by 2008 the number had fallen to 85 (SIKA 2007).

Figure 12 Visual representations of commuter flows and labour market areas. Source: ROS (2010), captions in the legend translated.
The decreasing number of local labour market areas reflects the increasing share of the population commuting across municipal borders. It is also an important example of a knowledge-producing practice underpinning the regional expansion concept. Figure 12 illustrates how commuter flows between labour market areas are visually represented in the regional plan (ROS 2010: 18).

This also means that infrastructure investments reducing travelling times down to the interval 20-40 minutes between places with large potential for commuting are viewed as important for achieving regional expansion effects (Nutek 2001).

The focus on travelling time reduction in turn gives CBA a central role in the planning process since the value of time savings dominate the calculations. This is shown in Figure 13, an overview of the CBA results of a number of road projects in the regional plan. The bar representing the time savings outweighs the combined benefits of all other parameters in the CBA, and so provides key information for putting the concept of regional expansion into practice.

The outcomes of CBAs are in turn reliant on traffic forecasting models for road and railway traffic volume increases. Consequently the results from forecasting models
constitute a key element in the problem-setting stories as illustrated by the centrality of the projected increase of transport volumes. A conclusion is that the combination of representations of commuter flows, traffic forecasting models and CBA plays a key role in framing regional expansion by categorising the information underpinning the problem-setting stories in specific ways.

5.3.2 Framing environmentally friendly transport

“Measures needed for a long-term sustainable transport supply include investments in the railway system to offer environmentally friendly transport alternatives…” (ROS 2010: 23).

As described in Theme I environmentally friendly transport has been a key policy ambition for more than two decades. This policy ambition is expressed through the ‘consideration objective’ of the national transport policy documents which, in turn, provide an important point of departure for the national and regional infrastructure planning processes (ROS 2010: 28).

The regional plan for Skåne refers to two main national policy objectives concerning the environment. Firstly, the plan stipulates that the regional plan should contribute to achieving the nationally established policy objectives, including the climate reduction objective for the transport sector: “The transport sector shall contribute to reaching the environmental quality objective of reduced climate impact by gradually improving energy efficiency in the transport system. By 2030 Sweden should have a vehicle fleet independent of fossil fuels.” Furthermore “[t]he transport sector should contribute to reaching the other environmental quality objectives and to reducing health problems” (ROS 2010: 21).

Six general regional planning objectives26 have guided the planning process, including an objective to “develop an environmentally friendly and safe transport system”. According to this objective “[a]n important part of the solution is a continued

26 The other five are: A continued regional expansion and regional integration; Increasing integration in the Öresund region; Develop the infrastructure in the growth centres of Skåne; Develop a transport system for everybody; Improve the links with the outside world.

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expansion of fast regional public transport offering better options and [thereby] taking market shares from the car” (ROS 2010: 28).

In turn there are a number of sub-objectives and further definitions linked to environmentally friendly transport, e.g. the proportion of employees able to reach their workplace within 45 minutes using public transport should increase in all municipalities; the proportion of total travel made by public transport should increase; the proportion of rail and sea transport should increase for freight transport; and the capacity of the railway system should increase (ROS 2010: 22).

**Problem-setting stories**

These planning objectives are underpinned by several intertwined problem-setting stories defining the problem from an environmental perspective. Problems of barrier effects, noise, air pollution and air pollution are mentioned. A key narrative concerns the 43% increase of transport-related greenhouse gas emissions from regional transport between 1990 and 2008 (ROS 2010: 19).

As mentioned above a central solution to the problems caused by transport is to transfer people and goods from road transport to public transport and rail. However, this ambition is in turn dependent on the possibility to increase the capacity of the public transport system.

Despite a doubling of the number of trips by public transport during the last decade, the modal share of public transport still only accounts for 15% of total transport volumes, and a central policy problem concerns increasing the share to 30% by 2037. It is argued that “… a market share of roughly 30% [is] a good objective for a metropolitan region steering towards climate objectives and a more sustainable transport system” (ROS 2010: 16). Consequently it can be argued that increasing the proportion of people using public transport is an important proxy for environmentally friendly transport.

Another part of the problem-setting story is that the desired development is restricted by bottlenecks and capacity constraints, above all in the railway network. Accordingly, it is argued that the transition towards environmentally friendly transport is severely halted since several railway investments prioritised at regional level are not included in the current funding framework. Increasing mobility is essentially framed
as a problem due to a lack of resources to invest in public transport (above all railway) (ROS 2010: 25-26).

Knowledge production practices
Strategic Environmental Assessment (SEA) is a central knowledge production practice for handling environmental concerns in the infrastructure planning process. The planning process under study was the first undertaken since the directive was adopted in 2004. The SEA statement (ROS 2008b) highlights the importance of the national environmental objectives, above all the objective to reduce climate impact. This is viewed as the key objective since measures contributing to reducing CO\textsubscript{2} emissions in most cases will help fulfil other objectives.

Additionally, since public transport volumes are used as a proxy for environmentally friendly transport, the statistics of public transport user levels and CBA are also forwarded as important knowledge production practices. (ROS 2008b)
5.4 Outcomes/Discussion

“… we don’t want traffic problems of any kind; we don’t want people to be inconvenienced by traffic or their mobility patterns restricted so that they can’t get to where they want. So the starting point is some kind of problem minimisation and opportunity optimisation.” (Interviewee 20)

The application of the framework in sections 5.3.1 and 5.3.2 illustrates how the planning discourse is influenced through the interplay between concepts, frames and knowledge production practices (see Table 7), which in turn have a number of important implications for the outcome of the planning process.

A first thing to notice is that there is a high degree of consistency concerning the framing of the concepts through the problem-setting stories (see Table 10). The ‘problem minimisation and opportunity optimisation’ starting point referred to by interviewee 20 above is quite illustrative of the established planning discourse. Given this point of departure it is quite obvious that investments in public transport infrastructure, above all railways, are put forward as the primary, ‘natural’ solution. But it should also be acknowledged that there are a number of important consequences of this framing.
Firstly, while the consistency indicates that there are there is a strong potential for synergies between regional expansion and environmentally friendly transport, these synergies come with a steep price tag. The following reflection by Interviewee 22 illustrates the dilemma of navigating the dual policy objectives of increasing mobility while reducing environmental impact.

“This conflict between regional expansion and sustainable development is interesting.”
(Interviewer)

“Yes it’s a difficult issue. Public transport has been part of this, and it’s then quite straightforward because you have a solution where you create accessibility in a reasonably sustainable way, so it’s a very good measure… It’s more a question about money, then, that we can afford to offer it… But there is a conflict, that’s pretty clear…” (Interviewee 22)
Secondly, another outcome of the framing is that both concepts are defined and operationalised in a way contributing to a planning discourse heavily emphasising capacity constraints and commuting.

5.4.1 Framing: capacity, bottlenecks and commuting

Regional expansion as a concept entails a framing actively facilitating commuting and increasing mobility. Likewise, environmentally friendly transport is also framed in a way emphasising capacity constraints, albeit with a focus on public transport and above all the lack of railway capacity. Additionally, the problem-setting stories have a strong focus on commuting trips.

Shifting road transport to railways and other forms of public transport is framed as one central aspect of the solution to the conflict between increasing mobility and environmental concerns. Consequently capacity is a central concern in the problem-setting stories; the lack of capacity as a problem, and the provision of capacity as the solution.

There is a fundamental dilemma of this framing linked to the phenomenon of induced traffic. It is well known that solving congestion problems in the road network by expanding road capacity, e.g. adding more road space, will only provide a temporary relief since making road travel easier will typically lead to more cars (c.f. Goodwin 1996). Similar outcomes can arguably also be expected when increasing the capacity of public transport infrastructure; facilitating the demand for latent mobility induces more mobility (although in this case it is also a desirable outcome as opposed to expanding road capacity to counter congestion).

Capacity improvements are clearly needed to achieve the ambitious policy objectives of increasing public transport use, but there is perhaps a lack of logic in the arguments and, more importantly, this begs the question of the extent to which investments in infrastructure can provide a realistic solution to capacity constraints. Expanding the capacity in one section of the network will probably cause capacity problems in another; the bottlenecks in the system will be temporarily relieved or moved elsewhere.
The emphasis on bottlenecks is also linked to the strong emphasis on commuting; the bottleneck problem relates to the problems of dimensioning the infrastructure systems and the service level of public transport according to peak hour traffic flows.

This evidently means that the central problem framing in the planning discourse is not that we travel and use transport too much – it is the lack of capacity (both rail and road). Since the analysis concerns transport infrastructure planning, this framing is not surprising. The nature of the game and the aim of the planning process is to determine how to develop the regional transport system, identify qualified infrastructure investments and put forward the best argument as to why these investments should be prioritised above investments elsewhere in the country.

This is in no way specific to the Swedish context. The general planning spirit resonates clearly with the “Curbing mobility is not an option” rationality expressed in the EU White Paper on Transport (EC 2011: 5).

It should also be stressed that the synergies between policy objectives concerning regional expansion (especially when used with the sustainable prefix) and environmentally friendly transport are considerable; in the regional plan for Skåne this is forcefully illustrated by the ambitious policy target for increasing the market share of public transport.

However, this framing focus on capacity excludes other definitions of problems and solutions and limits the available options in the planning discourse. One tangible consequence of this is that definitions to which the concept of environmentally friendly transport refers must be adapted to the dominant mobility rationality. This is important in the wider perspective of the questions posed in this thesis, since it seems to indicate that the sustainability agenda can only have bearing on infrastructure policy and planning as long as it affirms the dominant rationality stressing the importance of increasing mobility.

This brings us to the question of what type of problem-setting stories are excluded by the current framing. In the remaining sections of Theme I, this issue is addressed by looking at the kind of arguments some of the interviewees put forward in justifying the current framing. The issue of the role of knowledge production practices in the planning discourse is also discussed.
5.4.2 Alternative framings – discursive struggles

“An important strategy for Malmö [in solving the conflict between regional expansion and sustainability] is to improve the city public transport system. You could say that the regional level public transport system has been improved through the Öresund link and... the City Tunnel. The... [regional train] systems have actually been very good if you look at the last few decades. It has become easier to commute within the region, so the bottleneck is now once you’ve arrived in the city.”

“Is it a good or bad way to handle conflict?” (Interviewer)

“It’s the only way, I was about to say.” (Interviewee 18)

Crucially, environmentally friendly transport is framed as a matter of increasing the share of collective and non-road transport modes, but reducing or curbing the growth of road transport volumes is not an objective per se. On the contrary, dealing with an expected 20% increase in road transport volumes until 2020 is a central premise in the planning process.

An example of an alternative way of framing could be to establish a desirable future development and then use information from traffic forecasting models in back-casting scenarios to help understand the effects of different policy and planning options. This kind of approach is often suggested in research on sustainable transport (see e.g. Banister 2008 & Schiller et al 2010).

An example of an alternative framing is found in a report by the Transport Agency, where it is argued that road transport volumes need to be reduced to achieve the long-term climate objective.

“To achieve [CO₂] reductions in the order of 80 percent by 2030, it will not be enough with more efficient vehicles...increased use of renewable energy and the electrification of road transport. It will also require a change of direction in the development of society and infrastructure. The car’s role as a means of transport must be reduced...” (Transport Agency 2010b: 6, emphasis added)

This indicates a discursive struggle where alternative framings of problems compete to become established in the planning discourse. The Transport Agency report mentioned above was, for instance, developed parallel to the planning process studied, and the
Transport Agency supplied planning actors with key information such as traffic forecasts. However, it is clear that this alternative framing failed to influence the planning discourse.

On the other hand, two of the objectives relating to public transport are defined as policy goals rather than predictions, i.e. increasing the market share of public transport to 30% by 2037 and increasing the proportion of employees able to reach their job by public transport within 45 minutes. However, since the overall rationality of increasing mobility dominates the planning discourse, the solutions are heavily dependent on infrastructure investments.

Examples from two of the interviews will now be provided to illustrate some typical arguments found in the interview study about the issue of resolving the conflict between sustainability and regional expansion, and how these kinds of arguments produce a certain world view, making some options appear natural while ruling out others.

“Do you think there is a conflict between regional expansion and sustainable development?” (Interviewer)

“Yes to some extent. You can say that since [all] communication uses some sort of environmental resources, it’s clear that if everyone stayed in one place and worked at home, it could perhaps… be more ecologically sustainable. But I don’t see it as a realistic option, after all… we want to specialise, we want to push the development… and increase welfare… And for economic sustainability… the way forward is to continue the integration.” (Interviewee 18)

Importantly, this framing of the conflict between economy and the environment rules out any solution that would imply a reduction of mobility. Increases in welfare and increases in mobility are viewed as synonymous.

Interviewee 20 expressed a similar view with an additional emphasis on technological development.

“... the goal conflict between regional expansion and sustainable development. How do you think this is dealt with currently?” (Interviewer)
“I would say this, you’re definitely not handling it by counteracting the regional development, the idea to prevent movement between Malmö and Kristianstad doesn’t exist at all. I think most people reason like this: the fundamental ecological problems we’re dealing with... will in time be solved by technology... But much of what regional expansion and infrastructure investments are aimed at achieving, increasing labour market size and increasing mobility within a region is a bit more difficult to achieve... while technology changes within the fuel sector and technology shifts in transport will have a very large impact in a very short time when implemented... We’re not there now and there are certainly those who believe that we should not let go of things that cause increased problems in ecological terms. But ... the majority of... the politicians in power, they think we can’t afford to say no to greater efficiency…” (Interviewee 20)

So clearly, the expected efficiency gains, i.e. the economic benefits of increasing mobility, are considered more important than short-term aggravation of environmental problems caused by increasing transport volumes.

However, the same interviewee was also very clear on the need for increasing the modal share of public transport. To achieve this, the solution is framed as massive investments in railway infrastructure, including the upgrading of existing tracks not in use and the building of new tracks.

“...what does it take... to reduce the proportion of road traffic?” (Interviewer)

“There is hardly any doubt about what’s needed. It’s about putting trains back on all the tracks we already have, tracks that history has left behind, so to speak. There’s the Lomma Line, the Trelleborg Line... the old Staffanstorp Line and possibly the Simrishamn Line. This would create a radial system from Malmö with good train services, so people who live in Dalby, Lomma and these areas would choose public transport for their daily trip into town instead of driving a car.” (Interviewee 20)
5.4.3 Implications

As illustrated by the quotes from interviews and references from planning documents in the preceding sections, one implication of the capacity-constraint framing is a narrow focus on investments and a discrepancy between how solutions to problems are defined in the plan and what can be delivered.

The national economic framework for the planning period 2010-2021 resulted in less money than expected to the Region of Skåne, and so several major railway investments have been postponed. The funding deficit is estimated at some SEK 27 billion (ROS 2009). Consequently, the proposed solution to the problems as framed in the plan – i.e. railway investments to increase capacity and enable transfer of goods and people to railway – will not be feasible during the next decade. In the infrastructure plan this is acknowledged and it is argued that:

“After the year 2020 the investment needs will change dramatically, if the objectives of a more sustainable and climate adapted transport system are to be achieved.” (ROS 2010: 26)

Not surprisingly, a central problem with framing railway investments as a key strategy to resolve the conflict between increasing mobility and environmental concerns is that it is a very costly strategy. While it has not been possible to make a comprehensive review of all 21 regional infrastructure plans conducted in parallel, there is no doubt that the demands for railway investments far outweigh available resources.

As such, it can be argued that the proposed remedy to resolve the conflict between mobility and environment results in a focus on lack of money, rather than any attempt to reframe the problem to find possible solutions within existing budgets. Consequently, one implication is that the solution to the problem is postponed to future planning processes.

More specifically the kind of framing as shown in the analysis highlights two important questions. Firstly, since resources for infrastructure investments will always be limited compared to the demand, a key question is whether the capacity challenge for both the road and railway networks can be met. Secondly, the restrictions in available funding also raise the question whether the capacity challenge can be met with infrastructure investments alone.
Both questions are important from a sustainability perspective. While the policy ambitions for public transport are set at a high level, a lot of resources are simultaneously spent on expanding road capacity. Secondly, while management of demand is mentioned in the plan, the resources spent on, for example, mobility management amount to a fraction compared to what is spent on expanding capacity.

Another implication is that the focus on increasing commuting excludes other issues from the planning discourse, such as leisure, service and shopping trips. This is significant from a sustainability perspective, not least since a majority of passenger transport emissions are not caused by commuting trips.

According to transport survey data, commuting trips (work and school) account for 20% of total passenger kilometres travelled, while business travel accounts for an additional 16%. In contrast, leisure trips account for 41% and shopping and service trips for 12% (Trivector 2011: 46). Moreover, while Frändberg & Vilhelmsen (2011: 1238) show that average trip length for all purposes has increased considerably from 1978 to 2006, they note that leisure travel is associated with the longest trips.

Given this situation it seems clear that any planning or policy response to remedy environmental concerns caused by transport necessitates a broader scope than implied by the framing in the plan. As argued previously the strong emphasis on commuting and eliminating bottlenecks leads to a focus on investments to increase peak hour capacity of public transport. As important as this might be it is not evident that it is a feasible strategy for leisure travel.

5.4.4 The role of knowledge production practices in the planning discourse

“When reading your documents, I get the impression that you have a very good overview of commuting, but when it comes to leisure-related trips that also account for much of the transport volumes, what kind of tools are used for analysing that?” (Interviewer)

“There the tools are inferior… I think about one-third of all trips are work-related, and then another part is linked to work travel and such. Yet it is perhaps up to half the trips are made in leisure time and, looking at environmental impact, these journeys are equally important. I also think we use cars more for these trips. Still I think that work trips, where you work and where
you live, is a basic structure that is pretty solid and underpins a lot of traffic planning… these are also the trips that can most easily be done with public transport; they’re associated with certain routes. It’s harder to make a bus route that leads out into the countryside, or to cultural events and so on. There is less knowledge, the current understanding of leisure travel is based on travel surveys and then measuring traffic, but when it comes to commuting, you can work a lot more with databases, where you live and where you work, and analyse it, relate it to various groups and so on. You can do a lot with such sources.” (Interviewee 22)

An important explanation for the narrow focus on commuting in the plan is that knowledge production practices such as transport planning models, CBA and labour market area statistics direct the spotlight on commuting. CBA and labour market area statistics produce information directly relevant to the regional expansion objectives while simultaneously contributing to the definition of the concept.

In line with the findings of Basmajian (2010), this illustrates how analytical tools shape the planning discourse and the outcomes of the planning process. The emphasis on commuting is established in synergy with the policy context and the analytical models used. Consequently, it is a two-way relationship and if the policy context was more susceptible to other planning outcomes, other analytical tools would probably be considered more important.

As described in Chapter 4 CBA has a strong position in Swedish infrastructure planning, and as Banister (2008) argues, one problem of CBA is that it assumes that travel time minimisation is the central premise of transport analysis. This is problematic since it detracts from other perspectives, such as travel as a valued activity, travel time reliability, or the proposition that investments in infrastructure could help to remedy environmental problems.

The use of CBA contributes to framing the problem as a matter of reducing travelling times by increasing capacity and increasing travelling speeds, which, in turn, helps to establish a planning discourse biased towards investments with large potential for travel time reductions.

As illustrated in figure 13 (section 5.3.1) the problem with CBA from an environmental perspective is that it leads to a framing where time savings outweigh other aspects (see Banister 2008; Schiller et al 2010). In the regional plan this is
exemplified by how the information in Figure 11 is used to justify increasing CO\textsubscript{2} emissions from new road projects by arguing that the emission increases are insignificant compared to total transport sector emissions. It is concluded that: “The road investments will in total lead to increased CO\textsubscript{2} emissions from cars. The change is however marginal in relation to the magnitude of the total emissions” (ROS 2010: 60).

As a contrast, time savings, in most instances by definition also a matter of small and incremental changes, are given a much higher value and thereby a key role in the planning discourse. The point here is that, since facilitating and increasing the mobility of the labour force is the primary policy objective, CBA and statistics of local labour market areas are crucial for providing what is considered legitimate knowledge in the planning process.

This points to a problem of knowledge production practices linked to the concept of environmentally friendly transport. The nationally and regionally established objectives and associated knowledge production practices and procedures are indeed quite sophisticated, such as the monitoring systems for the environmental quality objectives and procedures like the Strategic Environmental Assessment (SEA). Nevertheless they seem to have a limited influence on the planning discourse and the outcome of the planning process.

One probable explanation for this is the lack of quantified objectives for emission reductions in the planning process. The following exchange with interviewee 22 sheds some light on how the national transport policy climate objective is adopted in the regional planning process:

“…the Road Agency expects a 20% increase in [road] traffic by 2020 while a reduction in carbon emissions from the transport sector is also expected to be achieved. It sounds tough. How does this influence the planning [process]? (Interviewer)

“We talked earlier about how we don’t have any operational or quantified objectives [for CO\textsubscript{2} reductions], so it’s not like you set goals and then see what steps are needed and then implement them. That’s not how the planning or decision-making process works. However, it’s become clear that we need to put more focus on the climate target and then it becomes more important when we discuss which infrastructure investments we must make.” (Interviewee 22)
It seems almost paradoxical that a planning objective considered to be of central importance lacks an operational definition. This is in contrast to objectives relating to regional expansion where the links are much stronger, such as through travel time reductions and local labour market area statistics.

The question of how the climate objective asserts influence on the planning process is a lot less clear:

“...it is of course important, so to speak, even if you can’t see this as clear steering towards a quantified objective. As I said before about this planning process, you realise that it doesn’t really work that way. There’s not someone sitting at a desk who can set an objective and make an analysis and then determine what measures to implement. Instead it’s like a tapestry of different objectives and there are many players... involved and therefore a broader decision process. And what the link actually looks like towards these objectives is more diffuse.” (Interviewee 22)

The response raises a number of issues highlighting the importance of the interplay between the concepts and the processes of framing in shaping the planning discourse. It is interesting to note that some policy objectives are operationalised while others remain more abstract. Expressed simply, objectives concerning increasing mobility are operationalised in a way that influences the outcome of the planning process. In contrast, the objectives concerning the reduction of emissions from transport are not.

In the environmental impact statement of the regional plan, the problem of trying to assess the impact of investments in the regional plan are stressed. It is argued that, in general, the influence of the plan is considered limited compared to the expected influence of general economic policy instruments at national level. As for the impact of the plan on specific environmental quality objectives, it is either argued that the influence is uncertain or that the plan cannot contribute to changing current trends (for example with regard to the climate objective) (ROS 2008b).
5.5 Is reframing possible? –concluding reflections
Theme II

A conclusion following from the discussion in sections 5.1 to 5.4 is that the concept of regional expansion has considerable influence on the planning discourse and that this framing prioritises increasing mobility above environmental concerns. Reframing in terms of defining objectives related to the two concepts differently, a more reflective use of information from knowledge production practices, and gathering more information on all travel patterns and habits (i.e. not only commuting), could be possible fixes to strengthen environmental consideration in the planning process.

This would be in line with authors arguing for a broader and more inclusive framing of what to consider in planning processes (e.g. Banister 2008, Schiller et al 2010). Similarly Hull (2005, 2008) and Preston (2010) argue for transport integration, i.e. greater integration of different policy areas, e.g. land use, transport planning, and environmental policy.

CBA in combination with spatial representations of commuter streams as used in the plan are central for the regional expansion concept. In contrast much less is known about spatial and temporal patterns of leisure travel. Accordingly a promising area of research is leisure travel patterns and habits since, as Tennøy (2010: 222) argues, “…reframing of the problem requires development of new knowledge”. In this case, new knowledge and a reframing to include leisure travel could potentially support the objectives of increasing public transport volumes.

How policy problems are framed, how concepts and objectives are defined and which information to consider relevant affects the planning discourse and the possibility to integrate different policy areas in the planning process. But it is also important to consider how the structure of the planning system influences the planning discourse and how this affects the possibilities to reframe.

The separation of land use and infrastructure planning characterising the Swedish planning system means that several important aspects influencing regional transport volumes are excluded. The location of housing and workplace development, as well other important destinations such as leisure, shopping and service facilities is ultimately decided at municipal level, so regional level actors such as the Region of
Skåne lack the means to perform a type of planning that restricts municipal development plans. This also offers a structural explanation as to why the concepts studied here are defined and operationalised the way they are, in the sense that the lack of legal planning tools at regional level restricts the available options.

This means that if the Region of Skåne wanted to pursue a planning agenda aiming to reduce growth in road transport as a means to reduce the environmental load of transport, the available options are restricted. However there is not a whole lot suggesting that this would be considered as desirable even if opportunities existed.

To summarise the analysis in this chapter: The concept of regional expansion has a strong influence on the planning discourse and the outcome of the planning process. An explanation for this dominance is that the concept has a solid foundation in knowledge production practices supporting the planning process. As a result the definitions and objectives of environmentally friendly transport are adapted to regional expansion objectives. This is manifested in a strong focus on capacity constraints, time savings, commuting and an emphasis on the lack of money for investments.

Alternative framings such as reducing or curbing growth in road transport volumes, or considering leisure and shopping travel, are excluded from the planning discourse. This illustrates the need for more knowledge on travel and energy consumption patterns. It also indicates a need to be aware of how techno-rational methods currently used in the planning process accentuate and legitimise one interpretation of reality dominating the planning discourse.
6. Theme III: Sustainability implications of user-fee funding models in two Swedish infrastructure projects

6.1 Funding approaches in Sweden

In this chapter, a comparative analysis is made of the funding arrangements for the Öresund Link and the Arlanda Rail Link. The aim is to explore how market solutions, in this case two different types of user-fee funding models, influence the conditions for sustainability.

In Chapter 4.5 it was briefly argued that the three mega-projects in this study functioned as testing grounds in transport policy and planning, by introducing novel solutions with varying influence on the rules of the infrastructure regime. The Southern Link was originally planned to be implemented with a funding model based on road tolls. This idea was however disbanded after political disagreements and a funding agreement was subsequently negotiated between the state, the Stockholm County Council and the City of Stockholm. Such co-funding arrangements between central, regional and local governments have since become a mainstay in Swedish infrastructure policy (c.f. Hultén 2012).

In this chapter attention is brought to how the user-fee funding models of the two other projects deviates from the typical modus operandi, and how the impacts of these funding arrangements can be understood from a sustainability perspective.

The funding arrangements illustrate how the strong emphasis on infrastructure meant that the introduction of new approaches to funding became important in the late 1980s.
The interview study showed that there were various driving forces behind the growing interest in alternative funding. The general trust in ‘infrastructure for growth’, the recession in the early 1990s, the EU accession, and opening up the infrastructure construction market for international competition were all important explanations for a strong interest in finding alternatives to the traditional tax-based funding.

The seemingly widespread enthusiasm for alternative funding approaches during the 1990s has cooled in recent years. For instance, in the policy arena, the door was shut on private funding prior to the 2008 Transport Policy Bill (Hultén 2012). The main argument against involving the private sector is that the state will always lend money at a better rate than the private sector, so it has been put forward as a primarily financial motive.

Nonetheless, user fees and infrastructure charges as financing mechanisms for transport infrastructure investments are still important; for example, revenue from congestion charges are part of funding solutions in Stockholm and Gothenburg. At the EU level, user fees and infrastructure charges have been proposed as an important strategy for sustainability (such as in the 2011 EU White Paper on Transport). It is presented as both a means of raising capital for vital investments, as well as an instrument for influencing travel behaviour.

However, this potential to kill two birds with one stone requires a careful balance between different interrelated issues such as project economy, influence on modal choice, and transport patterns and affordability. How this balancing takes place in practice raises questions about control of the pricing mechanisms, and how institutional arrangements influence the possibilities, incentives and willingness to balance different objectives.
6.2 Funding models as governance innovations

The funding models are treated as governance innovations in that they exemplify the way governments try to find new solutions to public production systems (Moore & Hartley 2008). The innovation involves changes at organisational level as well as the configuration of actors at system level. The institutional arrangements of the funding models illustrate both these aspects. The creation of ring-fenced public enterprises and the involvement of private actors in infrastructure provision illustrate a “…commercialisation of transport infrastructure” at organisational level (Farell 1999, p. 39).

While the projects differ in terms of institutional arrangements (one public-private partnership and one public project), they are both novel solutions compared to traditional tax base-funded projects. This is captured by making a distinction between funding model and financing mechanisms. In the thesis the following use of the concepts is employed: funding model refers to the institutional arrangement of the project (e.g. ownership structure and project finance arrangement); and financing mechanisms refer to revenue streams administered through the funding model.

At system level the introduction of (semi-) independent public enterprises and private actors involved in infrastructure provision and operation has resulted in a shift in the governance context (Graham 2000). Transport infrastructure projects have traditionally been an exclusive state responsibility, delivered and administered through executive agencies such as national road and rail agencies. The funding models studied here imply a shift, with increasing involvement of new actors such as ring-fenced public enterprises and private enterprises. This does not necessarily mean that the influence of the state is diminishing, but rather that administrative practices and means of influence are changing (Moore & Hartley 2008).

The funding models can be viewed as empirical manifestations of how society is moving from hierarchical governance to networked and market-based modes of

27 The main principle for ring-fencing in infrastructure projects is that costs and revenues are kept off the state budget and handled by public enterprises. (Farell 1999)
governance (Bäckstrand et al. 2010). Hierarchical governance is characterised by top-down power dynamics and relies heavily on regulations as a means of influence. Instead, networked governance is characterised by a dynamic of interdependence. When no single actor controls the necessary resources, cooperation and dependencies become important means of influence. Market governance relies on self-organisation through the market as the main principle (Bäckstrand et al. 2010).

The main characteristics of the projects and further details of these arrangements are provided in section 6.4.

6.2.1 Analytical approach

Theoretically the analysis departs from this understanding of the grand trends in public governance. Section 6.3 explains how two concepts drawn from transport planning literature, pricing signal and functional integration, are used to analyse important aspects in the nexus between the funding models as governance innovations and sustainability.

The exploration of the sustainability impacts of the funding models begins with a description of the institutional arrangements of the two funding models in section 6.4. This is followed by an analysis in section 6.5 based on the two concepts (pricing signal and functional integration), which are used to provide different perspectives on how the funding models link to sustainability.

The empirical material is based on interviews with actors involved in the decision-making processes of the cases, and secondary sources including official documents, e.g. government agreements and other official reports, as well previous research on the cases.
6.3 Funding models, user fees and sustainability

A key assumption in the analysis is that the establishment of new organisations administering project finance, design and operations while relying on market-based financing mechanisms has consequences from a sustainability perspective. This argument is based on two premises.

Firstly, the approaches to pricing for using the infrastructure has consequences for a number of critical sustainability issues, such as modal choice, access to and affordability of transport (Hull 2005). Who controls the pricing mechanism and the rationality of pricing strategies are important questions.

Secondly, the actors controlling the funding model operate in a market-based mode that affects the possibility, incentive and willingness to coordinate and cooperate with other actors. This in turn influences how well the infrastructure is integrated with the existing transport system, which is also a critical factor for sustainability.

These questions are linked to decisions made in the planning and implementation stages of the projects, as well as continuously during the operations phase.

The overarching theoretical framework described in Chapter 2.1 is used as a point of departure. The concepts of pricing signal and functional integration, are used as proxies for analysing the links between the funding models and sustainability. Figure 14 Functional integration and pricing signal
14 illustrates how these concepts are used to analyse different (partly overlapping) aspects of the links between the funding models and important sustainability issues linked to transport system investments, such as affordability, impact on modal choice and emissions.

### 6.3.1 Pricing signal

The cost (in monetary terms) of using transport services is one key challenge to sustainable mobility. A general argument is that pricing structures in the transport sector are a major contributor to the development of unsustainable patterns and volumes of mobility. Social marginal cost pricing and the quest to internalise costs for externalities, such as negative environmental and health effects, congestion and accidents, through deliberate use of the pricing mechanism to stimulate sustainable travel behaviour is a policy response enjoying strong support (Ubbels et al. 2001; Crozet 2007; Banister 2008; EC 2011; Hudson 2012).

This is for instance at the core of transport policy at EU level. In the EU White Paper on Transport it is stated that in the long run the principles of ‘users pay’ and ‘polluters pay’ should be fully implemented. Using marginal cost pricing to “…align market choices with sustainability needs (and to reflect the costs of ‘non-sustainability’)” is a key strategy (EC 2011: 15). It is also argued that increasing use of infrastructure charges and user fees are important elements of this strategy (EC 2011: 15).

Similarly, Ubbels et al. (2001: 73) argue that unconventional funding should be viewed as “…not only a means of raising financial support… but also … a method of sending appropriate (from a sustainable point of view) pricing signals to transport use”.

But realising this potential synergy raises several issues, neatly expressed by Hudson (2012: 610): “…the pricing mechanism can … be enormously powerful as a force of change, just as long as someone has a firm grip of the sustainable steering wheel and puts the pricing engine in gear. The question of who this might be is a rather more vexed question.”

The issues raised by Hudson are at the core of this chapter. Firstly, obviously there is no guarantee that the pricing mechanism supports sustainability. Pricing as an
instrument for sustainability is complex, given the need to consider the balance between different aspects outlined in Chapter 2.1, such as affordability, access to transport and impact on the environment. In funding models relying on user fees as financing mechanisms, this complexity is even more emphasised since objectives concerning project economy also enter the picture.

The purpose here is not to determine an optimal pricing signal from a sustainability perspective. Instead the aim is to explain how the institutional arrangements of the funding models differ in terms of control over pricing, and shed light on some of the complexities involved in balancing different objectives in the design of financing mechanisms. Some consequences of employed pricing strategies on transport patterns, and how this can be interpreted in terms of sustainability impacts, will also be highlighted.

### 6.3.2 Functional integration

The second concept introduced to study the link between the funding models and sustainability is functional integration. This concept draws on the work of Hull (2005) and Preston (2010), who highlighted the importance played by governance arrangements for the planning and delivery of transport systems “…across modes, sectors, operators and institutions…” (Preston 2010: 38). Hull (2005) and Preston (2010) both conceptualise different stages of integration that play an important part for sustainable transport. At the highest level, integration is about the integration of policy measures and sectors.

The concept of functional integration as used here refers to the most basic stages, and relates to the integration of fares, timetables, ticketing, information, service patterns and interchanges between operators and transport modes on a metropolitan or regional scale (Hull 2005; Preston 2010).

In combination, pricing signal and functional integration influence the ease of use of the transport system through linkages such as affordability, and inter- and intra-modal integration.
6.4 Institutional arrangements

This section provides brief accounts of the background of the projects with emphasis on the main explanations for implementing the projects through innovative governance solutions. This is followed by some preliminary reflections on the sustainability impacts of the decisions to implement the user-fee funding models in the projects.

6.4.1 The Öresund Link

The Öresund Link was a highly controversial project. The decision-making process had symbolic dimensions concerning the future destiny of the environment, going beyond issues normally associated with transport infrastructure (Blomquist & Jacobsson 2002).

Over the years, many suggestions had been put forward for how a fixed link across Öresund could be built and financed. In the mid-1980s, when the idea came to the fore again, an investigation directive establishing that the connection should be fully financed through user fees and assessed on grounds of commercial viability came to play a crucial role in the solution that was selected (Falkemark 1999: 77).

The great cost of the project (roughly SEK 30 billion including connecting land infrastructure)28, and the involvement of two nations, has been forwarded as key explanations as to why user-fee funding was preferred (Blomquist & Jacobsson 2002).

In the investigations phase there were several competing proposals for a fixed link between Sweden and Denmark. Ultimately, the decision came down to whether to build a combined road and railway bridge, or a rail tunnel. According to Falkemark (1999), the appraisal perspective of commercial viability favoured the alternative that included road traffic rather than the railway-only option.

**Funding model**

The Öresund Link is owned by the Swedish and Danish states through a public enterprise, the Öresundsbro Konsortiet. Construction capital was raised by the Öresundsbro Konsortiet, which borrowed money on the national and international credit markets. Loans for the coast-to-coast section of the link are the responsibility of the Öresundsbro Konsortiet and the two states act as guarantors through two subsidiary companies, Svedab, and A/S Øresundsförbindelsen (see Figure 15). The subsidiaries also financed connecting infrastructure in Sweden and Denmark (Öresundsbro Konsortiet 2008b).

**Financing mechanisms**

Revenue from user fees on the coast-to-coast section is the main financing mechanism. Roughly two-thirds of the revenue is generated from road traffic user fees, while the remaining third is a flat fee paid by the national railway agencies of each country (Öresundsbro Konsortiet 2008a).

Once the loan for the coast-to-coast section has been repaid (roughly SEK 20 billion), the revenue will be used to repay the debt for the connecting infrastructure. Currently the first payments to the owner companies are expected to be made in 2020 (Öresundsbro Konsortiet 2012a: 5). Meanwhile, operating costs for SVEDAB and A/S Øresundsförbindelsen are financed through loans and capital infusion from the owner companies (RR 2000). The loans for the entire project are expected to be fully repaid by 2035.
6.4.2 The Arlanda Rail Link

The Arlanda railway was a condition of the permit to build the third runway at the airport. A condition imposed by the Ministry of Environment was that the total emissions in the region would not be affected (Interviewee 12). To compensate for the projected increase in air traffic, a cap on CO$_2$ and NO$_x$ emissions was imposed on the airport, including car traffic to and from the airport. The emission cap was that the levels of CO$_2$ and NO$_x$ emissions ten years after opening the third runway were not allowed to exceed the levels in 1990 (ARN 2008b). The railway to the airport was expected to improve accessibility by public transport and contribute to reducing road transport emissions (Interviewee 12). After an environmental court ruling, the emission cap was abolished in 2013, but the preceding controversies regarding the role of the railway remained a point of contention.

Figure 15 Funding model of the Øresund Link
of the railway in aiming to reducing road transport emissions will be returned to in the analysis in section 6.5.

In the case of the Arlanda Rail Link, a second point is that the project took on a strong political and ideological dimension, and embodied an enthusiasm for private involvement in funding that subsequently did not take off – so far it is the only example of this type of funding model for a railway project in Sweden. The shift in power in the 1991 elections was a turning point and the Arlanda Rail Link became “…a symbolic project… for the government in 1991-94 to show that it could involve private stakeholders.” (Interviewee 40). In section 6.5.4 it will be explained how the funding model influenced the design of the project.

**Funding model**

![Figure 16 Funding model of the Arlanda Link, construction phase](image)

The Arlanda Link is a Public-Private Partnership (PPP). Some sections of the project are financed by a private consortium and some by public capital. The publicly-financed sections of the project include the upgrading to four tracks on the trunk line between Stockholm Central Station and the airport (estimated cost SEK 2,4 billion), the connection back to the trunk line north of the airport (SEK 850 million), one new underground station at the airport, and improved tracks and platforms at Stockholm
Central Station. Additionally the state provided a loan of SEK 1 billion to the private consortium (VTI 2004).

Repayment of the loan commences when the yield of A-Train amounts to a certain level.

The sections financed by private capital (amounting roughly to SEK 3.5 billion) include new railway tracks connecting to the trunk line south of the airport, two new underground stations at the airport, and rolling stock for operating the Arlanda Express shuttle service (Nilsson et al. 2008). When the project was completed, ownership of the infrastructure was handed over to the state (see Figures 16 & 17).

![Diagram of the funding model of the Arlanda Link, operations phase]

**Figure 17** Funding model of the Arlanda Link, operations phase
**Financing mechanisms**

A-Train AB was given a 40-year concession in exchange for transferring ownership to the state. This guarantees A-Train the revenue from the shuttle service between the airport and Stockholm Central Station, and the right to charge other train operators for using sections of the Arlanda Link constructed with private capital. Consequently, the Arlanda Link is owned by the Swedish state but the private actor controls the revenue streams (Wiven-Nilsson 1995; RR 2004). The proportions of revenue gained from tickets on the shuttle service in relation to track charges and station access fees are not official.

Some preliminary reflections on sustainability impacts of the two funding models can be made here. Both funding models were put forward as solutions to keep project costs out of the state budget. In both cases it has been shown that this intention was not fully attained. In the case of the Öresund Link, the costs of connection infrastructure are borne by the state budget through capital infusions to Svedab in anticipation of the Øresundbro Konsortiet starting to pay dividends to its shareholders. In the case of the Arlanda Rail Link, the interest payments on the conditioned loan to the private concessionaire are paid though the annual appropriations to the Transport Agency (Swedish Government 2011). Consequently, the lending of money for these projects will, to some extent, restrict the freedom of action in coming decades by tying up public capital in loan repayments and interest rates.

On the other hand, in economic terms the arrangements may turn out to be a good deal for the state in the long run, but this is no certain outcome and it also depends on how a good deal is defined.

In the next section, the cases are compared. The two proxy concepts, pricing signal and functional integration, are used to explore the nexus between the funding models and sustainability.
6.5 Comparative analysis

The cases provide examples of how the institutional arrangements of different funding models result in different approaches and rationalities concerning pricing. There are differences in control over the pricing signal and the consequences of pricing strategies on transport patterns.

6.5.1 Who controls the pricing signal?

A central difference between the funding models is the extent of control over pricing of user fees. The Arlanda Link exemplifies a funding model where one actor has considerable influence over user fees. A-Train, the private concessionaire, has full control over ticket prices on the shuttle service. The station access fees and track charges for other train operators are determined in the concession agreement between the Swedish state and A-Train (RR 2004).

The Öresund Link illustrates another approach; the user fees for road traffic are largely controlled by the Øresundsbro Konsortiet, albeit with some limits set by an agreement between the Swedish and Danish states. The Øresundsbro Konsortiet has no control over ticket prices on the train for journeys across the link; this is determined by the regional public transport authorities in Sweden and Denmark (Lyck 2002).

These institutional characteristics of the funding models are important, since varying degrees of control over financing mechanisms have resulted in different approaches to pricing that are described in the next section. This in turn has consequences for sustainability, by influencing mobility patterns.
6.5.2 Different approaches to pricing

The Öresund Link

In the decision-making process, the design of user fees became a controversial issue. The pricing strategy of the Öresundsbro Konsortiet regarding road traffic user fees continues to be a sensitive topic, highlighting tensions between project economy, regional integration and economic development, and environmental impacts of increasing transport volumes (cf. Améen 1992; Falkemark 1999; Söderström et al. 2002).

The controversies included concerns that if user fees were too low, this would result in increased transport emissions and unfair competition for ferry operators. On the other hand, there were also concerns that if user fees were too high, this would hamper regional economic integration, stifle traffic, and jeopardise the economy of the Öresundsbro Konsortiet. Consequently, the price for using the road and railway became a key issue in balancing these conflicting interests.

Deciding on how to approach user fee levels was no easy task given the complexity of balancing these different objectives. In the agreement between the Swedish and Danish governments (Swedish Government 1991b), several important limits for pricing strategies were established that illustrate concrete examples of how tensions between different objectives were managed. Factors involved were the directives of commercial viability, the assumption of a 30-year repayment period, and that the user fees on the coast-to-coast section would generate enough revenue to cover the expenses of the connecting land infrastructure (Falkemark 1999). The pricing strategy can be viewed as a compromise that balances project economy against other considerations within this time frame.

Another clause in the agreement stipulated that the price level of road user fees should be comparable to the cost of taking the car on the ferry (at the time of the agreement). A former Swedish minister of communications explained one motivation behind this:

“We wrote a clause [in the agreement] that the road traffic user fees should be kept at a level comparable with ferry traffic….this came about to calm the environmental opinion one might say. They feared that the bridge would lead to mass motoring…” (Interviewee 8)
Additionally, the Danish state had substantial stakes in ScandLines, a major ferry operator servicing several routes threatened by competition from the Öresund Link (Lyck 2002).

In combination, this decision process context imposed limits on the pricing approaches and toned down the commercial viability aspect.

The basic rationale is that road traffic generates the variable part, and railway traffic the fixed part of total revenue. This key principle underpinning the financing mechanism was established in the government agreement and sends an important signal to encourage maximum usage of the railway. This was part of a deliberate strategy “…to combine the environmental advantages of the railway with the economic advantages of road traffic.” (Interviewee 1)

It also represents an important departure from the transport policy guidelines prevailing at the time, which emphasised social marginal cost pricing as norm. A political advisor involved in the intergovernmental negotiations explained that a central idea in designing the details of the financing mechanisms was that “[while] it is not [in principle] allowed to subsidise one [mode of transport] with another…we assumed that would happen anyway…” (Interviewee 1)

Another political advisor also stressed the importance of the idea to subsidise the railway with income from road transport:

“We arrived at a, from an economic perspective, quite peculiar pricing model, namely that the railway companies would pay a fixed amount … and [then they] would be able to run as many trains as they wanted. The principle was that the more trains that were run, the cheaper it got.” (Interviewee 3)

Later some adjustments were made to this arrangement meaning that the regional public transport authority pays the same distance based track access charges as in the
rest of the Swedish railway network.\textsuperscript{29} The track access charges are paid to the Transport Agency, who in turn pays the flat fee to the Øresundsbro Konsortiet.\textsuperscript{30} (Interviewee 21)

In retrospect it can be argued that this approach to pricing is one important factor for the successful development of train traffic across the Öresund Link. On the other hand it could probably be argued that from a project economy perspective it would have been more beneficial if the Øresundsbro Konsortiet had direct control of track access charges.

The consequence was neither a marginal cost approach, nor a pricing approach emphasising maximum revenue – instead it was a compromise between project economic viability and political manoeuvring in response to vested interests and environmental protests.

\textit{The Arlanda Rail Link}

In contrast to the Öresund Link where user fee levels are decided by several actors, and to some extent are regulated by the government agreement, the funding model of the Arlanda Link awarded extensive power over pricing to one actor. This can essentially be described as a “pricing monopoly” as interviewee 12 expressed it. A-Train, the private concessionaire, has the right to employ any pricing strategy it sees fit for the shuttle service.

A-Train also has extensive rights regarding access to the tracks and facilities funded by private capital for the duration of the concession. The fees for other operators are settled in direct negotiations between A-Train and its counterparts (RR 2004).

\textsuperscript{29} Freight trains (accounting for less than 15 \% of trains) pay a special fee for crossing the link. The arrangement looks different on the Danish side (Interviewee 21).

\textsuperscript{30} Recently a revision has been made raising general track access charges substantially. A government proposal to drastically increase the access charges on the Öresund Link was however turned down by the Swedish Parliament in December 2010.
6.5.3 Consequences of pricing strategies on mobility patterns

*The Öresund Link*

While the environmental effects of ‘mass motoring’ across the bridge were important in the appraisal stage of the Öresund Link, the development after completion has shifted the focus of pricing strategies towards project economy and cross-border economic integration.

During the first years of operation, road traffic volumes were below the appraisal projections and jeopardised the economy of the project (see for instance Lyck 2002). The combination of substantial cost overruns (Flyvbjerg 2003) and the 30-year loan repayment time frame led to concerns that it could become necessary for the states to fulfil their obligations as guarantors to the debtors unless revenue picked up. To increase revenue, a differentiated pricing scheme aimed at attracting car commuters was introduced. This pricing scheme entails high fees for infrequent users while commuters and other frequent users pay a lot less. The strategy has been successful. In 2001, commuting trips accounted for 5% of the annual average daily traffic compared to 42% in 2010. During the same period traffic rose from some 8 000 to 19 000 vehicles per day (Öresundsbro Konsortiet 2011).

While this development is beneficial for the economy of Öresundsbro Konsortiet, it can also be viewed as problematic from an environmental perspective. The appraisal in the Environmental Impact Assessment statement is based on traffic volumes of some 6 500 vehicles per day (Améen 1992: 66). This can be compared to recent economic projections where the loans are expected to be repaid by 2035, which in turn is based on assumptions of traffic volume increases to 25 000-40 000 vehicles per day by 2025 (Öresundsbro Konsortiet 2012b). This illustrates a shift in the approach to pricing. In the project appraisal stage, the management aspect of the user fees were more emphasised, while the financing function became more important after the project opened.

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31 A one-way ticket without any discount costs SEK 390. In contrast a commuter discount lowers the price to less than 100 SEK per crossing (assuming that 20 journeys are made per month).
On the other hand the modal split for journeys across the Link of roughly 50% car, 50% train, compared with the average modal split in Skåne of (roughly) 75% car and 25% train, illustrates how the pricing signal encourages the use of public transport (Öresundsbro Konsortiet 2008). The development of train traffic across the Link has been highly successful. In 2012 some 11.4 million passengers and 5.8 million tonnes of freight were carried by trains across the link (Öresundsbro Konsortiet 2012b).

While not being directly causally linked to the design of user fees, it can be argued that it has played some part in this development. Had more emphasis been put on gaining revenue from higher variable fees for the use of the railway, the interest in providing a high-frequency (and, from the perspective of regional public transport authorities, lucrative) service across the link might have been lower (Lyck 2002).

The Arlanda Link

Compared to available alternatives, ticket prices on the airport shuttle are quite high. A return ticket (from Stockholm Central Station) costs more than twice as much as catching the bus, or driving to and from the airport. For two persons a taxi is cheaper, and the price of the train ticket is also comparable to the cost of parking a car at the airport for one week (ARN 2008 and Arlanda Express 2014).

In terms of influence on the modal split there has been a slight reduction in the proportion of taxis and private cars, while the major impact is a transfer of trips previously made by bus to train. Train travel accounts for around 25%, buses for around 20% and taxis and private cars for almost 55% of the modal share. These figures have been quite stable since the opening of the Arlanda Link and illustrate that, while the project in theory implied a big improvement for airport accessibility by public transport, the approach to pricing has limited the effects by transferring users from one public transport mode to another (RR 2004 & ARN 2008).

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32 A one-way ticket without any discount is currently (January 2014) SEK.260 There are however several different discounts available.
This became an important issue due to the emission cap at Arlanda International Airport. The emission cap, instituted in the environmental permit to prevent the new runway at the airport leading to regional increases in emissions, included road transport to and from the airport. Road transport emissions accounted for more than half of the total CO₂ emissions included under the cap, while the remaining emissions were generated by aircraft landing and taking off.³³ Despite an increase of three million passengers between 1990 and 2007, aircraft emissions were reduced by 15% while ground transport emissions increased by 30%. (ARN 2008a)

The emission cap was exceeded for the first time in 2007, and the airport was threatened with legal action for breaching the environmental permit. This also threatened the plans for further expansions at the airport (ARN 2011; DN 2008). According to the action plan established for reducing ground transport emissions, the modal share of public transport needed to increase from 45% to somewhere between 60-90% (depending on trends for passengers using the airport) to stay below the cap levels (ARN 2008b).

The institutional arrangement with the private concessionaire controlling the pricing signal for the railway clearly made this a complex objective to achieve. Since A-Train relies on various user fees as the main financing mechanisms, the possibilities for using the pricing signal to influence travel behaviour is limited and only an option if it supports their business strategy. For other operators, such as the regional public transport authority, the system with station access fees limits the attractiveness of serving the airport (Interviewee 39).

As events played out, the issue with decreasing road transport emissions to the airport became obsolete when the emission cap was abolished in 2013. The environmental court agreed to the complaint of Swedavia (the state-owned corporation operating Arlanda airport) that they could not be held accountable for the road transport to and from the airport. (Dagens Nyheter 2013) The case is however illustrative for the consequences of leaving the pricing mechanisms in the hands of an actor operating solely according to a commercial logic.

³³ Emissions from planes are modelled during the landing and take-off cycle, which includes all aircraft movement below 3000 feet.
Another aspect concerning pricing is the track access charges A-Train extracts from other operators. The idea was to incorporate some kind of mechanism in the agreement that would encourage A-Train to allow other operators to use the tracks. A political advisor involved in the negotiations with the private concessionaires explains how they reasoned.

“…it must be in A-Train's interest that someone uses their tracks when they themselves are not using them…. - and pay for it… So they [A-Train] would have an incentive to grant traffic to other [operators] provided they were paid on a non-discriminatory basis, it was built into the economic system” (Interviewee 12).

There is however an inherent conflict in trying to encourage other operators to serve the airport while charging them for track and station access. Initially this led to other operators showing limited interest in serving the airport. This situation was also aggravated by the regional transport authority having a vested interest in the airport bus service (Nilsson et al 2008).

34 As of January 2014 other operators charge a station access fee of SEK 75 for airport tickets, which they in turn pay to A-Train.
6.5.4 Impact on functional integration

Functional integration refers to the integration of fares, timetables, ticketing, information, service patterns and interchanges between operators and transport modes on a metropolitan or regional scale. The two cases illustrate different characteristics in terms of functional integration, and the characteristics of the funding models are one important factor in explaining the differences.

Passenger trains using the Öresund Link are part of a seamlessly integrated regional public transport system with shared ticketing and information systems\(^{35}\) and several transfer points between modes and operators.

In contrast, the Arlanda Link constitutes what one interviewee described as a “…stand-alone solution in an otherwise quite well integrated regional and national network” (Interviewee 40). This includes separate ticket systems for the airport shuttle as well as the physical design characteristics of the stations at the airport.

A main difference is the reliance on track and station access charges as financing mechanisms, which has acted as a barrier to functional integration. While integration was an objective pursued by the state negotiators, some interviewees expressed doubt about whether they had succeeded in achieving this. A former undersecretary at the Ministry of Communications stated:

”…we wanted to have an incentive to bring in other operators, an incentive for those who own and operate the track to open it up. It may not have occurred to the extent that we had hoped, but it is possible that the incentives that we built into the contract were not sufficient.” (Interviewee 5).

The concession with A-Train allowed the state a chance to opt out of the agreement if certain conditions regarding integration were not met. In 2011 a report was published where it was concluded that the level of integration was adequate and that the state

\(^{35}\) The Swedish interregional ‘fast train’ service operated by the state railway (SJ) is however an exception; the tickets and fares on the SJ X2000 trains are not integrated.
should not make use of the option to terminate the contract\(^{36}\) (Swedish Government 2011). The incentives for other operators to serve the airport seem to be working, although at a slower pace than expected.

None the less, several interviewees considered aspects of integration as being fundamentally problematic due to the station design at the airport. The stations serviced by the shuttle service are sack stations and the station served by regional trains is viewed as a compromise, limiting the possibilities to integrate regional and national train services.

A project manager at the Rail Agency explained the limitation of the airport station design in the following way:

“…to be able to run more trains via the airport in a more integrated way…the stations at the airport would have to be different… There is an… interurban railway station at the airport…but it has only two tracks, and…for through traffic the dimensions of the station determines the capacity. If you had several [tracks] and it was integrated, then there would be multiple platforms and multiple tracks in a through tunnel, a through-station.” (Interviewee 36).

The delivery of the project in a PPP model rather than as a conventional public project also changed the design of the project. Originally, the design of the Arlanda Link and the stations at the airport were quite different. According to a former regional manager at the Rail Agency, “… there is a big difference between the original intentions of [designing] the Arlanda Link as part of the nationwide rail network and the [business] concept that became realised” (Interviewee 33).

Another interviewee further echoed this point and explained that “[the project was] transformed over time. There was more and more emphasis on implementing it as a PPP with as little government intervention as possible. What was sketched as a large airy station under the airport eventually turned into this rat hole.” (Interviewee 35).

\(^{36}\) In turn this was based on the conclusion that the cost of terminating the contract would be considerably higher than the value of the right of use controlled by A-Train. The orders of magnitude of these values are kept secret so this conclusion cannot be examined in any detail.
The concept that was realised, providing a shuttle service between the airport and the city centre without any intermediate stops, is also something several interviewees consider as problematic from an integration perspective. Nilsson et al (2008) argue that the core market of the shuttle service is limited to a 3-km radius around Stockholm Central Station. While providing a fast and efficient airport shuttle service to the airport for people living and working within this area may be a viable business concept, the benefits are less obvious from a wider societal perspective. The airport is a major regional workplace and transport node and it can be argued that one consequence of the funding model is a project that only performs a shuttle service to Stockholm Central Station; the possibilities to improve conditions for commuting and the integration of freight handling were overlooked.37

Additionally, the northern fringes and suburbs of Stockholm have experienced a strong increase in workplaces. In this respect the funding model and the long-term concession with the private actor limits the possibilities to adapt to development in society. One state representative involved in the procurement process stated that:

“If this was in public hands, I am absolutely convinced that there would be a station in Kista today and perhaps another somewhere in Solna” (Interviewee 6).

37 The airport handles almost 10% of national air freight tonnage and has more than 16 000 employees. (TFK 2007)
6.6 What can we learn from the cases?

“… everybody discusses it [the funding model of the Arlanda Rail Link] in financial terms, how this has been successful ... or not.”
(Interviewee 35)

“… it would not have been this cheap if the state had funded everything with regular contracts… the State spent 800 million I think. And the facility cost nearly 2 billion…So society has gained a facility worth 2 billion by paying 800 million.” (Interviewee 6)

The purpose of this part of the study has been to explore the impacts of ‘market solutions’ in infrastructure funding from a sustainability perspective. The interview study disclosed conflicting views on the merits of alternative approaches to funding. This was especially pronounced when discussing the arrangements of the Arlanda Rail Link, where the point of contention boils down to what ‘society’ really gained from paying 800 million for a facility worth 2 billion as illustrated by the quotations above. This is an argument that can be made in both cases concerning the relative merits between short-term savings for the state versus the long-term transport system effects.

In both cases it was shown that commercial viability influenced the technical design of the projects in the planning phase. For the Öresund Link, the assumption of commercial viability played a part in ruling out a project alternative consisting of a railway tunnel (Falkemark 1999). In the case of the Arlanda Rail Link, the PPP model resulted in changes to the station design at the airport and a train service concept that emphasised performing a shuttle service to the airport.

The two cases also illustrate how the funding models as governance innovations by default contribute to a more fragmented governance context through the introduction of new organisations with substantial influence over strategic sections of the transport system. Graham (2000: 187) has argued that this illustrates how the introduction of “…quasi-competitive regimes…” in infrastructure provision may contribute to “… the splintering of integrated and ‘bundled’ networks into a range of individually financed and managed infrastructure projects.”

The cases provide examples of this fragmentation process, but also illustrate important differences. In the case of the Arlanda Rail Link, the decision to implement the project
as a PPP illustrates that the original intention of building the railway, to facilitate a modal shift from car to rail for ground transport, and thereby to reduce emissions, was thwarted. The Arlanda Rail Link and the emission cap at the airport exemplify a clash between a traditional, hierarchical approach to environmental policy making and the commercial logic of the PPP project.

Another point concerns how the regional public transport authorities have been affected through the funding models. In the case of the Öresund Link the design of the financing mechanisms and the approach to pricing has several interesting characteristics from a sustainability perspective. Subsidising the railway with user fees on road traffic has contributed an indirect boost to the economies of regional public transport authorities (Lyck 2002). In contrast to the Arlanda Rail Link, this has allowed regional public transport authorities to strengthen public transport services in other parts of the network by tapping into the revenue streams created by the new rail link.

On the other hand the reliance on road traffic user fees in the case of the Öresund Link does lead to a conflict between project economy and environmental sustainability, since increasing flows of traffic will lead to emission increases (at least in the medium term). The conflict is visible in that the road user fees are designed to subdue road transport volumes, but the reliance on income from road transport makes increasing volumes desirable from a project economy perspective.

The analysis has shown that maintaining a firm grip of “the sustainable steering wheel” (as Hudson, 2012, expressed it) in a context of market-based funding models is not easy. It requires the willingness to consider, and balance, the various impacts of pricing, as well as the power to use the pricing mechanism. In the case of the Öresund Link, commercial viability has been constricted and harnessed in a way that can be viewed as constructive from a sustainability perspective in that it supports the development of regional public transport.

A key point is that when considering new approaches to funding it is important not only consider project economy but to aim for a wider understanding of the effects on the governance context and the broader transport system effects.
7. Conclusions: conditions for sustainability in Swedish infrastructure policy and planning

In this chapter, the three empirical themes are summarised in section 7.1. Section 7.2 outlines some conditions for sustainability based on the findings presented in the empirical themes (Chapters 4-6) and the overarching theoretical framework (outlined in section 2.1). In section 7.3, a discussion is held on the outlook for sustainability in the Swedish context.

7.1 Summary of the three themes

The aim of this thesis has been to increase understanding of conditions for sustainability in Swedish transport infrastructure policy and planning. The point of departure was an understanding of the adoption of sustainable development in infrastructure policy and planning as an ongoing and unfinished process. The concepts policy and planning have been used as analytical lenses to distinguish between processes of intervention, with different purposes, at different levels of the political and administrative system.

In section 2.1 the reviewed literature suggested that infrastructure policy and planning ideally could contribute to sustainability by aiming to reduce transport demand, shifting to less energy-intensive modes of transport, and using the existing transport system more efficiently. The concepts avoid, shift and improve were introduced as categories describing different types of approaches and measures in infrastructure policy and planning.
Three empirical themes were explored to study different aspects of the conditions for sustainability. Theme I outlined broad trends in changes in the socio-technical systems of roads and railways through a transition theory perspective. The transition to auto-society and the parallel process of closing down railways was shown to be driven by the strong economic development, the rationality of traffic engineering and full-cost recovery as the main principle for developing transport system infrastructure. The change to the marginal cost perspective, increasing protests of the discontinuation of railway services, and the development of a counter discourse to auto-society during the 1970s laid the foundation for the resurrection of the railway in the past twenty years.

Increasing political interest in infrastructure as a means of promoting growth, parallel with growing environmental awareness and a legal/normative commitment to sustainable development, has played some part in changing the pattern and levels of investments in the infrastructure systems. This was described as a change in the direction of the technological pathway of the infrastructure system; a change which to some extent has been synergetic with the emerging sustainability agenda through the focus on rail investments. However, this expansive and expensive approach is also problematic from a sustainability perspective, since it naturalises the view of increasing motorised mobility levels and the necessity to increase spending on infrastructure.

Theme I showed that there is a normative commitment to sustainability in policy objectives, and that tools such as the four-step principle and Strategic Environmental Assessment have been introduced to support sustainability objectives in planning. Yet there is little evidence that avoid approaches (as suggested by the four-step principle) have had any influence. The commitment to increased spending is not showing any sign of waning and the development is one towards increasing sunk costs in infrastructure.

Theme II was based on a discourse theoretical perspective, and explored in more detail how conflicts between different objectives were managed in a regional planning process. The analysis highlighted that the concept of environmentally friendly transport is adapted to fit the logic of regional expansion. The framings of problems and solutions accentuated capacity constraints, bottlenecks, commuting, time-based accessibility, and a strong emphasis on increasing spending on rail to facilitate more
It was concluded that the consequences of this was an emphasis on lack of money for rail investments and inattention to leisure and shopping travel.

Themes I and II illustrate (with varying degrees of detail) how the world views of decision-makers strongly support the traditional mobility/welfare logic and that avoid approaches, i.e. aiming to reduce the levels of mobility, stand in stark contrast to prevailing views. Themes I and II also showed that, while there is a strong support for shifting road transport to rail and public transport, there is also a continued commitment to expanding and upgrading the capacity of roads.

Theme III, based on the question of sustainability implications of ‘market solutions’, provided another perspective. The analysis in this chapter illustrated the importance of considering the wider system impacts of market-oriented solutions. A main point is that new funding models change the governance context and make it more complex by introducing management organisations supervising strategically important sections of the transport system. Theme III highlighted both positive and negative impacts of new approaches to funding from a sustainability perspective. The Öresund Link showed that, in this case, the funding model functioned as a booster for the regional public transport by keeping the fees low for trains and high for road transport using the bridge. On the other hand, since the economy of the project relies on road transport revenue, there is a desire to increase road transport volumes. In the case of the Arlanda Link, the choice of funding model resulted in an expensive shuttle service and the reliance on charging other operators for track and station access also imposes limits on integrating with the existing public transport network. The result has been a limited shift from car to rail.
7.2 The conditions for sustainability today

So what can we learn from the study about conditions for sustainability in Swedish infrastructure policy and planning?

Sustainability has developed as one of many aims of transport infrastructure policy planning, and in parallel with other trends such as cost efficiency, infrastructure for growth, deregulation and regional devolution of decision-making. This is important to recognise since it influences the feasibility for avoid, shift, and improve approaches.

All three approaches are endorsed in policy and planning documents. Reducing the need for transport is even established as the main priority through the four-step principle. The urge to ‘think differently’ could not be much clearer.

In practice, however, shift and improve are the main strategies, and the shift approach is mainly focused on transferring road transport to rail. The importance of supporting walking and cycling is acknowledged but, in terms of spending, only a fraction of national level investment funds are allocated to walking and cycling infrastructure.

Connecting the findings of the study back to some of the core challenges of sustainable mobility outlined in section 2.1, the following conclusions about conditions for sustainability are drawn.

*There is a strong normative commitment to sustainability but it has a limited impact on practice*

Sustainability is embedded in an impressive arsenal of policy objectives, monitoring frameworks, legislation, and planning practices. Despite this, it is evident that development of the transport system infrastructure has not been significantly affected. The long-term environmental quality objective to reduce climate impact has become the focus, but so far infrastructure planning has not contributed to a development leading towards the objective.

In section 2.1 it was argued that considering the principle of safeguarding natural resources meant that infrastructure policy and planning should help to reduce environmental pressure locally and globally, now and in the future. Judging by the outcomes of the most recent planning processes, there is not much to indicate that
infrastructure planning contributes to the global and forward-looking dimension being fulfilled. Transport sector CO\textsubscript{2} emissions have stabilised but will, according to the assessment of the current policy and planning pathway, increase in the future. This leads to a paradoxical situation where reducing CO\textsubscript{2} emissions is a key area of the transport policy sustainability agenda but the vast amounts of money invested in transport infrastructure are perceived as making little or no difference at all in achieving this policy objective.

This indicates a problem with measuring the effects of new infrastructure. The indirect environmental effect of new infrastructure is genuinely hard to measure, and alterations in an already advanced transport system will simply not make much difference. Incremental changes, whether improvements or impairments, will always look minor compared to the effects of the totality. So far expected increases in emissions from new infrastructure have been justified by being insignificant in comparison with total transport sector emissions. It seems clear that increasing man-made capital overrides the preservation of natural capital whenever it boils down to a trade-off. This indicates a weak conception of sustainability.

This also suggests that, in practice, sustainability has mainly come to focus on addressing local environmental issues and road safety.

*Time-based accessibility – not proximity*

Time-based understanding of accessibility continues to dominate policy and planning. This is an obvious but none the less fundamental condition for sustainability, since it accentuates the tendencies towards more motorised mobility in general, and reinforces the upper hand for road transport in particular. Here the strong position of CBA and the view of cost efficiency as a matter of maximising time savings at the least cost plays a key role. In the context of expanding infrastructure investments and forecast models predicting a strong increase in road-based mobility, this has contributed to a lock-in in terms of roads having a systematic profitability advantage.

This is essentially also a question of reframing problems and benefits of mobility. In section 2.1 it was argued that considering the 2\textsuperscript{nd} principle for transport development (maintaining option value for future generations) raised questions about the taken-for-granted benefits of facilitating further increases in motorised mobility through
expansions of infrastructure capacity. The interviews with decision-makers and the analysis of policy and planning documents showed that there is a resolute confidence in the mobility-welfare logic. It is solidly entrenched and the continuous increases in spending in recent years seem to indicate that this view has become even more dominant.

*A permanent funding crunch*

The current way of navigating the conflict between commitments to sustainability and increasing mobility has made rail and public transport investments a key objective. While it is far from certain that these types of shift strategies are the most appropriate from a sustainability perspective, from a pragmatic perspective they have the advantage of enjoying widespread support. However, this is a shift agenda requiring a lot of money, and the demand for investments far exceeds the available means. One condition for sustainability is therefore a permanent ‘funding crunch’ for projects that could facilitate a shift to more rail and public transport. This condition will certainly not improve by large sums being spent on road expansion.

*The governance context – intermodal but fragmented and increasingly commercialised*

The current condition with an integrated and multi-modal Transport Agency is promising, but there is still a problematic division between transport, infrastructure and land use planning. It bears repeating that shift and avoid approaches understood as policy and planning measures aiming to curb or reduce aggregate transport volumes require more focus on proximity-based accessibility. In turn, given the current levels and patterns of mobility, a proximity-based perspective in planning is dependent on the integration of land use and transport planning, both at local and at regional level. The governance context with municipalities in control of land use planning, regional-level actors with limited legal and financial influence, and more commercially motivated actors in infrastructure provision and public transport clearly makes coordination across modes and sector boundaries both a central challenge and a core condition for sustainability.
7.3 Towards a sustainable pathway?

To sum up, we can see that on the one hand sustainability is at the core of the policy agenda, embedded in legislation and supported in planning practices. However, the perspective deployed in this thesis suggests that, apart from the increases in spending on rail, not much else has happened in infrastructure policy and planning that could be seen as clear evidence that we are clearly moving in a direction that could qualify as sustainable. If sustainable development, as suggested by Gudmundsson & Höjer (1996) in Chapter 1, is about challenging one type of development with another type of development, there is scant evidence of any drastic changes so far.

This is not least illustrated by Bypass Stockholm, a six-lane 18-km motorway tunnel currently shovel ready. We are about to spend (an estimated) SEK 45 billion on the largest road investment to date, which is not an encouraging prospect. There may be a lot of reasons to motivate this investment, but as interviewee 25 stated at the outset of this thesis, this is simply “not sustainable!”

But it may also be the case that we are beginning to see some light at the end of the tunnel. Changing the direction of large technical systems is clearly a difficult, arduous and gradual process where the types of changes in mind that we actually can see, such as the four-step principle, are slowly beginning to make an imprint on decision-making.

There are also important signs of change in individual travel behaviour and indications that cities are taking the lead in the transition process.

Peak car, i.e. saturation in the use of cars, seems to be a phenomenon becoming increasingly apparent in Sweden. The number of cars keeps increasing but growth in passenger car transport volumes have stabilised and there may even be signs of stagnation (Sydsvenskan 2013). This is all the more encouraging since it is occurring in parallel to substantial energy efficiency improvements in vehicles and in an economic context where Sweden, in contrast to many other nations, has recovered quickly from the economic crisis. There is also a general trend of young people postponing or not acquiring a driver’s licence (Trafikanalys 2012b).
It may even be suggested that we are witnessing what could be interpreted as a sign of a peak in domestic motorised mobility, where some cohorts of the population, most notably men under 45-years-old, have reduced their daily mobility (Frändberg & Vilhelmson 2011). While cautioning against drawing too far-reaching conclusions from these trends, Frändberg & Vilhelmson (2011: 1243) note that “…the observed counter trend towards mobility decline among the young (especially young men) can be seen as evidence of the existence of substantial manoeuvring room, in the sense that car-intensive lifestyles are not so strongly structurally determined.” It is certainly important that decision-makers seize this opportunity of widening the range of options.

The introduction of congestion charging in Stockholm and Gothenburg also illustrates that important changes in mind sets have taken place. The title of the 2010 comprehensive plan of the City of Stockholm, ‘The City for Pedestrians’ sends a seemingly clear message of which mode of transport to prioritise. Other signs indicating important changes can also be seen in the main metropolitan regions. In Gothenburg, cycling was reported to have increased by 22% in 2013 (Transport Agency 2014). The city of Malmö has persistently worked to improve the cycling infrastructure and currently a number of projects are under way to adapt urban road space for public transport and cycling.

Signals of change are not only coming from the metropolitan areas. A recent survey of 75 Swedish municipalities indicates that substantial amounts of money (several billion SEK) is invested, or planned to be invested, in cycling infrastructure in the next couple of years (På väg 2013b). In combination the development described above suggest that there are important signs of change and that we may be witnessing the end of the routine affirmation of infrastructure for more motorised mobility as the only way forward.
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9. Appendix 1a Interview questionnaire used in the early interview stage of the Omega project

(Designed by the Omega team)

QUESTION 1
Looking back, what was according to you, the most important events that shaped the project? (Turning points or starting points, not necessarily the project's official key dates)
• Which of these was most surprising? Most predictable?
• What was planned? What was unexpected?

QUESTION 2 - Tell us about an occasion when this project was saved or sabotaged?

QUESTION 3 - What were occasions when it was slow and when did the breakthroughs happen? What happened then?

QUESTION 4 - When have you or others around you suffered from, or been inspired by the results of the project? What happened and why?

QUESTION 5 - Imagine this project in 10 years. Will it generally be perceived as:
• a total failure or
• a huge success
What stories about the project you would tell to persuade or refute those people who felt this way?
10. Appendix 1b Interview questionnaire of late interview stage of the OMEGA project

Part 1. Overarching questions (Designed by the OMEGA network)

Question 1. Project success.

a) What are the characteristics of a transportation infrastructure project and what are the main distinguishing features of such a project?

b) In generic terms, what in your view constitutes a 'successful' transport infrastructure project?

c) Do you consider the case study as a successful project? Why/why not?

Question 2. Project appraisal (pre-construction phase) and project evaluation (post-completion)

a) In general, what criteria are most important in appraisal studies and in evaluation studies of transport infrastructure projects?

b) What criteria have been most important for the case study in: i) Appraisal studies ii) The evaluation?
   • What criteria was appropriate and what was inappropriate? Why/why not?
   • Is the concern for sustainable development, a criterion that has affected the evaluation process? If so, how, and to what effect?

c) What is the value traditional evaluation criteria (for example, maintaining budgets, travel time savings, financial return) as a measure of success for transport infrastructure projects in the 21st century when the vision of sustainable development is becoming increasingly important both globally and locally?
Question 3. Sustainability aspects
a) What aspects of sustainable development do you consider to be relevant in relation to transport infrastructure projects? Do you think the concern for sustainable development should play an important role in the planning and execution of transport infrastructure projects? If so, why and how? If not, why?
b) Was sustainability an important part in the planning and design stage of the case study? If so, how? If it were not, why?
c) Does the vision of sustainable development for a better opportunity to determine the success of a project?
d) Do you believe that it is possible to introduce strategies afterwards enabling transport infrastructure in general and in the case study project in particular to contribute to a more sustainable development?

Question 4. The project's decision-making process
a) What are in your opinion the most important factors and actors that influence decision making in the planning and implementation of transport infrastructure projects in general?
b) What factors were most important in influencing the decision making of the case study?
• Which actors had the most influence on the decision making process?
• What factors and influences had a positive or negative influence on the most important criteria for feasibility studies and evaluations identified in question 2?
c) What influences generated by other factors and actors (such as political power, rationality of technocrats, lobbying by special interests, mega events)?

Question 5. Risk, uncertainty and complexity
a) In what ways do you think the transport infrastructure in general is associated with risk, uncertainty and complexity?
b) In what way do you think the case study was/is associated with risk, uncertainty and complexity?
• How were these factors addressed in the planning and decision process?
• What worked well and what worked less well from this point of view?
Question 6. Project context
a) In what ways does the specific context influence the planning and construction of transport infrastructure in general?
b) Which context-specific factors were most important for the planning and construction of the case study? Why? Were there any context-specific factors that have not been handled in a good way?

Part 2. General questions regarding regional urban transport and infrastructure planning (designed by the Swedish research team)

Question 6. What are the main objectives of transport and infrastructure planning at regional level?

Question 7. Do you think that there are conflicts between different objectives? If so how are these conflicts dealt with? Is this a good or bad way to manage conflict?

Question 8. Do you think that there is a conflict between regional expansion and sustainable development? If so how is this conflict handled? Is it a good or a bad way to handle conflict?

Question 9. What sustainability indicators are linked to the objectives of the transport system and which methods and strategies are in place to guide development?

Question 10. How have transport and infrastructure planning been influenced by the case study?
- Impact on planning at urban level?
- Impact on regional level?

Question 11. Have the case study project made it easier or more difficult to achieve a sustainable transport system?

Question 12. How has urban land use planning in been influenced by the case study?

Question 12. Has progress been driven by public or private initiatives?
Question 13. Has planning been guided by an overall vision for the area or have it characterized by ad hoc decision-making?

Question 14. Are these areas in your opinion a good example of sustainable development in transport and urban planning?

Part 3. Concluding questions (designed by the Omega network)
(Interviewee chose which questions to answer).

Question 15. The objectives of transport infrastructure projects
On the basis of the case study experience, how should transport infrastructure objectives be set – by whom, in what forum, and how should they be appraised, evaluated and monitored?

Question 16. engagement, consultation and participation?
What generic lessons, if any, are there to be had from the case study regarding community involvement (engagement, consultation and participation) in mega transport project (MTP) planning, appraisal and delivery – along the line-haul route and around major transport hubs?

Question 17. national planning frameworks for MTPs?
Do you consider it essential that infrastructure projects such as the case study should only be promoted and delivered against the background of a planning framework which puts forward national development proposals expressing agreed economic, social and environmental (and other) objectives and priorities?

Question 18. Other general lessons
What other general lessons do you think can be learned from the case study?
11. Appendix 2. Maps

The Öresund Link: 1.) Upgrading of railway tracks, 2) New railway and motorway, 3.) The bridge section, 4.) Artificial island, 5.) Tunnel, 6.) New railway tracks, 7.) New motorway, 8.) New motorway (not included in funding model). Source Lantmäteriets GIS database.
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