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## Systemic errors in the transport sector

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## Summary

This background report discusses three fundamental systemic errors in the Swedish transport sector. The first error is that the cost of using infrastructure, particularly roads and railways, is too low. The second error is that a substantial number of large infrastructure investments are being made that in normal circumstances would be seen as economically unprofitable. A third error is that the large use of resources for investment in roads and railways and their operation and maintenance is not followed up at the project level. All the systemic errors are in the grey area between politics and public administration and do not involve any constitutional or other legal infringement. However, the systemic errors are contrary to the overall objectives for traffic policy established by the Riksdag.

While respecting that the Government and the Riksdag are fully entitled to make decisions that lead to what are here called systemic errors, four measures for improving system performance are proposed. The first proposal is to move the responsibility for drawing up instructions for social cost benefit analyses to a central agency or to the Ministry of Finance. The second proposal is that all projects costing more than SEK 1 billion undergo an external quality control before they are given the go-ahead. Both these proposals are based on Norwegian experience. A third proposal is to make public to the extent possible the results of the cost benefit analyses conducted and the estimates made of the social costs of using the infrastructure. This increases the transparency of political decisions. The fourth proposal is to instruct each agency to show in its annual report how many public procurement contracts have been signed in the past year, how many contracts have been completed and the extent to which actual costs have exceeded the costs specified in the original contract with the contractor.

# 1 Introduction

Modern society requires an infrastructure in the form of roads, railways and terminals that are well maintained and have sufficient capacity. Shipping lanes must be safe and port facilities have enough room. Air transport requires advanced communications technology and needs terminals and airports so that people can travel and goods can be transported.

In the transport sector in every country, no matter how the activity is organised, problems and deficiencies arise that must be dealt with on a regular basis. The continuous change in demand is one such example. Infrastructure capacity has to be adjusted gradually for an increasing number of travellers and transports to avoid bottlenecks. This is one of many examples of recurring decisions that have to be dealt with so that the provision of infrastructure will function satisfactorily.

The intention of this background paper is to point out a number of systemic errors in the transport sector. What is meant by systemic errors is something different and something more than the need to deal with deficiencies as they arise. Systemic errors allude to an often repeated difference between official objectives and actual decisions. The errors can in one way or another be linked to the properties of the service to be supplied and to the institutional structure for decision-making erected. The errors are also independent of the political majority and thus cannot be associated with ideologies, at least not directly.

The purpose of this background report is thus to discuss three systemic errors in the Swedish transport sector. The first is that, generally speaking, it costs too little to use the country's infrastructure; this error is discussed in Section 2. A second problem is that many investments are made even though they are obviously economically unprofitable (Section 3). The third problem has to do with inadequate follow-up of the activity carried out, be it the investment project or the infrastructure's operation and maintenance (Section 4). The concluding section, Section 5, is a discussion of the link between these observations and the possibility to use other means for tackling these challenges. Even though the problems considered may be general in nature, the focus is on the situation in the road and railway sector.

## 2 Below-cost pricing

Taking a position on what is meant by “correct prices” requires a norm. Section 2.1 considers the basis for marginal cost pricing, i.e. the traditional norm for infrastructure pricing. Section 2.2 then describes current knowledge about the social costs of using infrastructure, i.e. the information needed to charge prices in line with this norm. Section 2.3 compares the taxes and charges levied with these marginal costs, while Section 2.4 points out the policy conclusions that can be drawn from this discussion.

### 2.1 Pricing to maximise social utility

The cost of additional passengers or goods transport should form the basis for the price charged for using the infrastructure. This is based on the same reasoning companies follow to maximise their economic result by charging a price equivalent to the marginal cost of production.

Marginal cost pricing of infrastructure is based on the principle that society has built many miles of roads and railways as well as a number of airports and harbours. Regardless of whether these investments were actually well-advised, it is important that currently existing infrastructure be used in a sensible way. Charging a price related to the costs caused by the traffic when the volume of traffic increases or decreases sends a signal to users about the cost consequences of using infrastructure. Each passenger and each freight transport customer can thus decide what trips to make or freight to send or receive based on relevant information about the consequences of their respective consumption decisions.

The marginal cost for a commercial company consists of the use of resources to produce goods and services. A hotel must therefore charge for cleaning, laundry, other expenditures, and the wear resulting from providing accommodation. For infrastructure, the equivalent is the wear and tear from traffic. Hotel facilities must also be paid for their investment costs. This can be achieved by charging more than what is required to cover the running costs during those parts of the week or year when demand is particularly high. This explains the substantial price differences charged for staying at a hotel on the weekend compared with a weekday and the price differences between different seasons for a holiday hotel. In the infrastructure sector, bottlenecks may also occur when demand exceeds the available capacity, leading to queues and other problems related to scarcity. This justifies charging extra in situations in which there is particularly high demand, for example, in the way done for road traffic in Stockholm and (now) in Göteborg.

From society’s perspective, traffic also gives rise to significant external effects. Road traffic has environmental consequences in the form of emissions and noise and gives rise to the risk of accidents. To the extent that these effects are not handled in some other way, they thus provide a basis for pricing infrastructure use.

## 2.2 Marginal costs of using the infrastructure<sup>1</sup>

Table 1 summarises what is known about road traffic's marginal social costs in rural areas. It shows that passenger traffic causes very little road wear but heavy traffic causes much more wear. The figures do not reflect the exponential increase in wear when the weight per vehicle axle increases, i.e. the difference in wear caused by vehicles of different weights. Nor is it possible to use this type of table for identifying the differences in wear for various parts of the road network. There is strong evidence that heavy vehicles using new and well-built roads wear out the road to a limited extent while roads with an inadequate roadbed wear out more rapidly.

**Table 1 Marginal costs for passenger cars and lorries in rural traffic**

Cost component <i>SEK per vehicle km</i>	Passenger car	Lorry	
		Without trailer	With trailer
Infrastructure: operating all roads	0.016	0.016	0.016
Infrastructure: maintenance of European, national and main county roads		0.136	0.332
Infrastructure: maintenance of other paved roads		0.294	0.720
Accidents	0.120	0.310	0.310
Emissions to air	0.205	0.963	1.572
Noise	0.024	0.165	0.377
Scarcity	-	-	-
<b>Total</b>	<b>0.22</b>	<b>1.88</b>	<b>3.33</b>

Note: Costs are stated in 2010 prices. Km refers to vehicle kilometre.

The costs of accidents are different for light and heavy vehicles but it is currently not possible to further define variations between different vehicle categories. The cost differences for emissions to air from various passenger vehicles are relatively small; emissions from heavy vehicles are much greater. It is also obvious that heavy vehicles at places particularly exposed to noise in the road network cause considerable disturbance and thus social costs.

Table 2 summarises the corresponding knowledge about railway traffic's social costs. Some of these costs arise because trains that use electricity and diesel produce different amounts of emissions. Other costs are the result of the weight on the trains' axles as the wear on the tracks increases with the load. Furthermore, costs occur because a train passes, regardless of its weight. The risk of collision with road vehicles is one example.

<sup>1</sup> The figures used in this section and the next have been taken from Nilsson and others (2012).

Noises and risk of accidents occur only where many people live or where there are level crossings. They are not shown in the table for average values. However, it is possible to show that noise has an impact on real estate prices equivalent to a cost of almost SEK 3 500 for a fully loaded freight train and about SEK 800 for an X2000 between Stockholm and Göteborg. There may also be a substantial shortage in the railway network in that not everyone will be able to run their services in accordance with his or her actual wishes and in addition trains may be delayed. This suggests that the table should also contain information about the costs incurred because there is not enough room to give access to the track to all that want it.

**Table 2 Marginal costs railway traffic**

Component		SEK per unit	Cost
Infrastructure	Operation	Tkm	0.51
	Maintenance	Gtk	0.0092
	Reinvestment	Gtk	0.0094
Accidents	Level-crossing accidents; average not relevant	Tkm	
	Other accidents	Tkm	0.51
Emissions to air	Diesel locomotives	Litres	7.43
	Diesel multiple units (DMUs)	Litres	7.20
	Of which CO2	Litres	2.74
Noise	Average not relevant	Tkm	+
Scarcity		Tkm	+

Note: Costs are stated in 2010 prices. *Tkm* refers to train kilometres; *Gtk* refers to gross tonne kilometres.

## 2.3 Degree of internalisation

The ratio of the price charged to the activity's social marginal cost – the degree of internalisation – can be used to show any need there may be to change the price charged in various parts of the transport sector. If the ratio is less than one, it indicates that there may be grounds for raising the price charged. With a value higher than one, the reverse applies.

In Table 3, the external costs of *road traffic* have been recalculated as an average cost per vehicle kilometre that is compared with the tax take per vehicle kilometre. This recalculation does not mean that an average price should be charged; it has only an explanatory purpose. In fact, price differentiations according to best estimates of marginal costs should be a key part of the price setting policy. Earlier, this was not technically possible, but the development of vehicle based electronics has now progressed far enough that the prospects of far-reaching differentiations are quite different than they were only a few years ago.

**Table 3 Average marginal cost and tax for road traffic on European, national and main county roads**

<i>SEK per km</i>	Passenger vehicle	Lorry without trailer	Lorry with trailer
Accidents	0.162	0.373	0.369
Infrastructure	0.016	0.152	0.348
Noise	0.086	0.428	0.962–1.767
Air and CO2	0.253	1.160	1.896
Total marginal cost	0.516	2.113	3.576-4.831
Tax	0.442	1.044	1.861
Degree of internalisation	0.86	0.49	0.52-0.42

The table shows that passenger vehicle traffic seems to be not so far from paying its social marginal costs. However, it is clear that the price charged for heavy traffic would have to be at least doubled to match the social marginal costs it causes.

Table 4 summarises the degree of internalisation in railway traffic. The comparison refers to the prices charged in 2012, that is, the recent increases in track access charges have been taken into account while the cost estimates are a couple of years old. Freight traffic's degree of internalisation is obviously low. The lack of congestion cost estimates may be less important for freight traffic to the extent that freight trains use less congested tracks. In situations in which freight trains use parts of the rail network carrying a heavy load of traffic, it is conceivable that even limited cost increases for using this strategic capacity could result in substantial reorganisation of traffic.

**Table 4 Railway traffic: total marginal costs and track access charges**

	Total costs and charges, SEK million		Average, SEK per tkm	
	Passenger trains	Freight trains	Passenger trains	Freight trains
Accidents	108	85	1.04	1.29
Infrastructure (DoUoR)	487	1 263	4.66	19.03
Noise	233	386	2.23	5.81
Air and CO2	20	119	0.19	1.80
Congestion	+	+	+	+
Total marginal cost	848	1854	8.11	27.93
Total track access charge	540	532	5.16	8.02
Degree of internalisation	0.64	0.29		

Note: Charges are stated in 2012 prices and marginal costs in 2010 prices. Latest estimate.

The gist of this review is that heavy traffic on both roads and railways is on average under-taxed. This means that the volume of freight transport carried is higher than would be the case if the costs were fully internalised. The comparison indicates the relative orders of magnitude and indicates a need for comparatively large changes – i.e. increases – in the price charged. However, it is not possible to determine the consequences of these changes for the form of transport chosen based on this reasoning. Depending on how price sensitive the ultimate customers are and on the possibilities there are to change the activity's set-up in different ways, the effects may range from very limited to quite extensive. Further consideration along these lines would require more basic modelling than there is space for in this report.

## 2.4 Below-cost pricing as a systemic error

The figures reported in this paper are based on work conducted by VTI. The principles discussed are well known and widely accepted. In the late 1990s, the Swedish Institute for Transport and Communications Analysis (SIKA) was already making this type of estimate and later there was a remit from the Government to update the information annually. Transport Analysis has taken over this task and its most recent report can be found in *Trafikanalys* (Traffic Analysis 2012). The Transport Administration in its capacity remit (2012) makes mainly the same conclusions as Transport Analysis and VTI about below-cost pricing. It is also worth noting that similar estimates have been made in several research projects financed by the Commission, the latest conducted by VTI.<sup>2</sup>

Both the Commission's interest in these issues and the Government's remit to Transport Analysis should be seen in the context of the official policy in this area. In the EU, the marginal cost pricing principles, for example, have a prominent position in the current railway directive; see 2008/57/EC. In Sweden it is the Riksdag that establishes the overall objective for transport policy in order to guarantee an economically efficient and sustainable transport system for the public and for business. In recurring traffic policy bills, the Riksdag has also favoured a number of principles that should be associated with the implementation of this policy. One of these principles is that traffic's social costs are to be a basis for designing transport policy instruments. This means that a basic economic principle for effective resource use also has political support.

Estimating social marginal costs is not a precise science, and there is currently a lack of knowledge about several of the components that should in principle be included in the estimate.<sup>3</sup> Despite the lack of information about some of the cost items, there is a large consensus, both in the research community and in the government agencies responsible, that traffic in some key respects is priced below cost.

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<sup>2</sup> See [www.catrin-eu.org](http://www.catrin-eu.org).

<sup>3</sup> For this reason, the Government gave VTI a remit in late 2012 to conduct further research over the next two years in order to better estimate the social marginal costs of traffic (N2012/6321/TE). One of the aims of the work is to highlight the differences in marginal costs found in various parts of the respective infrastructure networks.

In particular, the annual update of the supporting data done by Transport Analysis shows that the Government has been informed of these conditions. Nevertheless, neither the current nor the previous governments have made changes aimed at increasing the probability that the principles approved by the Riksdag will be implemented. This observation can thus be considered a systemic error.

There are obviously several explanations for opposing changes in the price charged. Not surprisingly, there is active opposition to tax increases from those who would be affected. For example, were a kilometre tax reinstated, it could be a good policy instrument for handling various heavy vehicles' differences in road wear. The forest industry, however, thinks that this would damage the sector's competitiveness. Likewise, increases in the track access charges are considered a politically sensitive measure at a time when railways are seen as an active part of the effort to limit greenhouse gas emissions.

Obvious objections to price changes in one country are that they may affect competitiveness vis-à-vis other countries, that they may conflict with international regulations, etc. Under the common EU policy already referred to, however, competition is not affected as long as all the countries in the Community follow the policy decided; if not, the focus should be on those countries deviating from the policy, not on those who wish to follow the principles and rules.

To some extent, the Swedish industry also competes with countries outside the Community. To the extent that pricing in competing countries differs considerably, this may be a legitimate reason for *not* adjusting the tax take in Sweden for precisely those industries that would otherwise suffer. This is the same principle that should be followed when the pricing of two competing types of transport are discussed; if the price charged for one type of transport is not adjusted for the marginal costs, there is no justification for charging the full marginal costs in the competing type of transport.<sup>4</sup> Nilsson (1992) shows that in that case, fewer investments should then be made than are economically justified. In this way, bottlenecks that restrain the traffic increases that otherwise would have taken place are more or less deliberately created.

The consequences of charging insufficient prices for using the infrastructure are obvious: demand will be greater than it would be with a higher price. This is one of several explanations for the more rapid traffic growth and emergence of bottlenecks than would otherwise have been the case. In this way, investment pressures also build, i.e. the desire to eliminate bottlenecks. Moreover, the artificially low price and tax level also have consequences for companies' choice of where to locate their operations. Changing the pricing structure could conceivably change the location pattern. As noted earlier, estimating how large these efficiency losses are is not possible without in-depth analyses.

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<sup>4</sup> This reasoning is also rather similar to the difference between trading and non-trading sectors in handling greenhouse gases. As industry competing internationally pays less for its emission allowances than the non-trading part of the economy pays in the form of taxes, on fuel for example, there is little risk of "leakage", i.e. of production being moved to countries that have not introduced systems to limit the emission of greenhouse gases.

## 3 White infrastructure elephants<sup>5</sup>

Pricing affects the use of existing infrastructure. But a second systemic error in the transport sector is linked to the construction of new capacity. Section 3.1 defines the principles that should guide the construction of new transport infrastructure. Section 3.2 describes what these principles mean and how government agencies use the results of the analyses carried out when proposing project priorities. Section 3.3 then goes on to describe how previous and current governments have dealt with the agencies' proposals.

### 3.1 Principles

For society to maximise the utility of existing infrastructure, we have shown that the price charged should match the costs that the traffic gives rise to. Similarly, there is an investment criterion that the project should be implemented when the social benefits seen over the life of the infrastructure are at least as great as the cost of implementing the project. For this purpose, a *cost benefit analysis* is conducted. This criterion is also much like the corresponding business criterion: build new if the extra income that the new construction can generate is sufficient to pay for the original investment cost.

In 2004, 2008 and 2012, the Copenhagen Consensus was implemented with the overall aim of answering the following question: if a supranational organisation had USD 75 billion to be used in the best interest of humanity, what measures would be given priority? The work was carried out by experts, who conducted an economic analysis of a highly relevant measure in their respective specialities. The ensuing memorandum and the costing results were based on economic analyses. The results were sent to two other experts for critical review. At a final hearing, the results of some ten analytical reports of this kind were presented to a panel of five eminent researchers, four of whom were previous Nobel Prize winners.

At the 2012 meeting, discussions included various courses of action to reduce the risk of conflicts in countries with weak central governments. Another subject concerned the costs and benefits of reducing malnutrition while a third issue concerned the analysis of various attempts to deal with climate change.<sup>6</sup> The proceedings illustrate the broad application that cost-benefit calculations have, i.e. this technique is also applicable well beyond the transport sector.

Since at least the early 1960s, the World Bank has been instrumental in developing a technique for calculating the social costs of new road construction and maintenance of existing roads and the benefits these roads will provide. The modern version of this procedure is a fourth-generation model for estimating

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<sup>5</sup> According to Wikipedia, a *white elephant* is an economic concept for an object or project that is costly but without any return. The concept comes from South-East Asia, where kings were accustomed to make a present of white elephants to their enemies. As these elephants are holy, they cannot be used as work animals but are costly to maintain.

<sup>6</sup> See also [www.copenhagenconsensus.com](http://www.copenhagenconsensus.com).

the profitability of investments in roads and their operation and maintenance known as the *Highway Development Manual*, HDM IV.<sup>7</sup>

In the 1970s in Sweden, the Road Administration began work on developing an economic basis for decision-making for prioritising road investments. In 1988 the first manual for calculating the costs and benefits of railway investments was completed. Today key parameters are set for the calculations to be made in the infrastructure sector by the Working Group for Cost-Benefit Calculations (ASEK), a working group led by the Transport Administration. ASEK recommends the cost-benefit calculations and the analytical methods that should be used in analysing various forms of transport measures. It also makes recommendations on important input data (assumptions on macroeconomic and socio-economic developments, cause and effect relationships and valuations) to be used in traffic forecasts and economic analyses. Coordinating research and development initiatives taken in the area is another task. Recommendations on new and changed parameter values should be based on verifiable facts, knowledge and best practices. To ensure this, an advisory expert group composed of researchers has been associated with the work.

In Sweden, the Transport Administration has final responsibility for setting the parameter values and the methods to be used.<sup>8</sup> The Swedish Environmental Protection Agency is currently developing similar rules to be used in its area of responsibility. Norway, it should be noted, has chosen another division of responsibility for such matters. There the Ministry of Finance is responsible for developing a model that can be used throughout the public sector.

The Commission has also produced its own guide for economic evaluation of investments in transport infrastructure, *Developing Harmonised European Approaches for Transport Costing and Project Assessment* (HEATCO). The latest version goes back to 2006. Many countries have their own models, but what they all have in common is that the basic principles governing how the estimates are to be made are very similar. However, there are differences in the parameter values applied, not only because this is an area where there are new findings all the time, but also because there are differences between traffic and users in different countries.

### 3.2 Government agencies' use of costing results

Nilsson (1991) showed that the results of the calculations made before a planning decision in the late 1980s had little impact on the prioritisation of various investment projects. A few years later, an official review came to the same conclusion (the National Audit Office 1994). As a result of this review, the Government tightened the requirements for conducting economic analyses. Costing results are also to affect prioritisation (National Audit Office 2012a).

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<sup>7</sup> See [www.hdmglobal.com](http://www.hdmglobal.com).

<sup>8</sup> The latest version of the method, ASEK 5, is available at <http://www.trafikverket.se/Foretag/Planera-och-utreda/Planerings-och-analysmetoder/Samhallsekonomisk-analys-och-trafikanalys/ASEK---arbetsgruppen-for-samhallsekonomiska-kalkyl-och-analysmetoder-inom-transportomradet/ASEK-5---rapporter/>.

Eliasson and Lundberg (2011) have examined the proposed long-term investment plan that the Transport Administration submitted to the Government at the end of 2009. As part of the instructions constituting the formal start of the government agencies' planning work six months earlier, the Government singled out 90 projects that would be implemented at a total cost of SEK 115 billion. Many of these projects had been included in the plan for the period 2004–15 and were under construction or were in the final planning stages and there was no reason to draw up any new basis for decision-making for these projects.

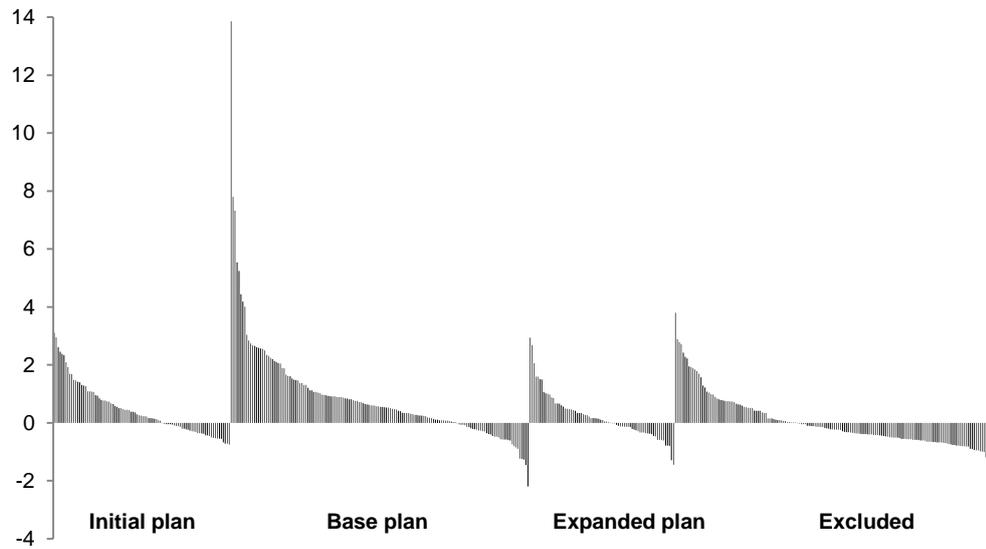
In their work on a proposed investment plan for the period 2010–21, the Swedish National Rail Administration and the Swedish Road Administration studied a total of about 700 possible investment projects. Of these, economic calculations were made for 479 projects. The agencies' work resulted in a proposal to implement 149 projects at a total cost of SEK 41 billion. This made the proposal the base plan. Moreover, the Government had asked the agencies to draw up an expanded plan that would include about 15 per cent more resources than in the base plan. The expanded plan included 71 projects. Of all the 479 projects for which economic calculations had been made, 169 investments were excluded from the draft plan submitted.

Figure 1 shows the profitability of the projects in different parts of the plan, as well as the profitability of the projects excluded. Profitability is defined here as the net present value ratio (NPVR). The numerator of this measure is the net value of all costs and revenue for the life of the project while the investment cost is the denominator. All investments with a positive ratio return more than the investment cost, while projects with a negative ratio are economically unprofitable.

The average profitability for all 479 projects, i.e. both those included in the plan and those not included is 0.41. For the initial plan, the net present value ratio is 0.45, i.e. only marginally higher than if 479 possible measures had been randomly selected. The Government's instructions for the planning work thus at this point put little weight on the project's profitability. The figure also shows that there are unprofitable projects in all three parts of the draft plan and that a number of projects have remarkably low profitability. There are even values under -1 in the base plan. Such projects would not be justified even if it were possible to disregard the investment cost.

The base plan has an average NPVR of 0.91. As can be seen in the figure, this implies that the Transport Administration allowed the CBA results to exert considerable influence over its prioritisation of proposals. However, one conclusion from the analysis is that the agencies mainly intended to use these results to identify the worst projects, i.e. to ensure that unprofitable projects were for the most part excluded.

**Figure 1 Net present value ratio for four groups of investments sorted in descending order of profitability within each group**



Source: Eliasson and Lundberg (2011).

### 3.3 The Government's decision

The plan ultimately adopted by the Government differed from the proposal submitted by the agencies in that several projects not included in the proposal were given high priority. One example is known as the Göteborg package, costing SEK 30 billion.<sup>9</sup> The Göteborg package was formalised in early 2010 when six parties – the Road Administration, the National Rail Administration, Region Västra Götaland, Halland County Council, the city of Göteborg and the Göteborg Region Association of Local Authorities – signed an agreement. The agreement includes the West Link (SEK 16 billion), the Marieholm Connection Project (SEK 4.2 billion) and some other improvements in the road network, including the Göta River bridge (SEK 5.2 billion). Also included in the package is support for a modal shift to public transport in the municipal and state road network for a total cost of SEK 4.6 billion.

The congestion tax charged in Göteborg beginning in 2013 is intended to raise SEK 16 billion which will constitute co-financing to cover the total investment cost. Municipalities and the region are paying for some parts of the package but most of the remaining cost will come from the national investment appropriation. In this way, other projects are bumped from the plan and all projects with a date in the plan that comes after the date for the Göteborg package are postponed to a later date than that stated in the agency proposal. It was possible to sign the agreement due to the principled position taken by the Government on the project.

<sup>9</sup> The Government's decision is available on this website: <http://www.regeringen.se/sb/d/11181>. The decision is framed in such a way that it is not possible to see either which of the above projects are in the plan adopted compared with the government agencies' proposed plan or which investments had been excluded from the plan.

The part of the package that concerns the West Link, a tunnel under central Göteborg that means that the central station will no longer be a railhead, has an estimated economic profitability of -0.55 (National Audit Office 2012). During the work leading to the signing of the plan, the costs increased from SEK 16 billion to SEK 20 billion. The Swedish National Audit Office's examination also shows that the utility calculated cannot be achieved with the investments specified. In reality there needs to be an additional investment of between SEK 20 billion and SEK 35 billion for this purpose.

### 3.4 White elephants as systemic errors

The Göteborg package is one of many examples of a white elephant. Governments with different political majorities take decisions to implement what are often very large investments alongside the planning work being done by government agencies subordinate to them. From society's perspective, this creates a problem because many of these projects have low economic profitability.

The Bothnia line is a well-documented example. A public inquiry (SOU 1996:95) showed that the project had low economic profitability. After a political agreement, the Social Democratic Government at that time reached a decision to have the line built. The follow-up done by the National Audit Office (2011b) showed that the investment costs increased sharply compared with the original plans and that despite this, there was not room to carry out all the investments required in order to realise the expected social utility.

Even though the work on the investment plan covering the period 2015–26 has still not begun, there is a decision in principle to build what is known as the East Link between Järna via Nyköping to Norrköping and Linköping. The project is estimated to cost SEK 30 billion. There is a lack of information on the project's economic profitability at this cost level. This is one of many such decisions made public in the Budget Bill for 2013.

There are a number of other examples of investments that are being implemented despite their low profitability. Many of these decisions are made outside the formal planning process and conflict with the decision in principle taken by the Riksdag. It is also obvious that such investments have no clear political or ideological basis.

In the same way that there are no formal errors associated with allowing taxes and prices charged to be set at too low a level, taking political decisions to make unprofitable investments is not a formal error. Politicians have in reality been elected with a mandate to take decisions perceived as legitimate. But there are two problems with decisions made on these grounds. The first is the large divergence between the principles decided by the Riksdag and the policy pursued in practice. The second problem is that projects are in fact allowed to proceed without a utility proportional to the costs incurred, while other investments with high profitability are not realised, as shown in the upper part of the above figure where there are a number of profitable projects that are not carried out.

A better use of society's resources could also certainly be found in many other sectors of society. One example, taken from the Copenhagen Consensus, shows that there are also good possibilities of conducting economic analyses in parts of society where they are currently not made and thus have a better basis for striking a balance in allocating resources across different sectors of the economy.

## 4 Inadequate follow-up

The two examples of systemic errors considered above are directly linked to the transport sector. This section instead discusses the absence of informative follow-ups, a problem that may include a large part of the public sector. As the knowledge about these matters originates in the transport sector, it is not possible to make any statements more general than that.

Section 4.1 describes the problem in the form of observations made in the context of a recently completed research project. Section 4.2 discusses the significance of comparing the costs of the activity conducted with the original decisions taken in the form of the long-term investment plan that determines which projects are to be undertaken in the next few years.

### 4.1 Cost at the time of procurement and the final cost<sup>10</sup>

With the aim of promoting a better understanding of the procurement process, the Swedish Competition Authority (KKV) in 2010 funded an analysis of the different agreements that the Road Administration<sup>11</sup> had concluded in the 2000s with its contractors. In the period in question, an average of about SEK 8 billion a year was invested, involving a substantial number of large and small measures of various types (motorways, 2+1 lane roads, reinvestments, walking and cycle paths, etc.) that recur year after year. All the documents used in the procurement process are standardised and at least at some time in the course of the procurement process can be found in electronic form. The contract written with the entrepreneur who wins the respective procurement is to be registered and the invoices paid by the government agency should be attested and processed as part of the financial accounting.

Work on the research project began with the production of a list of all the registered performance contracts carried out in the Road Administration's regions between 2000 and 2009. Table 1 shows that 1 831 procurement contracts were identified. For 335 contracts – almost a fifth of all – there was no information in the registers, i.e. it was not possible to find the document justifying the choice of contractor known as the evaluation protocol. The sum of the tenders for the contracts where comprehensive information on submitted and winning bids are available gives a total contract value of almost SEK 37 billion. This is equivalent to approximately half of the total investment in the period.

About 90 per cent of the contracts are what engineers refer to as Design-Bid-Build contracts (DBB), *utförandeentreprenad* in Swedish. Agreements of this kind mean that the Road Administration has the legal responsibility for the plans drawn up and for producing a specifications document with a bill of quantities. The latter document thus constitutes part of the specifications and specifies

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<sup>10</sup> This discussion has been taken from Nilsson and others (2012).

<sup>11</sup> The Road Administration and the National Rail Administration were merged into the Swedish Transport Administration in early 2010, but we have chosen to refer to them using their previous names when they are discussed in historical contexts.

exactly what tasks are to be performed in building a new road and in what quantity. Examples include cubic meters of rock to be excavated, meters of wildlife fencing, square meters of asphalt of various qualities, the number of trees that are to be felled, etc. The contractors' tenders consist of a unit price for each quantity specified and the tender with the lowest total cost when prices are multiplied by volumes is generally accepted.

In practice, the actual quantities (m<sup>3</sup>, m<sup>2</sup>, number of trees, etc.) may differ from the quantities estimated in advance, something that within certain limits is accepted. In addition, there is often a need for changes or additions due to unforeseen needs or new desires. The price of such additional agreements is negotiated between the purchaser and the contractor. Thus, the final price may deviate from the offer price for several reasons.

About a tenth of the contracts are of the Design-Build (DB) type. Unlike a DBB contract, it is then the entrepreneurs who submit tenders, not the Road Administration, who are responsible for project preparation. Thus there will be some duplication as all bidders must do at least some general project preparation beforehand to be able to submit a tender. But this makes possible a better adaptation of the project to the entrepreneur's cost situation and provides room for testing own solutions for carrying out the contract. Turnkey contracts are increasingly paid for at a fixed price, but this type of contract may also be subject to changes and additions, see Mandell and Nilsson (2011).

**Table 5 Information collected on the Road Administration's procurement contracts**

Region	Total number selected procurement contracts	Projects with complete information	Projects where information is lacking	
			Partially	Totally (%)
Middle	328	208	8	112 (34)
Mälardalen	124	87	19	18 (15)
North	555	399	90	66 (12)
Skåne	137	131	0	6 (4)
Stockholm	117	67	20	30 (26)
South-east	121	92	3	26 (21)
West	449	370	2	77 (17)
Total	1 831	1 354	142	335 (18)

One aim of the project financed by KKV was to compare the contracted cost with the actual resource use. To obtain an idea of the final resource use, the Road Administration's version of the accounting system Agresso was used.

The concept of an object number turned out to be of key importance when seeking to compare the cost at procurement with the ultimate cost. The first time a new project idea is tested, often in connection with a pilot study, a new object number is assigned to the project. This number follows the measure through its life and is used when an investment is included in the Government's investment plan and when a project is procured. If the investment is broken down into several procurements/contracts, object numbers which are derivatives of the original may be assigned to each new contract. Submitted invoices can be booked against object numbers in the accounting. It should also be possible to see the Road Administration's costs for a project.

Those are the principles. In practice, information about what object number to associate with a procurement contract is often missing in Agresso. It has only been possible to link an observation from a contract to an observation in the accounting system in 698 out of 1 352 cases, i.e. a little over half. The ratio between the costs *ex ante* and *ex post* in these projects varies between close to zero and more than four with an average of 1.09, i.e. costs were exceeded by 9 per cent.

But many projects had a cost *below* the original contract. One explanation may be that the projects are not yet finished. When projects in progress are not considered, 522 investments remain and the average cost overrun increases to an average of 11.5 per cent. However, there are still several projects where the final reported costs are lower than those initially contracted. At first glance, this is naturally gratifying, but on second thought, it is doubtful that the outcome is actually correct. As the contract is drawn up, the contractor has very little incentive to carry out the task in a way that means that the purchaser is billed a lower amount than that specified in the contract. It is therefore not reasonable to believe that so many projects have lower costs than those originally contracted.<sup>12</sup>

One possible explanation why many projects appear to be less costly than the agreement is that Agresso is not used in the way intended. Several examples of this were observed. Larger projects are sometimes divided up into several parts. Consequently, the possibility of comparing the cost assessments for the larger project with the cost assessments made for each of the smaller projects and in the end following cost developments for the project as a whole is often lost. Another example is that costs booked for one project are transferred to another object number. Even though there may be reasonable explanations for transferring costs in this way, in practice it becomes impossible to compare the costs of the activity carried out with the costs in the procurement contract.

## 4.2 Comparison of the outcome with the plan

Following up procurement contracts may be perceived as a technicality of limited public policy interest. But to follow up the projects that the Government has decided will be included in the investment plan, there needs to be a link

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<sup>12</sup> But projects can of course be less costly than any of the cost estimates made before the project was tendered.

from the cost outcome for the procurement contracts to not only the contracts signed, but also back to the original project plans. A separate project financed by the Road Administration has shown that this link likewise cannot be made (Pyddoke, 2011).

This should be seen against the backdrop of earlier analyses of the cost outcome in Swedish investments in transport infrastructure. For example, the National Audit Office (1994) criticised the Road Administration and the National Rail Administration for large cost overruns. The Government therefore decided that government agencies in their annual reports should report the cost outcome for the projects decided in the national infrastructure plans. This has also been done and there are currently about 170 projects completed and included in annual reports.

But this post costing is not based on the accounting system. Instead, a centrally placed official contacted the responsible project leader and the finance director in the region where the project had been carried out. This person described the cost outcome and thus provided the basis for the information found in the annual report. The Government also decided that the projects where costs grew during the planning period would be sent back to the Government for review. This can be interpreted to mean that there was no mandate to let the costs of the work rise freely for projects decided by the Government within a particular cost frame.<sup>13</sup>

The accounting is obviously guided by objectives other than ease in following up the costs in the project plan and in the procurement contracts ex post. But the National Audit Office has not directed any criticism towards the inability to use the accounting system for post costing or for comparing the actual costs to those in the procurement contract and planning decision.

### 4.3 Impossibility of systematic follow up of resource use

The Riksdag gives government agencies annual appropriations. For the Road Administration, there is one appropriation for operation and maintenance and another for investments. The funds reserved in the annual budget letter are then broken down within the agency to be divided between regions and sub-activities. The follow-up is made with the aim of ensuring that the allocation decided by the Riksdag is not exceeded. As neither the ministry responsible, the National Audit Office nor any other body ask for follow-ups at the project level, the agency likewise has no interest in them. The project-by-project follow-ups apparently nevertheless done at the regional level are not matched by a culture where comprehensive follow-ups are carried out in the organisation.

The research project described earlier would also review investments procured by the National Rail Administration in the same period. The problems there

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<sup>13</sup> In Norway there is a system where large public projects (over NOK 750 million) must undergo two quality assurances in the planning stage, both by the Government and the Storting (Norwegian Parliament). Read more at [www.concept.ntnu.no](http://www.concept.ntnu.no).

appear to have been even more serious. Of about 1 600 investments procured over a ten-year period, it was only possible to identify 550 projects in the registers. Almost 1 000 documents are completely missing or contain only incomplete information. A further problem was that there was nothing corresponding to the Road Administration's object number, which (in principle) would make it possible to link the contract with the cost outcome. It was thus not at all possible to follow up the National Rail Administration's resource use in the 2000s.

These observations coincide with the criticism from the National Audit Office in two reviews of cost control in large road and railway investments (National Audit Office 2010 and 2011a). The research project showed moreover that it currently is actually not *possible* to carry out project-by-project follow-ups except with great effort to ex post and manually attempt to trace decisions and cash flows.

Another example, also from the transport sector, indicates that the problems are similar in nature to those in public transport. Since about 1990, there has been competitive tendering for public transport. Regional authorities specify what public transport they want to have performed and contracts are awarded to the company submitting the tender with the most favourable financial terms.

While those in this sector have high ambitions to increase the use of public transport, its cost is rapidly rising. But little is known about why this is so. As part of the KKV study referred to, an attempt was thus made to follow up the contracts agreed by the entities responsible for bus and rail traffic. Even though the norm appears to be to use production contracts or gross contracts with a fixed payment for a predetermined traffic and regardless of the number of passengers, there are also in this area elements of various types of incentives for cost savings in order to handle quality issues and to encourage the operators to increase passenger traffic.

An ESO study showed that it was not possible to make any follow-ups of signed contracts and that in this sector, it was also difficult even to obtain a copy of the procurement contracts. This is described in more detail in Nilsson (2011) and with an in-depth look at rail traffic procurement contracts in Nilsson and Jonsson (2011).

#### 4.4 Follow-up problems as systemic errors

Each government agency, like each municipality and county council, has a remit drawn up by the Government to ensure that specified types of activities take place. For a large part of the 1900s, this remit was fulfilled by government agencies that produced services for the public in-house, i.e. they used their own staff, machines and equipment for this purpose. Developments in Sweden in the last 20–30 years have meant that services are now provided in new forms.

Some of the changes concern the introduction of customer choice models. In education, for example, parents can now choose the school that their children will attend. Furthermore, governments with different political support have

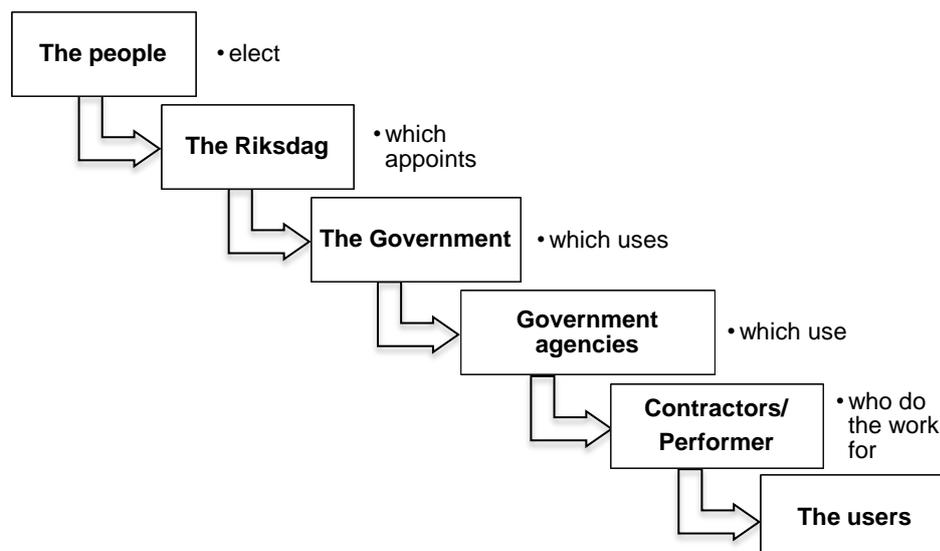
gradually also decided to instruct many agencies that the activity is to be performed by commercial undertakings and procured competitively. These government agencies have thus in practice become procurement offices instead of producing organisations.

The Road Administration is one example of this change. In the 1980s it had its own division for building new roads that carried out 20–30 per cent of all new construction projects and another division responsible for operation and maintenance. Currently all the Transport Administration’s investments are procured competitively. Operation and maintenance have also been exposed to competition, in the Road Administration’s case in the 1990s. Competition for the National Rail Administration’s railway maintenance began in the early 2000s.

The appropriation allocated the Transport Administration currently amounts to over SEK 40 billion a year. A large part of these resources goes to operation, maintenance and new construction of roads and railways. The third paragraph of the Government Agencies Ordinance (SFS 2007:515) runs: “The management of the agencies is answerable to the Government for its activity and is to see that it is conducted effectively ..., that it is reported in a reliable and correct way and that the agency manages government funds well.” Thus, the activity is to be undertaken at the lowest cost possible; the more cost effective it is, the larger the dividend for the funds allocated. The review in Section 4 shows that it is currently not known what the situation is in this respect.

The reason for a change-over to competitive procurement is to reduce taxpayers’ costs. This means that officials in the public sector have to carry out the task given to them by the Riksdag and the Government in a cost-effective way and that the task will be executed using competitive procurement. After the exposure to competition, a new level has been added to the delegation of tasks from voters to consumers of services as shown in Figure 1.

**Figure 2 The democratic delegation of responsibility in Sweden**



Source: Nilsson and others (2012).

Tarschys (2002) pointed out that there was largely a lack of information to bring to the Government and the Riksdag and ultimately to the voters on the outcome of the task they had been assigned. The research project referred to also shows that it is currently not possible to judge whether the resources that have been allocated to construct and maintain infrastructure are being used in an effective way.

It is already well known that following up cost effectiveness and productivity when activities are performed in-house poses serious problems. One reason has been that there is no accounting to show what costs in an organisation concern general administration and what costs are incurred when the activity is performed. This was a recurring problem in the attempts undertaken in the 1980s in the Swedish Agency for Public Management's work on productivity measurement; see for example Nilsson (1985).

As the earlier review made clear, exposure to competition has fundamentally changed the basis for conducting follow-ups. All procurement contracts have to be registered and invoices attested and booked against the registered agreement. With well thought out procedures, it is not only possible but also simple without incurring additional costs to compare cost outcomes with signed contracts. Supplementary information on the contracts concluded make it possible to conduct systematic analyses of cost drivers, of the importance of contract and payment forms, of comparisons of what the costs are for different ordering offices, etc.

Hartman and others showed that there are enormous difficulties in studying in a systematic way the effects of changes in the division of responsibility between the public and private sector in the welfare sector. From the research project financed by the Competition Authority reported above, it is clear that the change-over from in-house production to competitive procurement is also not possible to follow up. There very much needs to be systematic follow-ups of activities to learn what functions in a better or worse way: without follow-up, nothing is learned. The absence of possibilities to conduct project follow-ups should be considered a systemic error.

## 5 Conclusions and recommendations

The three systemic errors that have been discussed are to a large extent different in nature. The difficulties following up completed activities may be because no one has considered what can be gained from having access to this type of information. Consequently, it becomes difficult or impossible to learn from best and less than best practice in order to use resources in a better way in the future. It is still not sufficiently clear what problems this involves for the possibilities of developing the activity further.

As the cost of following up contracts is low, Nilsson and others (2012) present a proposal on how to handle this shortcoming. The Government can thus instruct its agencies in the Government Agencies Ordinance or in another way to state in their annual reports the number of procurement contracts concluded that year and the frequency of cost under or overruns compared to the contracted costs. The agencies can also be required to explain significant deviations. In this way, procurement issues acquire a totally different importance in public administration. This would also make it rational to organise registration and invoicing procedures in a way that makes it simple to compile the required supporting data.

It is less clear how the other two systemic errors can be dealt with. As already noted, the reason is that democratically elected representatives have every right to take the decisions considered appropriate. This is in fact the basis of a democratic system where decisions are not taken by officials with weak links to the will of the people.

This does not imply that all political decisions are wise. The two first systemic errors may thus result in costs to society that are considerably higher than they should be. Taxes and charges on the use of roads and railways that are too low lead to more traffic than what is efficient. This creates pressure for new construction to eliminate bottlenecks. Pricing that moderates the increase in traffic can make it possible to postpone spending on expensive new projects.

When an investment is economically unprofitable, its total utility for current and future users is not sufficient to justify the cost of new construction. Considering the increasing size of projects and thus the rising construction costs, this is a long-term burden on the economy. Because of pressure from regional interests that only meet a small part of the costs but will enjoy a large share of the utility from the new construction, there is a risk that resources will be shifted from investment in human capital (education), for example, to roads and railways with relatively less utility.

But it is neither possible nor desirable to eliminate political control over infrastructure investments. In the existing institutional structure, greater transparency is therefore a way of reducing the risk of unprofitable investments. Norway has taken some important steps in this direction. For example, the Norwegian Ministry of Finance has taken an active part in producing cross-sector instructions on how economic analyses are to be done and what parameter values are to be used; see NOU 2012. This ensures that government agencies conduct analyses in a uniform way and also creates the conditions where analyses can

be conducted without being influenced by the consequences for the agencies' own sector.

In Norway there is also a system whereby large public investments must be preceded by independent feasibility studies. The *kvalitetssikringsordningen* (KS) (quality assurance principle) thus requires external reviews before decisions are taken. KS1 is performed when a government agency presents proposals to the ministry responsible, and the results of the review determine whether the planning work is given the go-ahead. After processing, in KS2, a second independent review has to precede decisions in the Storting for all projects estimated to cost more than NOK 750 million. Regardless of the conclusions drawn in the quality reviews, the Government and the Storting always have the right to take decisions they consider appropriate. The significance of KS only means that there is a better basis for taking these decisions and a thorough analysis of arguments for and against the investments.

The Norwegian Ministry of Finance has asked the Norwegian University of Science and Technology in Trondheim to develop principles for the design of such feasibility studies. This is being done within the framework of the "Concept Project." The Concept Project has now also been asked to develop principles for ex post project evaluation. In this way, it is expected that the possibilities of carrying out evaluations in a consistent manner can be institutionalised.

Nothing in this memorandum indicates that far-reaching economic changes in the public sector such as exposure of previously publicly procured services to competition are wrong. But it is apparent that better follow-up of the activity carried out increases the probability of resources being used in the best possible way and the probability of future savings.

More transparency is also good medicine against systemic errors in the form of bad investments in infrastructure and too low taxes on infrastructure use. By improving knowledge about profitability and what constitutes an appropriate tax level, and by persuading democratically elected representatives to justify their decisions, there is a higher probability that decisions will be conducive to the proper use of resources. Elected representatives' right to take political decisions does not mean that all decisions of this kind are rational from the perspective of society in general. The Norwegian example shows how, within the framework of an unchanged democratic system, the transparency of the decisions taken can be improved.

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