



Summary:

The Swedish Transport Administration's road maintenance

Summary and recommendations

The Swedish National Audit Office has carried out a performance audit of the Swedish Transport Administration's maintenance of surfaced roads. The audit consists of three parts that deal with maintenance of road capital, knowledge of the road network status and the planning process for maintenance work.

Background

The Swedish Transport Administration is responsible for managing the national road network. The agency was formed in 2010 and at that time took over the responsibility previously held by the Swedish Road Administration. The condition of the road network is mainly influenced by the wear and tear of traffic and weather. Passenger cars account for the greatest part of surface wear and tear, while heavy transport accounts for the greatest deterioration under the road surface. Central government expenditure on transport policy was SEK 46.9 billion in 2015, SEK 10.3 billion of which was for operation and maintenance of roads. Maintenance of surfaced roads amounted to SEK 3.4 billion in 2015 and is carried out by contractors through public procurement.

From the point of view of effectiveness it is important to choose the correct type of maintenance and carry it out at the right time. Maintenance measures entail costs for the road operator while a poor state of the roads entails increased costs for road users and the surrounding environment. In terms of the national economy it is not profitable to maintain all roads in the best possible condition. However, refraining completely from maintenance is not an option.

The Swedish Transport Administration maintenance planning aims at using road surface measurements and other knowledge to identify which sections need attention and in what way. The considerations and priorities made by the Swedish Transport Administration are to promote transport policy objectives and be based on cost-benefit analysis.

Questions and grounds for assessment

The audit is divided into three overall questions that together aim to illustrate the effectiveness of the Swedish Transport Administration's maintenance of surfaced roads.

- Is road capital maintained effectively?
- Does the Swedish Transport Administration have sufficient knowledge of the state of the road network for effective planning and ordering of priorities for maintenance measures?
- Does the Swedish Transport Administration's planning process enable effective priorities and effective implementation of maintenance measures?

The Swedish NAO's assessments are based on the responsibility of the Swedish Transport Administration as road operator for national roads, transport policy objectives and the requirement that central government activities must observe a high degree of effectiveness and good economy.

Findings

The audit shows that the state of the road network has improved over a long period of time, but that only marginal changes have taken place in recent years. According to the Swedish NAO there are deficiencies both in the Swedish Transport Administration's knowledge of the state of the road network and in the financial planning of maintenance. Improvements in these areas would enable more cost-effective maintenance of surfaced roads. The most important audit findings are presented below for each of the three questions.

Is road capital retained effectively?

Maintenance of the road network must promote roads with good functionality for users, for example traffic flow and safety, and maintain the capital that the road network represents. In pace with wear and tear of roads, the capital is consumed, but maintenance measures restore the quality and the capital is retained. How the condition achieved can be evaluated in relation to costs is also of importance. Data on the state of the roads, costs of maintenance and traffic volume have been used to estimate how productivity in road maintenance has changed over time.

The road surface has improved over time

The two measurements of road surface condition that are of greatest significance in planning maintenance are longitudinal roughness (IRI) and rutting. Roads with a low volume of traffic are repaired more often due to longitudinal roughness, while roads with

high traffic volume are more often repaired due to depth of rutting. For the period 1990–2015 the existence of longitudinal roughness varied somewhat, but the general trend is towards an improvement. On the other hand, the depth of rutting has been relatively constant during the period, with the exception of somewhat deeper rutting measured in the early 1990s.

The state of the roads in the short term has been analysed in relation to the Swedish Transport Administration's fixed maintenance standard. The standard that was introduced in 2012 steers the level of ambition for road condition. Since then the proportion of the road network that does not achieve the established levels has been just under 5 per cent, with only marginal changes.

Productivity has increased

The Swedish NAO's analysis of how costs of road maintenance, condition of the roads and volume of traffic have developed over the period 1990–2015 shows some productivity increase. For the condition of roads where longitudinal roughness and rutting have been weighed together an improvement of almost 20 per cent is evident, while the traffic volume has increased by about 30 per cent. Despite this, annual costs of road maintenance have *not* increased during the period; on average road maintenance cost about SEK 3.3 billion per year between 1990 and 2015 at 2015 price level, taking into account price increases on input goods in the industry.

Is the Swedish Transport Administration's knowledge of the condition of the road network adequate?

The Swedish NAO has audited whether the regular road surface measurements carried out provide the Swedish Transport Administration with the material necessary for a systematic analysis of maintenance requirements and effective planning and priorities for maintenance measures. The Swedish NAO has also audited whether the measurements are supplemented by other necessary information in a systematic way. The Swedish Transport Administration's estimates of delayed maintenance in the road network were audited with regard to calculation methods and documentation.

Measurements of road surface condition can be more comprehensive

In its regular road surface measurements to assess maintenance requirements, the Swedish Transport Administration collects about ten different types of measurement of the road surface condition. The Swedish Transport Administration's maintenance standard specifies the threshold values for four of the measurements of condition, but it is above all the existence of longitudinal roughness and rutting that leads to maintenance measures. In the opinion of the Swedish NAO the measurements for the most part

provide a good picture of the conditions of the road surface, but there are some types of deficiency that the current condition measurements do not identify adequately. This applies to road friction, which is important for road safety, and local roughness, which gives rise to jolts for vehicles using the road. Cracks allow water to penetrate the road structure and speed up road deterioration. These are not all identified by the road surface measurements.

Limited knowledge of underlying strata

The appearance of a road under the surface affects how fast the road will deteriorate and when it will require maintenance. Measuring the condition of underlying strata is both more expensive and more complicated than measuring the surface itself. The Swedish NAO notes that the Swedish Transport Administration lacks knowledge of factors that are not identified through road surface measurements. For example, there is no aggregate information on the existence and state of road culverts, the road's dewatering capacity, the surface thickness and other geotechnical information on the condition and composition of the road structure. However, the Swedish Transport Administration has some planned and ongoing projects aimed at improving the level of knowledge.

Considerable uncertainty in estimation of delayed maintenance

The Swedish Transport Administration estimates that there is delayed maintenance of roads that would cost about SEK 18 billion to make up over a twelve-year period. This refers for example to the state of the surface, road culverts and in the underlying strata of older motorways. However, there is great uncertainty in the Swedish Transport Administration's assessments of the condition of underlying strata and also the existence and condition of road culverts. The methods used for estimating the state and costs include scaling up to national level on the basis of inventories in individual regions, as well as indirect estimates through analyses of road surface development.

There is probably a considerable amount of delayed maintenance of road structure and road culverts. The Swedish NAO considers, however, that the Swedish Transport Administration lacks knowledge of several important parameters needed to estimate the size and road sections that should be given priority for future maintenance. The Swedish Transport Administration has not reported these gaps in knowledge in the documentation to the Government. This means that the Government's documentation for long-term economic planning in this regard is deficient.

Does the planning process enable effective priorities and effective implementation?

The Swedish NAO's starting point is that different maintenance measures must be possible to compare systematically and decisions must be possible to make on the basis of consistent and clear grounds so that the Swedish Transport Administration can decide on measures that are economically effective. Predictable financing supports sound resource management and cost-effective solutions. The Swedish NAO's audit of the Swedish Transport Administration's internal planning process is intended to clarify whether there are procedures, guidelines and targets that contribute to a systematic and consistent working method. The Swedish Transport Administration's maintenance standard and the degree to which it is motivated by cost-benefit analysis is an important part of this. This also applies to the financial planning, which has been audited on the basis of whether procedures and planning for allocation of funds provides the conditions for the Swedish Transport Administration to ensure cost-effective contracts and that the measures that are best needed are also the measures that are implemented.

The maintenance standard should be based to a greater extent on verified effect correlations

The Swedish NAO notes that the Swedish Transport Administration has introduced working methods and systems that enable more systematic planning. The tendency is towards using objective measurement data to a greater extent as documentation and support when ordering priorities for action.

The Swedish Transport Administration's maintenance standard specifies threshold values for four condition measurements and is an important instrument for planning and ranking priorities for maintenance work. The Swedish NAO notes, however, that the standard is based on cost-benefit analyses for only one of the condition measurements (IRI), and then only partly. In the three other cases the standard is based on assessments based on experience, such as user surveys, simulations and historical comparisons.

The reason that quantitative cost-benefit analyses have not been used to a greater extent is that the Swedish Transport Administration lacks verified effect correlations for most links between the road's recorded condition and effects for users and the surrounding environment. In this context the Swedish NAO notes that no new verified effect correlations have been added since the Swedish NAO's audit in 2009 of the then Swedish Road Administration. The Swedish Transport Administration has noted the effect correlation for road maintenance as a possible area for development, but no projects have as yet been initiated.

In the opinion of the Swedish NAO better knowledge and effect correlation would facilitate setting priorities between different maintenance measures on the basis of economic cost-benefit analysis. Since road maintenance entails major annual costs for the State, the Swedish NAO assesses that there are potential gains to be made from more substantiated effect correlations, despite the costs that may arise in the short term for development work.

Variations in funds allocation a challenge to cost effectiveness

The Swedish NAO notes that variations and uncertainty in allocation of funds for surface maintenance creates challenges to effective maintenance. Both the Swedish Transport Administration's difficulty in predicting how much of the appropriation item operation and maintenance of roads can be used for surface maintenance and any appropriation adjustments during the current financial year contribute to this.

When the Swedish Transport Administration procures surface maintenance, 20 per cent of the budget is in the form of options. Furthermore, the districts must be prepared to procure work for an additional 10 per cent over budget for the cases where further funds become available. The reason is that a buffer is needed to offset costs for winter road maintenance, rising oil prices and other unforeseen events. Depending on how costs within the appropriation item for operation and maintenance develop, the Swedish Transport Administration can reallocate funds during the financial year. Surface maintenance is then used as a form of budget regulator; if there are more funds, more work can be done, and if the framework shrinks then planned measures can be postponed. The funds that become available after February may as a rule only be used during the same financial year for work included as options in existing contracts with contractors.

Large variations in available resources entail a risk that the surface maintenance will not be as cost effective as it could be. If extra funds are made available late in the year there is also a risk that the measures that are then possible in practice are not those with highest priority. Just over a third of the project leaders for surface maintenance state that changes in available resources during the year to a great extent influence the ability to make cost-effective priorities. Managers in the maintenance organisation as well as in control and analysis functions at the Swedish Transport Administration have stated that this allocation method means that operations are not optimal from the point of view of effectiveness.

The Swedish Transport Administration has limited possibilities to use appropriation credit for operation and maintenance of roads. It may only be used to manage disasters and unforeseen events, not for planned measures. Appropriation credit cannot be used to

deal with winter maintenance that has become more expensive than expected due to weather conditions. Nor may it be used because planned surface work has become more expensive due to higher oil prices or to bring forward planned work because raw material prices are favourable. This restriction on how appropriation credit may be used is not stated in the appropriation directions but follows from the Government's informal governance. Moreover, the Government reduced the Swedish Transport Administration's appropriation credit from 10 to 3 per cent in 2016. The Government could approve the use of appropriation credit by the Swedish Transport Administration to achieve greater flexibility in planning and thus better cost effectiveness.

The Swedish NAO's recommendations

The Swedish NAO makes the following recommendations to the Government and the Swedish Transport Administration.

Recommendation to the Government

- The Government should review the Swedish Transport Administration's opportunities and conditions for appropriation credit for operation and maintenance of roads. The Swedish Transport Administration could then be given the opportunity to use appropriation credit to offset cost variations that may arise due to external factors such as the weather (winter maintenance) and significant changes in raw materials prices. This would better equip the agency to set priorities based on cost effectiveness as well as to plan procurements better and thus achieve better business transactions.

Recommendations to the Swedish Transport Administration

- The Swedish Transport Administration should improve its assessment methods for delayed maintenance and clearly report deficiencies in documentation to the Government.
- The Swedish Transport Administration should start the work of implementing further effect correlations when setting priorities for maintenance measures. This would make it easier to base them on cost-benefit analyses.