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The four-step principle in transport infrastructure planning

– is it being applied as intended?

Summary and recommendations

The Swedish National Audit Office (Swedish NAO) has audited the Swedish Transport Administration's work to apply the so-called four-step principle in the planning of investments in transport infrastructure.

Background

Every year, the State invests around SEK 25 billion in new infrastructure in the area of transport. All investments that are approved and are deemed to cost more than SEK 100 million are reported in a 12-year national plan for transport infrastructure that is revised every four years. Decisions on investment projects are to be preceded by a review called the four-step principle. This means that conceivable measures are to be reviewed step by step.

The first step means that it is to be studied if it is possible to address an identified deficiency by reducing or changing demand. *The second step* is about identifying more efficient ways of using existing transport infrastructure. *The third step* includes considering limited renovations and *the fourth step* entails considering new investments or major renovations. The idea is that the fourth step should only be proposed if measures in the first steps are not enough to meet the needs.

The four-step principle was introduced in 1997 at the former Swedish Road Administration. Recurring criticism has been directed at the four-step principle not having made an impact on the actual planning. In the 2011 annual planning bill, it was decided that the planning of the selection of measures should be preceded by an unbiased study extending across multiple

modes of transport with the application of the four-step principle. The Swedish Transport Administration calls them action selection studies. An action selection study constitutes the most important documentation for the selection of measures in the Swedish Transport Administration, together with a so-called collective impact assessment, where an investment's collective costs and benefits are assessed.

To-date, there is no collective evaluation of the new planning process where the four-step principle is to serve as the guide. The purpose of this audit is therefore to investigate if the four-step principle is being applied as intended in the Swedish Transport Administration's action planning and in the action selection studies being done.

Questions and points of departure

The points of departure for the audit were both the Government's goals for the four-step principle as such and the transport policy objectives. Within the scope of the audit, the Swedish NAO has asked four questions to investigate if the four-step principle is being applied as the Government intended:

1. Do the action selection studies contain a systematic step-by-step review of alternatives of differing costs in accordance with the four-step principle?
2. Are actions reviewed in the intermodal manner intended?
3. Do the action selection studies serve as a good basis for the selection of measures?
4. Are the action selection studies and the four-step principle used as a basis for the selection of measures for the national plan?

Results of the audit

The Swedish NAO's overall conclusion is that the Government's and the Swedish Transport Administration's control does not support an approach across multiple modes of transport. The Government needs to clarify in several respects how the Swedish Transport Administration should work with the four-step principle, and the Swedish Transport Administration needs to develop the work method with action selection studies to achieve more cost-effective investments in the transport sector.

Step-1 measures are rarely useful to eliminate deficiencies in transport infrastructure

According to the Government, possible improvements in the transport system should be reviewed step by step according to the four steps. The Swedish NAO's audit shows that the action selection studies fulfil the principle that the measures reviewed are classified according to the four-step principle. In this sense, the four-step principle has had an impact on the work on action selection. At the same time, the step-by-step process needs to be developed.

The Swedish Transport Administration does not review all four steps in all action selection studies. In around half of the action selection studies, there is no review of measures classified as step-1 measures. In addition, the measures are not always reviewed step by step in the sense that it should be first reviewed if a less expensive measure can meet the need before more expensive measures are reviewed. The Swedish NAO's assessment is that the less costly measures are rather seen as a complement to more expensive measures than as an alternative to solve the problem. The Government's intentions with regard to the step-by-step review are thereby not fulfilled.

At the same time, the audit shows that the vast majority of step-1 measures are not useful for solving individual deficiencies identified in action selection studies, and the Swedish Transport Administration also does not have a mandate to implement and finance smaller step-1 measures. The Swedish Transport Administration thereby lacks adequate conditions for applying the step-1 level in the four-step principle. The Government has also not specified how the Swedish Transport Administration should work with the step-by-step process at the step-1 level and the degree to which step-1 solutions are desirable to a greater extent. This applies in particular since the Swedish Transport Administration over time has been given ever larger appropriations by the Government to be able to implement expensive investments that mainly belong to the step-4 level.

If the Government wants to reduce the demand for transport capacity in the long term, or implement transfers of traffic volumes between modes of transport, there are possibilities through general step-1 measures, such as fees, taxes, subsidies and a more well-conceived urban planning. Such initiatives may come from the Swedish Transport Administration, but as the Swedish Transport Administration does not have a mandate to itself implement many of the step-1 measures, it needs to take place with clearer support by the Government.

The intermodal perspective has not had enough of an impact

The intermodal perspective means that the four-step principle is to be applied to all modes of transport. This is fulfilled in the sense that the Swedish Transport Administration conducts the action selection studies in every mode of transport.

But the intermodal perspective also means that action selection is to be reviewed without bias so that the solution can be found in various modes of transport. The Swedish Transport Administration's descriptions of deficiencies are, however, rarely formulated so that measures from several different modes of transport can be reviewed. The deficiencies are accordingly considered in the vast majority of cases to be on the roads or railways in question, in the form of accidents occurring or traffic jams being common. Then it is difficult to work with open problem formulations of the type required for an approach across multiple modes of transport. One example of this is that environmental and health conditions are rarely a main reason for

action selection studies to be initiated since high emissions are rarely a problem just on a specific road or railway.

The descriptions of deficiencies are restrictively formulated to a particularly high degree in the railway area. Here, besides the action selection studies, so-called function studies are also done as a basis for the selection of measures with persistently somewhat restrictive descriptions of deficiencies. According to the Swedish Transport Administration, there are reasons for this as the railway is a closed system where deficiencies of a technical nature are more common. At the same time, this means that the four-step principle is less of a governing factor for railway projects. The assessment of the Swedish NAO is that the four-step principle can be used to an equally high degree in analyses of deficiencies in the railway system as for roads, but that the analyses may need to be done at a higher level with a national overview of the entire system. For example, stronger step-1 measures are difficult to propose on a regional level.

The Swedish NAO assesses that the intermodal perspective has thereby not had enough of an impact in the Swedish Transport Administration's organisation and that the Government has not given the Swedish Transport Administration enough guidance in the issue of how the intermodal concept should be interpreted in practice.

The action selection studies as a basis for action selection need to be improved

According to the Government, the measures decided on should contribute to achieving the transport policy objectives. According to the Swedish NAO this is fulfilled as the descriptions of deficiencies in the action selection studies have a connection to these objectives.

The Swedish Transport Administration has broken these objectives down into six so-called delivery qualities. The most common main deficiencies in the action selection studies are deficient safety, deficient capacity and deficient usability (availability). The other three delivery qualities (punctuality, robustness and environment and health) are rarely given as main deficiencies. The delivery qualities are not adapted to analyse deficiencies on an operational level and several of the delivery qualities overlap with one another; robustness and punctuality are examples of overlap in relation to capacity. The Swedish Transport Administration therefore needs to develop the work on the delivery qualities.

In order to assess the severity of the presented inadequacy or inadequacies, some form of comparative information is needed, such as what can be considered to be an acceptable standard for the section studied. Such information is missing in most action selection studies, however. The reason that this information is missing is mainly that the Swedish Transport Administration has not identified sufficiently developed reference values, but also that the reference values that are available in the Administration are not used to an adequate extent. The consequence is that it is difficult to determine if it is the most serious deficiencies that are

being investigated. Consequently, it also becomes difficult to assess if it is the most cost-effective measures that are ultimately proposed and implemented.

Few action selection studies contain quantitative economic estimates as a support for the selection of measures. Most action selection studies contain a qualitative assessment of the benefits and a rough indication of costs. The Swedish NAO assesses that this may normally suffice. For larger and more expensive measures, however, quantitative estimates of alternatives of varying costs should be done, where more expensive alternatives are posed against less expensive in accordance with the four-step principle. The Swedish Transport Administration has good conditions for doing such economic estimates with the developed impact interaction and estimation models available.

The quality of the cost estimates in the action selection studies is sometimes unsatisfactory. One explanation is that the procedures for knowledge transfer from those implementing the measures to those planning them are not sufficiently well-developed. Another explanation is that more and more cost estimates are being done by consultants. Here, the Swedish NAO notes a risk that the Swedish Transport Administration loses expertise with regard to cost estimates at an early phase for various kinds of measures.

A quality deficiency in the action selection studies is also that the Swedish Transport Administration concludes around one third of all of the studies without a clear measure proposal. In some cases, continued study is proposed. In others, a certain package of measures is proposed in the short term and one in the longer term, without any of the alternatives being ruled out. In such action selection studies, no action selection is done even though this is the purpose of the study. In almost half of all of the action selection studies, the Swedish Transport Administration also does not present any proposal on financing, and it is not always apparent if the action proposals are a basis for a decision in a national transport plan, a county plan or other kinds of decisions. Since different actors can be responsible for financing and implementing the measures, it is important that this is documented, something that needs to be improved according to the Swedish NAO.

In most action selection studies, there are no descriptions of how proposed measures relate to the current maintenance plan. This can be seen as a problem since some measures that are proposed are of a maintenance nature and therefore may need to be coordinated with the maintenance plan. One explanation that has come forth in the interviews is that the project managers who are responsible for the preparation of the action selection studies cannot simply collect the relevant information from the parts of the Swedish Transport Administration that are responsible for maintenance. Here, the transfer of knowledge within the organisation needs to be improved.

The collective picture is that the Swedish Transport Administration needs to improve the quality of the action selection studies by streamlining the study as a basis for action selection and by achieving a more even and more uniform quality.

Action selection in the national plan is sometimes based on older underlying materials

The Swedish NAO has examined a selection of the projects that are in the national plan for 2018-2029. Only projects intended to be implemented far in the future, with construction start no earlier than 2024, are included in the selection. The audit has shown that the Swedish Transport Administration bases action selections for the national plan on older supporting materials that have been prepared with a different methodology where the four-step principle has not been a clearly guiding factor. According to the Swedish NAO, there is reason to set the same requirements on being up-to-date for action selection studies as for collective impact assessments when these form the basis for action selection, especially when they form the basis for action selection for the national plan.

Recommendations

To the Government and the Swedish Transport Administration

- The Swedish NAO's observations indicate that it may often be difficult to find cost-effective solutions in the current planning system, which to a large extent builds on deficiencies being identified from a local level. The Government and Swedish Transport Administration should therefore consider having nationally prepared deficiency analyses and prioritisations on a system level constitute a starting point for the early planning of investments in transport infrastructure to a greater extent.

To the Government

- Clarify how the Swedish Transport Administration should work on the first step in the four-step principle, which consists of trying to solve deficiencies through reduced demand or transfers between modes of transport. This is in light of there being few such step-1 measures that are at the disposal of the Swedish Transport Administration.
- Clarify what is meant by the Swedish Transport Administration implementing a step-by-step review in the selection of measures. This is in light of the Swedish NAO observing that less expensive measures are mainly seen as complements to more expensive measures, rather than as alternatives.
- Clarify more concretely what is meant by conceivable measures being reviewed with an approach that extends over multiple modes of transport. This is in light of the Swedish NAO's audit indicating that the Swedish Transport Administration almost always

describes the deficiencies based on the specific road or railway, which impedes a broader perspective.

- Make sure that the Swedish Transport Administration sets the same requirements on being up-to-date for action selection studies as for collective impact assessments when they form the basis for the selection of measures. This applies in particular to documentation that forms the basis of action selection for the national plan.

To the Swedish Transport Administration

The Swedish NAO is aware that the Swedish Transport Administration is conducting a development effort that is linked to the action selection studies. At the same time, the audit indicated several quality problems and the Swedish NAO therefore provides recommendations for the continued work.

- Develop a clearer specification of the concept of a deficiency, which is a central concept in action selection. There is no clear connection between transport objectives, cost-effectiveness, delivery qualities and operational deficiency concepts in the individual cases. Better internal tools, reference values and delivery qualities need to be developed in order for the deficiency concept to be able to function well as a basis for action selection.
- Consider modifying the action selection study methodology so that the main alternatives to packages of measures posed against each other reflect steps 2-4 in the four-step principle more. One proposal can, for example, be formulated in the scope of existing infrastructure; another in the scope of a limited expansion and possibly yet another that presupposes new construction. This way, possible solutions to the step-2 or step-3 level could be alternatives to expensive step-4 solutions, and not complements as they are today.
- Improve the quality of the action selection studies so that they can persistently serve as a good basis for action selection. Deficiency descriptions should to the furthest possible extent be presented with reference values so that the severity of the deficiency is presented. Use quantitative economic estimates as support for the selection of measures if it concerns major projects. A distinct proposal on action selection and proposal on financing should always be presented. In addition, there should be a description of how proposed measures relate to the current maintenance plan.
- Develop a better knowledge transfer internally within the Swedish Transport Administration between those who implement and those who plan measures, as well as between planners of measures and those responsible for maintenance. This should improve the possibility of both making good cost estimates and choosing good measures.