POST EVALUATION OF ROAD INVESTMENT PROJECTS: HOW CORRECT ARE THE ESTIMATED FUTURE BENEFITS IN THE CASE OF NORWAY?

A. Kjerkreit & J. Odeck
The Norwegian Public Roads Administration, Norway
annekj@vegvesen.no

ABSTRACT

The Norwegian Public Roads Administration (NPRA) carries out cost benefit analysis (CBA) for its trunk road schemes. The purpose of this is to provide decision makers with information regarding the economic viability of the projects. Essentially, CBAs are performed ex ante. They are a prediction of what will occur if projects are implemented.

A question raised by the government auditors and the decision makers is whether the predicted impacts are actually achieved. Thus in 2005, the Norwegian Ministry of Transport and Communications authorised the NPRA to continually carry out ex post studies of implemented projects to reveal the extent to which predictions are correct. The purpose is to determine how far the NPRA is achieving its objectives and benefits from its road programme. Five major road projects will annually be subjected to ex post studies.

By recalculating CBAs of 5 Norwegian road schemes 5 years after the opening with actual data, we find the net present values are greater than forecasted for all 5 projects. One of the main reasons for this is a higher traffic growth rate than forecasted. Investment costs are both under and over estimated. Divergences are also explained by changes in the project design from the before to the after analysis.

1. INTRODUCTION AND BACKGROUND

The purpose of cost benefit analysis (CBA) is to provide decision makers with information regarding the economic viability of projects e.g. by how much will travel time, accidents and air pollution be reduced, and whether these reductions are large enough to offset the investments cost. Based on information from CBA, decision makers may choose to implement those projects that are expected to give high economic returns. CBA's are generally carried out *ex- ante;* before projects are implemented.

In Norway, as is the case in many other countries, there has been no systematic ex post assessments of road investments. Hence, there is little knowledge on the extent to which the expected impacts presented to the decision makers are realized. Road projects in Norway have in the past only been systematically audited with respect to road investment costs [1].

The objective of CBA is to present the relevant impacts to decision makers so that the most economically worthwhile alternatives or projects can be chosen.

Calculations conducted in the cost benefit analysis (speed, accidents, etc) are complex and requires detailed input. Without ex post evaluations, there is little knowledge to what degree the models used to predict impacts reflect the true impacts or not. Questions have been raised as to whether planners try to make a project look particularly beneficial so as to receive funding for the project (also known as "project crush"). As Oxera [2] points out,

ex post evaluations will (1) give input to development of appraisal techniques and tools over time, (2) may give important lessons to designers who are looking for good practicing evidence on delivering roads, (3) show results to policy makers who want to know if the schemes deliver planned benefits and that the road policy is proving effective and (4) show communities if their concerns are effectively addressed or not.

In 2005, concerned with the issues addressed above, the Norwegian Ministry of Transport and Communication authorised the Norwegian Public Roads Administration (NPRA) to continually carry out ex post studies of implemented projects to reveal the extent to which predictions made are correct. The purpose of the ex post re-evaluations is to determine how far the NPRA is achieving its objectives i.e, benefits from its road programme.

Based on the requirement from the Ministry of Transport and Communications, the NPRA developed a guideline for ex post evaluations of monetised impacts [3] and implemented a framework for ex post evaluations. The framework developed by NPRA proceeds by selecting 5 projects each year to undergo an ex post evaluation. The framework was implemented in 2006 and is described below.

This paper presents the results of the first 5 ex post evaluations of benefit cost analysis following the new guideline. The paper is based on the ex post analysis of 5 road projects conducted by consultants in 2006 for the NPRA [4, 5, 6, 7, 8].

The paper is organised as follows: Section 1 provides the description of data and methodology, Section 2 presents the empirical results and Section 3 the concluding remarks

2. METHODOLOGY AND DATA

The guideline for Impact assessments for NRPA (HB 140 Konsekvensanalyser [9]covers a wide range of monetised and non monetised impacts and is widely used both for selecting appropriate alternatives within a given project and between competing projects country wide to enter the National Transport Plan (NTP). Table 1 presents the main impacts covered in the Norwegian impact assessment methodology.

Table 1- Monetised and non monetised impacts

Monetised impacts	**Non monetised impacts**
- Travel time savings - Vehicle operating costs - Accident costs - Induced traffic - Inconvenience cost (ferry projects) - Increased health (walking and cycling) - Noise nuisance - Local air pollution - Road maintenance costs - Residual value of capital - Cost of public funds - Road investment costs	- Visual landscape - Community life effects and outdoor recreation - Natural environment - Cultural heritage - Natural resources

As can be seen from the table, CBA is an integral part of impact assessment. It does not cover impacts that are not measurable in monetary terms. However, it covers quite a large share of the expected impacts from road projects; almost all user benefits.

The NPRA has developed a standardised methodology and guideline for ex post evaluations taking into account only the tangible impacts contained in the CBA. The reason was that only these tangible impacts could be controlled for from one year to the other thus ensuring consistency. Furthermore, there is an established computer programme for calculating these impacts (EFFEKT) such that the ex ante evaluations can be retrieved and compared to the ex post evaluations. The ambition has been to keep the data requirement on a coarse and sober level but still at a level where robust results can be expected. This means detailed results are not expected on the exact impacts, but rather, results where it can be concluded whether it is plausible that the benefits are the same as, bigger or less than forecasted.

The main objective of the ex post evaluations is to measure to what degree the decision makers were presented with the right information about the project's impacts at the time the decision to build was made. Thus, the base principle in the post evaluation is as follows:

- Benefit cost analyses and forecasted impacts presented to the decision makers when the decision to finance the projects was made (the go ahead decision), are the analyses to undergo an ex post evaluation.
- Outturn data on traffic, accidents, costs and speed 5 years after the project has been opened for traffic is used to re-estimate the cost benefit analysis. The original analysis (before analysis) and the re-estimated analysis (after analysis) are compared. The standard cost benefit analysis software package (EFFEKT) is used in this process.

Further, the framework for ex post evaluations implemented in 2006 can be summarized as follows:

- 5 projects are chosen each year to undergo an ex post evaluation. The only requirements is that the projects should have been open for traffic about 5 years and have a construction cost above 200 mill Norwegian kroner (NOK). The projects are chosen the year the ex post evaluation is conducted. Planners are not aware if "their" project will undergo an ex post evaluation when they are doing the impact assessments, so that all projects are planned and assessed with the same level of accuracy.
- The baseline for the ex post evaluation are the assessments that were presented to the decision makers at the time the decision to fund was made. This means that, in the cases where assessments were made earlier than at the decision time, they are updated to the baseline level.
- In order to secure independent evaluation; external consultants are commissioned to conduct the evaluation.
- The ex post evaluations focus only on impacts that enter the CBA; impacts that are monetised. Ideally, non monetised impacts should also have been included in the ex post evaluation as they are normally a part of the wider impact assessment delivered to the decision makers. Thus, a procedure for their inclusion should also be developed in the future.

Projects develop over time. Typically, it takes about 5-10 years from when the municipal master plans are made to the time the decision to build are made. Thus, from the start of the planning process to the time of ex post evaluations, about 20 years may elapse. Within this period, considerable changes in the project may occur. As mentioned earlier, it is the calculations and forecasted impacts presented to the decision makers when the decision to build is made (the decision to finance the project) that undergoes an ex post evaluation.

Appraisal techniques and models are constantly revised and developed, hence the methodologies in use from the before situation (decision to build) to the ex post analysis may be different. Our main objective is to test ex post whether the information presented to the decision makers at the time the decision to build was made were accurate. This imply that the same software package must be used both at the ex ante and ex post stage. Otherwise the results may be distorted in the sense that discrepancies are explained by changes in methodologies and not the forecasts made by planners. Thus, to avoid problems of this type, all ex ante calculations presented to the decision makers were redone using the software package EFFEKT 5.6.3 while holding the original assumptions intact. The same package was again used in the ex post calculations. In this way, the divergence between ex ante and ex post evaluation could only be ascribed to the divergence between estimated and actual impacts and not changes in the methodologies.

Because we are considering ex post evaluations only 5 years after the projects were opened, traffic forecasts create a problem. This is because traffic forecasts are made for the 25 years analysis period and hence we cannot judge whether the forecasts are or will be correct from only a five years perspective. Therefore in the ex post evaluations, we have assumed that the original forecasts made for the last 20 years of the analysis period i.e., after the 5 years we consider, will hold.

2.1. Data collection and ex post analysis process

The ex post evaluations are based on a limited set of data at a coarse level. Due to the long time passing from the municipal master plan through budget and to the opening of project, part of the ex post evaluation is dedicated to uncover the history of the project. The history may explain the differences between the calculations conducted in the before and after situation. The data collection and ex post evaluation process involves the following steps:

1) Acquiring project overview, project history and project development over time. This involves acquiring all the necessary details of the project such as objectives of the project and other changes in the project (changes in design etc)

2) Retrieving the database which was the basis for CBA presented to the decision makers at the time the decision to build was made

3) Possibly redoing the original CBA with a newer version of the software for CBA

4) Substituting the outturn data into the cost benefit analysis in (3) and recalculating. Outturn data includes:
    a. Traffic on main link and bypassed link based on traffic counts for the first 5 years. Traffic growth for the next 20 years of the project life is assumed the same as in the baseline assumption.
    b. Accidents for the first 5 years of the project. This data is used to recalculate the accident risk which is substituted into the cost benefit analysis.
    c. Cost overruns or under runs

d. Average speed

5) Once (1) – (4) is accomplished, the differences between the before and after studies are compared and explained

2.2. Characteristics of projects studied

Five projects of different characteristics were chosen for ex post evaluation in 2006. A short summary of each of the project is as follows:

Rv 714 Hitra-Frøya:
Hitra-Frøya is a project where a fixed link (sub-sea tunnel) replaced a ferry link between the islands of Hitra and Frøya. The project consists of the tunnel and the connecting roads. Hitra had already been linked to the mainland. The objective of the project was to increase the accessibility to and from the Island and to boost regional development.

Rv 23 Oslofjordforbindelsen(Oslo fjord link)
The Oslo fjord link is a strait crossing (sub-sea tunnel) across the Oslofjord which replaced the Storesand- Drøbak ferry. The objective of the project was to decrease user costs and to link E6 and E18 which are two trunk roads on each side of the Oslofjord. Other secondary objectives were to reduce accidents and improve the environment on the local roads.

Ev18 Rannekleiv- Temse
The project replaced an old trunk road on E18 between two cities in the south of Norway. The objective was to reduce user costs and to reduce environmental problems, traffic accidents and uncertainty by transferring traffic from local roads to the new E18

Ev 134 Teigeland- Håland
The project replaced an existing road with a new road mostly in a tunnel. The objective is to reduce user costs and reduce the risk of avalanches.

Rv 62 Øksendalstunnellen
The project replaced an existing road with a new road mostly in a tunnel. The main objective is to reduce the feeling of insecurity caused by avalanches and secondarily to reduce user costs.

3. RESULTS

The main objective of this study is to get insight into whether there is a divergence between the forecasted impacts and the estimated impacts based on outturn data. Data on construction costs, accidents and traffic are of special importance when explaining the differences in the cost benefit analysis between the before and after situation. Also historical changes in the project are of importance.

3.1. Changes in the project from the before to after analysis

Rv 23 Oslofjord project:
A 2 stage project was assumed in the before analysis. The first stage was a single tube tunnel and the second stage was the construction of a twin tube tunnel to separate the traffic to get one way tunnels. The second stage was assumed to be realised in 2013. At the time of the ex post analysis, only a single tube tunnel with two lanes had been built and

there is no thoughts about building the second stage. The second stage is thus not included in the after analysis.

Rv 714 Hitra- Frøya:
The planned project consisted both of the tunnel and an improvement of the connecting road. At the time of the ex post evaluation, the design of the connecting road had still not been decided, meaning a part of the project still has not been built. In the ex post analysis, only construction costs of the built part of the project is included and the traffic is assumed to follow the old road on the part that is not built.

Ev 134 Teigeland – Håland
A part of the project was not built since the project management decided not to build the full project to avoid cost overruns.

Thus already at this stage, one may conclude that several changes occur early in the project life to the effect that projects are not realised as planned. This may have an impact on the magnitude of cost overrun and traffic volumes as we shall see the next sections.

3.2. Construction costs

Table 2 below reports the magnitudes of cost overrun.

Table 2 - construction costs

	Construction costs (mill NOK)		
	Before	After	Difference
Rv 23 Oslofjordforbindelsen	1560	1370	-12 %
Ev 18 Rannekleiv - Temse	215	263	22 %
Rv 714 Hitra - Frøya	589	460	-22 %
Ev 134 Teigeland - Håland	437	385	-12 %
Rv 62 Øksendalstunnellen	215	218	1 %

The construction costs seem to have been over estimated on three of the five projects. The history and development of these projects are however important factors which explain some of the difference between the before and after situation. For the Rv 23 Oslofjord project a part of the project (the twin tube tunnel) has not been built at the time of the ex post analysis and will most likely never be built. Hence the construction cost is lower than assumed in the before analysis. In the case of Rv 714 Hitra- Frøya, a part of the planned project has not built, hence the investment cost in the after analysis is lower than in the before analysis. A part of the Ev 134 Teigeland- Håland project was not built since the project management decided not to build it to avoid cost overruns on the project. The cost is thus a bit smaller than assumed in the before analysis.

In the case of E18 Rannekleiv- Temse, the costs were under estimated in the before analysis. More environmental mitigating measures were built, changes in the standard of the tunnels due to traffic safety and geo technical difficulties during construction were some of the reasons for this.

3.3. Traffic volumes

Both traffic volumes and traffic growth rates are an important input when calculating benefits of the schemes. Traditionally the traffic forecasts for simple schemes have been

conducted using traffic count data and simple elasticity models. The prognoses for traffic growth rates are most often based on the national forecasts for different regions.

Table 3 shows the traffic forecasts and the outturn traffic for the opening year and the average traffic growth the 5 first years after the project was opened

Table 3 – Traffic forecast and outturn traffic

	Traffic opening year			Average traffic growth, 5 first years	
	Before	After	Deviation before/after	Before	After
Rv 23 Oslofjordforbindelsen	4240	3780	-11,0 %	1,4 %	6,8 %
Ev 18 Rannekleiv - Temse	8232	10242	24,4 %	1,2 %	3,2 %
Rv 714 Hitra - Frøya	353	512	45,0 %	1,2 %	18,3 %
Ev 134 Teigeland - Håland	1000	1367	37,0 %	1,2 %	2,3 %
Rv 62 Øksendalstunnellen	1386	1345	-3,0 %	1,0 %	5,5 %

The quality of the traffic forecasts varies between projects. For two of the five projects, the traffic volume was lower than forecasted in the opening year. For all projects, the average traffic growth was higher than expected. This implies higher traffic volumes in year 5 after opening for all projects studied in comparison to the forecasts.

In all the projects, national traffic prognoses for the regions were used for traffic growth rates. The results in Table 3 emphasizes the need for the ongoing work on traffic prognosis where the national transport prognosis is revised, and also split on different road types, giving the option of using traffic prognosis that are better adjusted to the specific project. In other words, the prognoses that have been used seem to have been too general and did not take account of project specific factors.

The observations in Table 3 can be explained on a project by project basis as follows. For the Oslo fjord project, less heavy vehicles chose the new link as compared to forecasts. Further, the new link did not divert traffic from the ferry further south through the Oslo fjord tunnel as was expected. When considering the growth rate for the first 5 years, the observed growth rate is higher than predicted by the national models.

In the case of the Hitra- Frøya project, the fixed link seems to have induced more traffic than forecasted. Induced traffic of 63 AADT was assumed in the opening year. The forecast/assumption did not take into account that the toll on the tunnel would be removed in 2004, as this was not known in the before situation. Traffic counts adjusted for general traffic growth showed an increase in traffic in the opening year of about 165 AADT. It is uncertain whether the induced traffic is caused only by the Hitra-Frøya tunnel or if the neighbouring projects (Eg the Hitra tunnel linking Hitra to the mainland) are also causing some of the effect. The toll on the tunnel was removed in 2004, leading to increased traffic for that year, thereby influencing the average traffic growth for the 5 first years. The traffic growth rate the first 5 years has generally been higher than forecasted.

For Ev 18 Rannekleiv- Temse, the analysis shows that the traffic generally was higher than expected both for the project link and the links which were relieved. The diversion from local roads to E18 was, however, smaller than expected.

In the case of Teigeland- Håland, both the traffic in the opening year and the average traffic growth is higher than expected. In Rv 62 Øksendalstunnellen, the traffic growth has been much higher than expected for the first 5 years of the project. The average traffic growth rate for the project has been higher than the average traffic growth in the county which again has been higher than the national traffic prognosis for the county. Questions

have been raised to whether the high average traffic growth can be a result of diverted traffic from other routes. This however has not been tested in the ex post analysis.

3.4. Accidents

Data on accidents were used to recalculate the accident risk. These accident risks were then substituted into the EFFEKT programme to calculate reduction in accidents and accident costs. Because 5 years is a short period, the data on accidents gathered are uncertain and should be used with care. Table 4 reports the estimated reduction in accidents with personal injury for the opening year in the before and ex post analysis,

Table 4 – Estimated reduction in accidents with personal injury; opening year

	Estimated reduction in accidents with personal injury, opening year	
	Before	After
Rv 23 Oslofjordforbindelsen	8,6	7,8
Ev 18 Rannekleiv - Temse	6,1	8,1
Rv 714 Hitra - Frøya	-0,2	-0,2
Ev 134 Teigeland - Håland	0	0,7
Rv 62 Øksendalstunnellen	1,84	1,94

All projects except for Hitra-Frøya have a lower accident rate than forecasted. A part of the Hitra-Frøya is still not built. The traffic is thus still following the old road on the link connected to the tunnel, meaning a longer travel distance than assumed in the before analysis, implying a slightly smaller reduction in accidents with personal injury for the opening year.

The Oslo fjord project has a lower accident rate than forecasted, and the reduction in accidents is estimated to be lower in the after analysis for the opening year. The reason for this is most likely lower traffic than forecasted in the opening year. In the before analysis of Teigeland – Håland, the accident rate assumed for the new tunnel was higher than what is normally used for such projects, hence the accident savings were estimated to be a bit lower than in the after analysis.

3.5. Estimated speed vs. travel time measurement

Travel speed was measured for the project and compared to estimated average speed on the main new link in the before analysis. The results are shown in Table 5.

Table 5 - Estimated and measured average travel speed

Project	Before	After
Rv 23 Oslofjordforbindelsen	84 km/h	77 km/h
Ev 18 Rannekleiv-Temse	85 km/h	80 km/h
Rv 714 Hitra - Frøya	74km/h	68 km/h
Ev 134 Teigeland - Håland	80 km/h	80 km/h
Rv 62 Øksendalstunnelen	80 km/h	79km/h

In the Oslofjord analysis, the speed limit was assumed to be 90 km/h for the new link in the before analysis. The speed limit was however set to 80 km/h, thereby implying a lower average speed on the new link. In the ex post analysis of the Hitra –Frøya project, the traffic is still following the old road on a part of the project leading to a lower speed than calculated in the before analysis. The measured speed is substituted into the after benefit cost analysis for both these two projects. Questions arose about the measured speed in

the Rannekleiv-Temse project and the measured speed was thus not used to recalculate the cost benefit analysis. In the two last projects, the measured speed was close to the estimated speed and hence the measured speed was not used in the recalculation of the benefit cost analysis.

3.6. Benefit cost analysis

By comparing the results of cost benefit analysis before and after the projects were implemented, we can deduce to what degree the objectives of the projects are being achieved. The results of such a comparison are shown in figure 1.

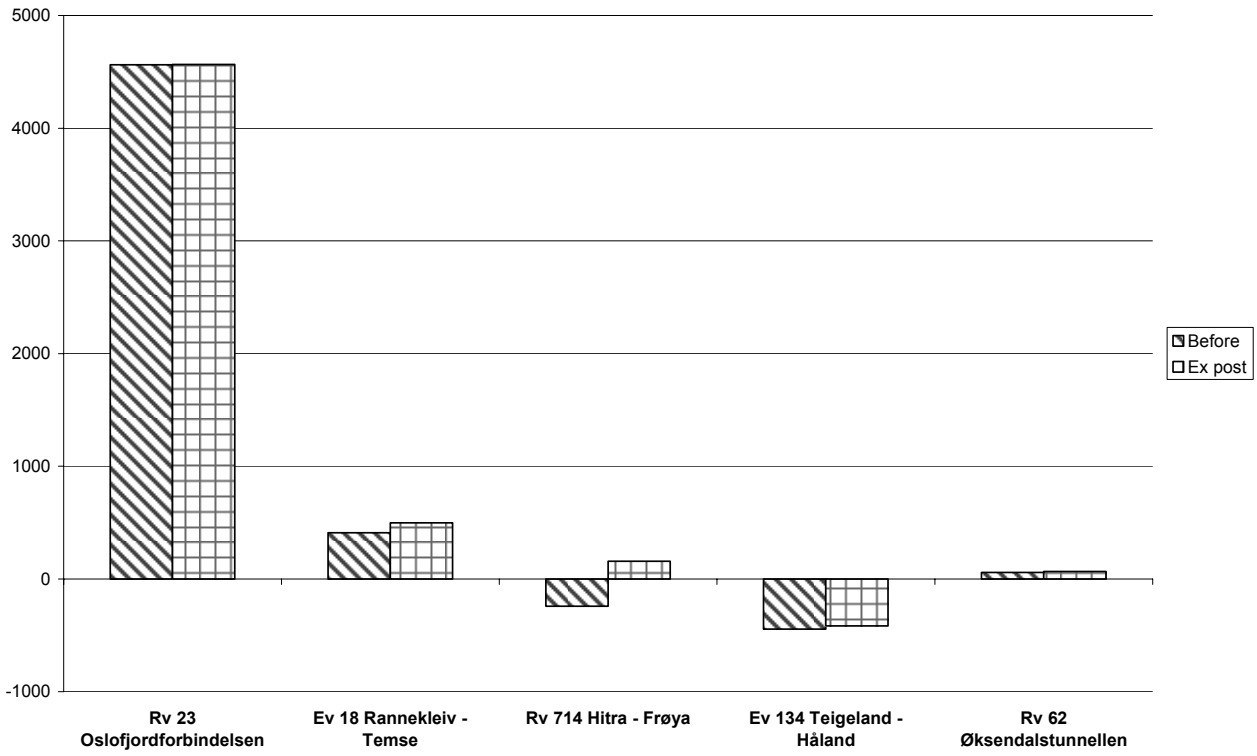

Fig 1 - NPV in before and after analysis

NPV for all projects are higher than forecasted; meaning that the projects have led to larger benefits to the society than forecasted.

Table 6 presents the differences between the forecasted and actual estimated impacts. A positive number means the calculated impacts in the ex post analysis is higher than originally forecasted. A negative number means the impacts are smaller than forecasted.

Table 6 – cost benefit analysis

	Difference before- after (Mill NOK)					Difference % of predicted				
	Rv 23 Oslofjord-forbindelsen	Ev 18 Rannekleiv - Temse	Rv 714 Hitra - Frøya	Ev 134 Teigeland - Håland	Rv 62 Øksendals-tunnellen	Rv 23 Oslofjord-forbindelsen	Ev 18 Rannekleiv - Temse	Rv 714 Hitra - Frøya	Ev 134 Teigeland - Håland	Rv 62 Øksendals-tunnellen
Time	512	87	66	22	5	13 %	23 %	58 %	49 %	4 %
Accidents	-66	163	-29	33	10	-14 %	52 %	237 %	1630 %	11 %
Vehicle operating costs	16	-81	-17	1	2	2 %	-240 %	553 %	40 %	4 %
Residual value	-24	5	-8	-7	-2	-19 %	22 %	-22 %	-23 %	-7 %
Welfare gaing induced traffic			183					451 %		
Inconvenience costs	-101		31			-36 %		74 %		
Other		-6	-8	0	0	1 %	156 %	-81 %	-20 %	6 %
Total Benefits	**337**	**167**	218	**49**	**17**	**4 %**	**22 %**	**96 %**	**60 %**	**5 %**
Other costs	**123**									
Total Cost	**335**	**78**	**-180**	22	**6**	**22 %**	**23 %**	**-38 %**	**4 %**	**3 %**
NPV	**2**	**89**	**398**	**27**	**10**	**0 %**	**22 %**	**165 %**	**-6 %**	**18 %**

First, consider time costs. All projects have higher time savings than originally forecasted. Even for the projects where the average speed on the main link was lower than assumed, the travel time savings are higher. The main reason for this is higher traffic than expected. Another explanation is that some of the projects were built with a somewhat slightly better standard, leading to higher time cost savings.

Concerning accident costs, 3 of the 5 projects lead to higher accident cost savings than expected. Looking back to 3.3, this can be explained by a lower expected accident frequency on the new link. Both the Oslofjord project and Hitra Frøya achieves lower than expected accident cost savings. In the Hitra- Frøya case, both the higher traffic and the fact that a part of the project is not yet built are reasons for lower accident cost savings.

For vehicle operating costs, Hitra- Frøya has a smaller reduction in vehicle operating costs than forecasted. This is also the case for E18 Rannekleiv – Temse, where the before analysis forecasted a reduction in the operating costs while the after situation seems to show an increase in operating costs. The travel distance is longer than assumed in the before analysis of the Hitra-Frøya project since a part of the project is not built. This has lead to a smaller reduction in vehicle operating costs than forecasted. Higher traffic in the system, less diverted traffic to the new road lead and a lower speed limit than assumed has in the Rannekleiv- Temse project led to an increase in the vehicle operating costs.

With respect to the estimated welfare increase caused by induced traffic, Hitra-Frøya seemed to have a higher induced traffic than forecasted, hence leading to a higher estimated welfare gain in the ex post evaluation of the project. In the ex post cost benefit analysis, the welfare gain caused by induced traffic is the main benefit, hence it is important to consider the uncertainties in the calculation of induced traffic. Some of the measured/calculated traffic ex post might be diverted from public transport. Some of the induced traffic might be a result of neighbouring projects. Probably a better and more complete CBA should have included both the Hitra-Frøya project and the neighbouring projects together and considered all transport modes.

Looking at the cost benefit analysis in relation to the objectives of the projects, it seems that the projects are fulfilling their objectives.

4. CONCLUDING REMARKS

One of the biggest challenges in the ex post evaluations has been to find the data and documentations of the project. Cost benefit analysis of the projects are done at different stages in the planning process hence making it difficult to find both the right database with documentation of the inputs to the analysis. A well organised system where the original cost benefit analysis with the corresponding input data is gathered and documented is needed to make good ex post evaluations in the future.

The ex post evaluations have revealed:

- All projects seem to result in higher NPV than forecasted and to fulfil their objectives.
- The average traffic growth rate has generally been higher than forecasted. The national regional transport forecasts on traffic growth rates have most likely been too coarse to be used at a specific project level. Ongoing work on National traffic prognosis where the prognosis is revised and also split on different road types will hopefully reduce the divergence between the traffic forecast and the outturn traffic and hence the accuracy of the cost benefit analysis.

- 2 of the projects have been built differently than was presented to the decision makers. The reason for this was to avoid cost overruns for one of the projects. A part of the second project was postponed due to the fear of cost overruns, and is still not built as it has been difficult to decide on the design of the rest of the project. It is thus natural to raise the question to whether the plans presented to the decision makers were adequate to warrant the decision to build.
- Knowing the history of the project is of importance when conducting the ex post analysis. The reason for divergence between the before and after analysis can be due to the project being built differently than was assumed in the before analysis

The ex post evaluations presented in this paper have focused on the cost benefit analysis. Non monetised impacts are sometimes the main reason for choosing an alternative in front of another option; hence it is interesting to evaluate these impacts ex post. One of the challenges in the future will be to consider which method can be used to evaluate these impacts as objectively as possible.

Ex post evaluations can be of importance both in the development of appraisal methods and as a valuable tool for measuring to what degree the NPRA is achieving its objectives and benefits from its road programme. More results are needed before general conclusions can be drawn. Providing results from the ex post evaluations to planners and decision makers can provide valuable input into the planning processes.

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