

**Summary:**

# **Cost benefit analysis of a tunnel replacing the ferry operating between Horn and Andalsvåg in Southern Helgeland in Northern Norway**

## **Background**

A tunnel is planned to replace today's ferry between Horn in Brønnøysund municipality to Andalsvåg in Vevelstad municipality. The direct distance is 5 km. This area is in the southern part of Helgeland in Nordland county in the Northern Norway. The tunnel had a calculated cost for 405 mill NOK in 2004 prices. The valuation was carried out by The Road Department in Norway. To day a ferry is operated between Horn and Andalsvåg by a local ferrycompany (Torghatten Trafikkselskap as).

A new tunnel will not be finished at the earliest in 2010. The problem we ask in the report is what are the social benefits and costs of a project that replace the ferry with a tunnel.

We have studied the available ferry statistics of the last 3 three years and come to a conclusion of how the travel is divided between the different travel purposes and by which rate they have been growing for the available years of the statistics.

We have assumed that the yearly increase in the demand for ferry travels is 2 pct.

## **The economic costs of the project**

We have assumed a ferry has a life of 20 years while the itself tunnel has longer lifetime, but other components have shorter lifetimes than a ferry.

In the ferry alternative we have assumed a manning of 3 men on two shifts. We have assumed a calculation interest rate of 4,5 % in both alternatives. In 2010 the yearly costs of the ferry alternative is 23,9 mill NOK while it is yearly costs of 37,9 mill NOK in the tunnel alternative valued in 2010 at 2007 prices.

The yearly difference in costs (both capital and operating costs) between the ferry alternative to the tunnel alternative is calculated 13,9 mill NOK.

## **The economic benefits of a tunnel**

It is important to have a though analyses of the benefits of establishing a tunnel compared to the ferry solution of today. Principally we should only count the effects generated by the projects not effects that are transferred from another municipality from another municipality within our study area which is assumed to

the 8 surrounding municipalities around Vevelstad, (The study area is beside Vevelstad, the municipalities of Bindal, Sømna, Brønnøysund, Vega, Herøy Alstadhaug, Leirfjord numbering totally approx. 24 000 persons.)

We should only include economic activities created in establishments within tourism where the customers come from areas outside our defined study area. And mostly it is such demand from foreigners or tourists coming from a lng distance outside this area.

We have calculated the yearly inconvenience costs to the habitants of the area to 7 mill NOK. This covers all such costs;

- a) reduced and hidden waiting time
- b) adaption of the travel to the time of the ferry arrivals (no travels in the night)
- c) reduced time of travel

Especially b) no night service of the ferry is important to the habitants of the Vevelstad municipality.

For the farmers in the area the transport costs of produced milk and other deliveries will be reduced by a tunnel. Such costs is addition to the cost calculated above. The reduction in transport costs are valuated to 210 000 NOK per year.

The hospital situated at Sandnessjøen. (Altstadhaug north of Vevelstad is serving the whole population with hospital services.) There is an ambulance boat transporting the patients to and from the hospital. The operating costs of this service will be reduced by a tunnel because the service distance of the boat will be substantially shorter. We have used the hospital's estimates which have calculated this to 1 mill NOK per year in 2010.

## **Tourism**

There will be established a new national park north of Vevelstad which will be much more accessible by having a tunnel compared to the ferry. Such traffic will increase by establishing the park, but it will have a further growth by having a tunnel. We have calculated this under different assumptions to more than 1 mill NOK yearly.

## **Calculation of a cost benefit ratio**

All values are at mill 2007 NOK. The benefit of the tunnel compared to the ferry alternative is calculated to 155 mill 2007 NOK. The cost of establishing and operate the tunnel compared to the ferry is calculated to 161,1 mill 2007 NOK. A tunnel under the fjord consists of different components some have a long lifetime (the tunnel itself), while others (pumps and other equipment) have shorter life. The ferry is assumed to have a life of 20 years before it is not used as a ferry used for public transport.

The project we are discussing is recommended to last for 25 years.

The results of the calculations are shown in the table S1.

*Table S1. Calculation of discounted values of costs and benefits for 2010.  
Mill 2007 NOK.*

Calculation		Discounted values (mill 2007 NOK)	Restvalue (the tunnel alternative less the ferry alternative)	Sum
1	Benefits (alternative of tunnel less ferry alternative)	155,5		155,5
2	Costs (tunnel alt. less ferry alt.)	93,0	68,1	161,1
3 = 1 - 2	Net Benefit of the tunnel alt, compared to the ferry alternative of today	62,5	-68,1	-5,6
4 = 3 : 2	Cost Benefit Ratio			-0,03

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This gives a cost benefit ratio<sup>1</sup> of 0 which gives the interpretation that the project is so to speak profitable.

Our conclusion is that with the traffic we observe to day the tunnel benefits do not exceed the costs compared to the ferry alternative. The calculated ratio is 0. This means that the extra invested funds in a tunnel give return to the society compared to the ferry solution that covers the extra resources the society has put into it.

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<sup>1</sup> In an international context where the cost benefit ratio is 1,00 when the social costs equal the benefits, the calculated cost benefit ratio is calculated to 0,97.