Institute of Transport Economics
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Summary:

A Cost-Benefit Analysis of Proposed New Infrastructure in the Southern Helgeland region

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In this study, we calculate the costs and benefits of proposed new infrastructure in the Southern Helgeland region in Northern Norway, infrastructure comprising a subsea tunnel (7 km) and a bridge connecting Hamnøya with the mainland at Vevelstad. Roads connecting the tunnel with the existing roads and a ferry berth at Hamnøya are included in the new infrastructure alternative, which is calculated will be profitable with a very small margin.

Sør-Helgeland Regionråd has proposed a cost-benefit analysis of new road infrastructure:

1. A tunnel from Horn in Brønnøy county to Vevelstad county
2. A bridge joining Hamnøya with the mainland at Vevelstad
3. A change in the ferry service between Vega (Igerøy) – Hamnøya (Vevelstad) and Tjøtta (Alstadhaug) (two ferries)

The proposal (called "new infrastructure" in this analysis) will realise increased traffic through the tunnel. The population of Vega will benefit from a more frequent ferry service between Brønnøy and the mainland at Vevelstad and two ferries serving Hamnøya out of Vevelstad.

The "new infrastructure" will be an alternative to the situation today (Alternative 0), where there is no tunnel connecting Vevelstad mainland with Brønnøy or a bridge connecting Hamnøya and Vevelstad. With the "new infrastructure", traffic to and from Vega will benefit from shorter and more frequent ferry routes and from the tunnel under Velfjord. There will be more traffic using the tunnel than there is currently on the two ferries between Igerøya at Vega and Horn at Brønnøy and the ferry between Andalsvåg at Vevelstad and Horn, i.e. more traffic passing through the tunnel than was assumed in a previous cost-benefit analysis carried out for this area (Jean-Hansen, 2007).

The new proposal will lead to greater regional integration of the municipalities of Sør-Helgeland. County road 17 between the regional centres of Sør-Helgeland (Brønnøysund and Sandnessjøen) will have increased traffic. The alternative is the E6, which is the main route bypassing Vevelstad through Nordland county. It is longer (96 km longer) and there are no ferries.

We have examined the routes connecting Brønnøysund and Sandnessjøen as part of the longer routes such as between Trondheim and Bodø, where Brønnøysund and Sandnessjøen are the regional centres. The through traffic between Bodø and Trondheim will probably still opt for the route along the E6 with no ferries.

The three routes calculated in the cost-benefit analysis are:

- Brønnøysund-Sandnessjøen along County road 17
- Brønnøysund-Gladstad (the main centre of Vega)
- Brønnøysund-Sandnessjøen via Vega

The routes are calculated for three types of vehicle (passenger cars, lorries/vans and heavy goods vehicles (longer than 14 metres)) and for both Alternative 0 (the situation today) and the "new infrastructure" alternative.

The general costs are calculated for each vehicle type, i.e. travel time, driving costs and ferry tickets with no tolls on the "new infrastructure" alternative. General travel costs have been calculated for all three routes and both alternatives.

Costs differ for each type of vehicle. For passenger cars, driving costs are calculated at NOK 1.45 per km (Samstad et al., 2005) inflated by the CPI from 2005 to 2010. For lorries/vans, costs are NOK 4.33 per km and for heavy vehicles NOK 4.97 per km. Calculation includes variable costs such as fuel, tyres, insurance and servicing of vehicles.

Saved travel time

The times saved travelling by the different routes are calculated in the table below.

Table S.1 Travel times by the two alternatives. Saved travel times by each route. Minutes. Percent.

	Br.sund.Vevelstad-SSj (Fv 17)		Br.sund.-Vega (Gladstad)		Br.sund.-Vega-SSj	
	Alt 0	Alt New Infrastructure	Alt 0	Alt New Infra-structure	Alt 0	Alt New Infrastructure
	Minutes		Minutes		Minutes	
Driving time	60	62	27	46	43	62
Ferry time	70	39	50	24	120	39
Waiting time	60	30	40	15	100	28
Travel time	***190***	***131***	***117***	***85***	***263***	***128***
Saved traveltime		-60		-32		-135
Saved travel time in percent of travel time in the Alt 0		-31 %		-28 %		-51 %

Source: TØI.

We assumed a traffic speed of 60 km per hour for all vehicles and all routes. Estimation of the expected duration of waiting times on routes is the most uncertain part of the analysis.

Costs

The costs of the "new infrastructure" alternative are given in the table below.

Table S.2 Construction costs for the "new infrastructure" alternative. Mill 2010 NOK (MNOK).

Infrastructure	Costs according to SVV Region North	TØI's calculation
Tunnel	900	990
New road system to tunnel	50	50
Bridge between Hamnøya and Vevelstad	200	140
Ferry berth at Hamnøya	50	50
Total costs of the "new infrastructure"	1200	1230

Source: SVV Region North and TØI.

TØI's calculation of costs takes into consideration the uncertainty of tunnel costs, while the SVV Region North's estimate does not.

Total implementation costs of the "new infrastructure" alternative are calculated to be MNOK 873 (M€112), but when increased accident costs, environmental costs and costs to society are included, i.e. the infrastructure financed by public taxes, the total costs are MNOK 965 (M€124) calculated at 2010 values.

Traffic calculations

The three ferries (Horn - Andalsvåg, Horn - Igerøya and Forvik - Tjøtta) carried a total of 105 600 vehicles in 2009. According to the NTP (National Travel Plan - NTP)) prognosis for Nordland county, ferry traffic is expected to increase to 113 800 vehicles by 2020. Depending on changes in general costs for the different types of vehicle, this will increase when the "new infrastructure" (tunnel and bridge) alternative is established and ready for use. The traffic will have increased to 186 700 vehicles by 2020. The "new infrastructure" alternative will mean an increase of 72 900 vehicles in traffic in 2020, which is calculated by multiplying the reductions in general travel costs by the elasticities of the types of travel (leisure, to/from work and in service).

Calculated elasticities of the general travel costs are:

- Passenger cars have an elasticity of -1.2
- Lorries and vans have an elasticity of -0.9
- Heavy goods vehicles have an elasticity of -0.5

The elasticities for passenger cars are weighted by purpose of travel: leisure (-1.6), work (-0.7) and service (-0.5).

The benefits that will be gained from the "new infrastructure" are calculated to be MNOK 966.

Cost-benefit ratio

Cost-benefit ratio is calculated as the net benefit (MNOK 966 minus MNOK 965) equalling 0.2 MNOK. The cost-benefit ratio is then calculated as:

0.2 : 965 approximately 0

i.e. the project is calculated as profitable with a scarce margin given the assumptions made in the analysis, which are standard in cost-benefit analysis.

Cost-benefit analysis of the two alternatives is uncertain in regard to length of waiting time on the ferry quay. Careful analysis shows that the cost-benefit ratio will increase to +0.05 if waiting time is cut by 5 minutes in both alternatives. If reduced by only 5 minutes in the "new infrastructure" alternative, the cost-benefit ratio will increase to +0.18 and in this case the project will be profitable with a good margin.