



## Concept Symposium 2016

# Governing the Front-End of Major Projects

### Feasibility study of a fixed link across the Oslo fjord



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Around 2 million of Norway's total population of 5 million live near the Oslo Fjord which is considered to be a substantial barrier for transport and regional development. Presently there are two crossings of the Oslo Fjord south of Oslo – a subsea tunnel 20 kilometers from the capital and a ferry service between the relatively small towns of Moss and Horten approximately 40 kilometers further south.

In November 2014 the Public Roads Administration in cooperation with governmental authorities for railways and coastal services presented a report from a front-end analysis of the transport system across the Oslo Fjord. The presentation gives an overview of conclusions and recommendations and discusses some methodological challenges. The report recommends further planning of a fixed road link between Moss and Horten. Here the Oslo Fjord is 5 kilometers wide, and this is obviously a mega project. A tunnel or a bridge may cost 20 – 60 billion NOK (approx. 2 – 6 billion €). The transport directorates conclude that the market for rail travel across the fjord is far too small to make a railway crossing economically viable.

Transport analysis and socio economic assessment indicate that monetized benefits of a fixed road link may be considerably higher than costs. On the other hand a new road for 30 – 40.000 vehicles per day will have adverse effects in sensitive areas with national value when it comes to nature, agriculture and cultural heritage. Thus the front-end analysis has raised massive protests on both sides of the Oslo Fjord.

Many expects a fixed link will generate considerable benefit outside the transport market – so called wider economic impact. This perspective is investigated with a spatial, computable equilibrium model. The result is that wider economic impact seems to be modest compared with other big road projects.



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# Feasibility study of a fixed link across the Oslo fjord

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# The Oslo fjord region today



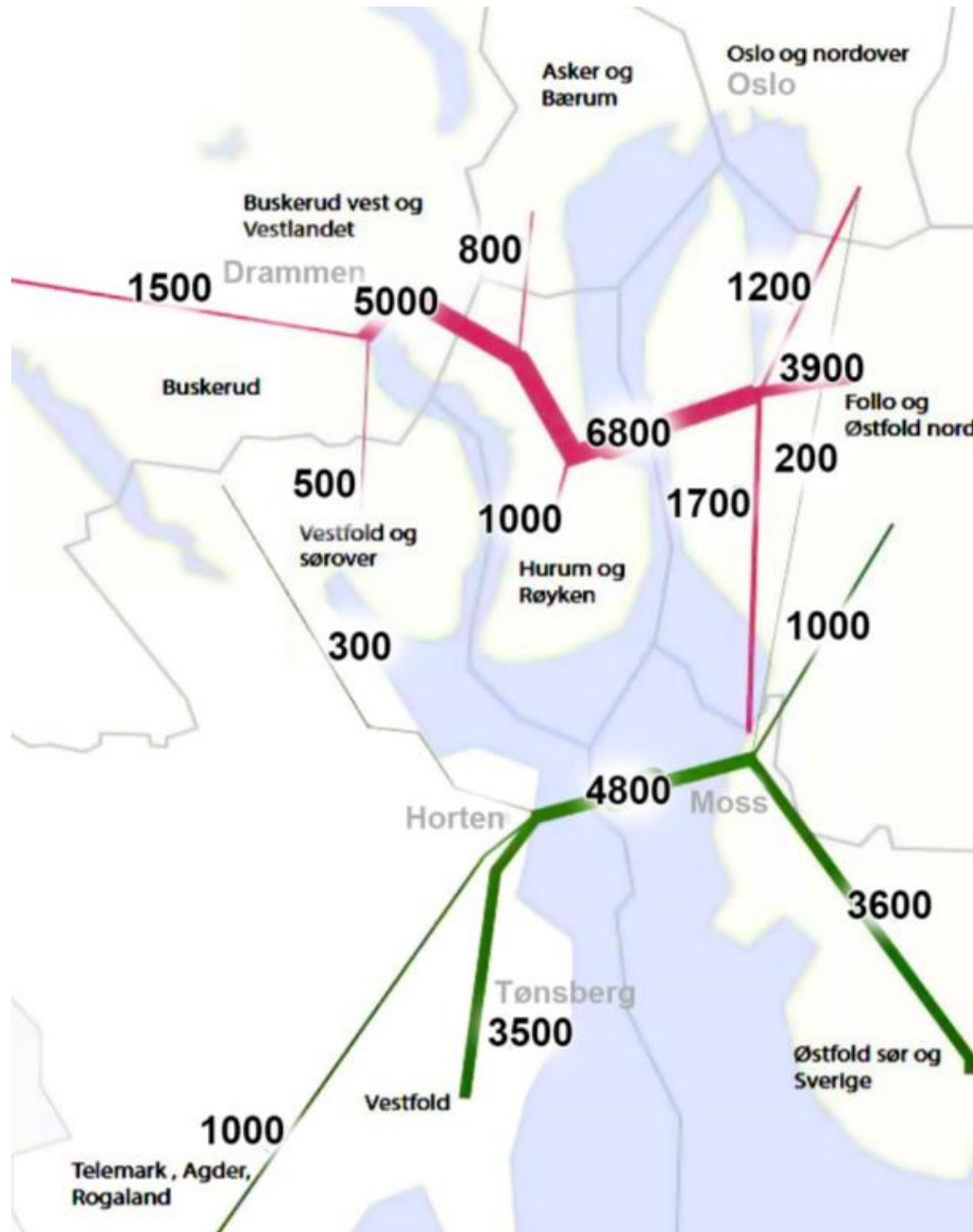
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- Oslo – the capital of Norway
- 2 million people – 40 per cent of the Norwegian population
- A subsea tunnel and a ferry service across the Oslo fjord
- A corridor on each side of the fjord with motorways and ongoing building of InterCity railways
- The Oslo fjord is considered to be a substantial barrier to transport and regional development





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## Present traffic flows across the Oslo fjord

Transport model calculations, 2010



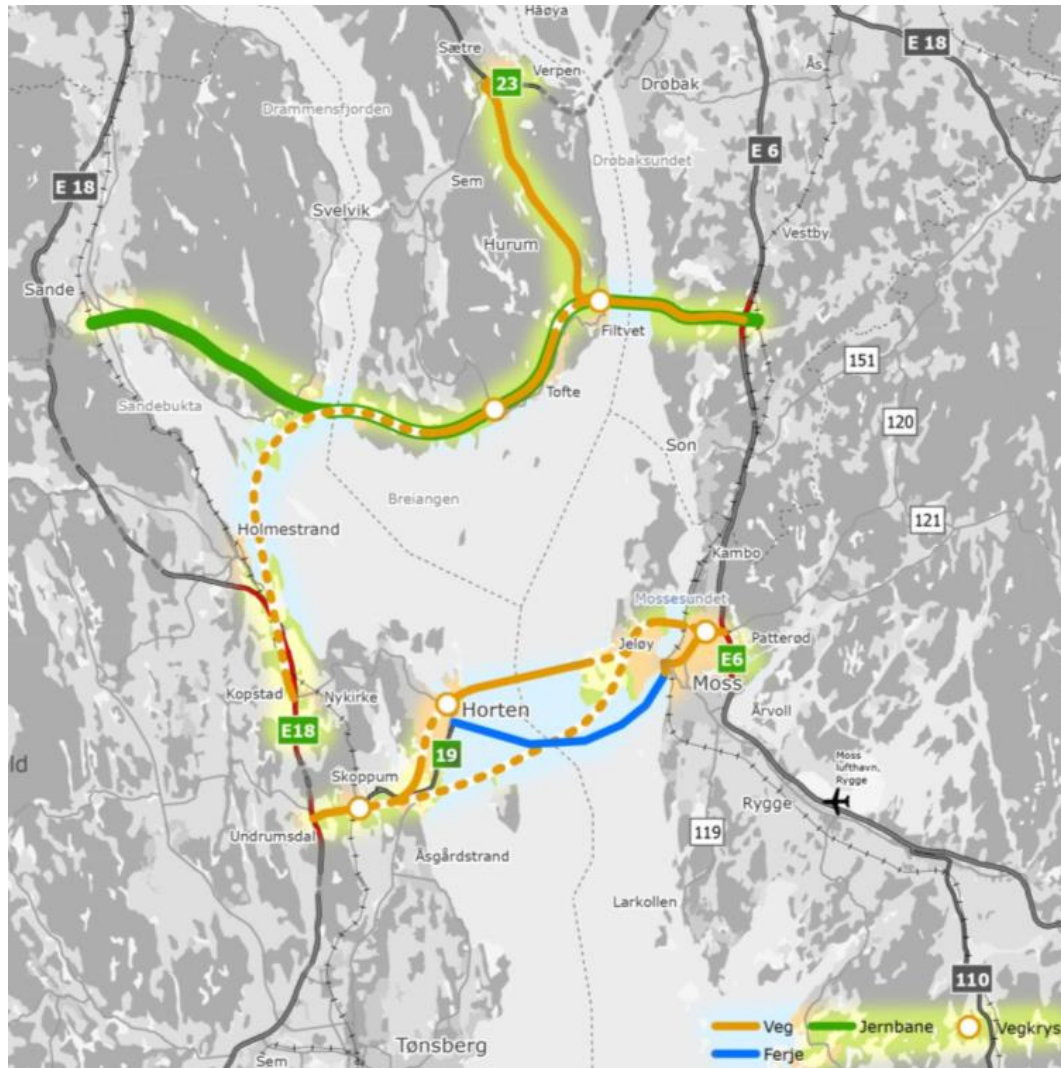
## Societal objective

# Point of departure

- Our societal objective
  - ✓ An environmentally friendly and efficient transport system that delivers predictable transport, meets requirements of enterprises and connects markets for housing and labour across the Oslo fjord.»



# Analysed concepts

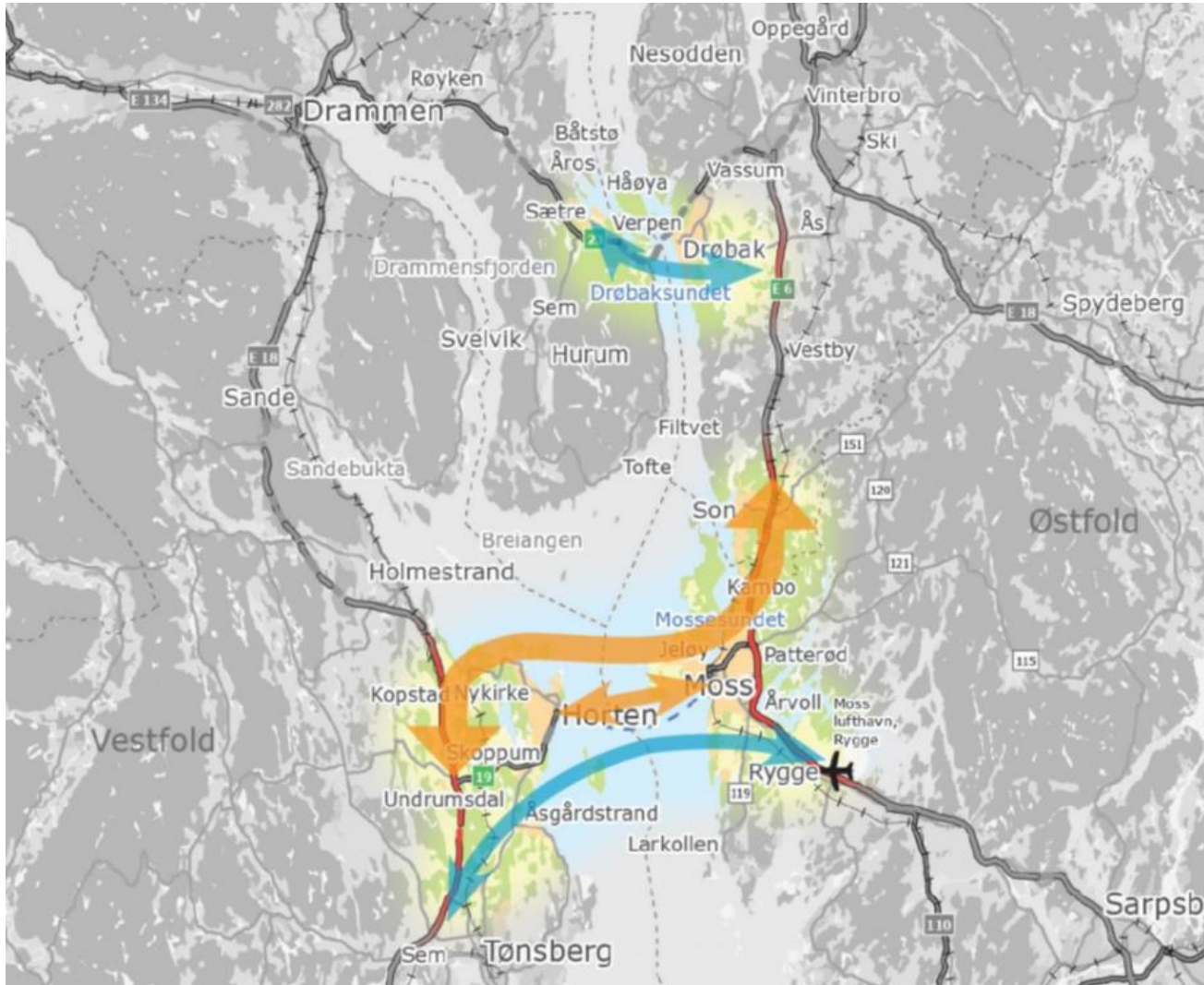


- Three road links with bridge or tunnel (orange lines)
- One railway link (green line)
- Improved ferry service (blue line)

Dotted lines are tunnels

## Effects on traffic flows

# Example: A fixed road link Moss – Horten



## Results from transport analysis

- ↔ New traffic across the fjord – due to changes in destinations and routes
- ↔ Present traffic flows in the Oslo fjord tunnel or with the ferry Moss – Horten (only modest increase in these travels)



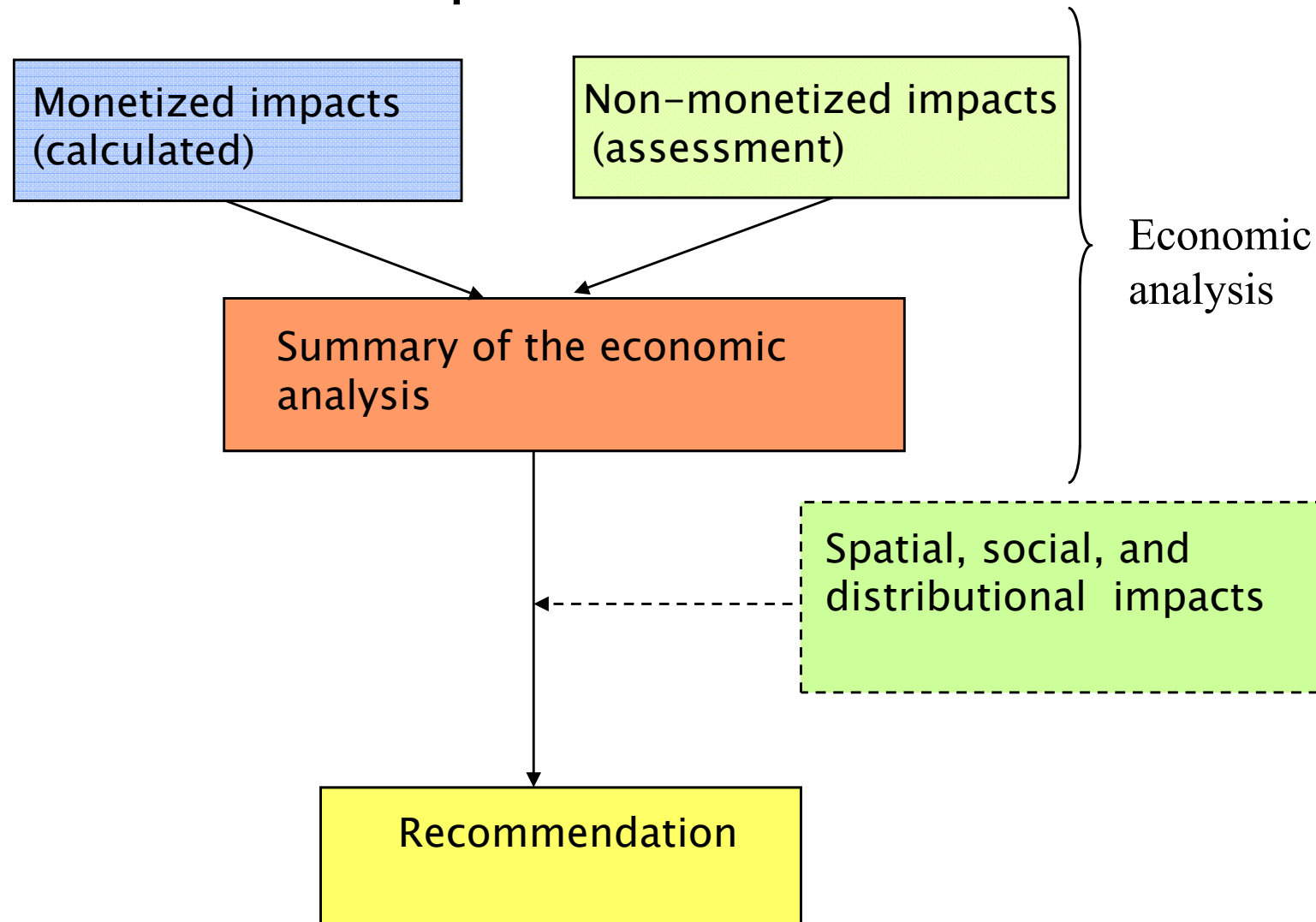
## Our recommendations

- Continue planning of a fixed road link between the towns of Moss and Horten
  - ✓ This concept seems to give the highest benefit for transport and enlargement of markets for housing and labour
  - ✓ Further investigations are required to choose tunnel or bridge
- In the short term it is important to develop a more frequent and environmentally friendly ferry service
- Unfortunately – the market for rail travel is far too small to make a railway crossing economically viable.



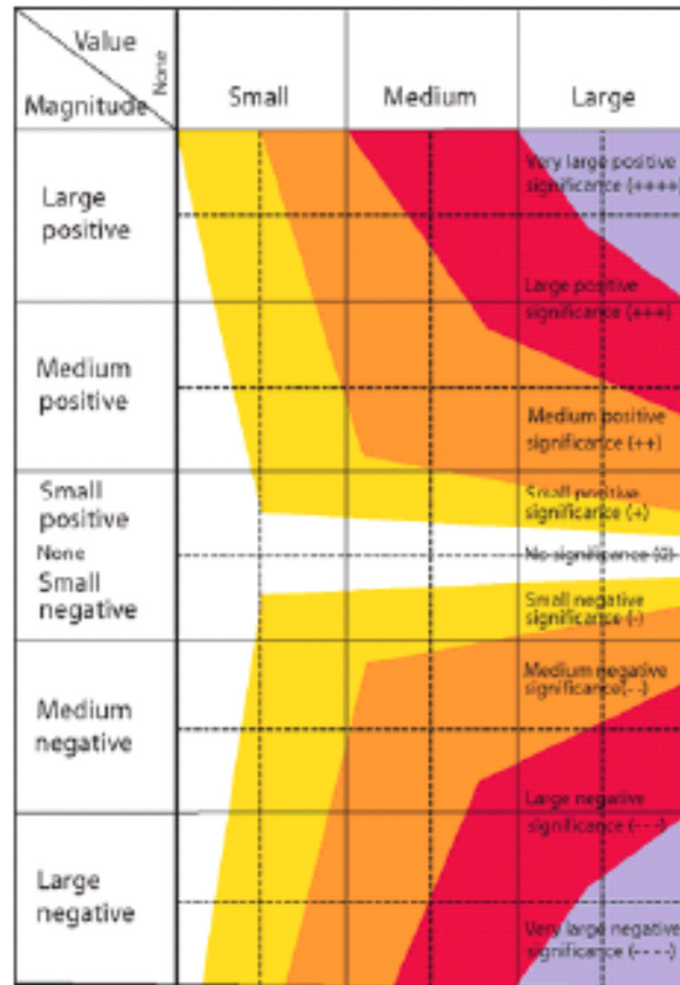


# Procedure of Impact Assessment





# Assessment of non-monetized impacts



*The significance of the various impacts is to be assessed by combining the value and the magnitude of impact.*



# Economic analysis – monetized and non-monetized impacts

<b>Benefactors</b>	<b>Impacts</b>	<b>Category</b>
Transport users	Travel time, travel cost, health for walking/cycling, insecurity	Monetized
Operators	Change in economic result	
The government	Budget effects	
Third parties	Traffic accidents	
	Noise and air pollution	
	Residual value	
	Cost of government funds	
	Landscape	Non-monetized
	Community life and outdoor life	
	Natural environment	
Cultural heritage		
Natural resources		



# Monetized benefits and costs

In NOK mill.

<b>Benefactors</b>		<b>Bridge Moss – Horten</b>	<b>Tunnel Moss – Horten</b>
Transport users		78 000	72 000
Operators		÷ 6 000	÷ 6 000
The government		÷ 38 000	÷ 16 000
Third parties	Traffic accidents	÷ 1 300	÷ 2 300
	Noise and air pollution	÷ 269	÷ 99
	Cost governmental funding	÷ 7 600	÷ 3 200
	<b>Net benefit</b>	<b>25 000</b>	<b>44 000</b>
	Net benefit per NOK in budget funds	<b>0.7</b>	<b>2.8</b>



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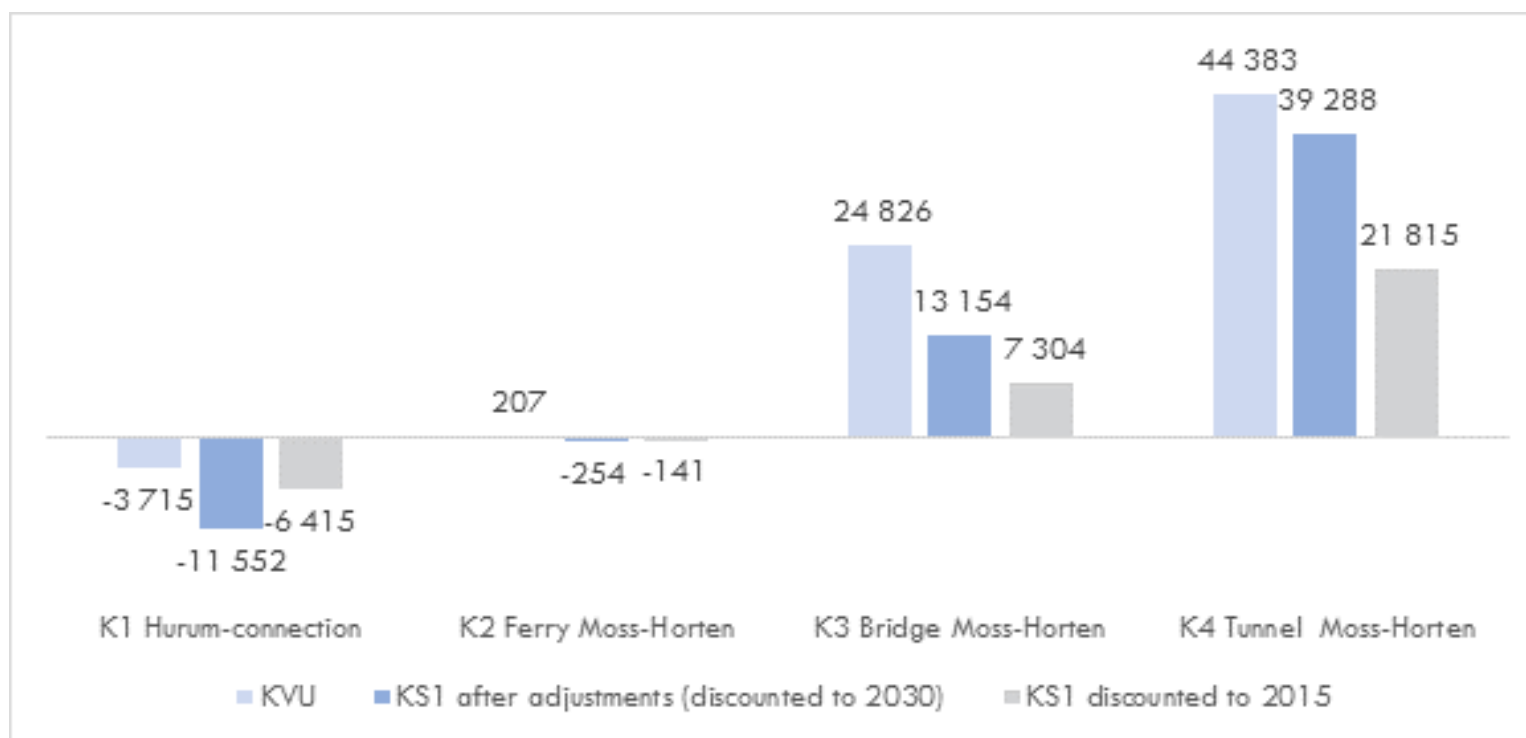
# Uncertainty in transport models and economic analysis

- Benefits for users of the transport system represent nearly all benefits measured in monetary terms
  - A result from the transport model based on present preferences and travel behaviour
  - How reliable is the model in calculating the long term effects of a completely different transport system?
- Are our estimates of investment costs far too optimistic?
- We can't avoid uncertainty in planning
- Uncertainty is an important topic in the external quality assurance (QA1)



# Net benefits, results after QA1 adjustments

## Concepts K1-K4 (NOK mill.)



Source: The Norwegian Public Roads Administration (Statens vegvesen), Oslo Economics and Atkins Norway



# Effects on regional development

- Emphasized by the Ministry of Transport and Communications
- Three approaches to assess effects on regional development
  - Wider economic impact
  - Potential for increased commuting
  - Long term effects for allocation of new housing and jobs





# Wider economic impact I

- Common anticipation –a fixed link should generate considerable regional effects on top of benefits covered in CBA
- Economists agree that some transport projects have wider economic impact
  - Due to agglomeration effects
  - Especially major projects in cities
  - No authorised method for estimating wider economic impact



## Wider economic impact II

- Institute of Transport Economics calculated wider economic impact in a spatial, general equilibrium model (SCGE model)
  - Reduced transport costs contribute to more efficient use of resources in markets outside transport
  - In principle SCGE compares benefit of concepts in two situations – with perfect and imperfect competition
- Result from calculations in SCGE model
  - Relatively low figure for wider economic impact compared to other Norwegian projects
  - Possible explanation: A fixed link will connect two rather similar regions with nearly the same population and «clusters» of towns with a variety of jobs and within commuting distance to Oslo



## Balancing monetized and non-monetized impacts I

- **CBA**  $\implies$  a fixed road link Moss – Horten seems to be a very promising project – in monetary terms
- **BUT** a motorway across the Oslo fjord also means
  - More car traffic and increased emission of greenhouse gases
  - Congestion, noise and air pollution in towns
  - Adverse effects in areas with national interests related to nature and cultural heritage
  - Negative impacts on outdoor life at sea and on shore
- A fixed link, especially a bridge, has met massive protests from local and national organisations and municipal councils



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## Bridge Moss – Horten

«Invisible» landing via an artificial island





## Balancing monetized and non-monetized impacts II

- Our front end analysis (KVU) concludes that positive monetary net benefit outweighs non-monetary adverse impacts of a fixed link
- This conclusion is not based on calculation
- (Hopefully) we have a transparent method for evaluating non-monetary effects on a scale with nine impact levels