



Statens vegvesen
Norwegian Public Roads
Administration

The Coastal Highway Route E39 : – an improved and continuous road by 2035

21/09/2016

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The E39 Coastal Highway Route

Attracts a lot of attention at home and abroad

JUL 22, 2016 @ 04:41 AM 10,056 VIEWS

The Little Black Book of Billionaire Secrets

Could Norwegian Engineers Really Build A Floating Tunnel In A Fjord?



Laurie Winkless, CONTRIBUTOR

I am a writer and physicist, obsessed with the science of cities [FULL BIO](#) ✓

Opinions expressed by Forbes Contributors are their own.

For those of us who live in busy, built-up cities, travelling through tunnels is an everyday occurrence. But engineers in Norway want to build a world-first in one of their fjords – an underwater, tube-shaped tunnel that floats. This is being proposed as part of a [huge infrastructure project in Norway](#) – an upgrade to highway E39, which runs from Kristiansand in the south to Trondheim in the north, a route which is 1100 km long. But thanks to Norway’s (staggeringly beautiful, but occasionally inconvenient) geology, it cuts across seven fjords. Which means that your ‘drive’ between the two cities actually includes seven ferry trips, and takes 21 hours. The upgrade aims to make the route entirely ferry-free, to reduce travel time to just 11 hours. And this is where the proposal for a floaty bridge-tunnel comes in.

Now, as you know, I’m a big fan of both bridges and [tunnels](#), but a structure



How comfortable would you feel driving through a submerged tunnel?
(Image credit: Statens Vegvesen/NPRA)

Forbes, 22 July, 2016



Nærmere 13 mill visninger – 91k likes Facebook

The world's first underwater suspended tunnel is planned in Norway.



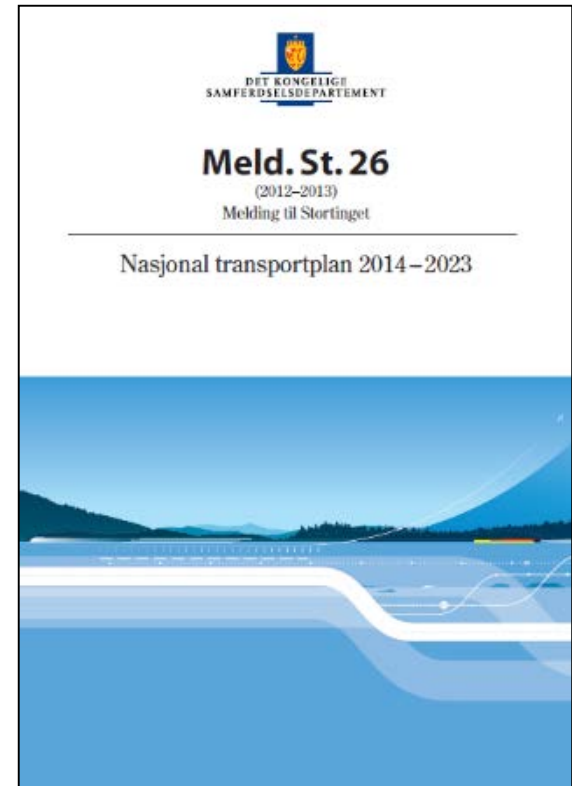
[Video](#)



National Transport Plan 2014–23

Discussed in Parliament June 2013

- From the Government's Report to the Storting (White Paper) No. 26 (2012–2013):
 - Ambition: An upgraded and continuous E39 Coastal Highway without ferries
 - Within 20 years if construction takes place as one continuous project
 - NOK 150 billion will reduce travel time with 7–8 hours
- The Storting agreed

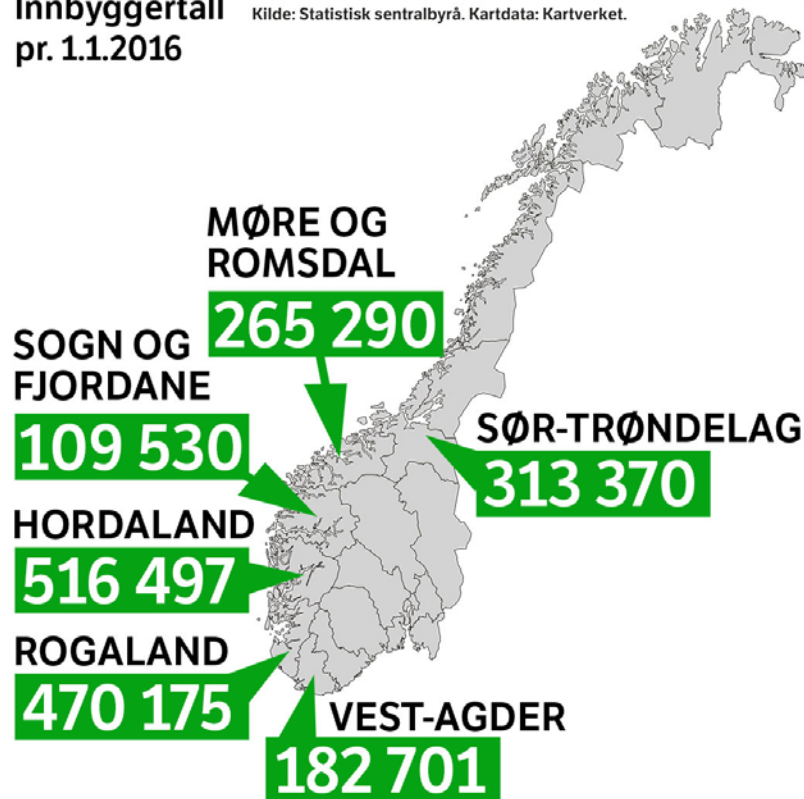




The E39 Coastal Highway Route Population

Innbyggertall
pr. 1.1.2016

Kilde: Statistisk sentralbyrå. Kartdata: Kartverket.



- 35 % of our population
- 48 % of our export value



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Today's E39

- The E39 Kristiansand-Trondheim: Approx. 1100 km, including 7 ferry crossings
- E39 ferry connection Kristiansand-Hirtshals in Denmark
- E39 links up with the E45 Aalborg - Italia



The E39 Coastal Highway Route



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Improved and continuous – how?

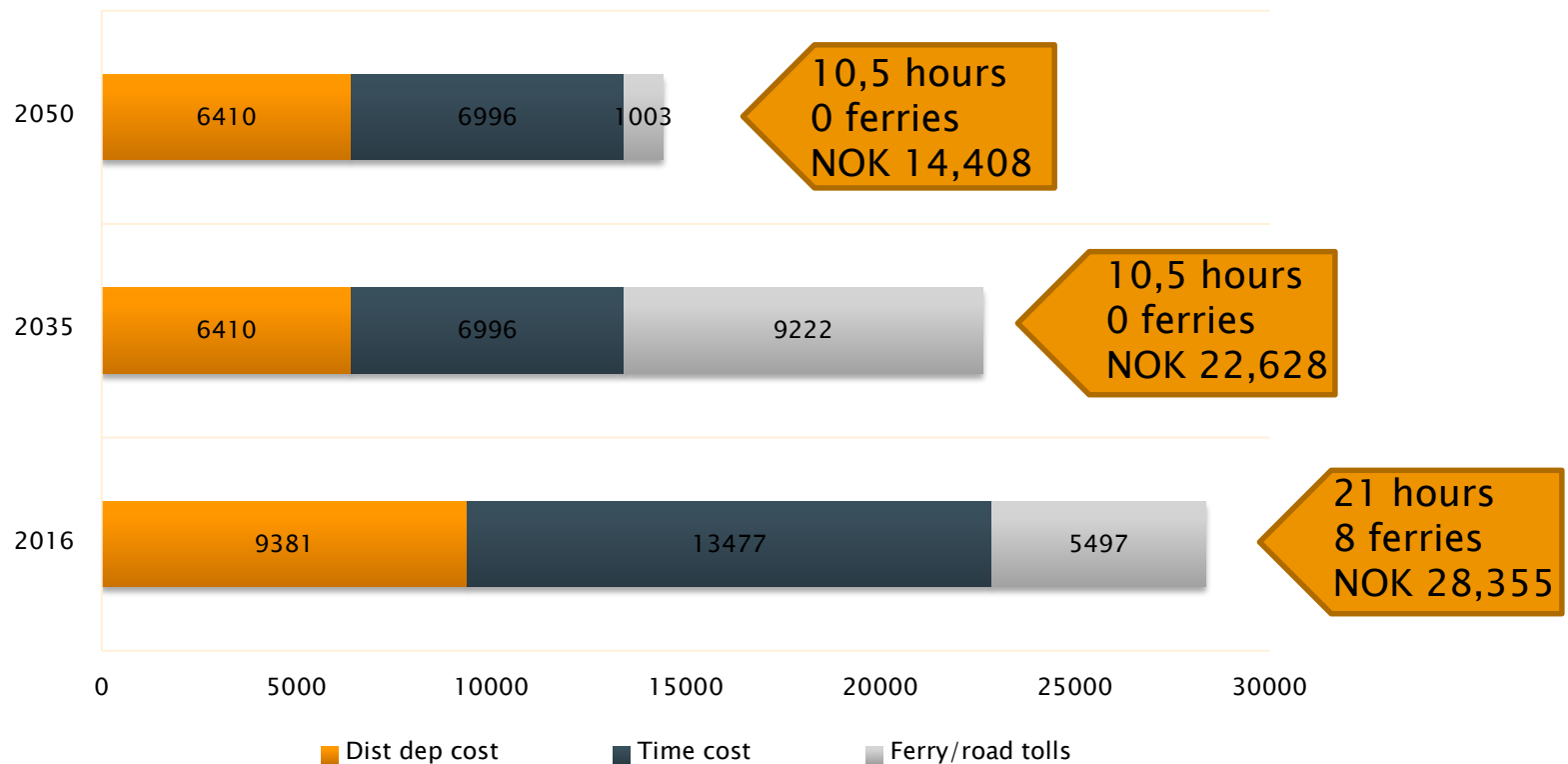
- Main transport artery through Western Norway
 - Improved standard, in both urban and rural areas
 - A number of fiord crossings require **new untried solutions**
- Travel and transport times **reduced by 50 %**
- Open road 24/7





The E39 Coastal Highway Route

Major savings for freight transport by road





The national transport plan (NTP) 2018–2029

Work in progress

- The transport agencies' proposal for the NTP was handed over to the Ministry of Transport and Communications on February 2016
- Development strategy for an improved and continuous E39 Coastal Highway Route Kristiansand–Trondheim
- Consultations/commenting and political processing towards spring 2017





The E39 Coastal Highway Route Environment

- Major construction-related impact in a vulnerable coastal landscape
- Emissions of greenhouse gases are to be cut
- Emissions over a 40-year period will be almost the same as for today's E39 – despite strong increase in traffic volumes
- Underlying parameters are constantly changing; new energy sources exploited

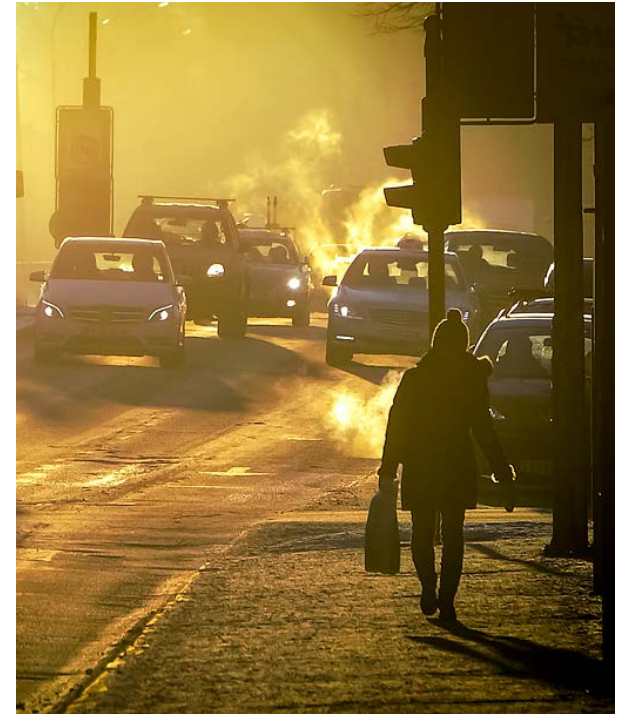


Foto: Statens vegvesen

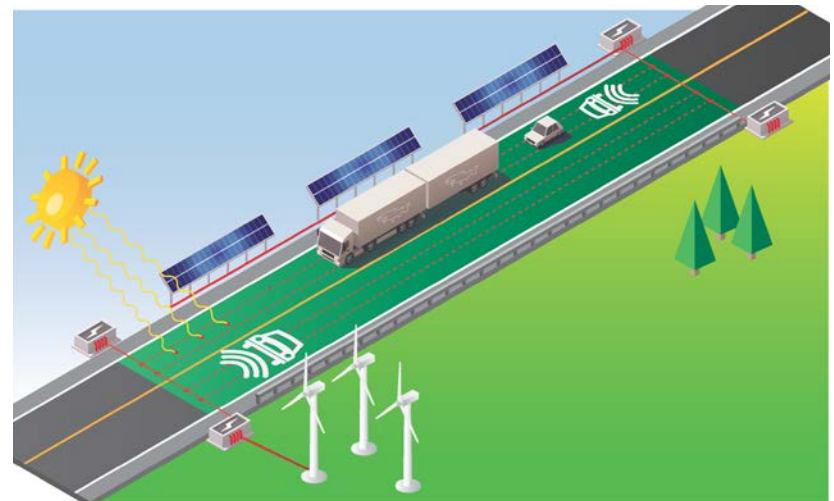
The Sustainable Infrastructure

Energy harvesting, storage, efficiency improvement and charging

Assessing the potential for:

- Wave power
- Tidal power plants
- Wind power
- Solar power

Power road?



The E39 Coastal Highway Route

New technology and competence

- The five largest fiord crossings require development of new technology and more knowledge
- Development costs estimated to make up 5 % of construction costs for each project
- Competence building

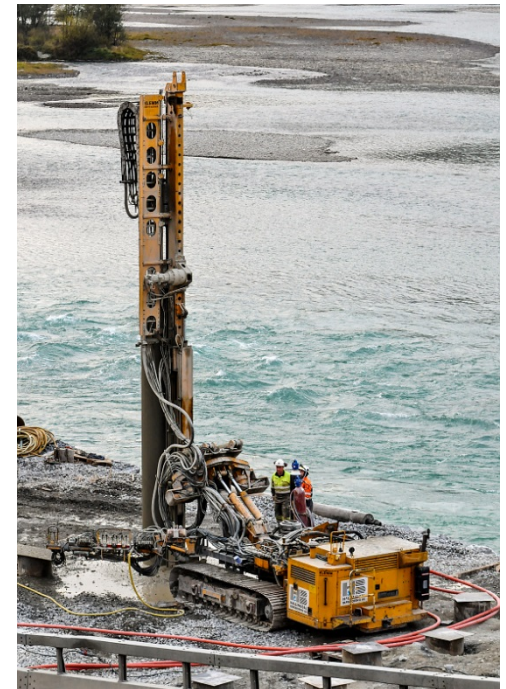


Photo: Statens vegvesen

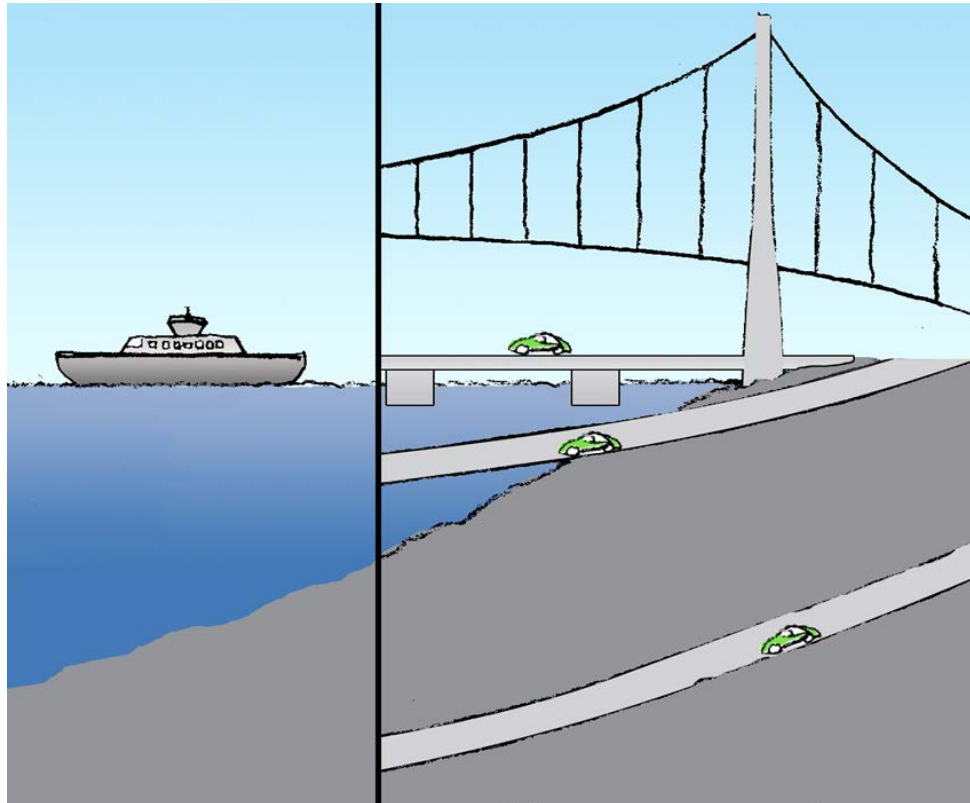


The E39 Coastal Highway Route

Costs and financial challenges

- NOK 340 billion, incl VAT
 - Initial estimate NOK 150 billion
 - The extent of the project has increased to include improved road standard with higher speeds etc.
- Potential for road toll collection:
NOK 110 billion

Alternative methods for fjord crossings



- Suspension bridge
- Floating bridge
- Submerged floating tube bridge
- Immersed tunnel or subsea rock tunnel



Recent developments in offshore structures



Illustration: Kurt Wathne



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Julsundet: Suspension Bridge Romsdal fjord





Conceptual design: Suspension bridge across the Sognefjord



Illustration: Statens vegvesen



Conceptual design: Suspension bridge across the Sognefjord



Illustration: Statens vegvesen/Aas Jakobsen



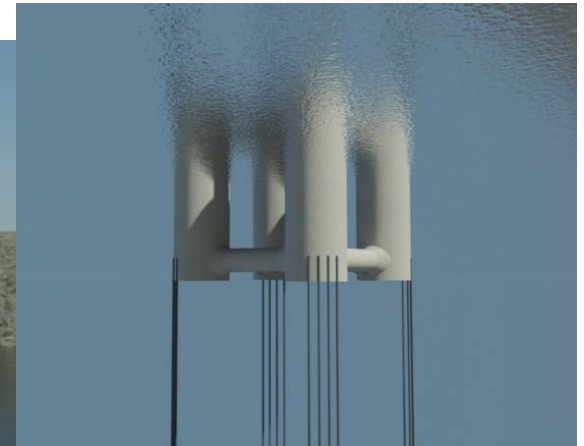
Conceptual design: End-anchored floating bridges across the Sognefjord



Illustration: Statens vegvesen



Conceptual design, floating bridge: Cable stayed bridges on floating pontoons



Based on offshore
technology:
Tension leg platforms
(TLP)

Illustrations: Statens vegvesen



Conceptual design: Submerged Floating Tube Bridge

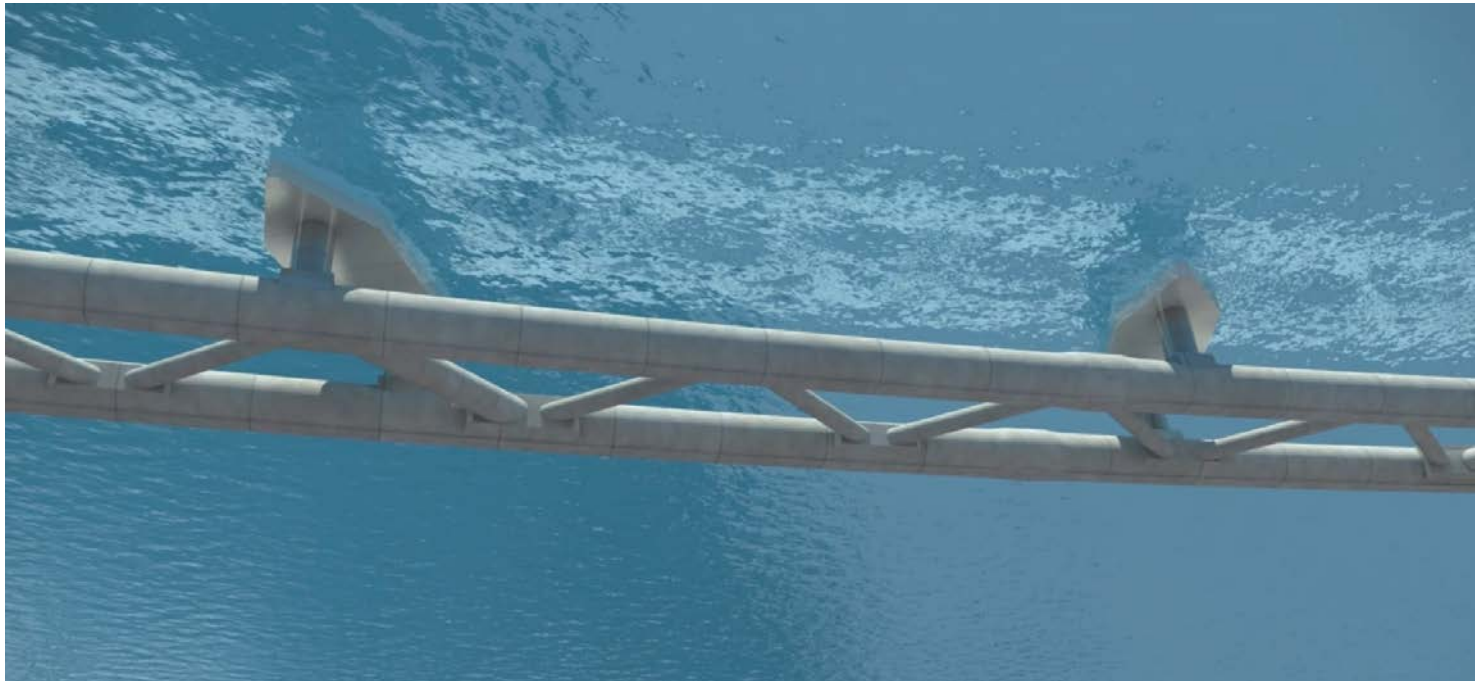


Illustration: Statens vegvesen



Conceptual design: Submerged Floating Tube Bridge



Illustration: Statens vegvesen



Conceptual design: Floating bridge in combination with suspension bridge, Bjørnafjord

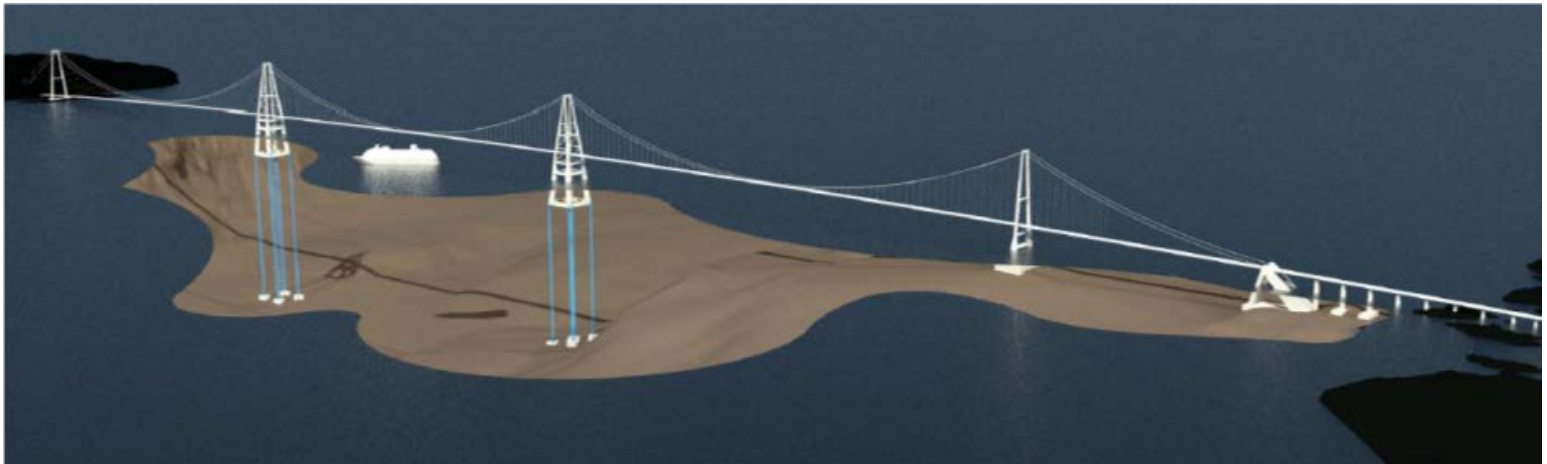


Illustration: Statens vegvesen



Conceptual design: Side-anchored floating bridge in combination with cantilever bridge



Illustration: Plan arkitekt/Statens vegvesen

Conceptual design: Submerged floating tube bridge anchored with inclined tethers





Conceptual design: Submerged Floating tube bridge with pontoon

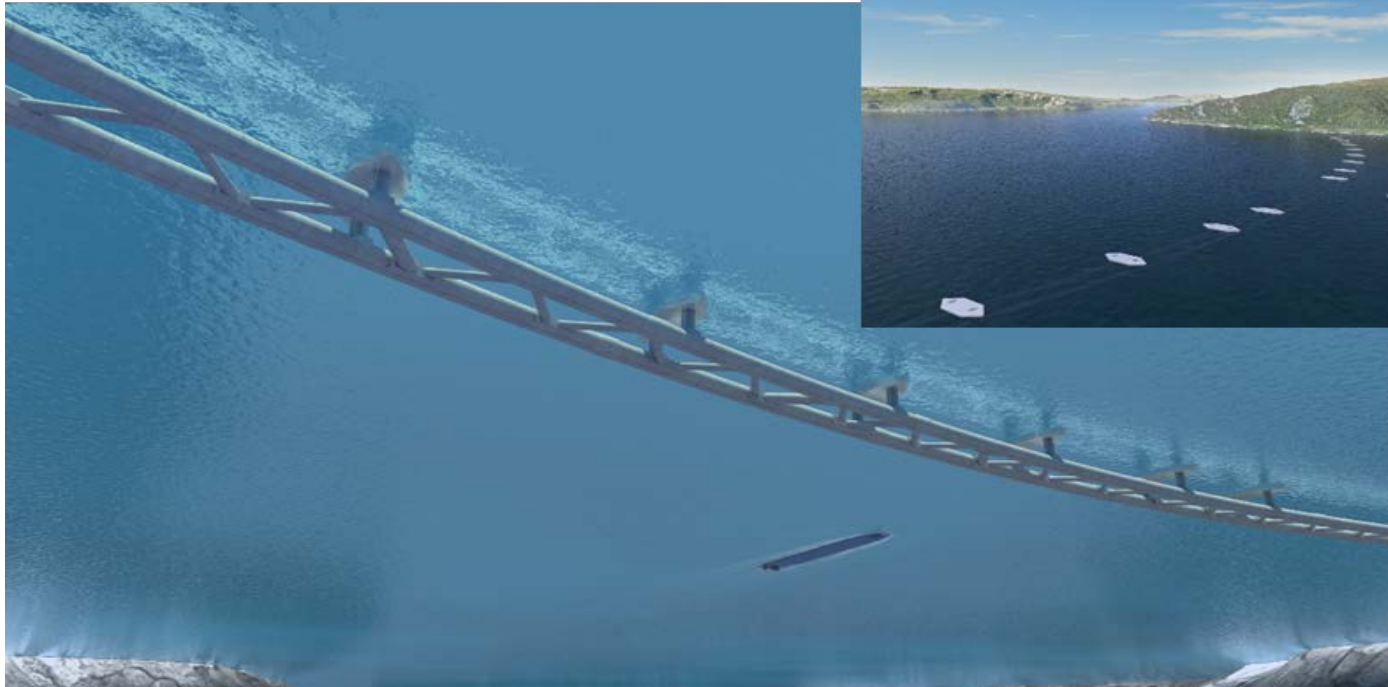


Illustration: Statens vegvesen/Vianova



The E39 Coastal Highway Route Summary

- Technologically feasible – YES
- Possible from a planning perspective – YES
- Financially challenging –
the NTP will give us the answer
- Will it be realised? – YES, I believe
- <http://www.vegvesen.no/Vegprosjekter/ferjefriE39>

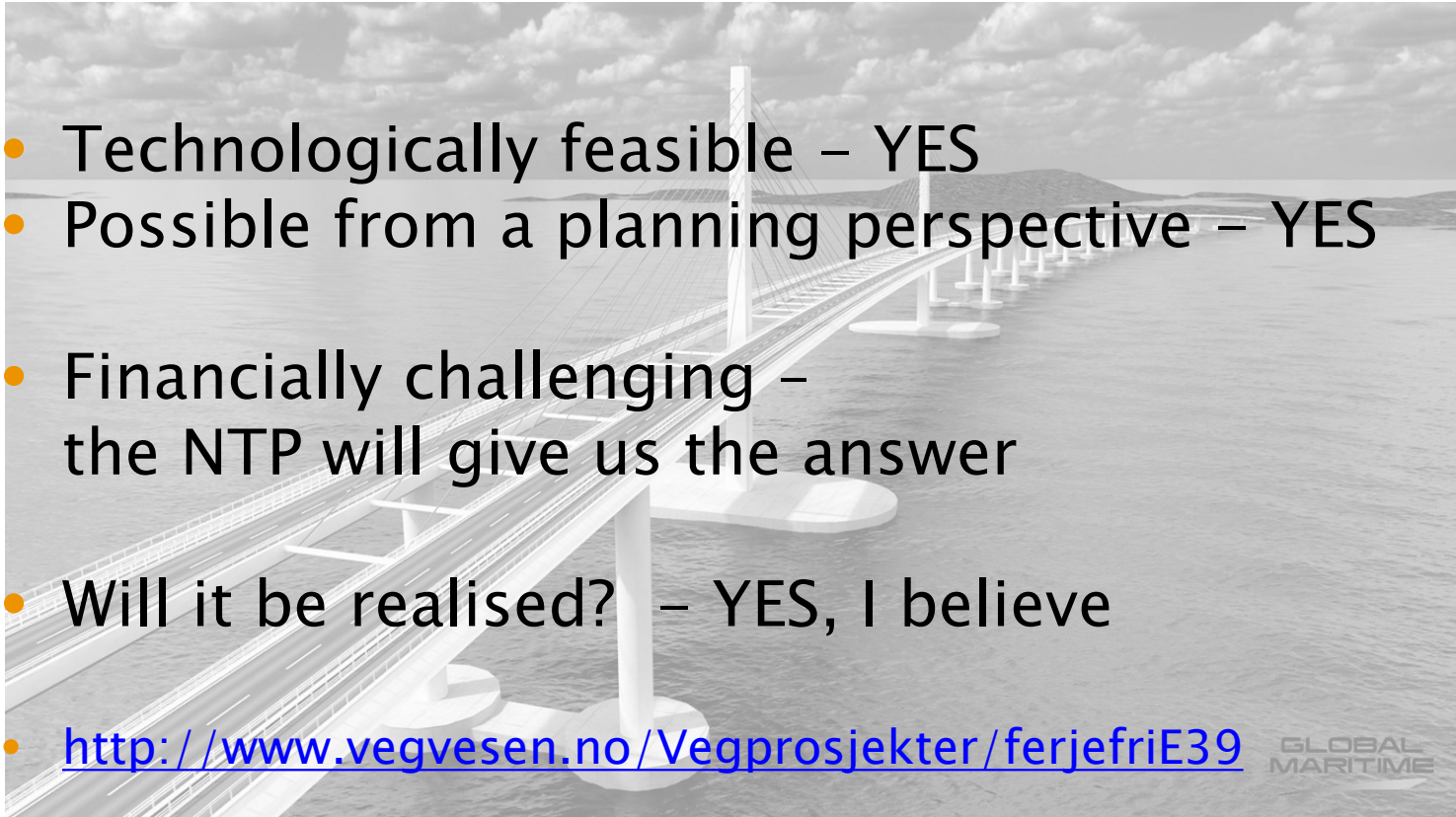


Illustration: Global Maritime