The Coastal Highway Route E39 Program

Kjersti Kvalheim Dunham, Programme Manager
Tampere January 23rd 2019
Se filmen om Ferjefri E39
Utbedret og ferjefri E39
23.01.2019
PC
YouTube
Photo from Ellingsen, NPRA
The Coastal Highway Route E39

The current E39

- E39 Kristiansand-Trondheim nearly 1100 km, including 7 ferry connections
- E39 ferry connection Kristiansand-Hirtshals
- Aalborg: The E39 joins the E45 which continues to Italy
Facts about the counties along the E39

Inhabitants as of 1 Jan 2017

- 1/3 of the country’s population
- Approx. 60% of our export value

Source: Central Bureau of Statistics (SSB)
Map details: Norwegian Mapping Authority
The Coastal Highway Route E39

The NTP 2018 – 2029

National Transport Plan 2018–29 presented in April 2017, adopted by the Storting (Norwegian parliament) in June 2017:

- The E39 is to become a continuous route without ferries
- Travel time will be cut in half
- 1/3 of the funding and 3 of the largest fjord crossings are included in the first 12–year period
The Coastal Highway Route E39
Plan for completion of the project within 30 years

- Requires an annual investment of NOK 5–20 billion NOK (£ 0,43–1,73 Billion)
- A total of 110 billion NOK could be toll costs (£ 9,5 Billion)
We are working on crossing challenging fjords

Construction is well underway!
Coastal Highway Route E39
10 % is completed

- 1/3 of the E39 will be completed within 2025

- Different stages of progress on the various stretches – Nye Veier AS
New solutions and new competence

How will we make it happen

● Development of new technology and more knowledge
  – Five highly challenging fjord crossings (2–5 km wide)
  – Utilise experience from offshore technology development and qualification
  – Studying wind/waves/current, new constructions, driver experience, sustainability, contracts…

● Building competence
  – More than 50 PhDs ongoing with the Norwegian University of Science and Technology (NTNU), Chalmers technical university, the University of Stavanger (UiS) and others (including post.docs)
  – Berkeley and Iowa (USA), UCL (UK), ETH (CH), TU Delft (NL), DTU (DK) and more (current application, MIT)

● Involving the industry
  – More than 40 different private companies have been involved in the development related to the large fjord crossings
  – Seminars held to involve and update the industry on the E39 project regularly (often online!)
The Coastal Highway Route E39

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NB! The planning and building is the responsibility of the NPRA regions
The E39 Coastal Highway Route

Challenging fjord crossings

<table>
<thead>
<tr>
<th>Fjord</th>
<th>Width (km)</th>
<th>Depth (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halsafjorden</td>
<td>2</td>
<td>5–600</td>
</tr>
<tr>
<td>Julsundet</td>
<td>1.6</td>
<td>5–600</td>
</tr>
<tr>
<td>Romsdalsfjorden</td>
<td>16 km tunnel</td>
<td>330</td>
</tr>
<tr>
<td>Sulafjorden</td>
<td>3.8</td>
<td>500</td>
</tr>
<tr>
<td>Vartdalsfjorden</td>
<td>2.1</td>
<td>600</td>
</tr>
<tr>
<td>Nordfjorden</td>
<td>1.4</td>
<td>500</td>
</tr>
<tr>
<td>Sognefjorden</td>
<td>3.7</td>
<td>1250</td>
</tr>
<tr>
<td>Bjørnafjorden</td>
<td>5</td>
<td>550</td>
</tr>
<tr>
<td>Langenuen</td>
<td>1.3</td>
<td>500</td>
</tr>
<tr>
<td>Boknafjorden</td>
<td>27 km tunnel</td>
<td>390</td>
</tr>
</tbody>
</table>

*= subsea tunnel
Cost-efficient, safe and high-tech bridges and tunnels

We are developing technology for the whole of Norway – and beyond!

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You can hear NPR (National Public Radio) News radio here!
The history of suspension bridges in Norway 1972–2013

- Hardangerbrua: 1310 meter
- Askøybrua: 850 meter
- Osterøybrua: 595 meter
- Sotrøbrua: 468 meter

Source: Kristian Berntsen
The Sulafjorden crossing – the most challenging
Floating bridge – combined with cable-stayed bridge on floating pontoons

Based on off-shore technology - tension-leg platforms (TLP)

Illustrations: NPRA
South of Bergen – connecting cities

5 km floating bridge over Bjørnafjorden

- Engineering, concept development
- Continously improving design basis
- Concept development of floating bridge through 2019
- Feasibility study through 2020
- End anchored or side anchored floating bridge or a suitable combination of both.
The Rogfast Subsea Tunnel

- The “Rogfast” or the Rogaland Fixed Link is a sub-sea road tunnel currently under construction.
- The 27 km twin-tube (10.5 m diameter) tunnel will run below two fjords – Boknafjorden and Kvitsøyfjorden.
- Three tunnel contracts and two early contracts (ongoing).
- Maximum depth of the tunnel will be 392m below sea level – a world record.
- Modified tunnel appearance for tunnel safety: to cope with driver monotony we plan on widening the tunnel and changing the lighting in an effort to relieve the monotony.
- The project is featured as a key project report in the World Highways issue November/December 2018.
Submerged floating tube bridge anchored to pontoons on the surface

Illustrations: NPRA
Floating Suspension bridge $l = 4000m$

- E39 Sulafjorden

Ellipse floater with moonpool
Measurements

- Wind
- Waves
- Current
- Ship traffic
- Rock / soil
- Subsea landslides
- Met ocean
- ...

08/05/2018

Programme Manager Kjersti Kvalheim Dunham
Ongoing measurements

Environmental loads
Research within The Coastal Highway Route E39

Materials… one of many questions

- Stronger cables
- Lighter constructions
- Durable constructions in a harsh environment
- Withstand ship collision or explosions

- Steel structures
- Welding techniques
- Sandwich elements?
- Concrete
- Aluminium
- New materials or new combinations?
Great potentials!

Sustainability

Flyte for flytebro
A total of 75 PhDs/Post.docs are ongoing/finished, 15–45 new in 2019

Knowledge reduces the cost!

Film where student explain how they contribute too the whole of NPRA (February 2018)and how they contribute to the UN Sustainability Goals (september 2018) are on Facebook/ferjefrie39
Join us now!

Facebook!

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The Coastal Highway Route E39
Interactive map with information on status and progress
Free webinars Fridays at 10 am (CET)

Join in on https://www.vegvesen.no/ferryfreee39
In the city of Stavanger

The Ryfast tunnel to open in 2019

Light art…
292 m below sea level

Photos: Øyvind Ellingsen, NPRA
One chance only!

Subsea half Marathon October 5th 2019

Ryfastløpet
Halvmaraton (21 km)
The Coastal Highway Route E39

Summary

- Technologically feasible
- Feasible from a planning perspective
- Financially challenging
- We are well underway!
- [http://www.vegvesen.no/ferryfreee39](http://www.vegvesen.no/ferryfreee39)

Illustration: Global Maritime
More information:

www.vegvesen.no/ferryfreee39

www.facebook.com/ferjefrie39

www.youtube.com/vegvesenet

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