



Statens vegvesen

Norwegian Public Roads
Administration

Project Overview

Coastal Highway Route E39



Abstract

The Norwegian Public Roads Administration (NPRA) has been commissioned to investigate the potential for trade and industry, regional employment and settlement patterns of eliminating all ferries along the western corridor (E39) between Kristiansand and Trondheim. Further, this project will explore the technology required for the remaining fjord crossings. In addition to these two components, the project will consider how the road and bridge infrastructure can be utilised to generate power from solar energy, currents, waves and wind. Implementation strategies and suitable types of contracts are also included in the studies.

The project is administered by the NPRA Directorate in Oslo, with the chairs of the respective six county councils as members of the advisory board. The directors of the relevant professional departments of the NPRA are also members of the advisory board, which is headed by the NPRA Director General, Mr Terje Moe Gustavsen.

Background

Norway's coastal highway E39 is part of the European trunk road system. The route runs along the western coast of Norway, from Kristiansand in the south to Trondheim in central Norway, a distance of almost 1100 km. There are eight ferry connections along the route; most of them are wide and deep fjord crossings that will require massive investments and longer spanning structures than previously installed in Norway. The current travel time of some 21-22 hours between Kristiansand and Trondheim is also influenced by the overall road standard of the route.

The newly initiated project Coastal Highway E39 has been commissioned by the Norwegian Ministry of Transport and Communications to clarify the technological challenges and possibilities and to explore the benefits for industry and for society at large of developing the route into a more efficient corridor with no ferry connections. This project may reduce the travel time along the coast from Kristiansand to Trondheim by 7-9 hours, to a total of about 12-13 hours.

One of the objectives of the study is to substantiate the costs of construction, operations and maintenance, and the benefits for the society at large in a life cycle perspective of e.g. 50 years.

The feasibility study contains four components:

- 1. Society:** likely impacts on national and regional economies, trade and industry, and employment and settlement patterns
- 2. Fjord crossings:** technological challenges and alternative concepts for crossing the fjords
- 3. Energy:** how bridge structures can be utilised for power generation from renewable sources such as solar energy, winds, waves and tidal currents
- 4. Implementation strategies and types of contracts:** the most appropriate and best approaches for implementing and financing a project of this magnitude and complexity.

The study is primarily set up to create general and cutting-edge knowledge through studies and research, while the respective NPRA regional office will be responsible for the planning and design of the specific fjord crossings and related processes.

This project has already generated substantial international interest, and its character requires utilisation of all available professional expertise domestically and internationally within a number of fields and professions.

The project is commissioned by the Ministry of Transport and Communications and administered by the Norwegian Public Roads Administration (NPRA).

Responsibility for the components is distributed among different organisational units in the NPRA.

The project will present its first recommendations in August 2012.

Society

This component will establish likely national and regional impacts, generating knowledge and identifying appropriate socio-economic methods in close cooperation with universities and research institutions.

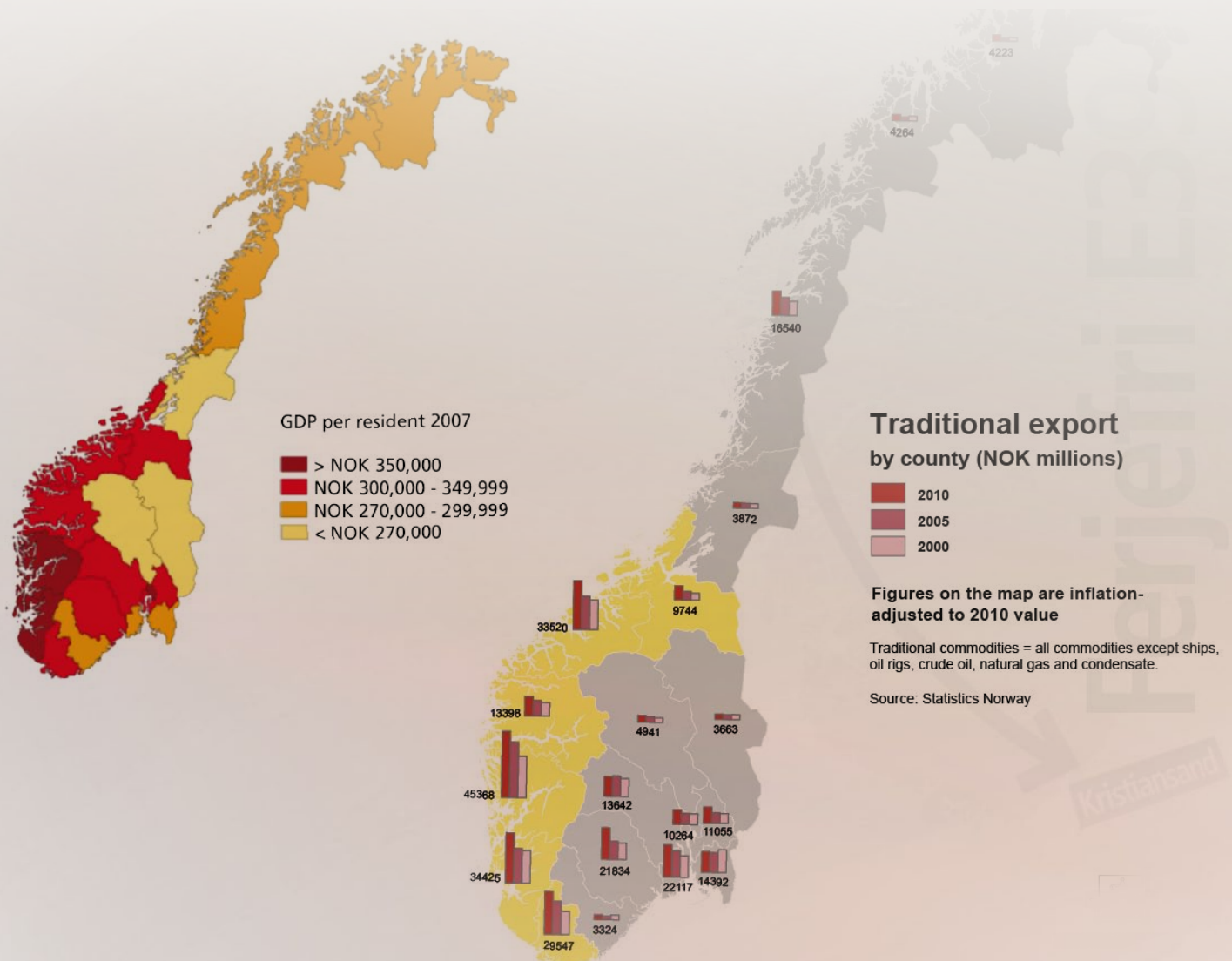
Impact studies for previous domestic and international projects that have substantially changed travel and transport patterns will be consulted as need be when developing possible expanded methods for impact assessments.

About half of Norway's traditional export is generated by industries and companies along route E39, which should provide the shortest possible travel time for north-south bound traffic in western Norway. Likewise, this route is crucial to regional development in western Norway, as many synergy effects depend on how effectively it interconnects areas with large populations and substantial trade and industry.

In order to create satisfactory links between the project and education and research, we will actively promote cooperation with educational and research institutions and consultants.

Among the important effects we want to study are the wider impacts of investing in infrastructure. This aspect seems to be somewhat neglected in prevailing socio-economic methods. It is important to take into account the impacts that are not reflected in traffic or in direct economic growth, such as the conglomeration effects of human resources and the broader regional "knowledge hub" offered to businesses along the western coast of Norway.

This component is headed by the NPRA regional office of the Central Region.



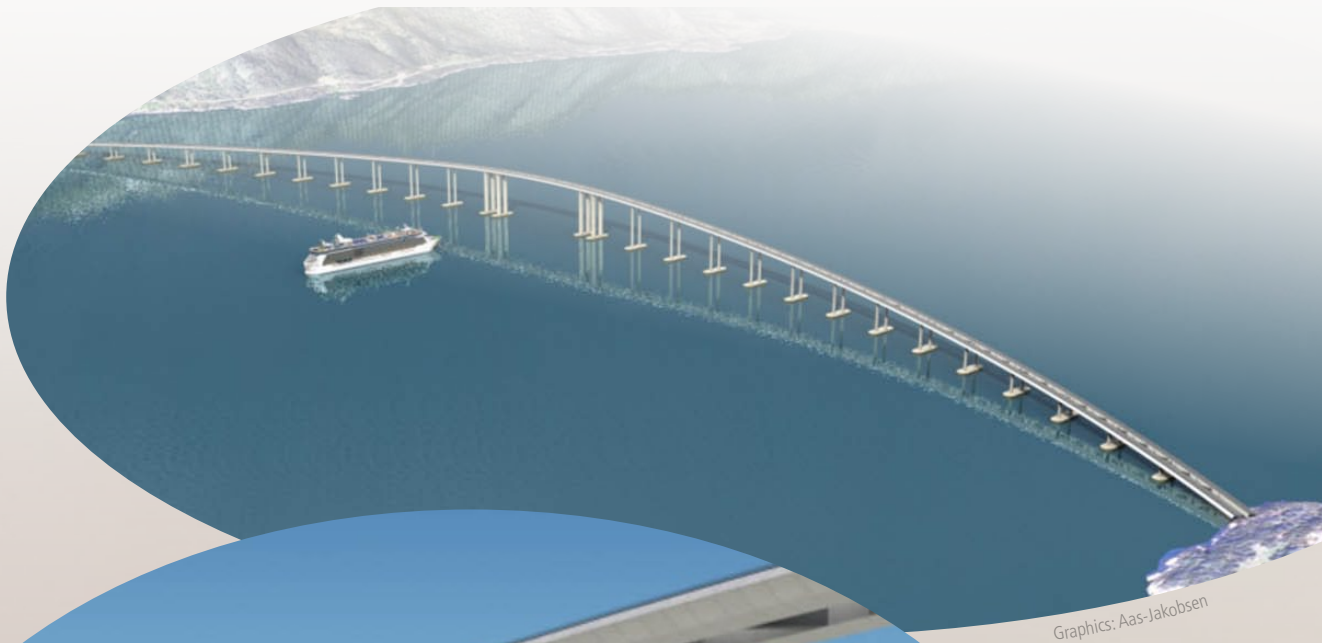
Fjord crossings

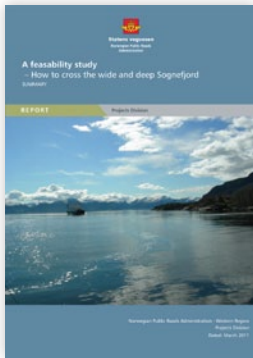
This component will explore technological alternatives for the eight fjord crossings still being operated by ferries.

This component was launched about 2 years ago. The Sognefjord, which is about 4 km wide, is being used as a pilot site for developing new concepts for extreme bridges. With its vast depths of up to 1300 m and 200-300 m of bottom deposits above the rock, the Sognefjord is considered the most difficult and challenging fjord to cross.

The fjord crossings team is looking into three main alternatives for the Sognefjord: a suspension bridge, a floating bridge, or a submerged floating tunnel. Combinations of the three are also being considered.

On-going work includes risk analyses related to shipping operations on the Sognefjord for the different alternatives. A competitive dialogue has been initiated with consultants that have expressed their interest in participating in the further detailing and development of these alternatives within the framework of the pilot study.





◀ In March 2011 the fjord crossings project team presented a report summarising the idea phase, which is available on the NPRA website at www.vegvesen.no/ferjefriE39

The depth of the Sognefjord is rather extreme; the other fjords along the route are more typically some 500-600 m deep. Different depths and lengths may require different concepts and solutions, and the technological implications and costs related to anchoring systems for floating structures will be of particular interest.

This component will require cutting-edge national and international knowledge, including experience and technologies from marine and offshore installations and operations.

The team will also look into:

- implementable technologies
- the carbon footprint of construction, maintenance and operations
- costs of construction, maintenance and operations
- structural strengthening required due to power plants attached to the structures (see Energy component below)
- other consequences for the environment, waterways and safety

A number of specific concept studies have been undertaken during the past year, and the project team has looked into some 35 specific crossing locations on several of the fjords.

As soon as the Ministry of Transport and Communications has established the various master plan locations for the crossings, further more detailed studies will be initiated.

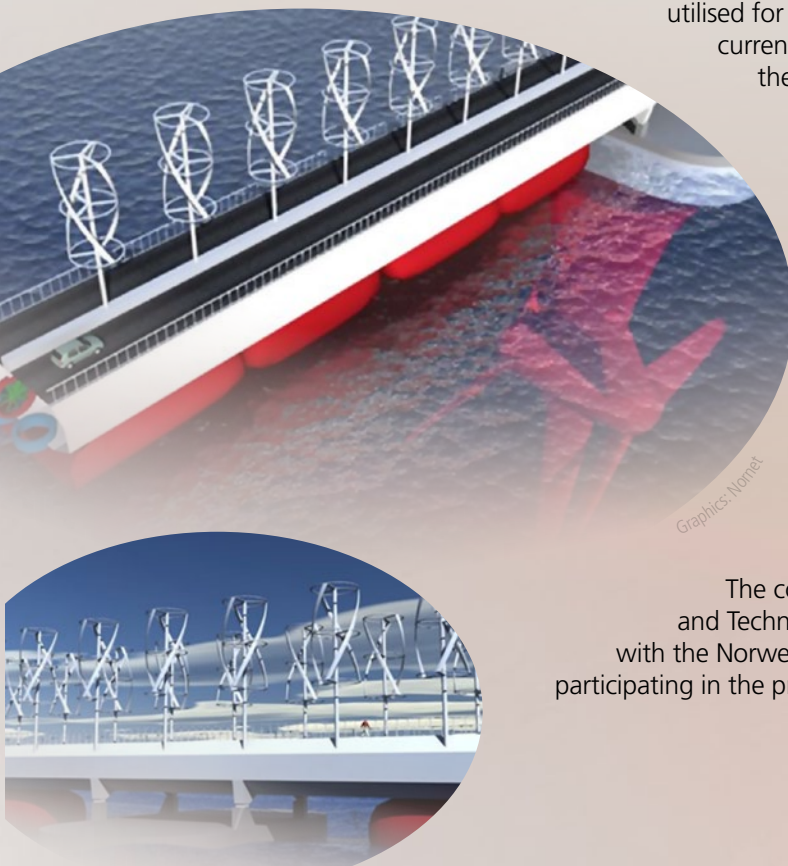
Energy

The energy component will consider how bridge infrastructures can be utilised for producing energy from the renewable sources solar, tide currents, waves and winds. These studies will also explore how the energy production potential may be utilised for the approximately 15,000 existing river bridges managed by the NPRA.

At this stage it is difficult to assess the production potential of such installations, and a separate feasibility study to assess the accessible potentials from various sources is currently starting up. While renewable sources are often found uneconomical due to high infrastructure costs, such costs may change considerably if shared with others.

This component has designed research topics for master students at universities of technology in Norway as well as in Sweden.

The component is managed by the Road Safety, Environment and Technology Department at NPRA Headquarters in Oslo, with the Norwegian Water Resources and Energy Directorate (NVE) participating in the project team.



Implementation Strategies and Types of Contracts

This component will consider which strategies and types of contracts are most appropriate and efficient for a project of this magnitude. A key question is whether special types of contracts used in the oil sector or internationally can be used for this type of construction project.

This crucial component is being managed by the Roads and Transport Department at NPRA headquarters in Oslo.

Concluding remarks

Access to necessary professional skills and sufficient capacity within civil and maritime engineering are paramount for the success of a project of such magnitude and complexity. The same applies to models for implementation and financing, types, size and length of contracts, and possible patent rights and conflicts of interest in the innovation and feasibility phases.

The scope and design of the project may also spur advances in civil and maritime engineering both domestically and abroad.

It is thus imperative to involve firms and institutions and other stakeholders from the construction and maritime sectors at an early stage in the process.



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