

Summary and conclusions

This report has been conducted for the Kattegat Committee in cooperation between DAMVAD and Grontmij | Carl Bro from March through October 2009.

The purpose of this report is to complete a preliminary analysis of the economy and potential dynamic effects if a Kattegat fixed link is established combined with a high-speed train connection between Copenhagen and Aarhus that will reduce the travel time to 1 hour.

The report includes the first estimation of the economics in connection with the Kattegat fixed link together with a high-speed train connection between Aarhus and Copenhagen as well as a preliminary screening of the dynamic effects.

The results of the report show that a Kattegat fixed link together with a high-speed train connection between Denmark's two largest cities will be a good investment for society and it will have significant opportunities to trigger societal dynamics in great parts of the country; opportunities that will not otherwise emerge.

The main conclusions of the report can be summarized as follows:

A Kattegat fixed link and high-speed train connection with a travel time of 1 hour between Aarhus and Copenhagen will be an economical sound investment

The total cost of a Kattegat fixed link, land constructions, and high-speed trains between Jutland and Zealand is estimated to be approximately DKK 101 billion. The Ministry of Transportation's Teresa model¹ has been used to make an economic estimation including a range of conditions together with an estimation of the saved travel time. Our central assessment suggests that a Kattegat fixed link will have a positive economic present value and an internal interest of approximately 6%.

There will be significant dynamic effects – presumably DKK 10-20 billion annually – beyond the effects of shorter travel time, which ascribe to the positive economical assessment.

A Kattegat fixed link entails a paradigm shift in the traffic development between west and east Denmark, which will be linked to significant dynamic effects as many people, businesses, and citizens' behavior will be fundamentally changed.

This type of dynamic effects is not fully retained through shorter travel time in existing models. For that reason a preliminary assessment has been conducted of the potential dynamic effects a Kattegat fixed link including high-speed trains with a travel time of 1 hour between Copenhagen and Aarhus.

There is a need for a continuing development of the existing economical model of calculation so the model can predict more accurate dynamic effects of major traffic investments.

There is a possibility that the dynamic effects can exceed DKK 10-20 billion annually. However, with the options presently available to calculate the potential dynamic effects it is difficult to reach an accurate estimation.

For that reason, there is a need to procure new knowledge on the potential dynamic effects of major infrastructural projects, which can more precisely predict the economical consequent of the new behavior that will be experienced by many people, businesses, and organizations in a great part of Denmark.

¹ The Teresa model is the national authorized economical model for calculating effects of infrastructural investments.

The area around Aalborg and the larger cities in central Denmark will obtain a significant proximity to the capital, which will present new opportunities for settlement, business development, and easier access.

A Kattegat fixed link with a travel time of 1 hour between Aarhus and Copenhagen by high-speed trains will also reduce the travel time between Copenhagen and for instance Aalborg, Herning, Viborg, Silkeborg, Randers etc. Access to the labor market, knowledge market, and the capital's infrastructure such as Copenhagen Airport will be significantly strengthened.

New options will emerge for many people, businesses, and organizations; options that would otherwise not emerge. These options will strengthen Denmark's adaptability and contribute to a better use of our total resources.

Kalundborg, Holdbæk, and the rest of Northwestern Zealand will with a travel time of just 30-40 minutes to Denmark's two largest urban areas get entirely new development and growth opportunities.

A Kattegat fixed link and a high-speed track between Aarhus and Copenhagen will for Zealand entail new train stations for instance in Kalundborg, Holbæk, and Roskilde. The new stations will provide an opportunity to launch high-speed trains between these cities, which will entail significant shorter travel time for these cities as well as Copenhagen and Aarhus.

A Kattegat fixed link will influence settlement and provide better opportunities for business development. With a train station on Samsø the island will become a suburb to Aarhus and both opportunities for settlement and business development will be fundamentally changed.

Copenhagen will obtain a large critical mass and thereby strengthen the endeavors to become the growth center of Northern Europe.

If the rest of Denmark is brought closer to Copenhagen it will provide the capital with a large critical mass and contribute to strengthen the possibilities for Copenhagen to become *the* growth center of Northern Europe. 67% of the population in Denmark will be within a travel distance of 2 hours to Copenhagen, compared with 40% today. With the Great Belt fixed link Odense and the triangle area² were interlinked with Copenhagen and the Oresund fixed link connected Malmø and Southern Sweden with Copenhagen as well. The upcoming Fehmarnbelt fixed link will further bring Hamburg and Northern Germany closer to Copenhagen. A Kattegat fixed link and a high-speed train between Copenhagen and Aarhus will be able to transform Denmark into a single metropolis in an international context.

In the future Copenhagen will have the greatest challenge in correlation to access to educated labor and will with a Kattegat fixed link get access to a larger potential labor market and for instance large cultural events will have a greater audience catchments area etc.

A Kattegat fixed link will have significant positive impacts on the environment. The environmental impact is estimated to be half-a-million metric ton annually in CO₂ reduction.

Denmark is faced with a challenge to meet the goals of CO₂ reduction in the coming decades. Much indicates that only technological breakthroughs or political decisions to change behavioral patterns will be able to ensure fulfillment of the environmental goals.

² The triangle area is made up of the three cities Vejle, Kolding, and Fredericia.

A Kattegat fixed link together with the introduction of high-speed trains will entail significant CO₂ reductions as a result of cessation of ferries, reduced air traffic, and electrification of the train services.

The environmental impact is estimated to save approximately half-a-million metric ton annually in CO₂ emissions. An expected transfer of passengers from cars to trains should be added to the CO₂ reductions, which has yet to be estimated.

A Kattegat fixed link will increase the market share of the collective traffic.

It is likely that a high speed train connection between Copenhagen and Aarhus will entail an increase of market share in favor of the trains. It has been calculated that the market share can be expected to rise from 25% to 55.8%.

The international experiences of introducing high speed trains also show that a significant amount of passengers from airplanes, car, and bus will choose trains in stead.

For at period of time a Kattegat fixed link will limit the traffic on Vejle fjordbroen together with the critical situation at Køge Bugt motorvejen.

If a Kattegat fixed link is not established by 2025 then there will be intensive traffic congestion both on Vejle fjordbroen (the bridge crossing the inlet in Vejle) and at Køge Bugt motorvejen (the highway by Køge Bay), which will mean that political decisions on investments that will increase the capacity on the highway probably are needed.

The east-west traffic in Denmark can be unified in one organization with a contiguous financial model for Great Belt fixed link and Kattegat fixed link.

A Kattegat fixed link will together with the Great Belt fixed link make up a complete service of the east-west traffic in Denmark. To avoid unfortunate competition between the two fixed links the funding and service of the fixed links should be joined in one organization.

The economy of the Great Belt fixed link and a Kattegat fixed link should be interconnected, hence a part of the surplus the Great Belt fixed link is expected to generate after 2031 should be spend on financing a Kattegat fixed link. In the light of the life expectancy and economic size of the investment it can be relevant to consider a payback time for the Kattegat fixed link of 50 years.

In chapter 2 the background and framework for this report is described.

In chapter 3 the visions for the technical configuration of the fixed link are outlined.

In chapter 4 and 5 the economical preconditions, methods, and estimated effects are outlined.

Chapter 6 presents a future scenario that based on an evaluation of a number of central indicators form the basis for an assessment of the dynamic effects in chapter 7.

In chapter 8 the Kattegat fixed link's impact on the railroad will be assessed

Chapter 9 assesses the impact on the traffic congestion in selected places in Denmark.

Finally, chapter 10 frames financial considerations of a Kattegat fixed link.