



Pre-feasibility study Stockholm -  
Helsinki using Hyperloop One technology  
Short summary

July 2016

# Executive summary

The pre-feasibility study has analyzed the Stockholm-Helsinki fixed link from three different aspects:

- Cost and benefit
- Technical
- Legal

The Stockholm – Helsinki corridor is estimated to 500 km, with 11 stations spread out along the route – and with Hyperloop One technology, journey times between the two capital cities will be dramatically reduced. It will only take approximately 28 minutes to travel between Stockholm and Helsinki, in effect creating a new Nordic super-region, where it will be possible to live in Sweden and work in Finland – and commute on a daily basis.

Preliminary calculations of the Stockholm-Helsinki corridor, including Hyperloop One system, is estimated to cost 13 EUR Billion (CAPEX), whereas the total CAPEX, including gliding stock, risk, overhead and allowances is estimated to 19 EUR Billion.

First indications show that the Stockholm – Helsinki corridor has a strong potential to result in a positive economic case. Preliminary transport economics modeling show that Value of Time benefits will add almost 25 Million hours per annum saved due to substantial reduced travel times.

The corridor consists of three main technical solutions – tube dug down, on pylons and sub sea tunnel depending on geotechnical prerequisites.

There are many legal aspects that need to be further addressed. Permission, the right of way and taxation and social benefits are some examples. However, regarding legal obstacles, no insurmountable barriers can be identified at this stage.

# What is Hyperloop One?

2: Pods operate in tubes, which creates a controlled environment.

1: The vehicle is a pod, which can be sized to carry freight or passengers.

3: Air pressure in the tubes is massively reduced to eliminate almost all resistance.

4: The pods levitate instead of using wheels, to eliminate friction.

Source: Hyperloop One



# Current travel times between city centers are extensive



The yellow line schematically represents the journey made by passengers using air travel between the city centers, including the trip out to the remote Arlanda (ARN) airport at the Stockholm end, and the inbound ground transport trip from Vantaa (HEL) airport in Helsinki.

Whether using public transport, taxi or private car for these feeder/distributor journeys, and taking into account the ground handling time at the airports, end-to-end journey times between the two city centers take approximately 3.5 hours, with only around 1 hour of that being actual flying time.

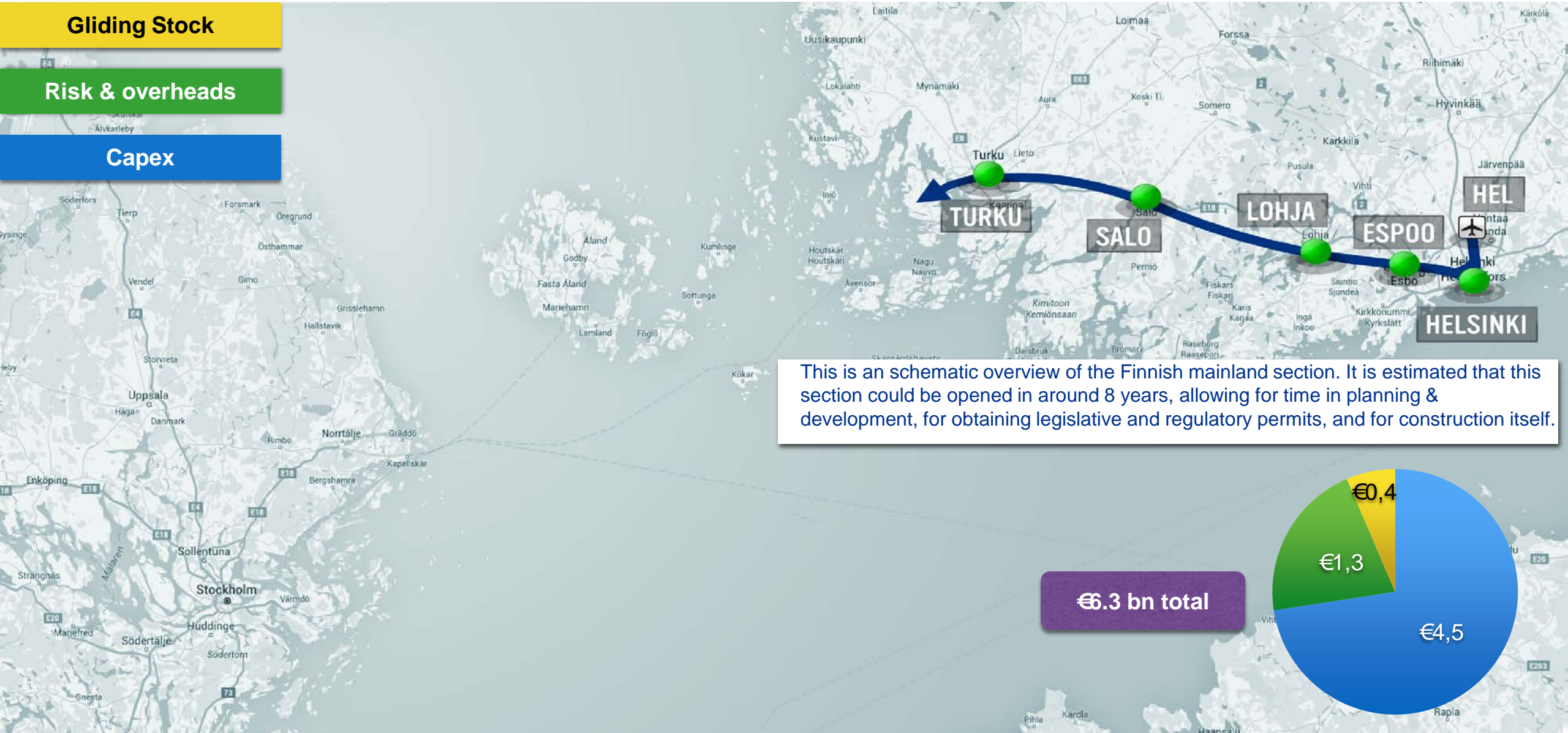
There is also a ferry connection between Helsinki and Stockholm, taking 17.5 hours. Turku to Stockholm takes 11 hours. All ferries call in Åland. The orange lines represent ferry routes.

# Substantially reduced travel times will change the future landscape

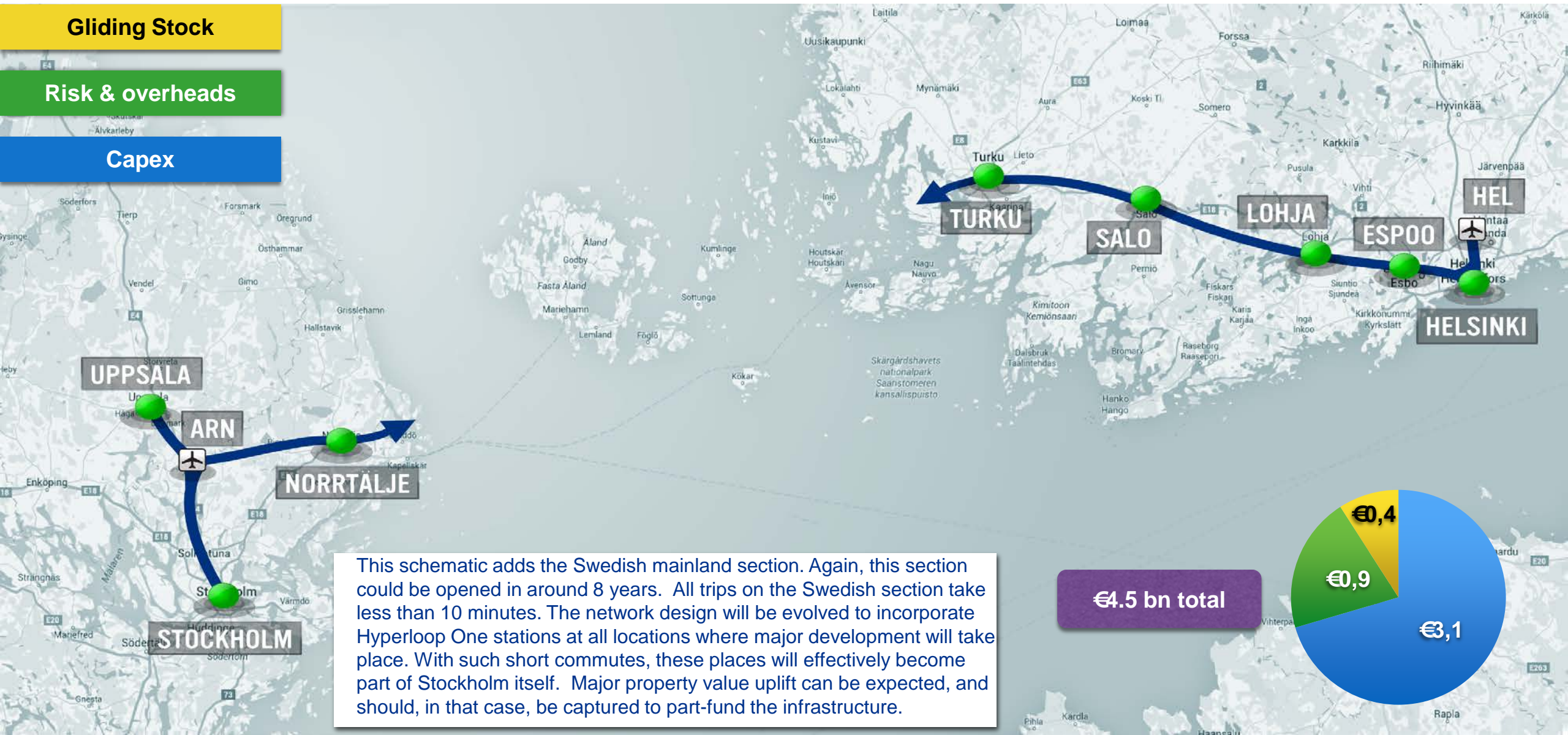




# The Stockholm - Helsinki corridor can be built in stages (1/3)



# The Stockholm - Helsinki corridor can be built in stages (2/3)





# The Stockholm - Helsinki corridor can be built in stages (3/3)

Gliding Stock

Risk & overheads

Capex



This schematic adds the International Link, which is a sub-sea tunnel between the Finnish to the Swedish coasts, with a terminal in Åland. This section could open for traffic approximately four years after the mainland sections. The mainland sections are thus generating revenue and delivering strategic benefit before the International Link enters service. Completion of the International Link enables the entire Stockholm to Helsinki super-region to function as a single economy. It becomes possible to live in Sweden, work in Finland – and easily commute on a daily basis.

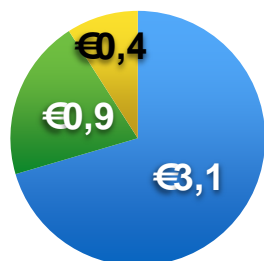


# The complete Stockholm - Helsinki corridor is estimated to €19 bn

Gliding Stock

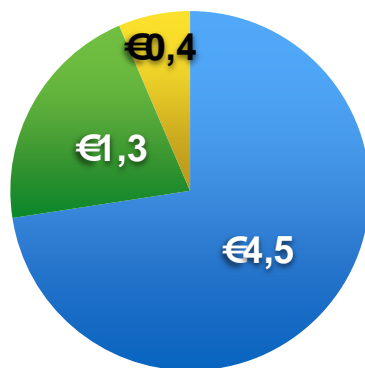
Risk & overheads

Capex



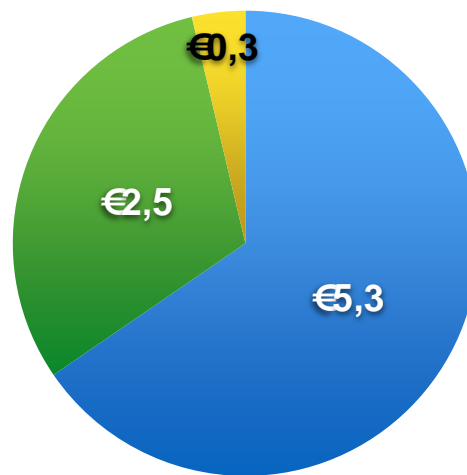
€4.5 bn total

Sweden Mainland



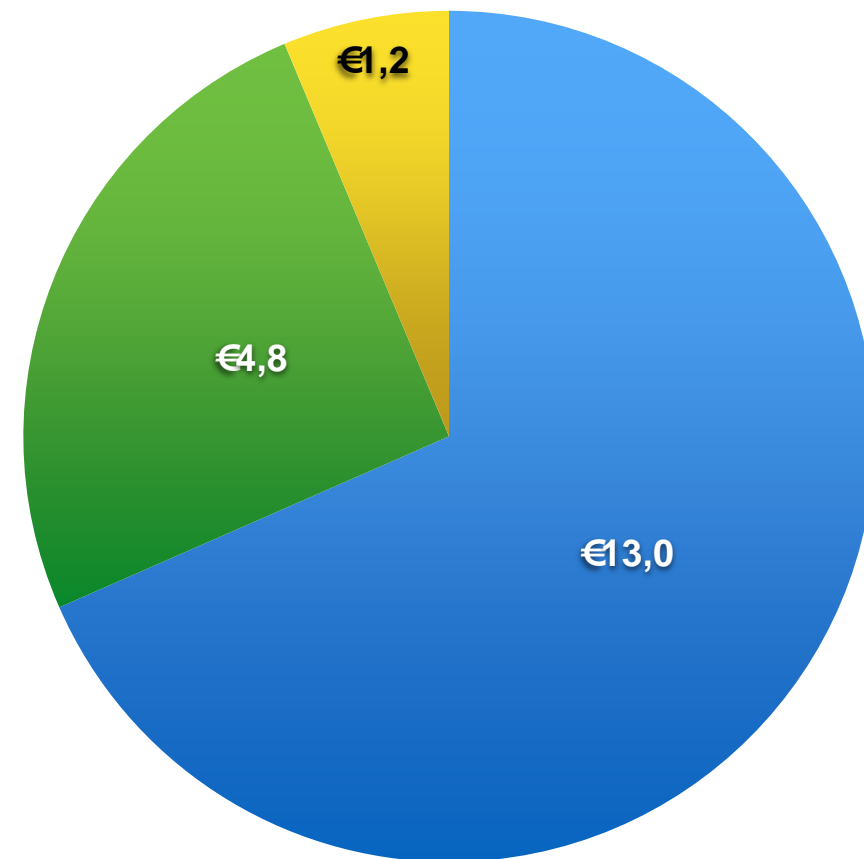
€6.3 bn total

Finland Mainland



€8.2 bn total

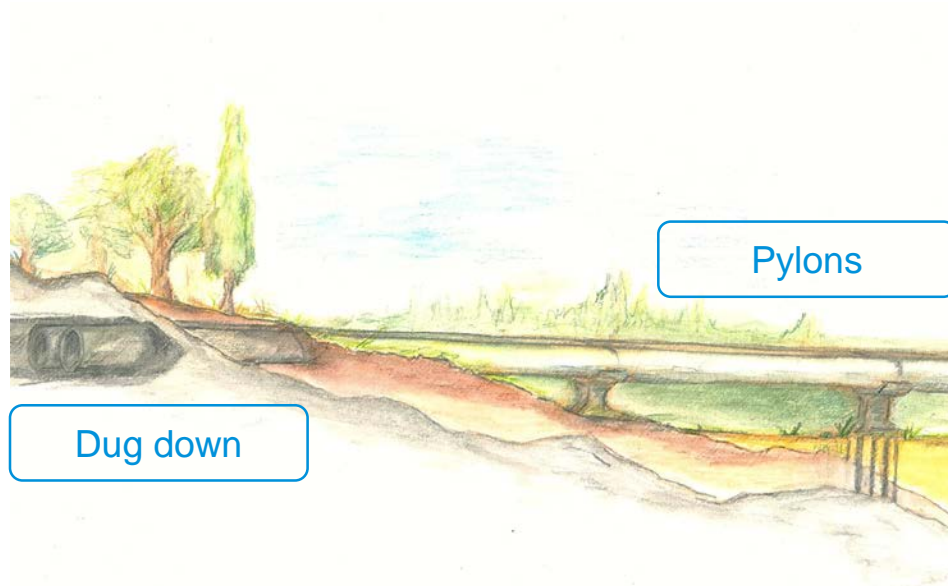
International Link via Åland



€19.0 bn total

Entire Project

# The 500 km and 11 station corridor will consist of three main technical solutions





# Summary of legal considerations

## **To enable the building of the link we see many different legal considerations and questions that have to be solved**

- The link will most likely be built in two phases, the Swedish and Finnish corridors and the International corridor. This means that most of the international legal questions have to be considered in phase two. Before the second phase can begin, agreements between the two states and Åland are needed.
- There are various ways to finance the project and different models are possible. However, since legal considerations, government approvals and other governmental interactions are needed throughout the project, we are preliminary of the opinion that the best way forward is a cooperative alternative between Sweden/Finland, Hyperloop One and maybe other parties as well.
- In order to structure the link as a cooperative project and to enable different investors in the project, procurement legislation and conflict of interest questions need to be considered.
- It is also crucial to start discussions with the governments at an early stage since adjustments to existing legislation most likely are needed. Hyperloop One is the 5<sup>th</sup> mode of transportation which means that there is, neither in Sweden nor in Finland, any legislation regarding this type of transportation. However, implementation of new legislation is complex and time consuming. We would therefore be inclined to propose adjustments to existing Railway Acts.
- To enable the building of the fixed link several permissions are needed. A thorough impact assessment on nature is needed and has to be approved in both Sweden and Finland. In the second phase, when the tunnel under the Baltic Sea is built, the same assessment has to be done off shore.
- The right of way needs to be discussed with land owners. Expropriation can be a way forward.
- Taxation and social benefits are also major question in this project. Åland has a special tax exemption in the EU.

**As a whole, many different legal aspects and new questions will be added in the different phases of this case. However, regarding legal obstacles, no insurmountable barriers can be identified at this stage.**

# The time, from feasibility study to completed construction, is estimated to 12-15 years (incl. construction time of 8 years)

## High-level time plan from feasibility study to completed construction

- Detailed design, Legal and Procurement: 3 – 4 years.
- Environmental permits, land take: 3 years.
- Construction: 8 years.
  - Tunnel boring 2 parallel tunnels diameter 6,5 m.
  - Pylon production and Hyperloop tube logistics: in parallel with tunnel boring.
- Total: 12-15 years.



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