

An aerial photograph of a coastal region featuring several islands and a large body of water. The water transitions from a deep blue to a vibrant turquoise near the shorelines, indicating shallow depths. The islands are covered in dense green vegetation. The overall scene is bright and clear, suggesting a sunny day.

We're better
connected



Based on your knowledge right now, do you think Jersey and Guernsey should work together to scope the feasibility of connecting the Channel Islands and France?



The Connect 3 Million Vision



Teitur Samuelsen of the Faroe Islands Tunnel Corporation

It can be done! Faroe Islands Case Study



Arild P. Søvik of the Norwegian Tunneling Society

Prof. Eivind Grøv, Chief Scientist at SINTEF

Lessons from Norway



How we move forward

The problem

**Vulnerable
tourism
sector**

**Reliance
on finance
industry**

**Sub-scale
on
everything**

**Ageing
population**

Growing challenges

**Narrow tax
base**

**Elusive
GDP
growth**

**Finite
workforce**

**Housing s
hortage &
high cost**

The opportunity

Guernsey

15 min

Jersey

17 min

30 min

Pop: 70,454
GDP: € 2,007,939,000

60 min

Pop: 1,473,114
GDP: € 42,343,906,100



**Enrich
trade and
tourism**

**Diversify
economy**

**Greater
connectivity**

**Critical
mass
savings**

**We are better
when connected**

**Grow tax
revenue**

**Increase
GDP**

**Access to
workers**

**Alleviate
housing**

An aerial photograph of the Faroe Islands, showing several islands with green vegetation and white sandy beaches, surrounded by deep blue water. The text "Case Study 1 How the Faroes did it" is overlaid in white.

Case Study 1

How the Faroes did it



Teitur Samuelson

CEO of Eysturoyar- og Sandoyartunnilin
(the Faroe Islands Tunnel Corporation)



**EYSTUR- og
SANDOYARTUNNLAR**

The Faroe Islands in brief

- 18 islands – 1,387 km²
 - 54,000 inhabitants with our own language and culture (vs 171k CI)
 - GDP: £3.65 billion (vs £9.11 billion CI)
 - Home rule – within the Kingdom of Denmark
 - Not part of EU
 - Main industries:
 - Fishery
 - Fish Farming
 - Offshore Service
 - Tourism
- vs CI
- Finance
 - Professional, business, scientific & technical services
 - Other business activities



EYSTUR-og
SANDOYARTUNLAR

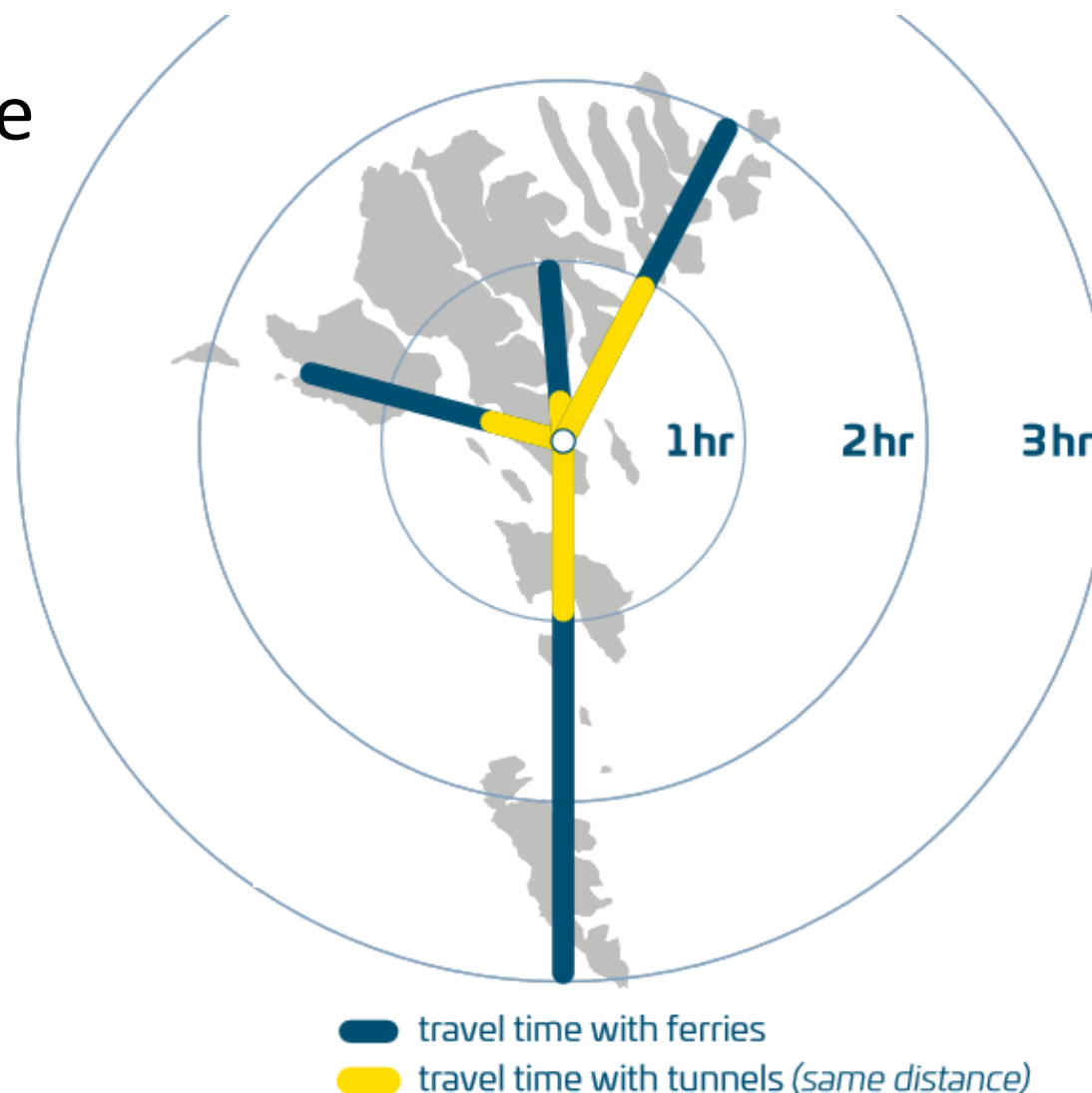


Infrastructure development in the Faroe Islands

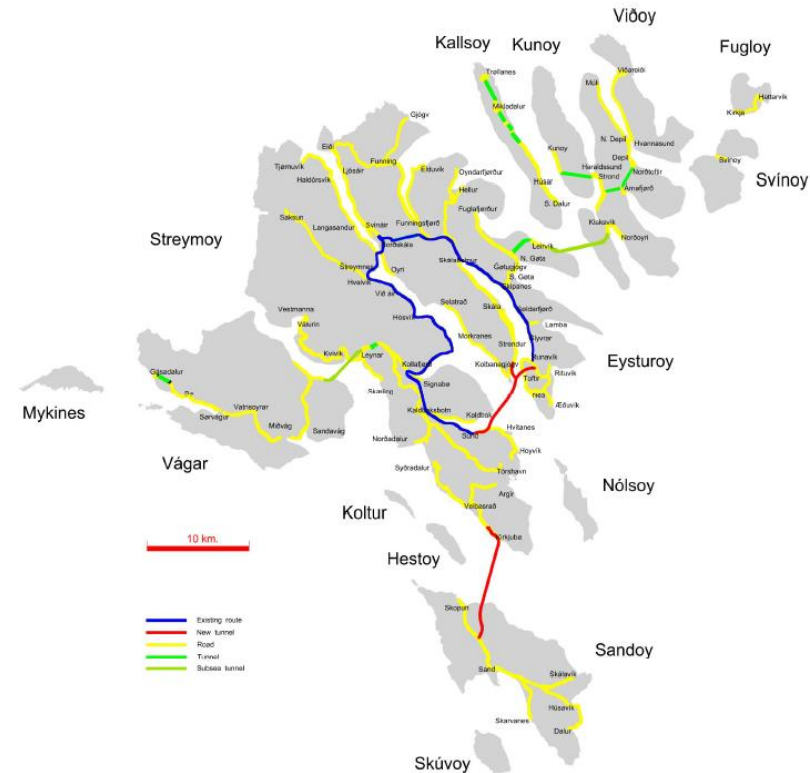
Significant investments the last 60 years in infrastructure

- Roads: 1.000 km.
- Mountain Tunnel: 23
- Bridges: 3
- Subsea tunnels: 4

Travel time to and from the capital Tórshavn



The project and background



- Construction of two subsea tunnels
- Reduce the travel time to the capital Tórshavn by 50-70%
- Create an alternative, to the today weather exposed infrastructure
- Sandoyartunnlin connecting the Sandoy island to the main island
- Political wish to improve the infrastructure to all regions in the Faroes

The company that made it possible

Governed by Parliament Law no. 30 from 14.04.2014

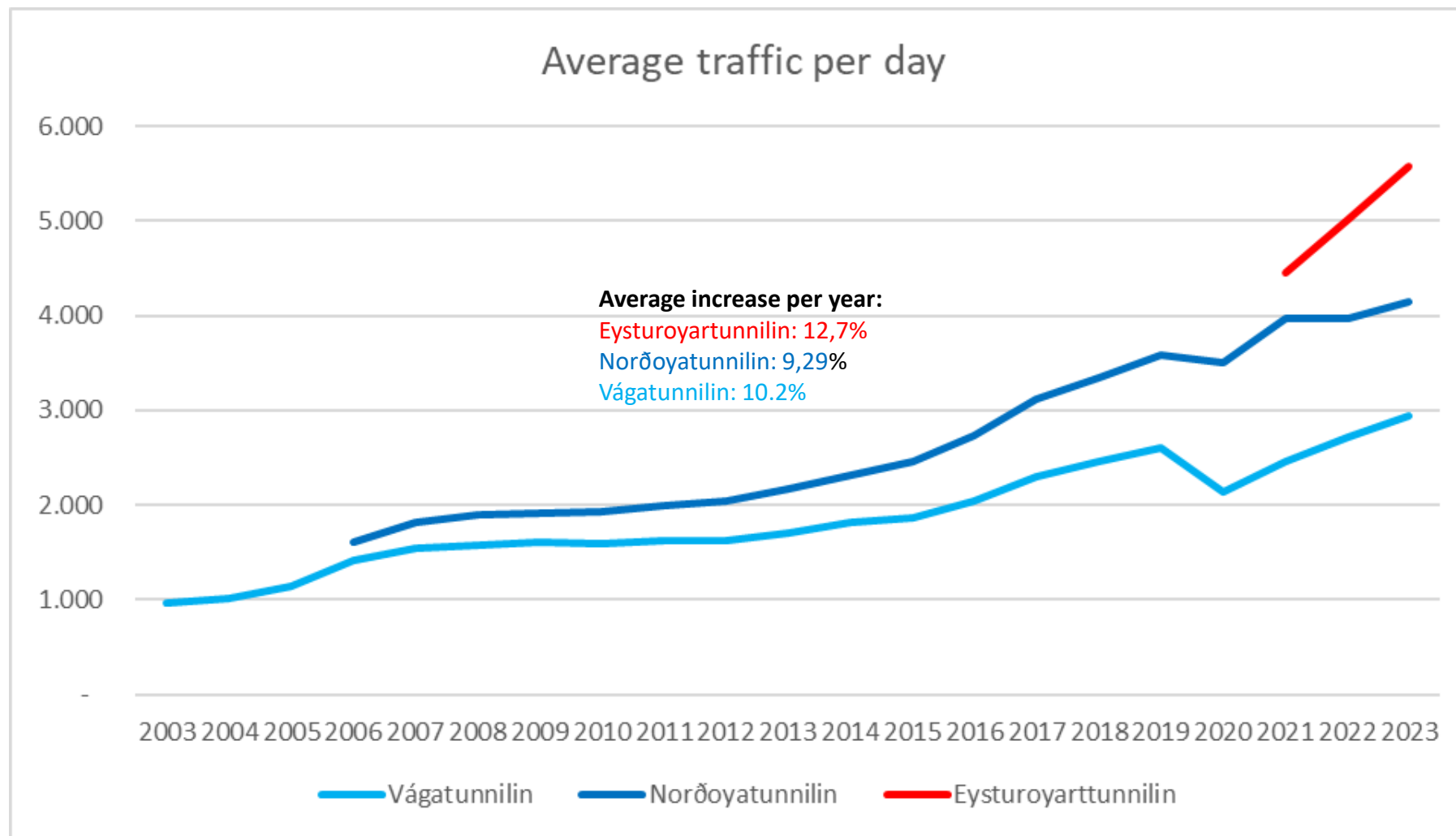
- 100% owned by the government in the Faroe Islands
- Established in 2014 to construct and operate two subsea tunnels
- First drill the Eysturoy tunnel and then, at the latest in 2018, start the drilling the Sandoy tunnel
- Share capital of DKK 400 million (£46m) paid in by the Faroes Government
- Government guaranty of minimum traffic to finance the tunnels
- The law was approved by all parties in the Faroese parliament



Other sub-sea tunnels in the Faroes

	Vága (airport)	Nordoy	Eysturoy	Sandoy
Length (Km)	4.9	6	11.2	10.8
Slope (‰)	69	59	50	50
Lowest point (m)	-105	-150	-187	-147
Lanes	2	2	2	2
Standards	Norwegian	Norwegian	Norwegian	Norwegian
Construction time	3	2.5	3-4	3-4
Vehicle per day	1,824	2,310	6,200	350-400

Traffic development in the subsea tunnels



The Eysturoytunnel



The Sandoytunnel





Main challenge in the project: to reduce **risk**

- Big project – also internationally - in a small remote community
The main risk was to finance the project
- High financial gearing, high debt
Big interest rate risk
- Long construction time approximately 7 year
Re-finance risk and increased interest rate risk
- Reduced number of companies capable of constructing this type of tunnels
Maybe 10 in Scandinavia
- Geological risk
Use the experience from the other two sub-sea tunnels in the Faroe Islands

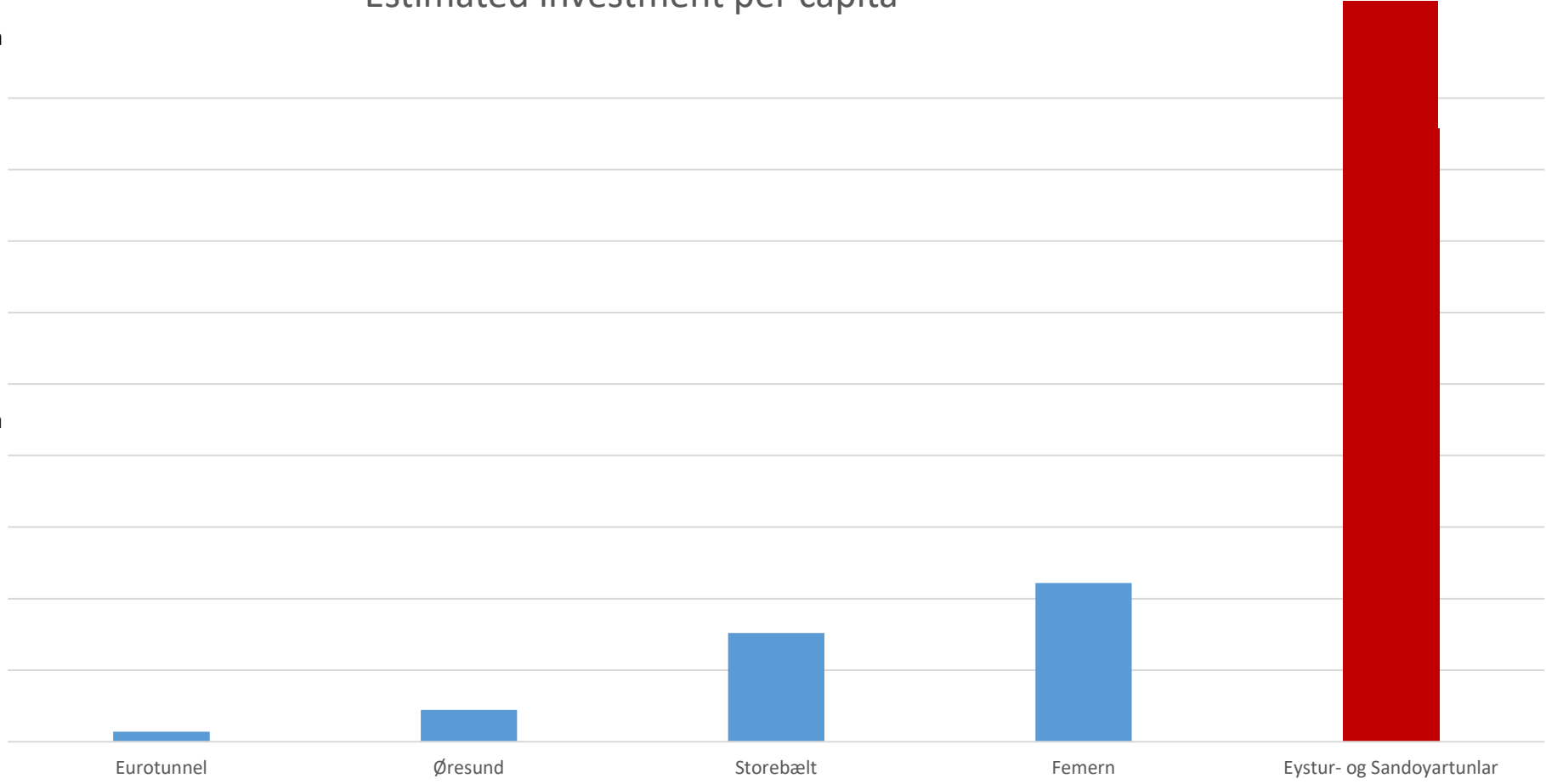


A big investment in a small country

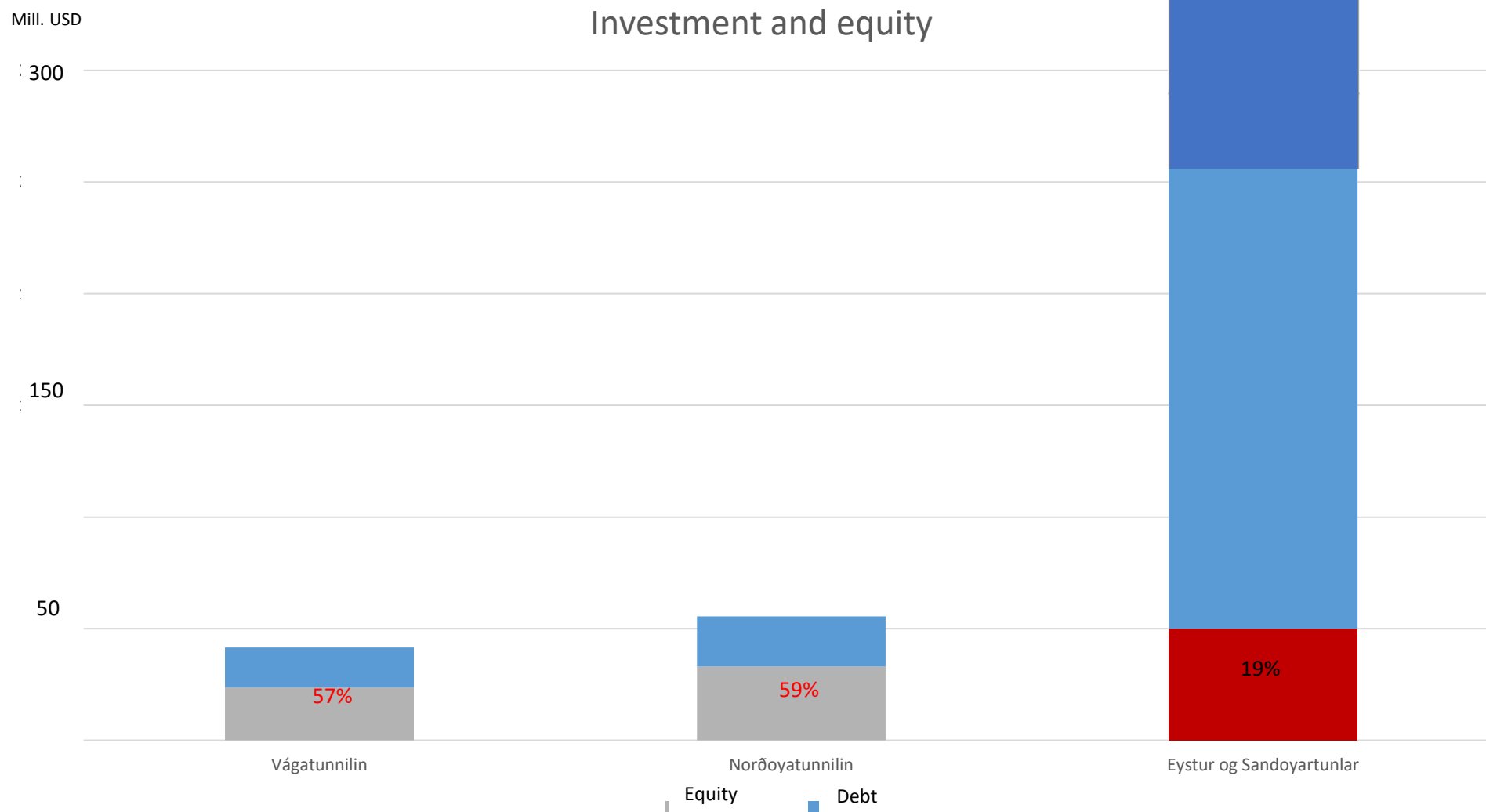
Estimated investment per capita

ERU 7,100/capita

EUR 3,550/capita



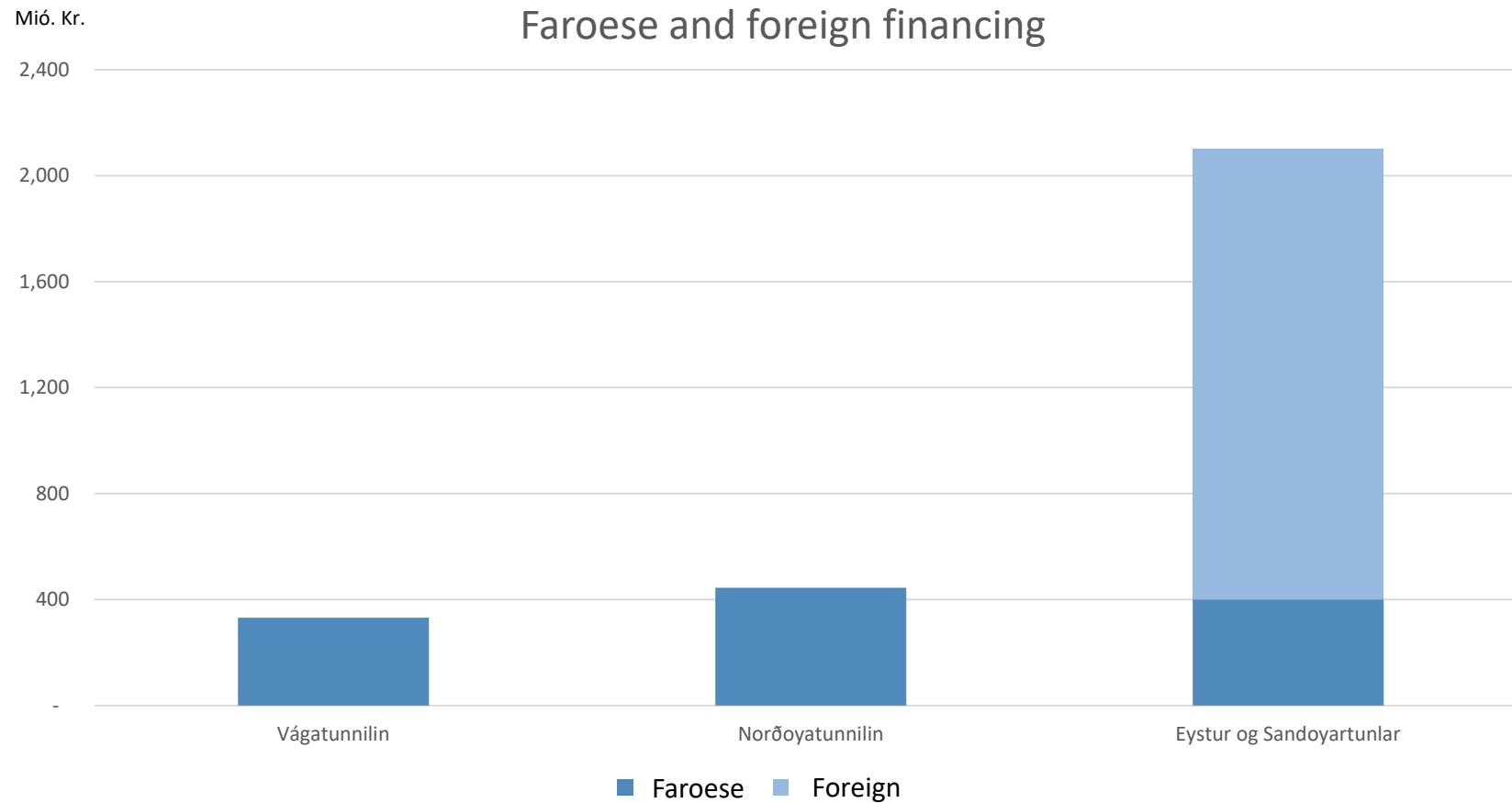
Financial gearing



* Numbers for Vágatunnilin og Norðoyatunnilin are indexed to 2014

Explore the financial market:

Foreign investment necessary



* Numbers for Vagatunnilin and Norðoyatunnilin are indexed to 2014

Risk that the interest rate will increase again ...construction time 6-8 years – What then?



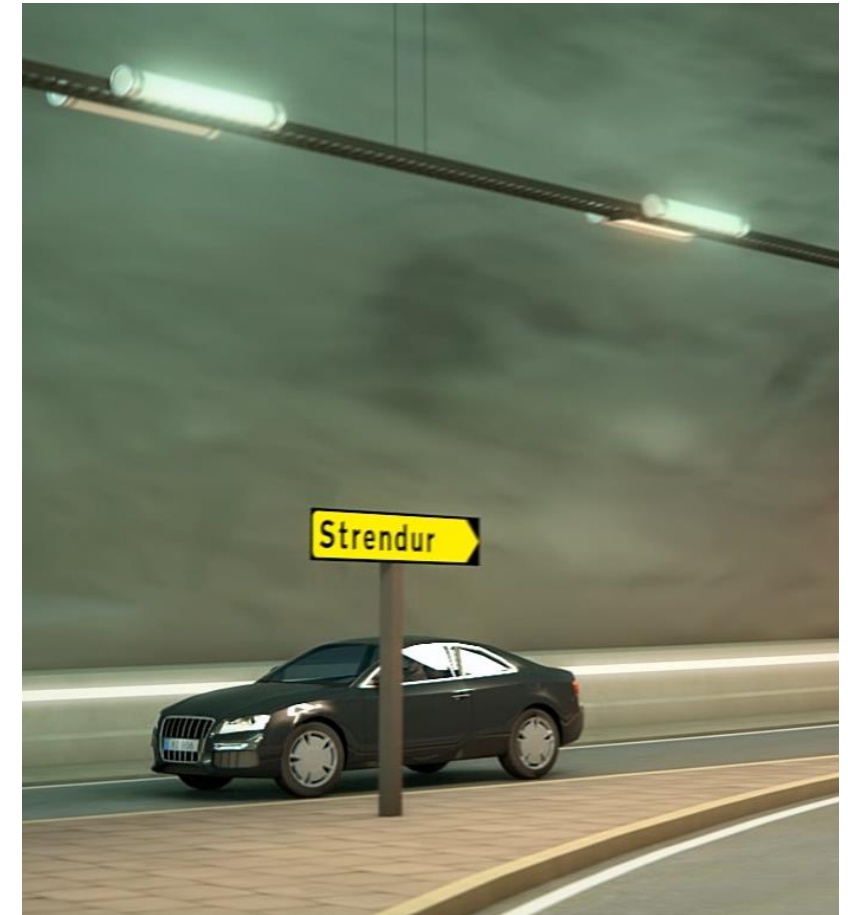
- Timing of the project favourable, with regards to the interest rate

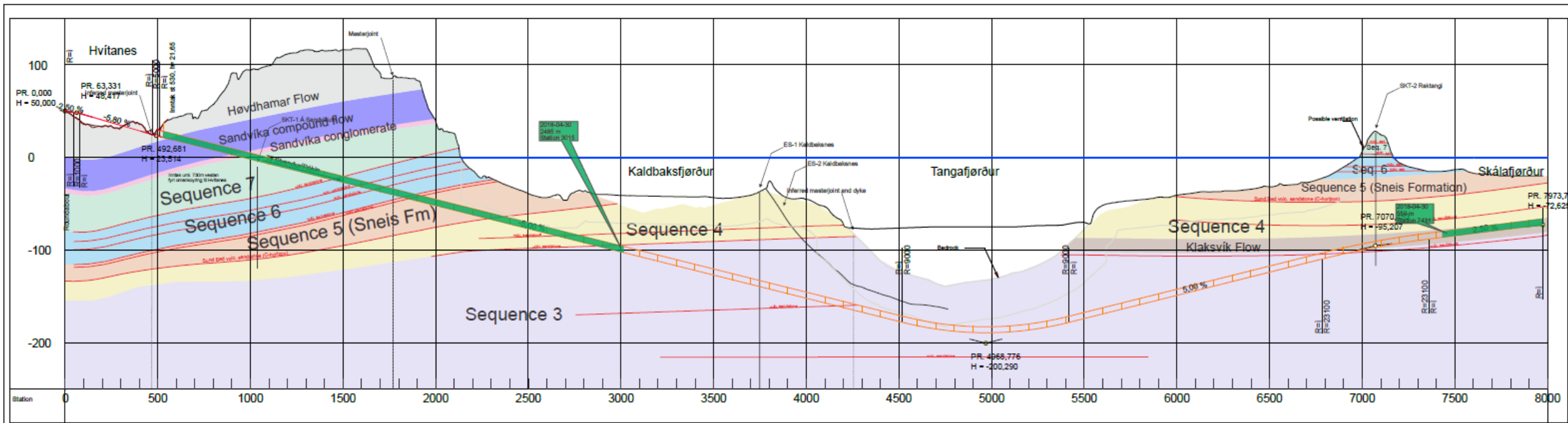
Focus on minimizing risks

Geology

- I. All geological surveys carried out
 - I. Different types of seismic data collected, and different types of cored drillings carried out
 - II. Known geology
 - III. Same advisers as in the other subsea tunnels
 - IV. Sintef og Jarðfeingi (Eivind Grøv and Martin Heinesen)
- II. Same design company Norconsult

Designed in accordance with Norwegian standards





Construction

I. Construction

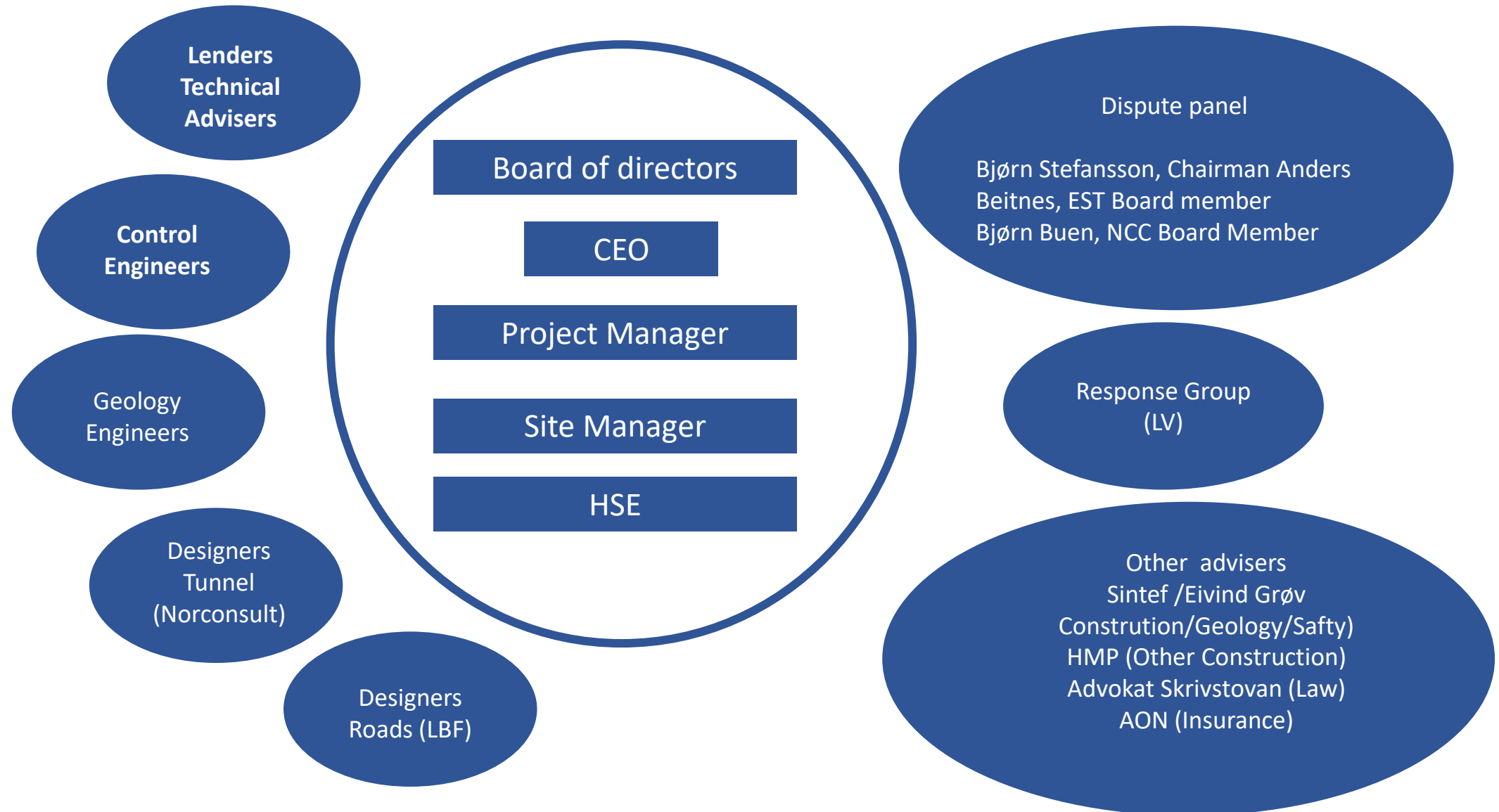
- I. Same contractor as built the other subsea tunnels in the Faroes (NCC)
- II. Some of the same people, that did the other tunnels
- III. One of the largest construction company's in Scandinavian
- IV. Due to financing, fixed price contract with NCC, but items variable
- V. Traffic estimated prepared by Rambøll
- VI. According to Rambøll probable conservative.
- VII. Not incorporating significant jump in traffic



Risk management



The organisation of Eystur- og Sandoyartunlar P/F



Eysturoyartunnilin

Opened for traffic 19 December 2020

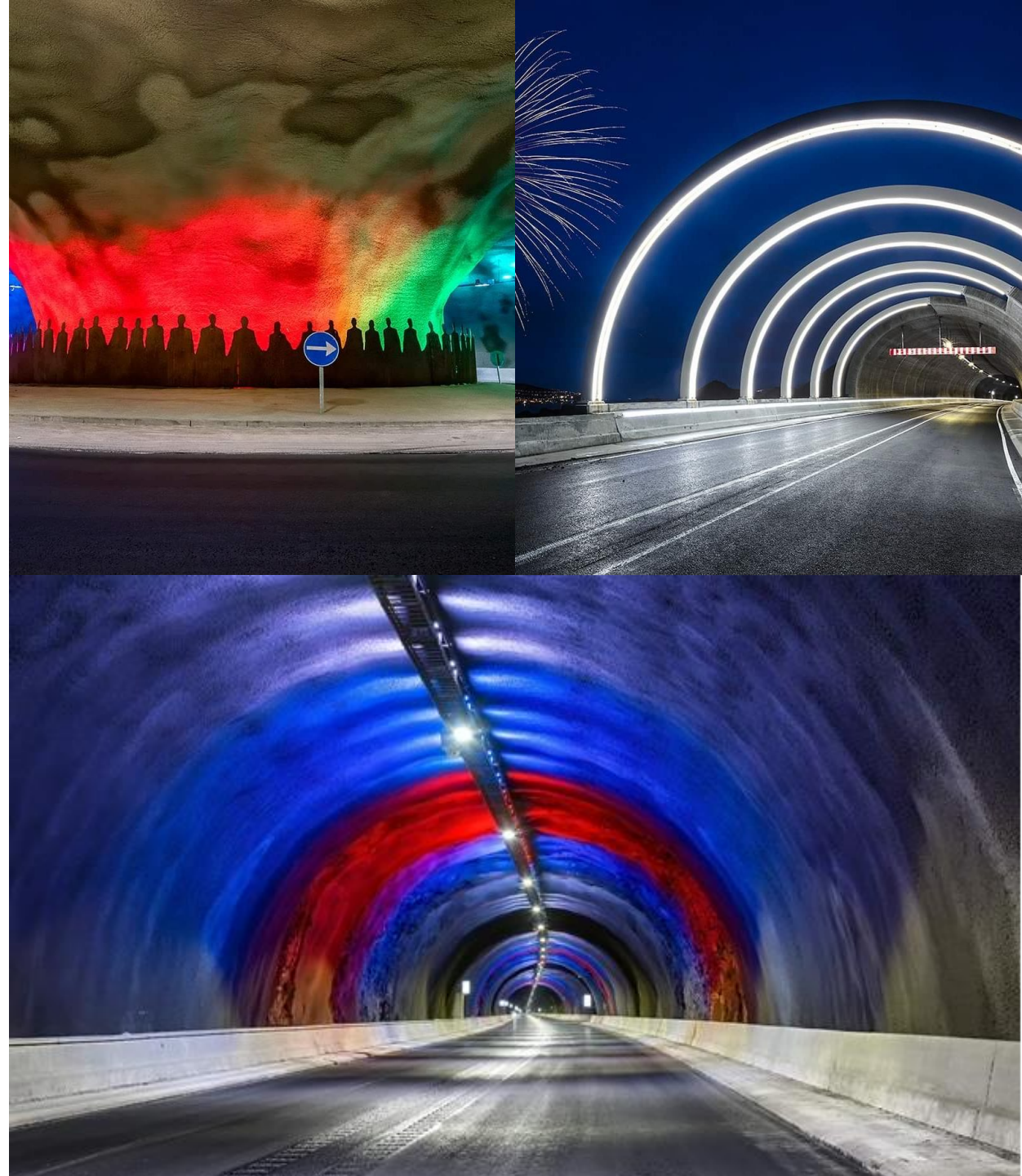
Traffic slightly lower than expected, but steady increasing.

Based on statistics implement new initiatives to add “new” traffic and hence increase traffic.

Completed on budget

Opened 6 months earlier than originally planned

<http://www.estunlar.fo/fo/um-tunlarnar/eysturoyartunnilin/framgongd-vid-boring/>





TIME 2021 World's Greatest Places

WHERE THE POSSIBILITIES ARE ENDLESS Striking new underwater traffic circle opening in the Faroe Islands

Faroes Islands, 2021 | Updated 10th December 2021



Underwater network: The Eysturoy Tunnel will be followed in a few years time by the still-in-construction Sandoy Tunnel, which will link Eysturoy to the island of Sandoy.

This article is more than 1 year old

Giant underwater 'jellyfish' roundabout becomes latest Faroe Islands tourist attraction

Already a hit on social-media, an infrastructure project linking the two largest islands is set to become a big draw for foreign visitors



Incredible underwater roundabout set to open

The Eysturoy tunnel network is almost 7 miles long



Faroe Islands: Inside the undersea tunnel network

The Faroe Islands are set to open an under-sea roundabout following more than three years of construction. The underwater tunnel connects the islands of Lønging and Eysturoy in a network some 7 miles (11 km) long. The network is set to open in 2021.



Roundabout located 187m below ground in the Faroe Islands

Swedish contractor NCC has completed work on a the Eysturoy tunnel, 11.2km underneath the Faroe Islands. The tunnel, which has a roundabout 187m below sea level, links the Faroe Islands capital of Tórshavn with both sides of Skálafellur fjord.



Faroe Islands become home to world's first undersea traffic circle

TRAVELNEWS.COM / TRAVEL NEWS, FAROE ISLANDS / Created: Jan 6, 2021, 07:57:01



YOU'RE READING

Synopsis
The bottom surface of North Atlantic Ocean has a series of sub-aquatic tunnels, linking the uneven islands that feature the Faroe Islands archipelago. According to the latest reports, the newly built undersea Eysturoy tunnel has g...

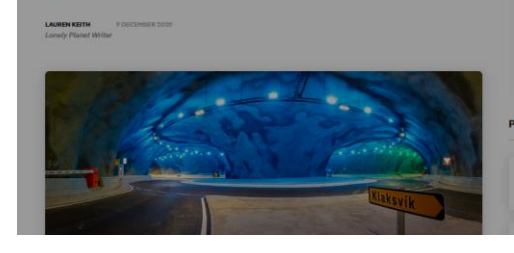


POPULAR GALLERIES

- As India prepares to unlock, here's our travel wishlist
- A guide to Bali's most picturesque attractions
- Beautiful hill towns that are best explored in April

Travel News / All Travel News Stories / Europe / The world's first underwater roundabout...

The world's first underwater roundabout is opening in the Faroe Islands



EYSTUR- og SANDOYARTUNLAR

Sipa Press photo gallery for 'The Faroes Islands Eysturoy Tunnel' with multiple image thumbnails and a legend.

The tunnel went viral

Sandoytunnel

Opened for traffic 21 December 2023

Traffic higher expected

Completed on budget

Opened on time



Eysturoyartunnin



Sandoytunnel



EYSTUR-og
SANDOYARTUNLAR



Sandoytunnel



EYStur- og
SANDOYARTUNLAR



Sandoytunnel



EYSTUR-og
SANDOYARTUNLAR



Sandoytunnel



EYStur-og
SANDOYARTUNLAR



An aerial photograph of a coastal region, likely in Norway, showing a large body of water and several islands. A thick red line is drawn across the image, starting from the top left, crossing the water, and ending on the right side. The text "Case study 2: Learning from Norway" is centered over the water area.

Case study 2: Learning from Norway



Arild Petter Søvik

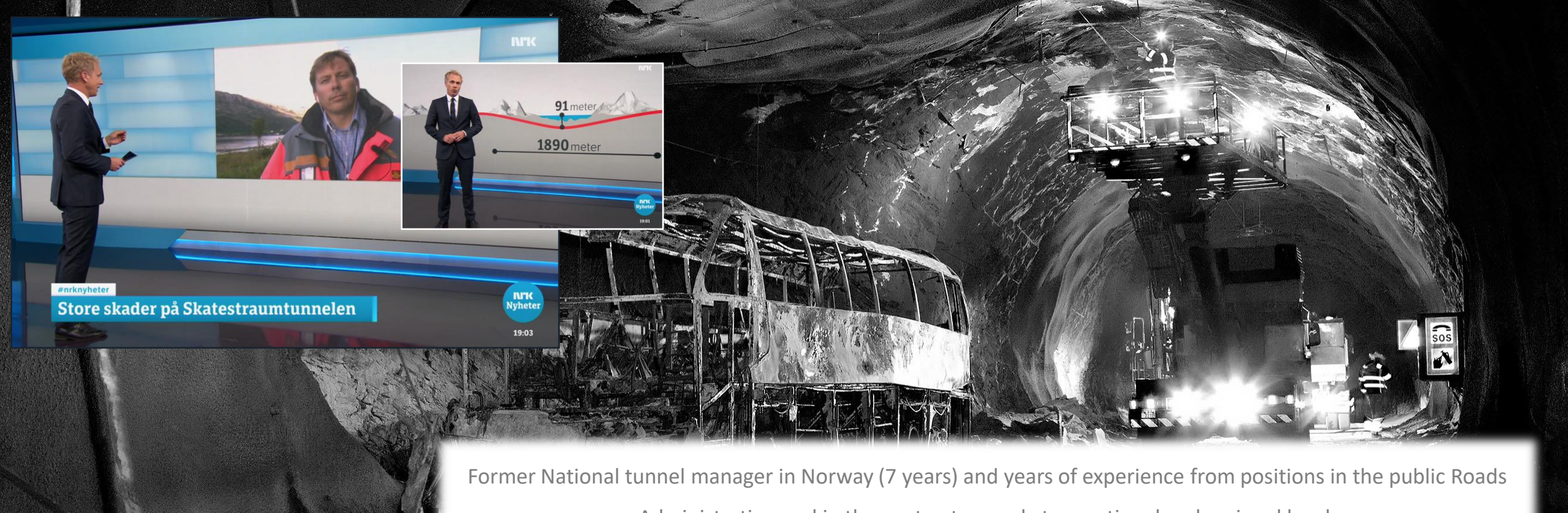
CEO of the Norwegian Tunneling Network

Prof. Eivind Grøv

Chief Scientist at SINTEF, Former President of NTN



NTN
NORWEGIAN
TUNNELLING
NETWORK



Former National tunnel manager in Norway (7 years) and years of experience from positions in the public Roads Administration and in the contractor market on national and regional level.

Arild Petter Søvik

CEO, Norwegian Tunnelling Network
&
Expert Tunnel Advisor

Responsible for dealing with all clarifications and formal approvals for all road tunnels in Norway, in both early studies, planning, construction and operation.

In-depth knowledge about Norway's tunnelling industry and Norwegian standards, road infrastructure and traffic management.

Today, CEO in Norwegian Tunnelling Network, an independent consultant in the industry and tunnel expert, offering services to professional networks, road authorities and the industry on national, regional and international level.



Standards

Our philosophy are our strength

Our philosophy – **Cost-effective** design-construction-operation:

- We have a history in thinking cost-efficient development of infrastructure in a challenging fjord and mountain landscape and scattered population
- Major infrastructure developments for more than a century:
 - Rail from Bergen to Oslo (1883-1909)
 - E39 Ferry-free Connection Kristiansand - Trondheim (2021 - 2040)
- Experience with the largest, longest, deepest and most complex projects in the world – and we plan to break all records in the coming years
 - Gaining more and more knowledge and experience (the National Transport Plan) - and we aim to develop an efficient, environmentally friendly and safe transport system in Norway.
- Experience with a high-rate development: > 50 road tunnels under construction, >150 under planning at any given time, and > 1800+ road tunnels in operation (today 70+ longer than 4 km and 40+ sub-sea tunnels)

NTN
NORWEGIAN
TUNNELLING
NETWORK

Land of fjord crossings and sub-sea tunnels



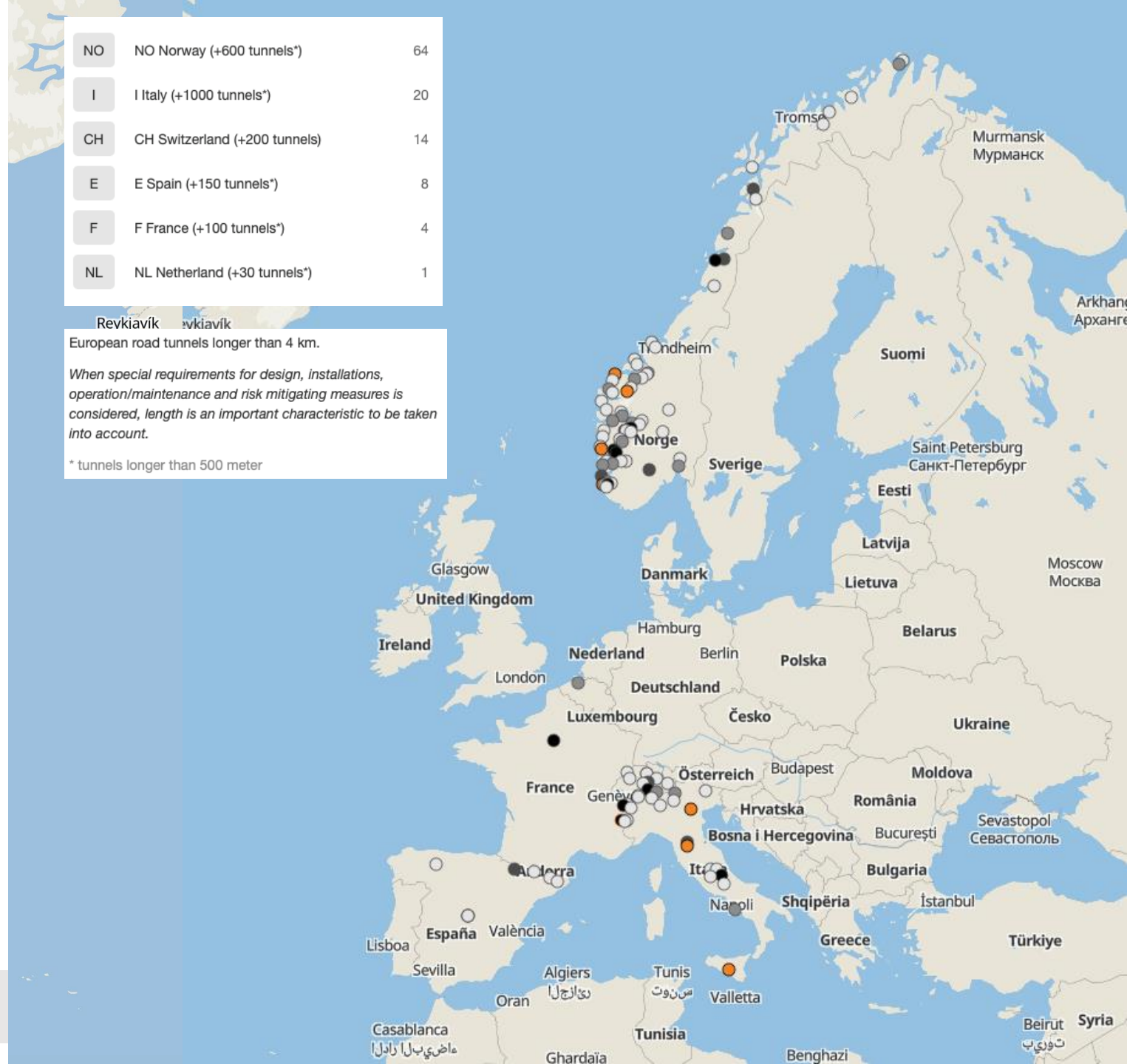
Lærdal tunnel 24 km (world's longest tunnel)



Rogfast tunnel (26,5 km) - Under construction

NO	NO Norway (+600 tunnels*)	64
I	I Italy (+1000 tunnels*)	20
CH	CH Switzerland (+200 tunnels)	14
E	E Spain (+150 tunnels*)	8
F	F France (+100 tunnels*)	4
NL	NL Netherland (+30 tunnels*)	1

Revkiavík vkiavík
 European road tunnels longer than 4 km.
 When special requirements for design, installations, operation/maintenance and risk mitigating measures is considered, length is an important characteristic to be taken into account.
 * tunnels longer than 500 meter



What is cost-effective project implementation?

- Finding the correct standard: Regulations that differentiate between low traffic and urban high traffic tunnels (appropriate design: 1 or 2 tubes/size on cross-section)
- Choice of tunnelling method that is best suited for the geological conditions, but also other factors can influence the choice of method.
- Choice of safety/ventilation strategy based on acceptable risk and best suited for a cost-effective design and operation.
- A cost-effective way to implement control and monitoring systems (ITS)
- A cost-effective distribution of Traffic Control Centers and a cost-effective operational and maintenance
-

Remember always: The guidelines for building infrastructure must ensure a correct level of investment, both for the infrastructure in general and for tunnels. For roads, the risk on the open road are often higher than the risk in tunnels.





Why subsea tunnels?

Connecting regions and communities

Why subsea tunnels?

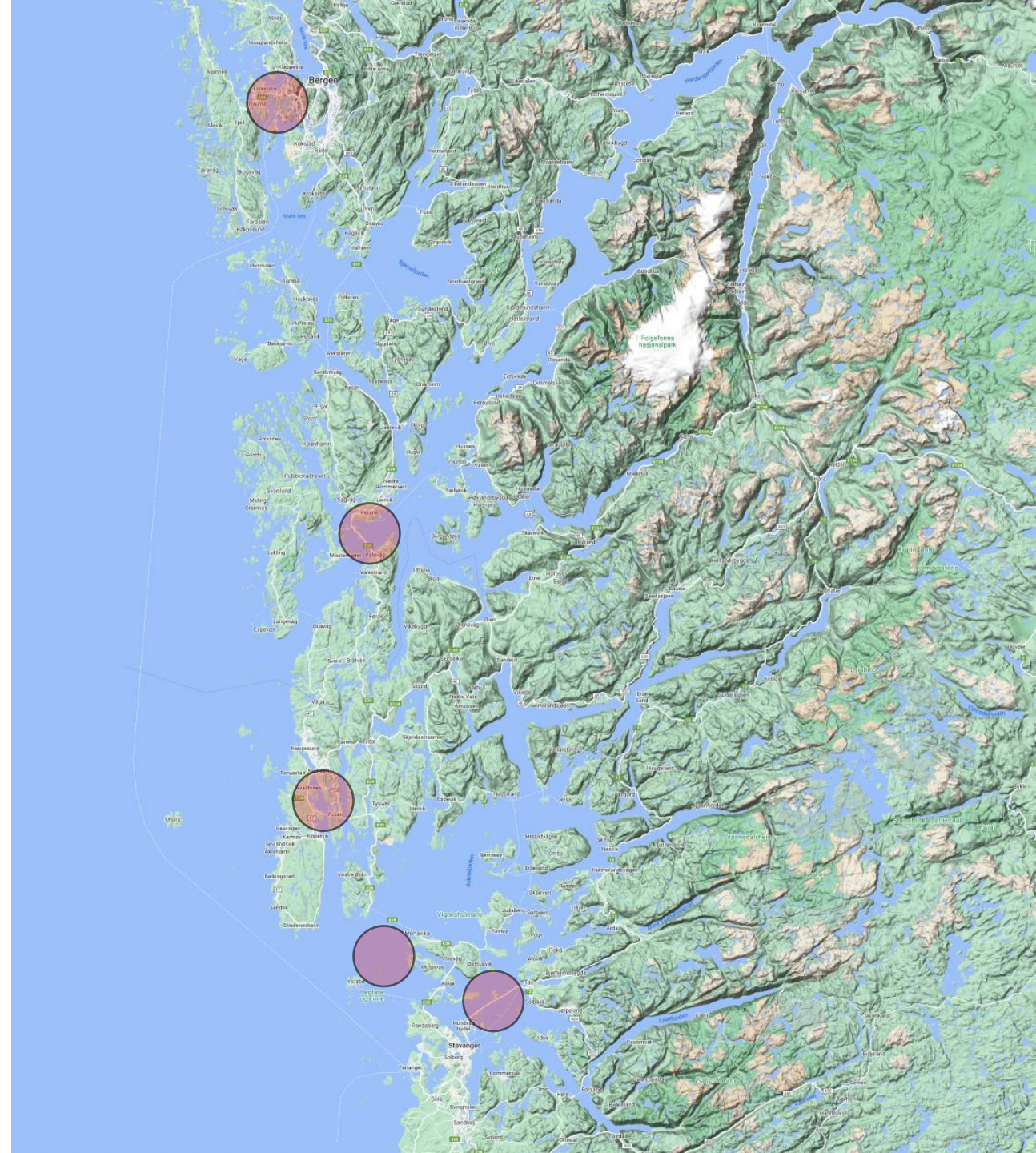
Connecting regions or local communities

Alternatives: Ferry, Bridge or Tunnel connection?

- Feasibility
- Future traffic prognoses
- Future development of society (example exp. work region)
- Costs; Investment, Operation, Maintenance, Social Economic (impact on society) and Sustainability

*Quantified and analyzed in each project

- But also, other reasons ..



E39 Rogfast (example)

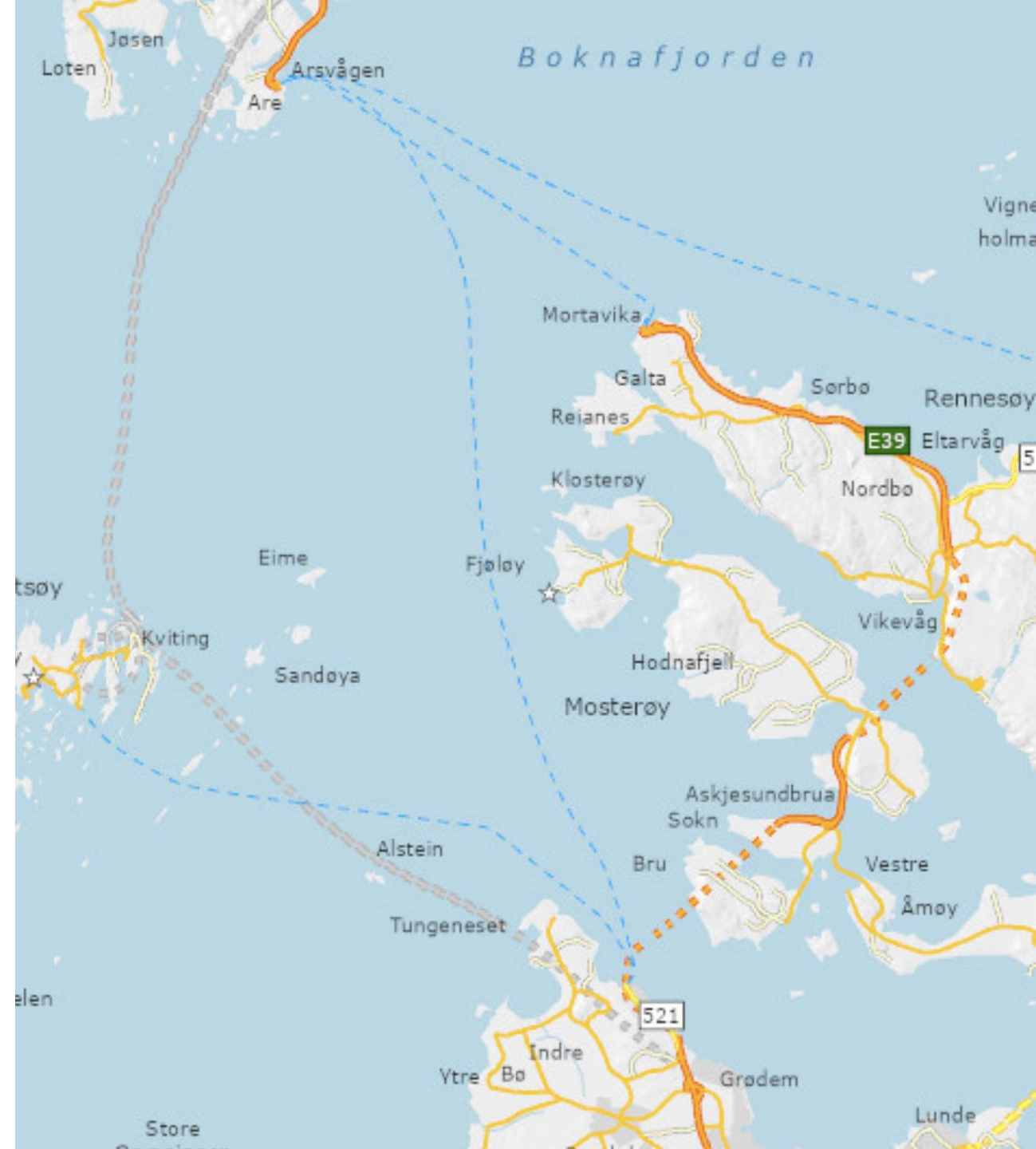
Connecting regions and local communities

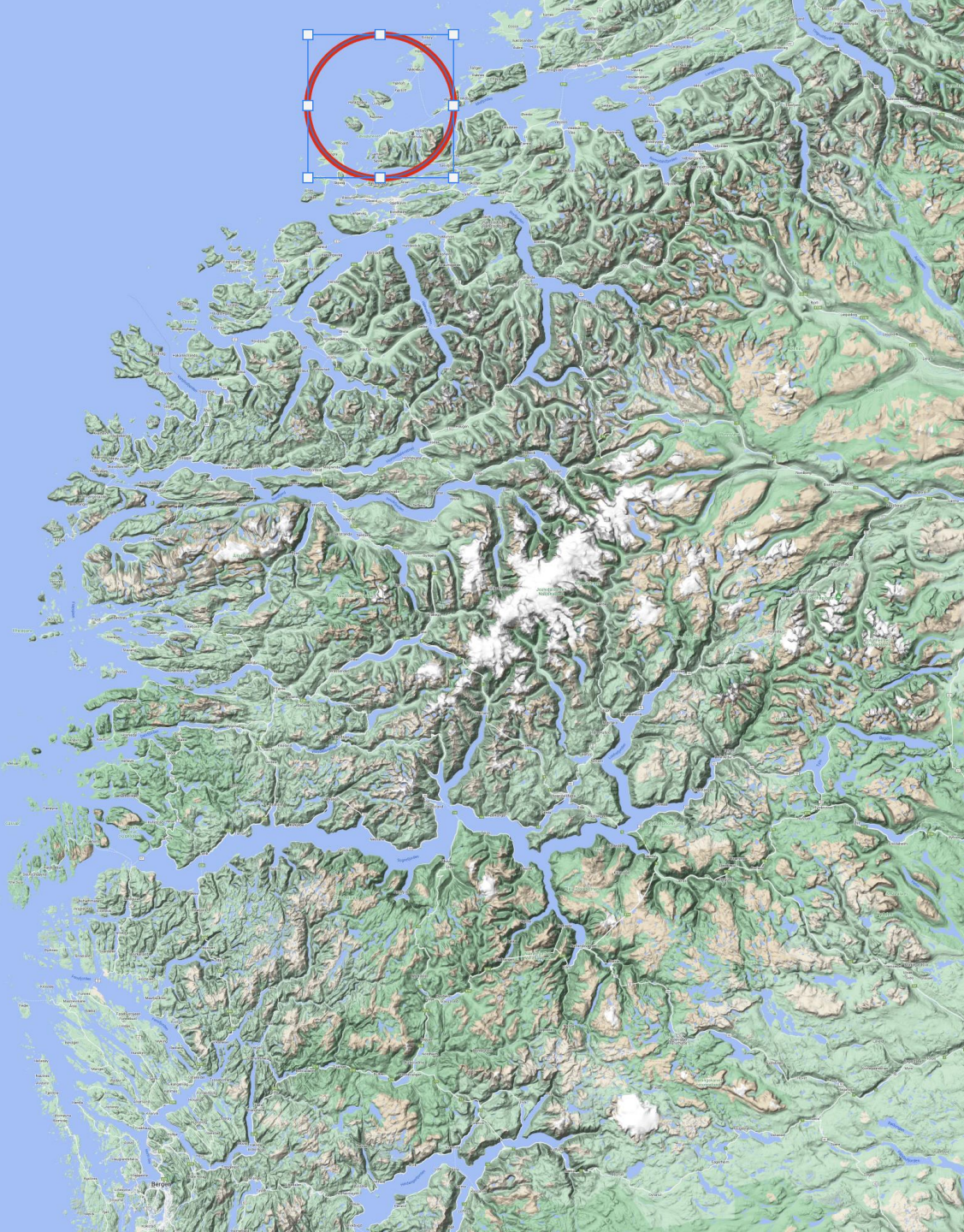
Replacing two subsea tunnels and two ferry connection (including the local community of Kvitsoy)

A 4-hour travel time (route diversion) – Availability is suddenly a key element for this high traffic strait crossing!

Availability measure: Diversion of traffic to one tube (bidirectional) in case of closure du to incidents or maintenance

26,5 km doble tube tunnel, 390 m below sea level!





Example: F659 Nordøyvegen

Low traffic subsea road tunnels

Located on the west coast of Norway, connecting small communities to the main land (2700 inhabitants!)

The project is a local mainland connection and a ferry replacement project

A district road, financed locally and a road tax loan (from the Norwegian Parliament)

The project assumed an AADT in the first collection year (2023) of 693 vehicles and an annual growth in traffic volume of 0.9%.

Cost: 5 600 mill. NOK (550 mill. USD)

F659 Nordøyvegen

Low traffic subsea road tunnels

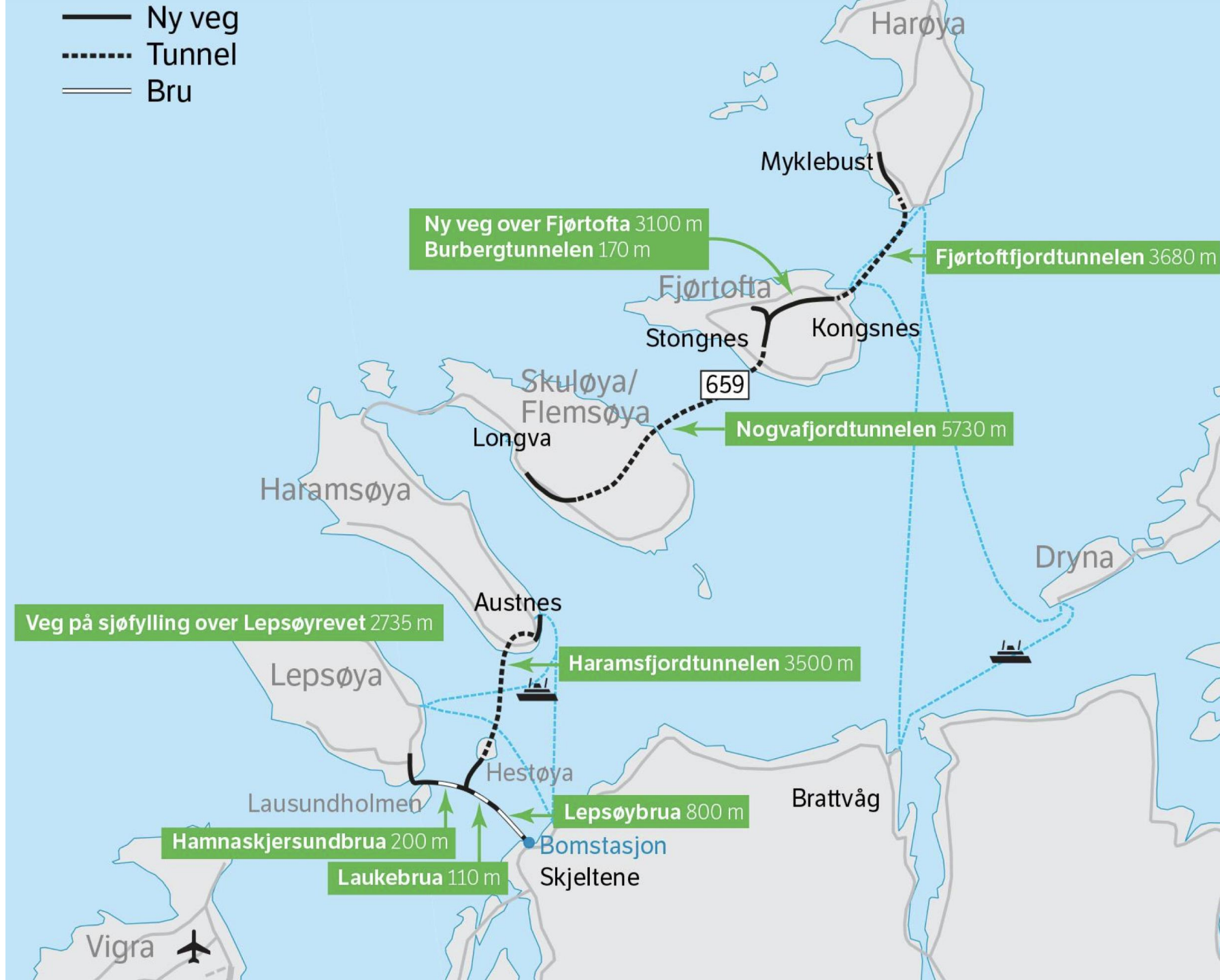
Total Project Cost: 550 000 000 USD

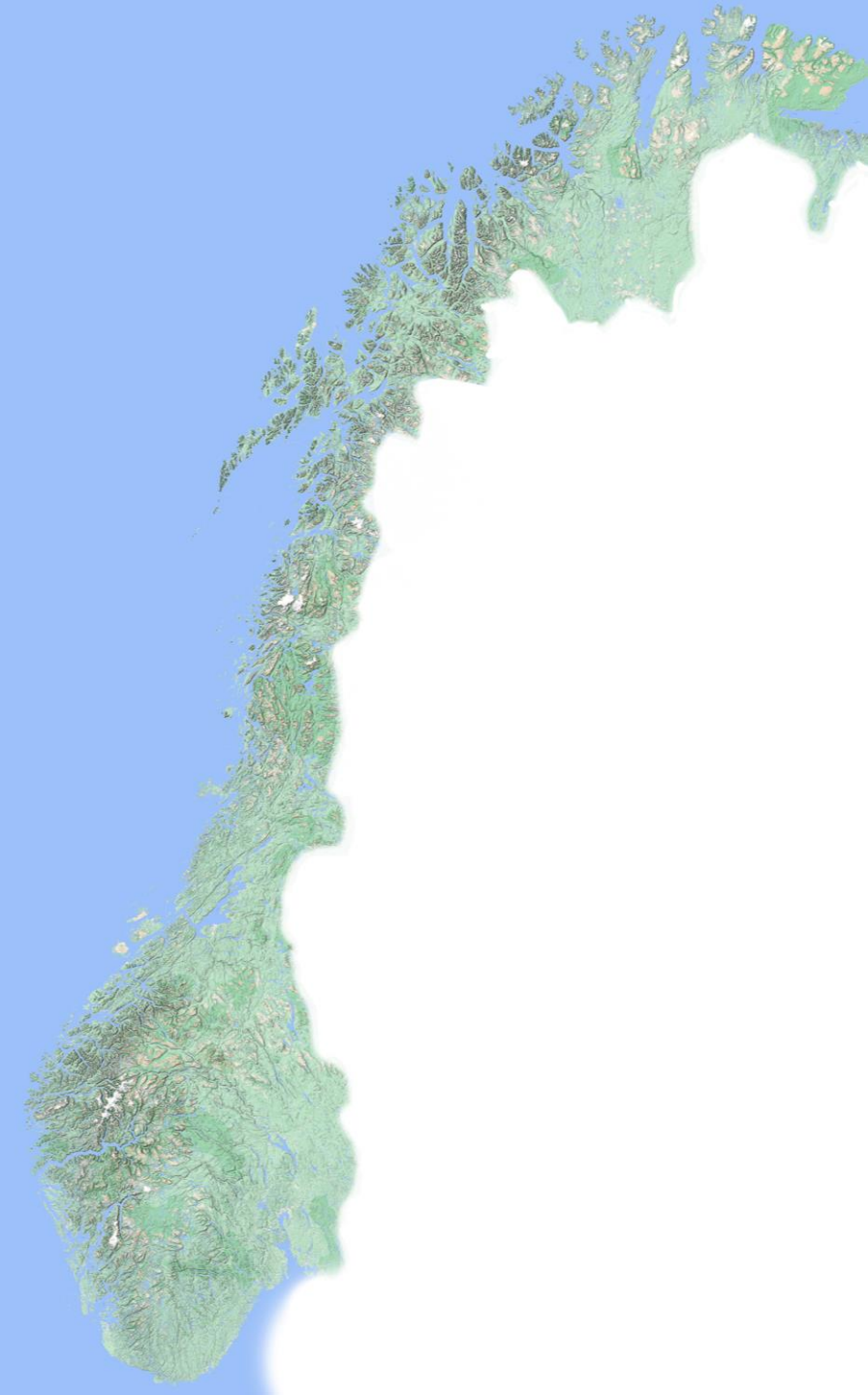
- Connection to 2700 inhabitants
- Lepsøy bridge, 800 m.
- Laukebrua 110 m.
- Hamnaskjersund bridge 200 m.
- Haramsfjord tunnel 3500 m.
- **Nogvafjord tunnel 5730 m.**
- Fjørtoftfjord tunnel 3680 m.
- Burberg tunnel 170 m.
- Road on sea filling 2735 m.

- 13 km tunnels ..

Nogvafjord tunnel 5730 m.

- Highest incline 7%
- 134 m below sea level
- Opened: August 2022





Costs – recent learnings from Norway

Recent report (NHO 2016)

- It is problematic that infrastructure projects have turned out to be more expensive than originally assumed. The most important reasons for the increases are changes in content, increased scope or changed assumptions for the project in the early phases
- Projects throughout the planning phase and over time incur higher costs because of project extensions and increased standards and quality requirements (both local and central authorities are sources of such cost increases)
- **In the construction phase, i.e. after the decision to implement the project and where the project's content has largely been determined, the costs seem to be mostly as predicted**





What influences costs?

Planning phase

- Choice of transport type
- Traffic conditions and capacity issues
- Choice of standard
- Geographic conditions and ground conditions
- National, regional and historic development of relevant legislation
- Dealing with risks (safety) and operational issues and mitigating measures
- How procurement and contract is handled in the investment project
- How procurement and contract is handled in the operational phase
- And of course, other ..





Costs – recent learnings from Norway

Planning phase

Cost growth from early estimates to a finished project:

- We have historically (2016 report) operated with an uncertainty of 40 percent in the cost assessments in an early phase, (often the early cost estimates have been revised upwards), and often because of the projects being expanded
- Insufficient knowledge also increases costs (In several cases, cost increases in the planning phase are due to insufficient knowledge, a basis which can only be uncovered through more detailed planning and project development, example ground conditions)

Be aware: Low, early cost estimates affect the decision-making process

- A too low-cost estimate in an early phase may lead to projects being "remained" in the decision-making process for longer than they would have been if the correct picture of the costs were presented in an early phase..
- Important: Improve early cost estimates by having procedures to address unknown cost drivers/factors in planning at an early planning stage. And be more reserved in presenting cost estimates before the projects are fully matured and defined.





Costs – recent learnings from Norway

Engineering and construction phase

- ❖ Competition in the construction market generally appears to be sufficiently good (Norway for similar projects)
- ❖ Price-oriented contracts:
 - A too strong focus on price in offers can lead to poorer quality in the final product, which in the long run results in increased costs for society
- ❖ Quality can be ensured in a better way by using competition with negotiations as the procurement procedure:
 - This means that the client can negotiate with the providers about all aspects of the offer. After the negotiations, a revised offer is submitted which is subject to final evaluation and contract award. This give a better control of critical activities, target achievement, quality and cost optimization in the project for the client.
- ❖ For tunnels: **How to share risks between the client and the contractor is important!**





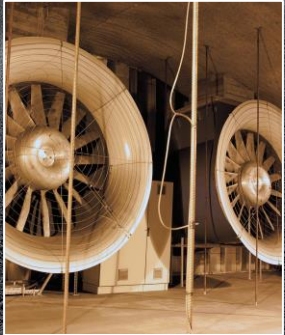
Costs – learnings from Norway

Operational phase

Important to set goals and plan for all factors that influences Reliability, Availability, Maintainability and Safety in operation!

Be aware, a part of the costs in the project is to establish an operational scheme which suits the purpose. Another cost is to operate the tunnels. It is of great importance to bring in experience with operation and maintenance in the early stage of planning!

Which type of transport mode (road, light rail and rail), and how will this influence investment costs and operational cost.





Operation

Challenges and **best practice**

Tunnel construction and installations can have weaknesses that affect reliability, availability, maintainability and safety.

Tunnels with weaknesses largely affect costs, lifespan of construction and installations, and in many cases give high socio-economic costs in terms of more frequent shutdowns and less available road network. In addition, weaknesses could significantly affect safety.

It is important to apply new research, best practices, innovative technologies and bring in experiences from operation.

RAMS is an important tool in planning, especially in planning / engineering of new tunnels.

R

Reliability

Construction, infrastructure, installations and equipment have an important role in safety, and we are dependent on reliability.

A

Availability

Weaknesses in construction, infrastructure, installations and equipment lead to closures, social economic costs and unnecessary costs in operation.

M

Maintainability

To ensure functionality over time, the solutions need to be designed in such a way that operation and maintenance can be carried out in a cost-effective way.

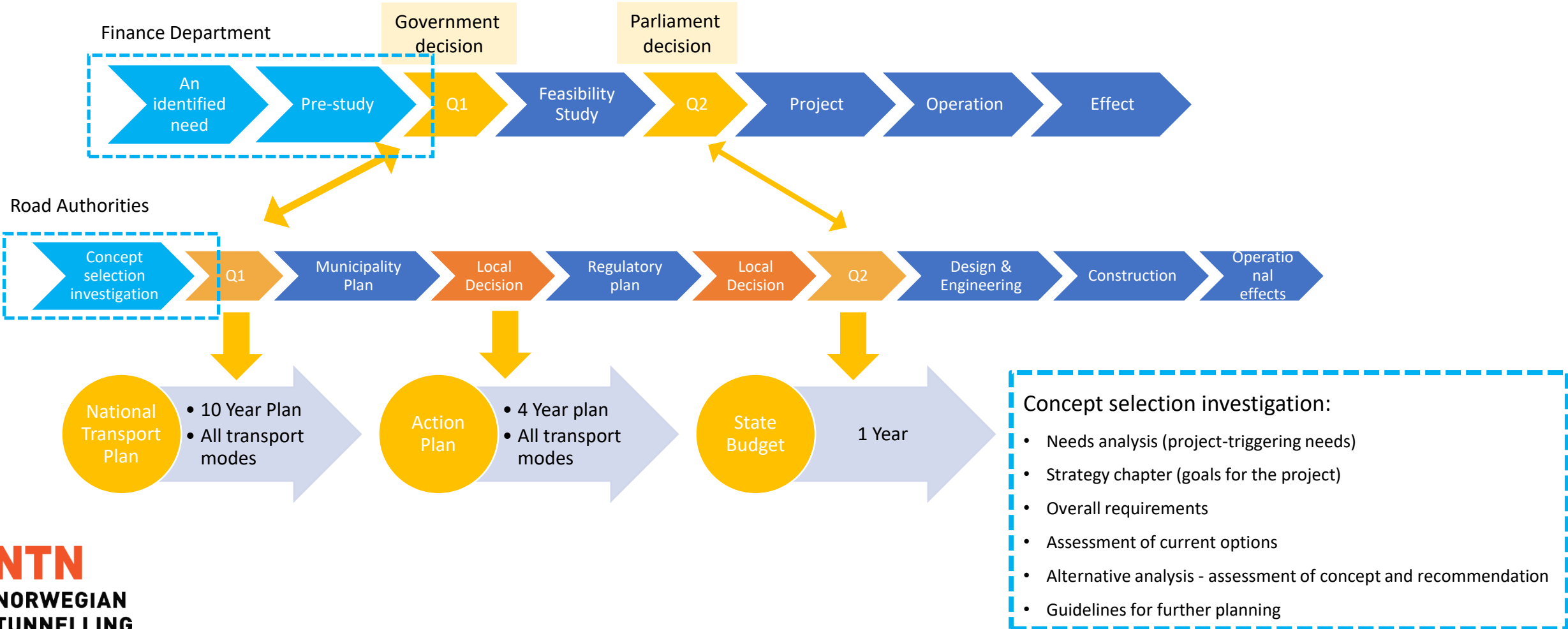
S

Safety

Safety is affected of weaknesses in construction and installations.

Steps in the process

Planning Infrastructure in Norway - Early planning





First steps in the process

Concept selection investigation report

- ❖ The first chapters involve a review of various stakeholders and their needs and conclude most important needs. A basis for formulating goals for the initiative (social goals and impact goals) and which requirements the concepts must meet.
- ❖ Various solutions are assessed to cover the needs. The different concepts are assessed in relation to goal achievement and a socio-economic analysis is made. This is the basis for professional recommendation on which concept should form the basis for further planning.

An open process with broad participation from municipalities, county councils, business and various interest organizations. The concept selection investigation report is sent for consultation to the authorities and stakeholders.

External consultants carry out professional quality assurance; Q1, concept selection investigation work, mainly based on studies of the main report and annexes. Quality assurance team prepares a separate Q1 report.

It is the Government, based on the concept selection investigation report, consultation statements and the Q1 report, decides on which concept to be used as a basis for further planning according to the Norwegian Planning and Building Act (legislation)

Norway have developed a comprehensive set of legislation, requirements and guidelines, especially suited for the purpose of planning, constructing and operating tunnels and subsea tunnels! All based on many years of experience.

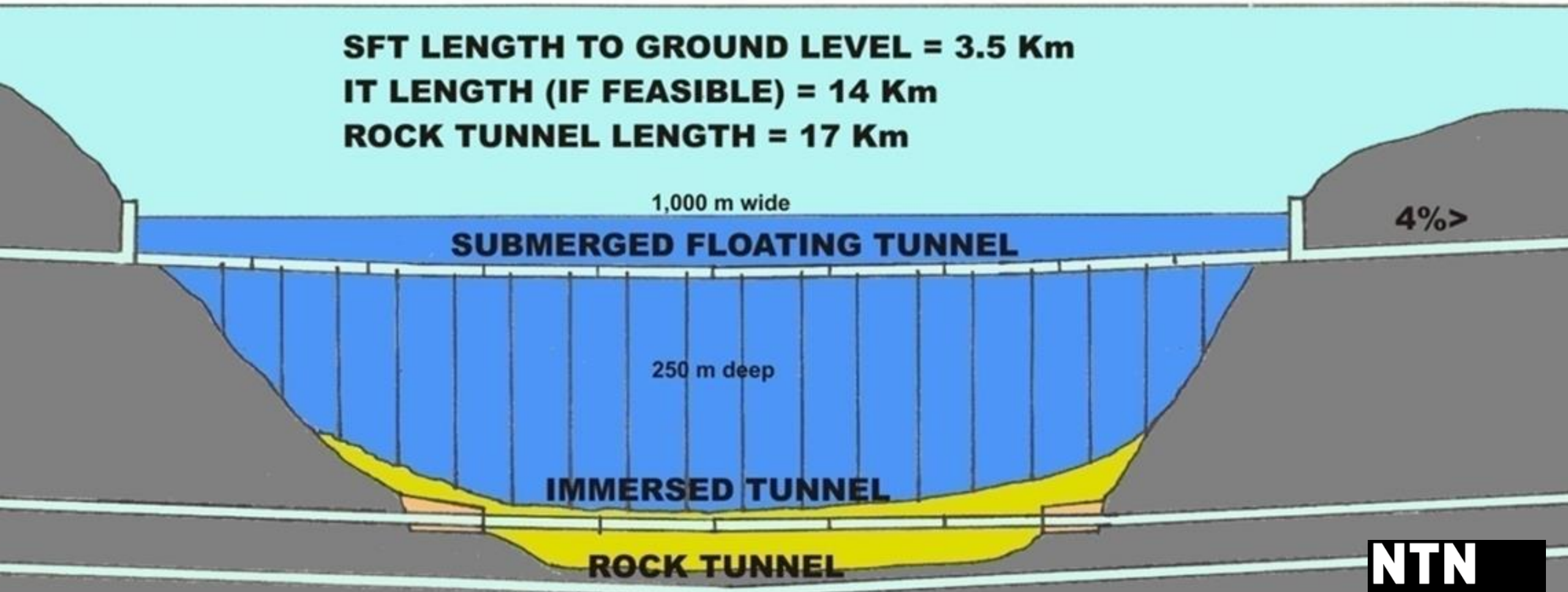


An aerial photograph of a coastal region, likely in the UK, showing a large body of water and several islands. A thick red line is drawn across the image, starting from the top left, crossing the water, and ending on the right side. The text "Tunnels and geology" is overlaid in white on the red line.

Tunnels and geology

What is a subsea tunnel?

SFT LENGTH TO GROUND LEVEL = 3.5 Km
IT LENGTH (IF FEASIBLE) = 14 Km
ROCK TUNNEL LENGTH = 17 Km



COMPARISON BETWEEN TUNNEL OPTIONS
(Natural Scale)

Understanding the geology

Onshore we observe, record and map

Guernsey

Augen Gneiss formed from a granite body
2000 mya with foliated quartz diorite in the centre and west of the island with metamorphosed sediments

Sark

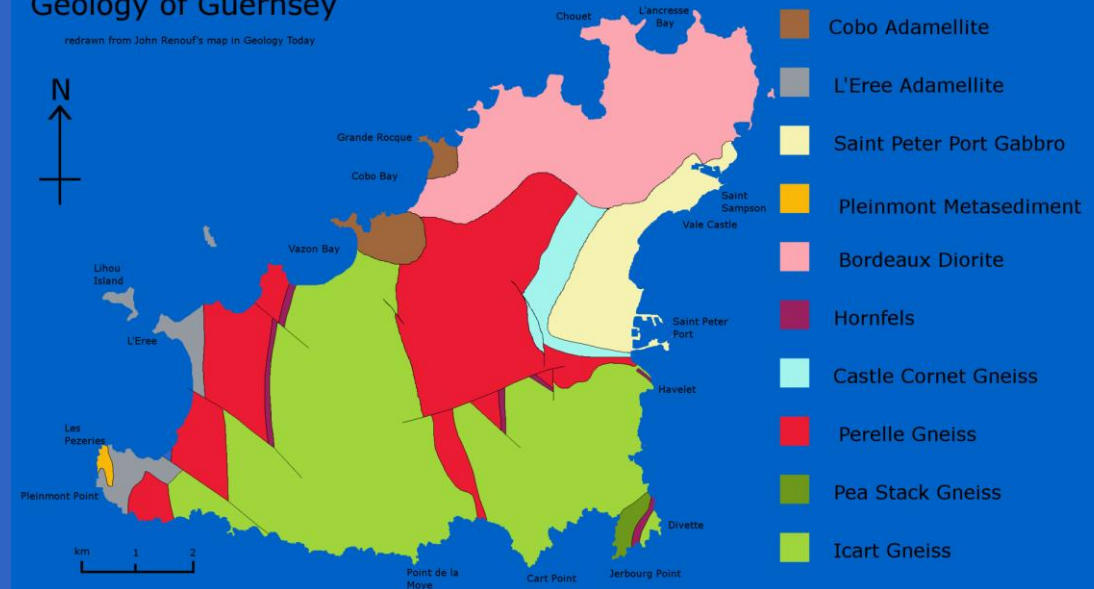
Mainly of amphibolite and granite gneiss rocks, intruded by igneous magma sheets called quartz diorite. 6-700 mya

Jersey

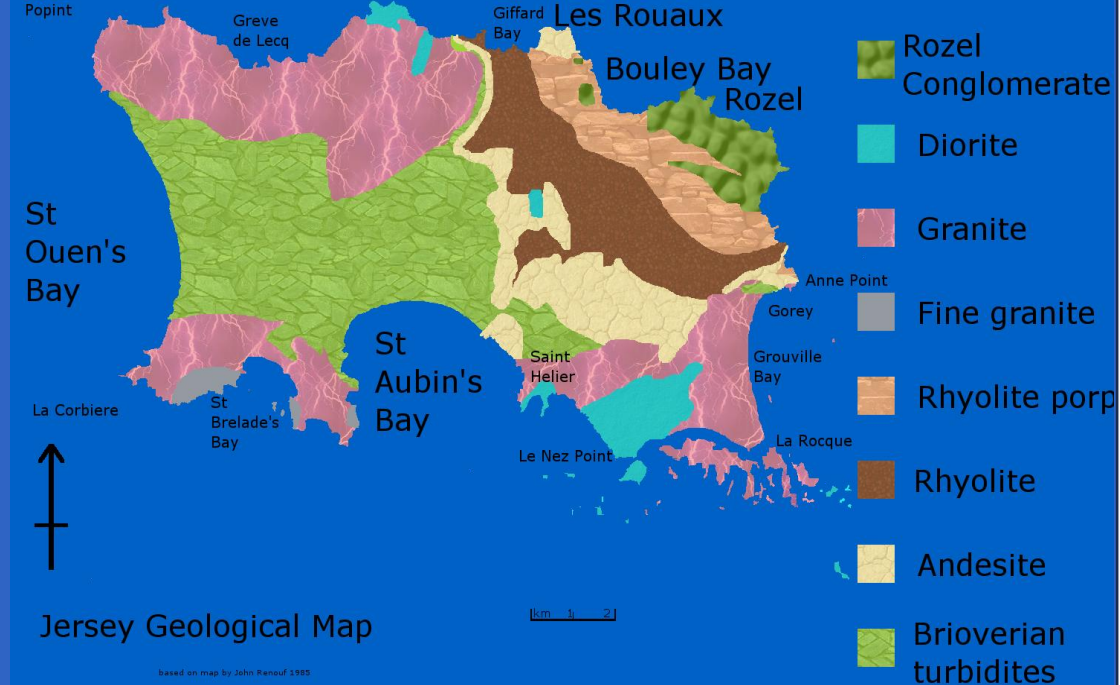
Mad e up of mix: 700-900 mya volcanics, ranging from conglomerate to shale, volcanic, intrusive and plutonic igneous rocks of many compositions, and metamorphic rocks as well.

Geology of Guernsey

redrawn from John Renouf's map in Geology Today



Sorel Point



Jersey Geological Map

based on map by John Renouf 1985

Understanding the geology

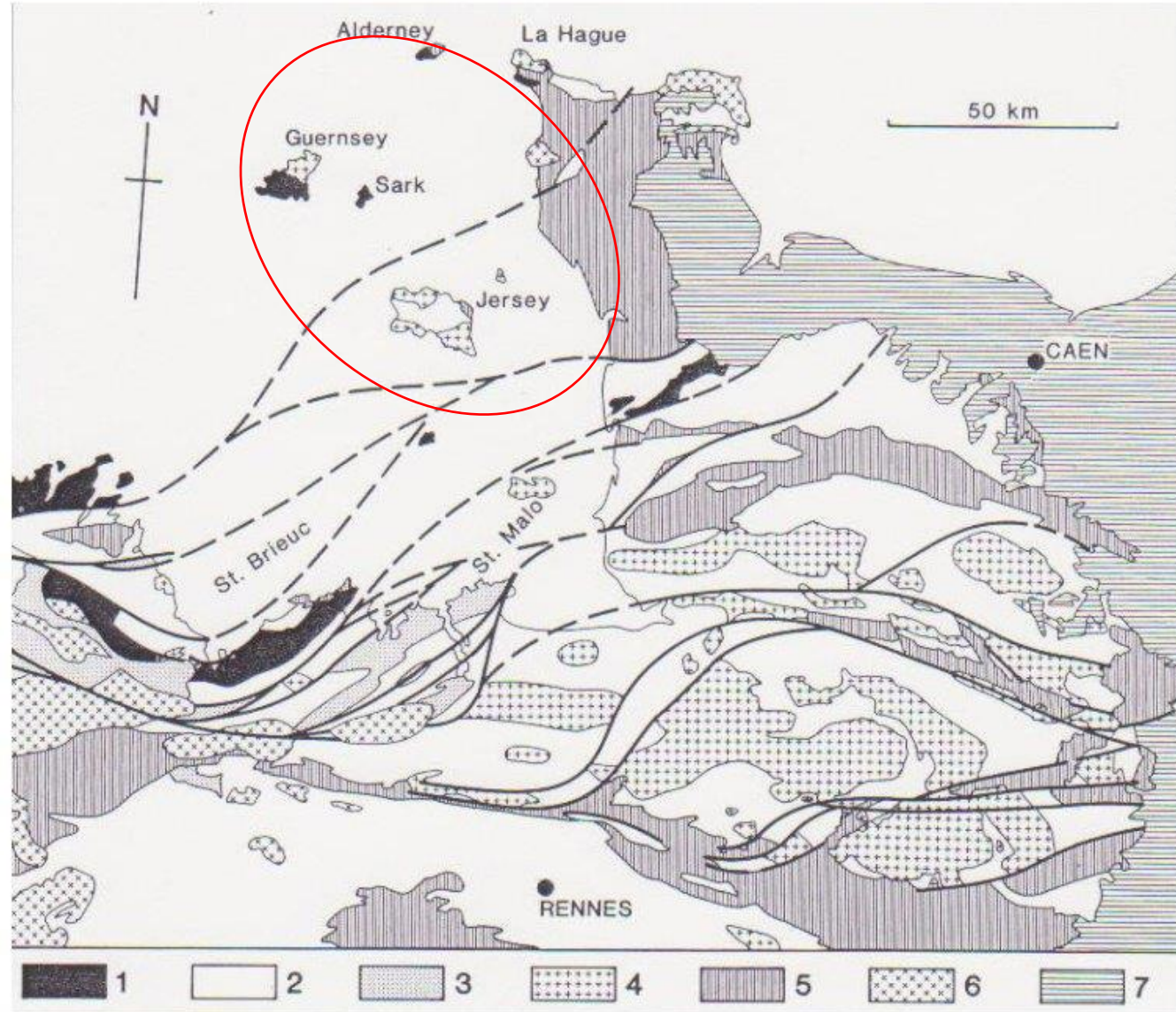
Off-shore we see nothing with our bare eyes

Needs investigated by:

- Seismic methods
- Core drilling

Need to know:

- Depth of soil/sediments,
- Depth of the top of the bedrock,
- Bedrock quality and fault zones



Ground investigations

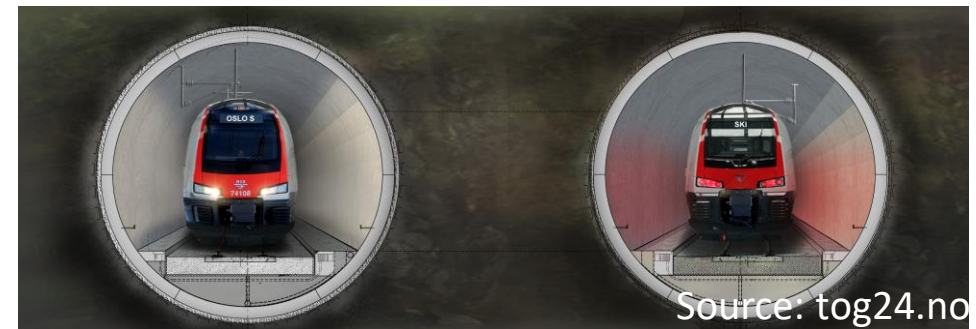
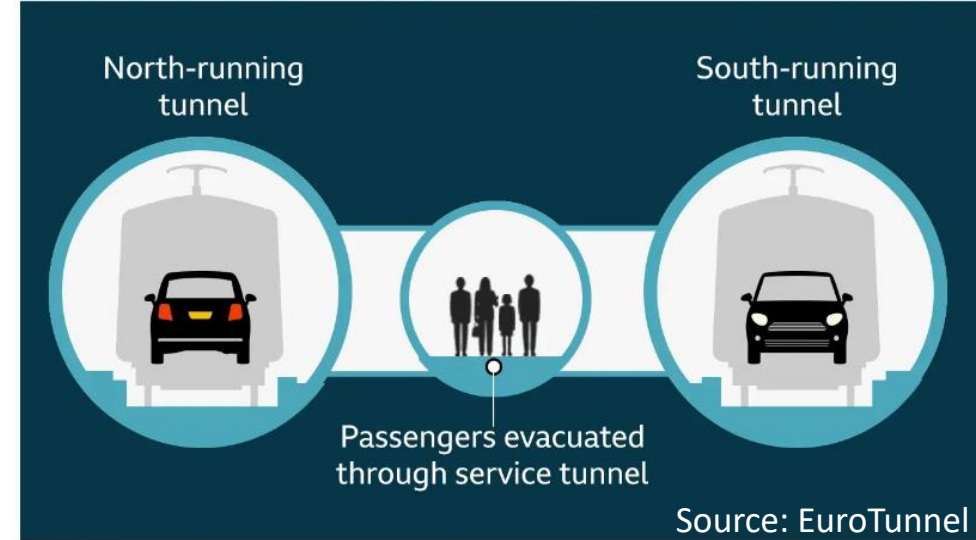


- Adaptability with respect to ground investigations
- Cannot investigate to such a level that all risk is ruled out
- Accept that some residual risk exists
- Conduct dedicated investigations
- Every single investigation measure has its particular purpose
- Most investigation means are indirect, understanding geological features from a tunnelling perspective
- Start at regional scale to understand structural features
- Narrow it down to particular features that need to be investigated
- Accept that further investigation can be done when the underground is opened
- Geological tunnel mapping to update the geological model
- Probe drilling is an acknowledged investigation method

Understanding tunnelling methods

- Channel tunnel = TBM
- In hard rock subsea road tunnels = D&B
- Rail roads on land recent = TBM
- Road tunnels on land = D&B

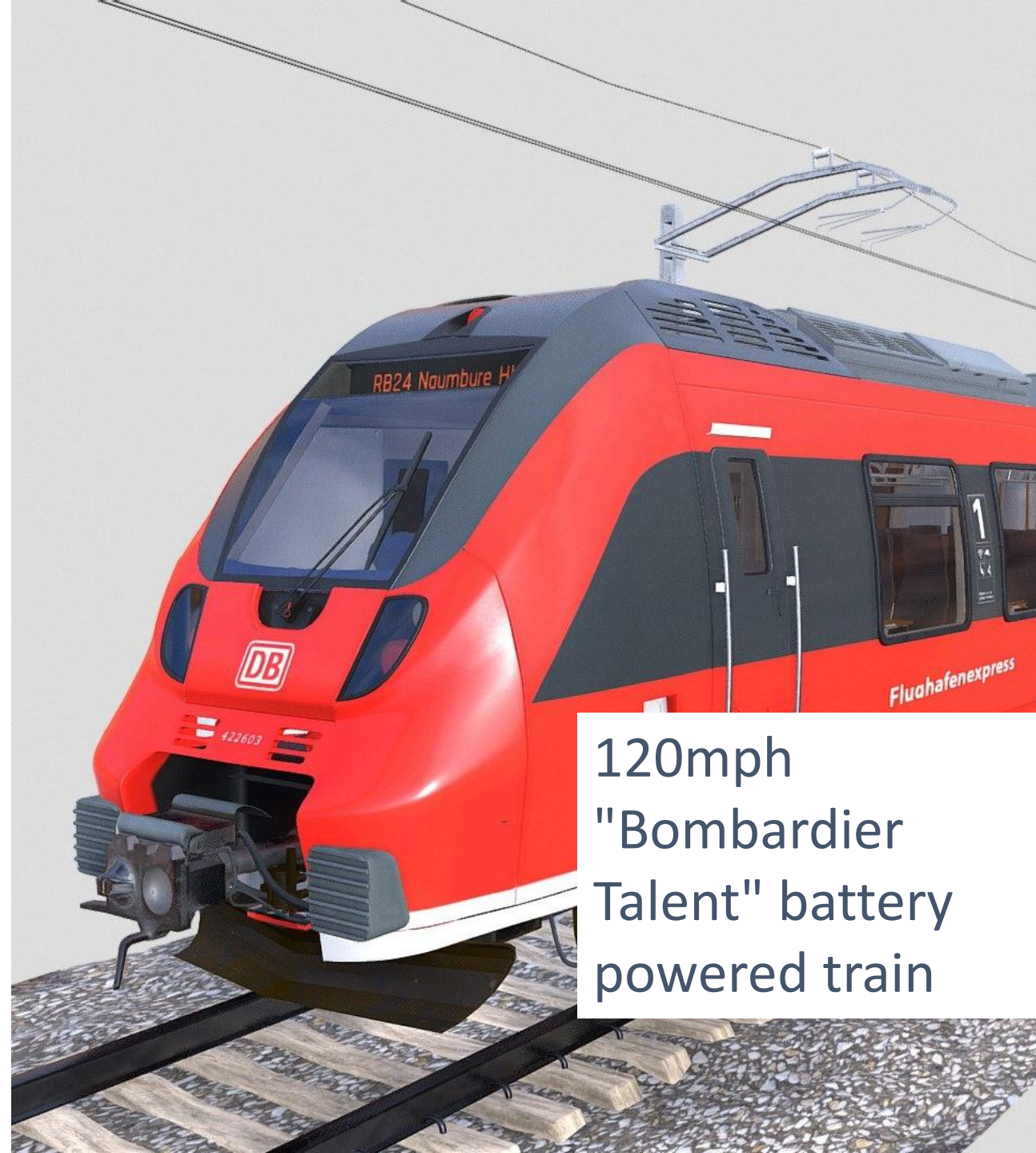
Why is that?



Key design decision

Road vs Rail

- Decisions effects tunnel design
- We want people not vehicles!
- Takes up less space
- Rail most effective way of moving people
- Lower environmental impact
- Reduced taxes



120mph
"Bombardier
Talent" battery
powered train

Design guidelines

N500 Vegtunneler

Gyldig fra 2024-01-01

LA NOUVELLE DIRECTIVE 2004/54/CE RELATIVE À LA SÉCURITÉ DES TUNNELS ROUTIERS

par Bernd THAMM, Direction générale de l'Énergie
et des Transports, Commission européenne

INTRODUCTION

Dans son Livre Blanc sur la politique des transports (1), la Commission souligne la nécessité d'envisager une Directive européenne concernant des exigences de sécurité minimales pour garantir un niveau élevé de sécurité pour les utilisateurs des tunnels, particulièrement ceux dans le réseau routier trans-européen (RRTE). Les incendies dans les tunnels du Mont-Blanc et du Tauern en 1999 et dans le tunnel du Gotthard en 2001 ont indiqué un niveau insuffisant de sécurité de certains tunnels routiers, et ont conduit ainsi à des décisions au niveau politique.

Afin d'éviter des accidents/incidents et limiter leurs conséquences s'ils se produisent, une nouvelle Directive 2004/54/CE (dans la suite la Directive) fixe des exigences de sécurité minimales pour les tunnels existants et futurs de plus de 500 m de longueur sur le réseau routier trans-européen. Elle détaille les devoirs et les responsabilités de l'exploitant d'un tunnel, qu'il soit un opérateur public ou privé, et fixe également un certain nombre d'exigences pour le trafic. Afin de provoquer des réactions appropriées et rapides, un accent est également mis sur l'information et la communication. Afin d'informer les usagers du meilleur comportement à tenir, des campagnes d'information harmonisées sont envisagées à l'avenir et des propositions de signalisation harmonisée sont formulées dans tous les cas d'incidents dans les tunnels routiers.

Il y a dans presque tous les États membres, des tunnels qui tombent dans le champ d'application de la Directive. Un

(1) Livre Blanc de la Commission du 12 septembre 2001 : « Politique européenne des transports pour 2010 : temps pour décider », COM (2001) 370.

THE NEW DIRECTIVE 2004/54/EC ON ROAD TUNNEL SAFETY

by Bernd THAMM, Directorate General Energy
and Transport, European Commission

INTRODUCTION

In its White Paper¹ on transport (1) policy, the European Commission emphasises the need to consider a European Directive on minimum safety requirements to guarantee a high level of safety for the users of tunnels, particularly those in the trans-European road network (TERN). The fires in the Mont Blanc and Tauern tunnels in 1999 and in the Gotthardtunnel in 2001 demonstrated an insufficient safety level of certain road tunnels and have called also for decisions at political level.

In order to prevent accidents/incidents and to limit the consequences of them, if they occur, a new Directive 2004/54/EC (in the following the Directive) fixes for existing and future tunnels over 500 m length on the TERN minimum safety requirements. It details the duties and the responsibilities for the owner of a tunnel, whether that is a public or private operator, and also fixes a number of traffic requirements. To provoke suitable and rapid reactions, an accent is also put on information and communication. In order to inform the users on best behaviour harmonized information campaigns are envisaged in the future and proposals for a harmonized signalisation in all incident cases in road tunnels are given.

In nearly all European Union Member States (in the following Member States) there are tunnels which fall within

(1) White paper from the Commission on "European Transport Policy for 2010: Time for decision-making", 12 September 2001, COM (2001) 370.

DESIGN MANUAL FOR ROADS AND BRIDGES

VOLUME 2 HIGHWAY STRUCTURES
DESIGN (SUB-
STRUCTURES AND
SPECIAL STRUCTURES)
MATERIALS
SECTION 2 SPECIAL STRUCTURES

PART 9

BD 78/99

DESIGN OF ROAD TUNNELS

SUMMARY

This Standard describes the procedures required for the design of new or refurbished road tunnels located within Motorways and Other Trunk Roads. It gives guidance on the necessary equipment and Operational and Maintenance Systems that need to be considered by the designer to facilitate continued effective and safe operation.

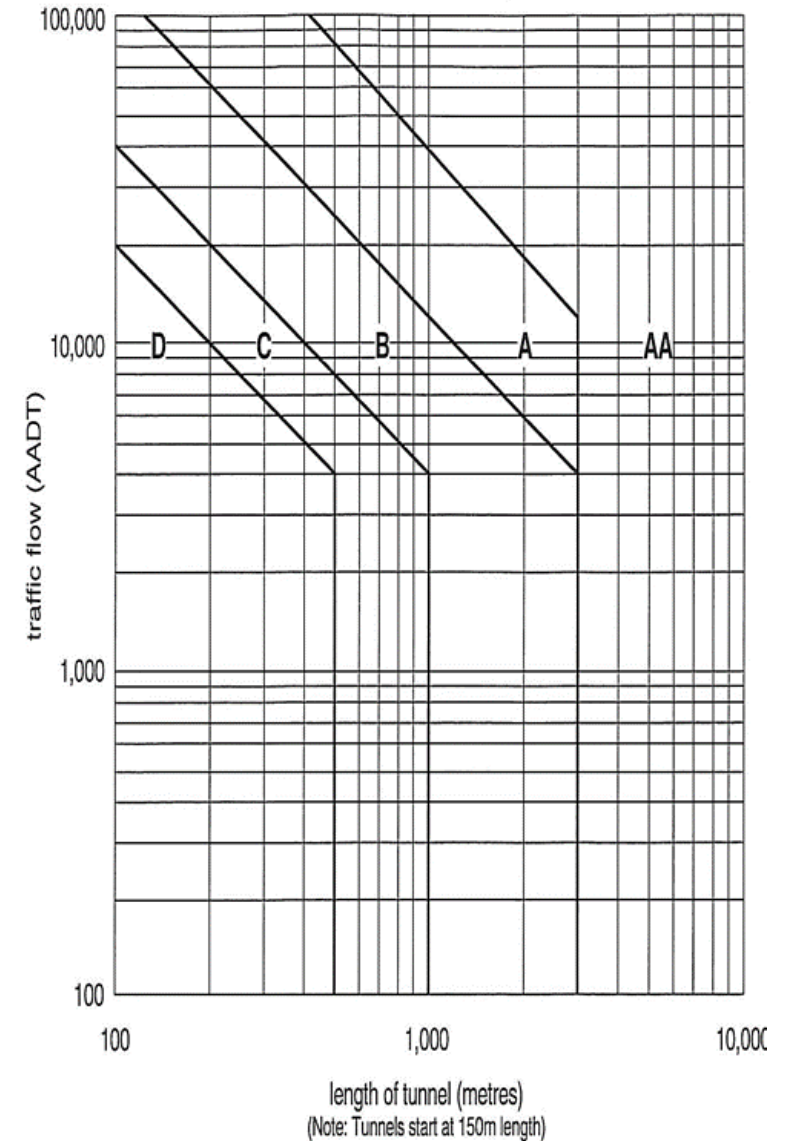
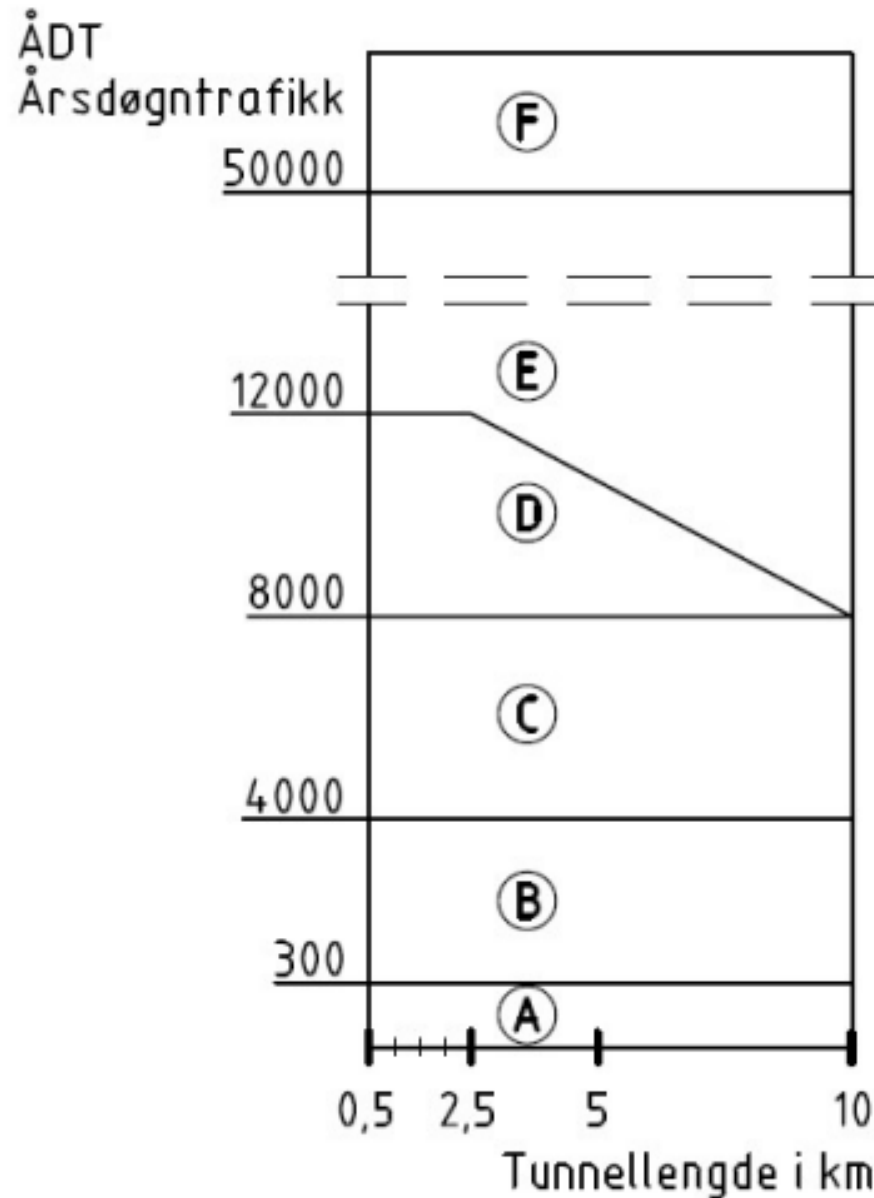
INSTRUCTIONS FOR USE

This is a new document to be inserted into the Manual

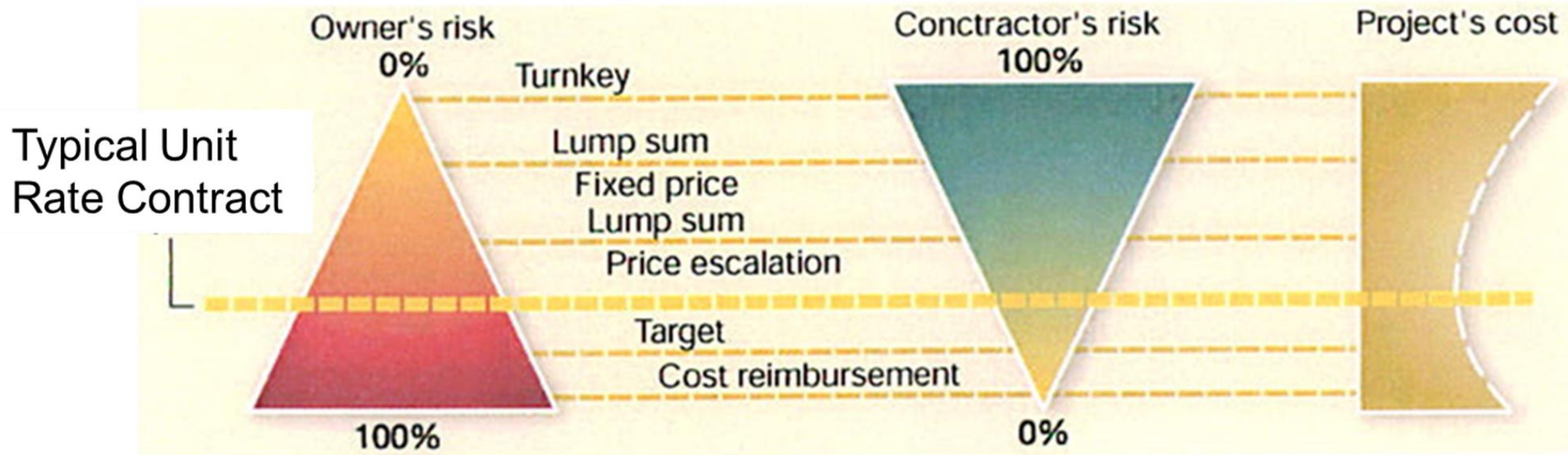
1. Insert Part 9 into Volume 2, Section 2.
2. Archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.

How do they approach traffic density



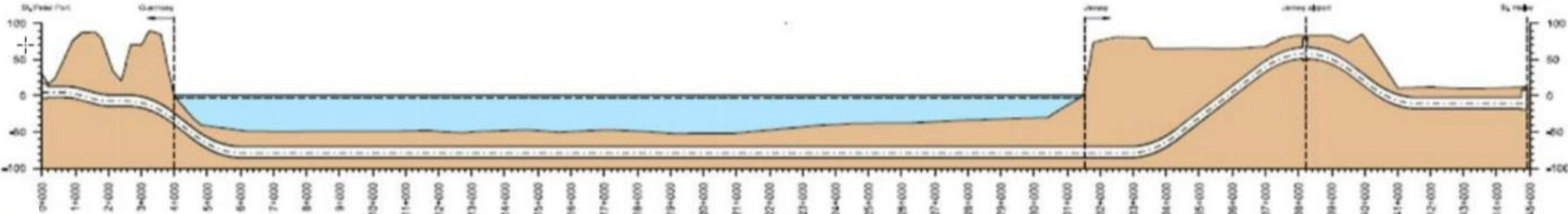
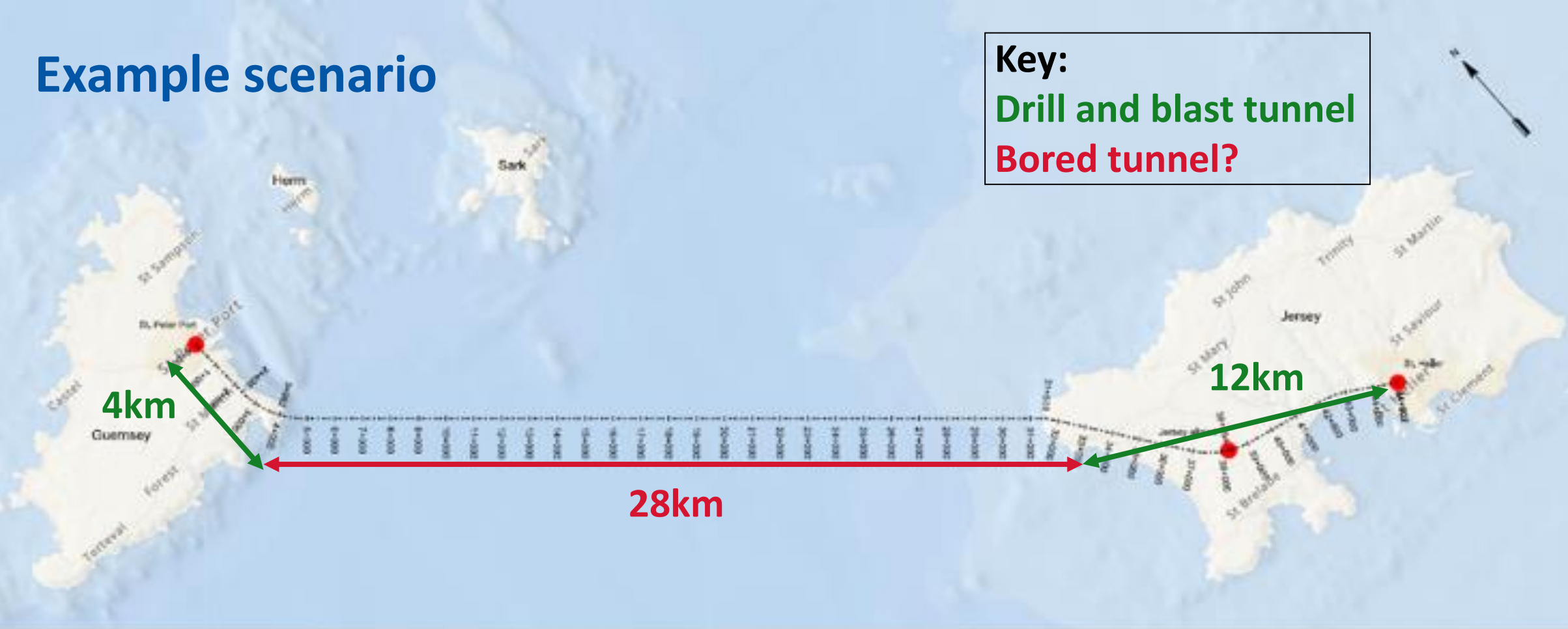
Risk mitigation and risk registers



- Risk analysis for the construction works – important to engage an experienced contractor and site supervision
- Risk analysis for the operation and traffic in the tunnel – including human behavior and accident prevention
- Contract format with risk sharing principles between Project Owner and Contractor

Example scenario

Key:
Drill and blast tunnel
Bored tunnel?



Estimated Costs for example scenario Guernsey-Jersey

- Mining the tunnel (drilling and blasting) £11m km in Faroes.
- Tunnel Boring Machines (TBM) £30m km HS2.

Mining: £500m- £1,200,000



Potentially 16-year payback

Boring Machine: ??



Potentially 35-year payback

Unlike other infrastructure, the tunnels will service their own debt

Gibraltar-Spain is 10k vehicles/36k people a day,
what could Guernsey-Jersey-France be?

If we have: -
24k people per day
£30 return
£263M income in year 1.

Allow 6% growth p.a.

£3.5Bn
income over
10 years

An aerial photograph of a coastline with a red line tracing a path across the water and land. The path starts on a small island in the upper left, goes down and right, then down and left, then right, then down and right, and finally right. The text "Moving forward" is centered over the path.

Moving forward



Pre- feasibility phase

Route finding, overall geology, brief on tunnel design and inventory, rough cost and time estimates



Feasibility study

Further detailed geological investigations, legal explorations, setting the tunnel design, cost & time



Detailed / Tender Design

Geological base line, contract documents, BoQ etc

Pre- feasibility phase


Guernsey & Jersey States
joint working group to
scope the proposition

Feasibility study

Jointly owned, arms-length
Tunneling Corp set up to
deliver with Jersey &
Guernsey government
representative on board.

Detailed / Tender Design

Directed by Tunnelling
corporation with expert
contracted resource

An aerial photograph of a coastline with two islands. A thick red line starts on the smaller island in the upper left, goes down and right, then curves around the larger island in the center, and finally goes up and right towards the mainland on the right. The text is centered over the water between the islands.

If you want to be **big**,
you have to start
thinking **big**

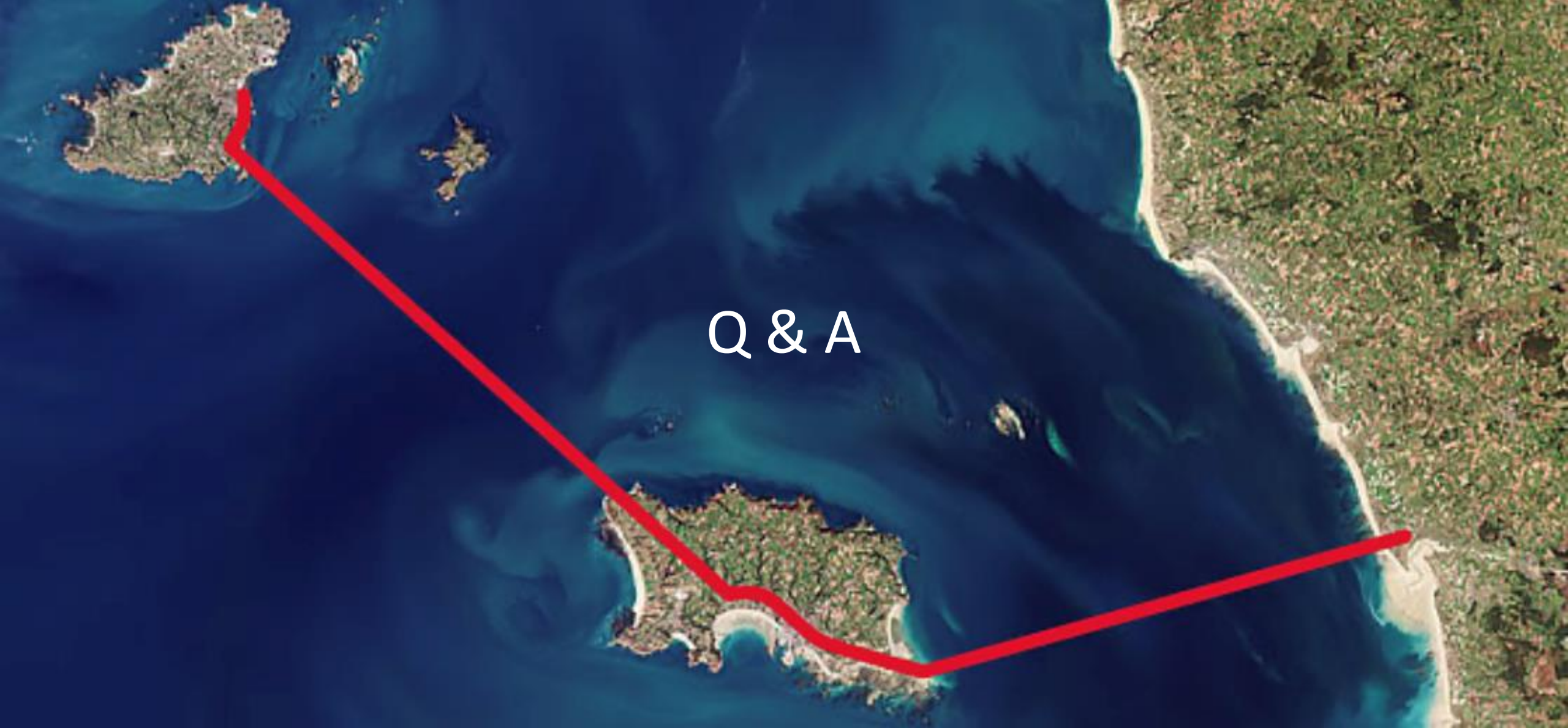
In summary...

A fixed link will help with many of our biggest challenges

It's ambitious but doable: Similar things are done in other places

It'll be revenue generating on top of the economic benefit opening-up finance options

...but to find out for sure we need to commit to investigating it properly



Q & A

Now you've heard from the experts, do you think Jersey and Guernsey should work together to scope the feasibility of connecting the Channel Islands and France?





Find out more...

<https://connect3million.com>