

Fehmarnbelt Fixed Link

One of Europe's biggest construction project

SWERMA 21-04-2015



Femern
Sund ≈ Bælt



DENMARK

SWEDEN

JUTLAND

SCANIA

ZEALAND



LOLLAND - FALSTER

Femern
Sund ≈ Bælt



FEHMARN

SCHLESWIG-HOLSTEIN

MECKLENBURG-WESTERN POMERANIA

Per Åkesson

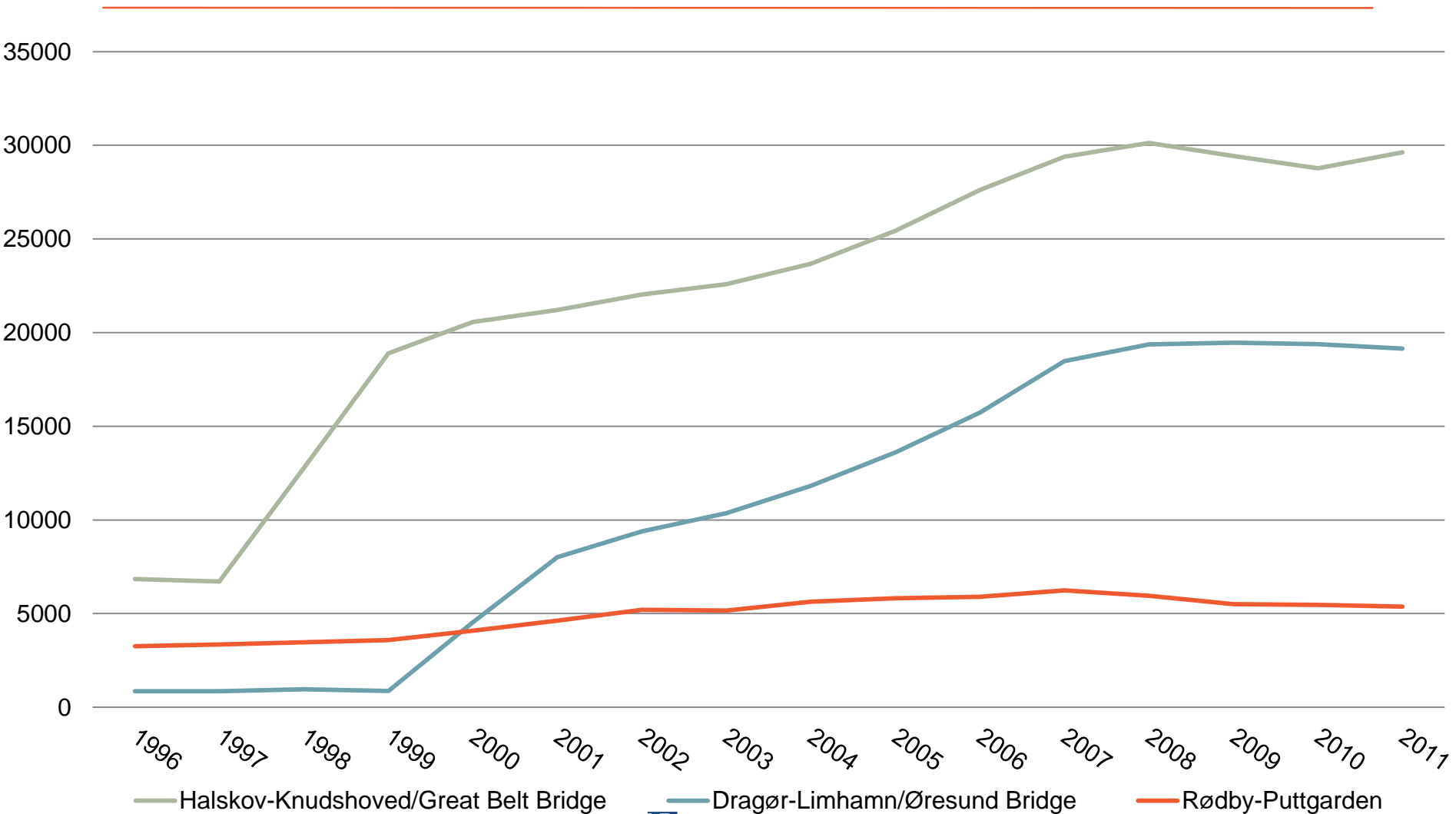
The shortest way to Scandinavia - Connecting Northern Europe



In the heart of Northern Europe



Average daily traffic over the three crossings



The treaty of 3 September 2008

- The coast-to-coast section will be owned by Denmark and financed by its users
- The Danish state will provide guarantees and receive all revenue from the link
- Denmark will determine the fees
- The toll station will be located in Denmark
- Denmark has reserved the right to finance the Danish landworks from the revenue from the coast-to-coast section
- Germany will finance the extension of the German landworks

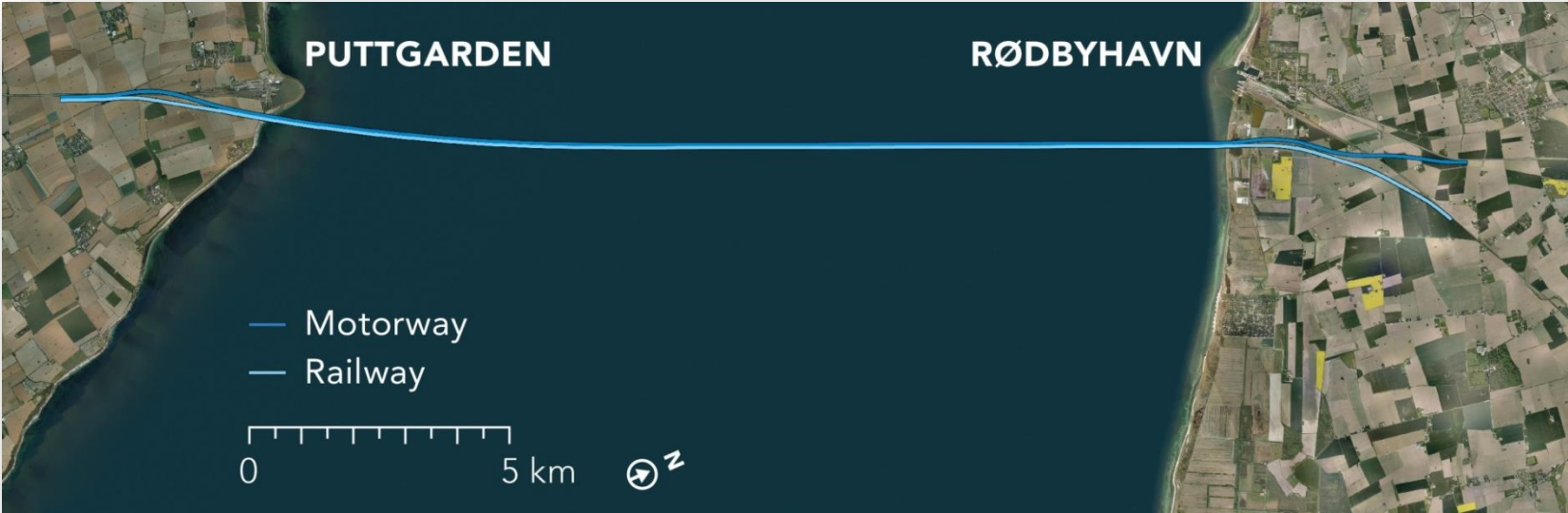
The fixed link and the hinterland



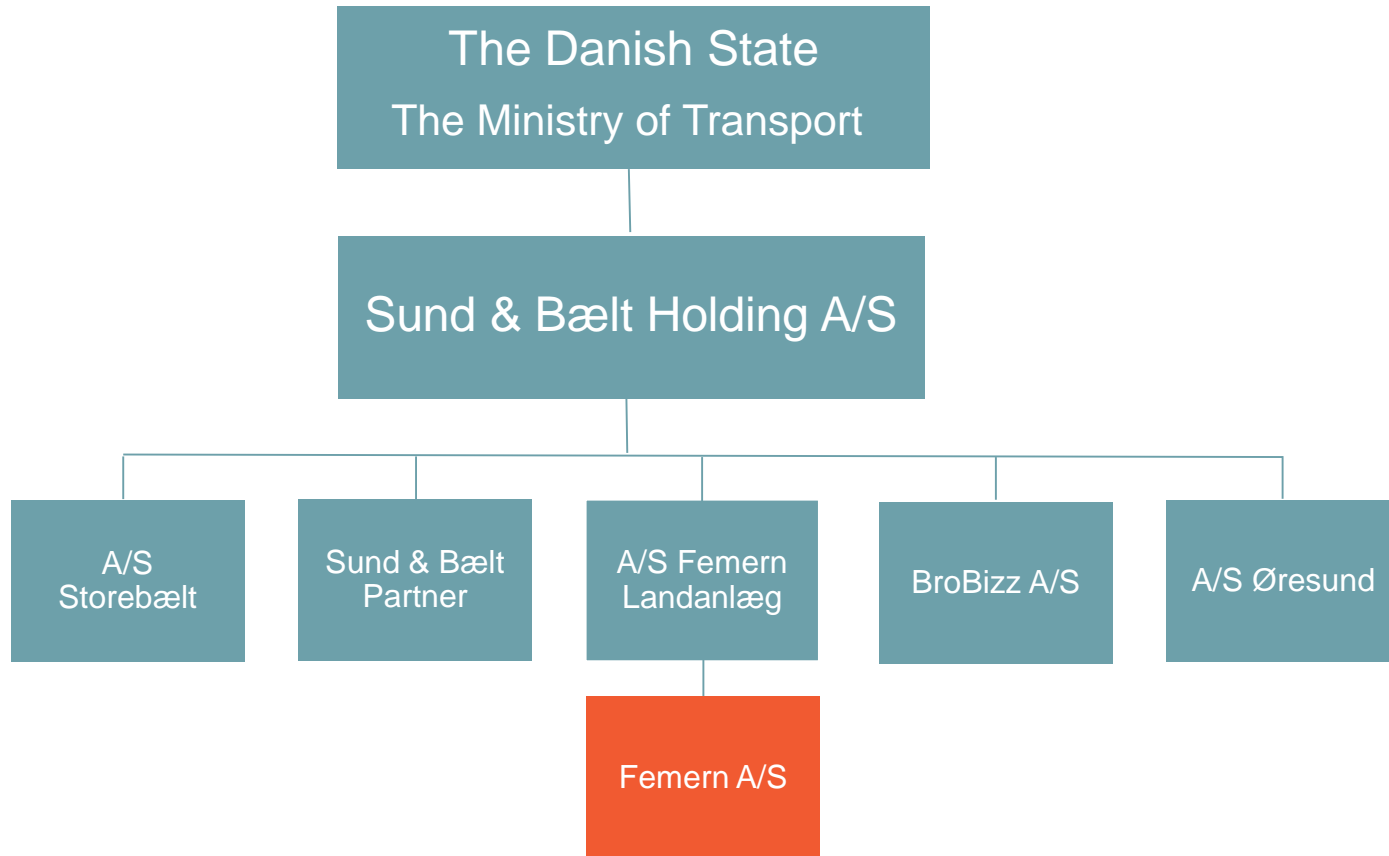
Improved infrastructure makes a difference

- Flexible transport and time savings: Faster and more seamless transport – better mobility
- Remove a psychological barrier – drive when ever you want to
- Open 24/7/365
- Saves minimum 45 minutes each way
- No waiting time, no marshalling, no ticket reservation
- 160 km shorter stretch between CPH og Hamburg
- Completely new opportunities for the railway – international traffic, freight and commuting
- Infrastructure does make a difference: Jobs, productivity, new markets and improved logistics etc.

The immersed Tunnel



Femern A/S – A Danish owned organisation



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- A private organisation, 100 % owned by the Danish state
- Femern A/S is responsible for:
 - Financing the project
 - Planning
 - Approval of the project
 - Construction of the fixed link
 - Operation and maintenance

Immersed tunnel



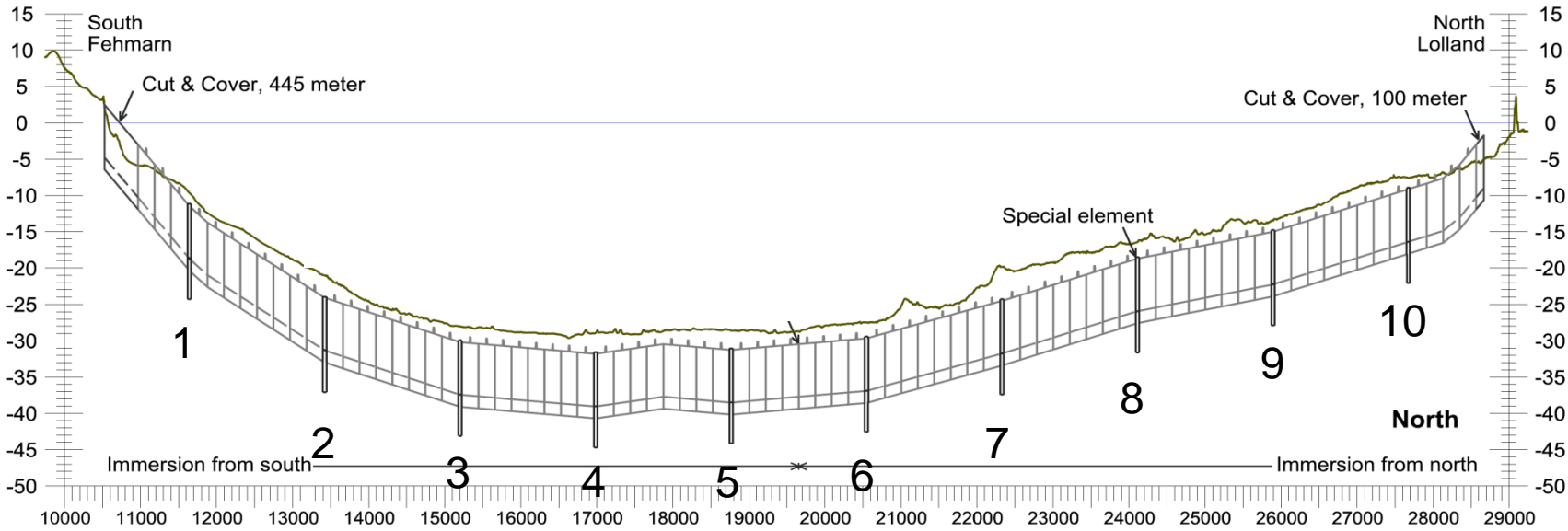
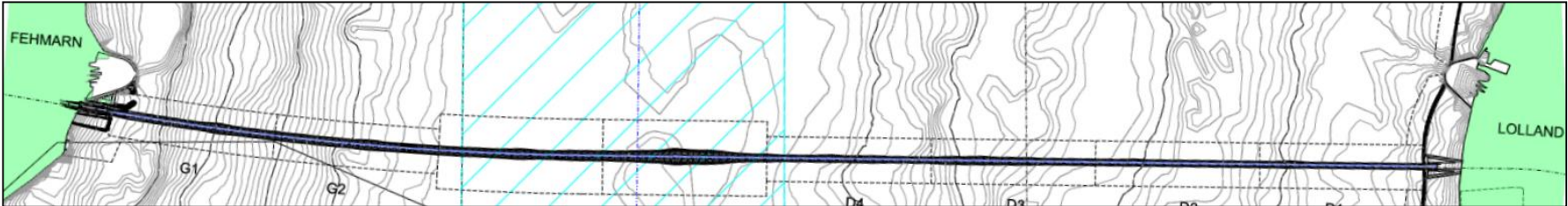
The Fehmarnbelt Tunnel

- 18 km long with four tunnel tubes
- Two double-lane motorway tubes with emergency lane
- Two rail tubes with electrified rail tracks
- Runs between Rødbyhavn on Lolland and Puttgarden on Fehmarn

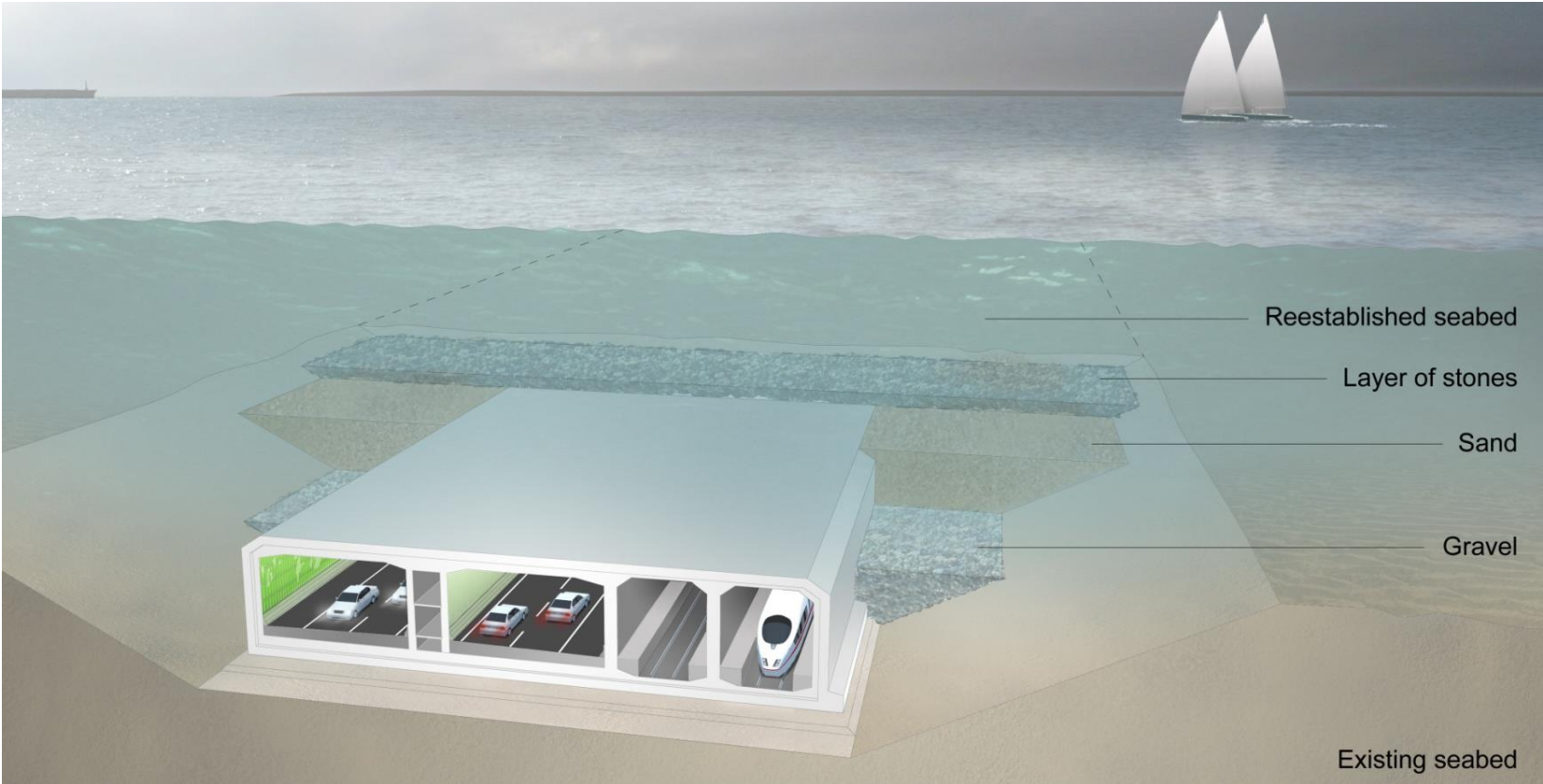
- Construction budget 7 billion EUR (2015 prices)
- Owner: The Danish state
- Client: Femern A/S



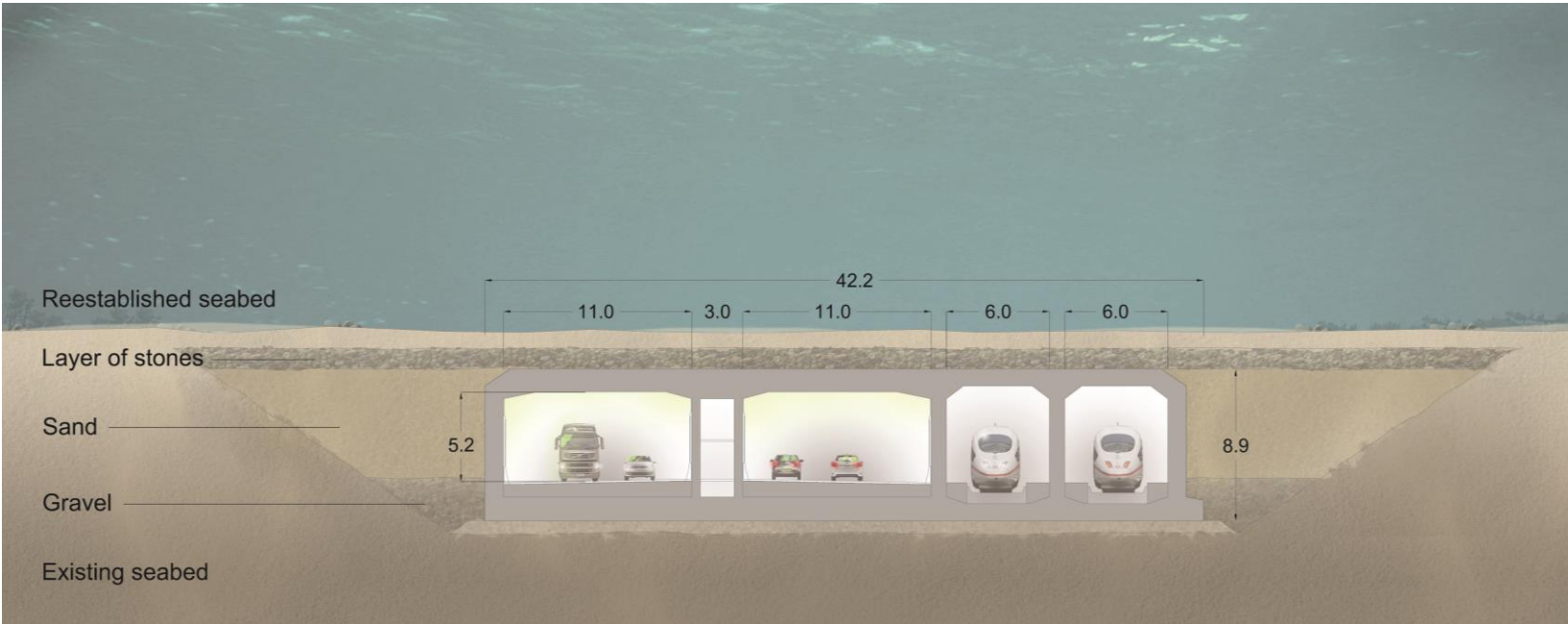
Alignment



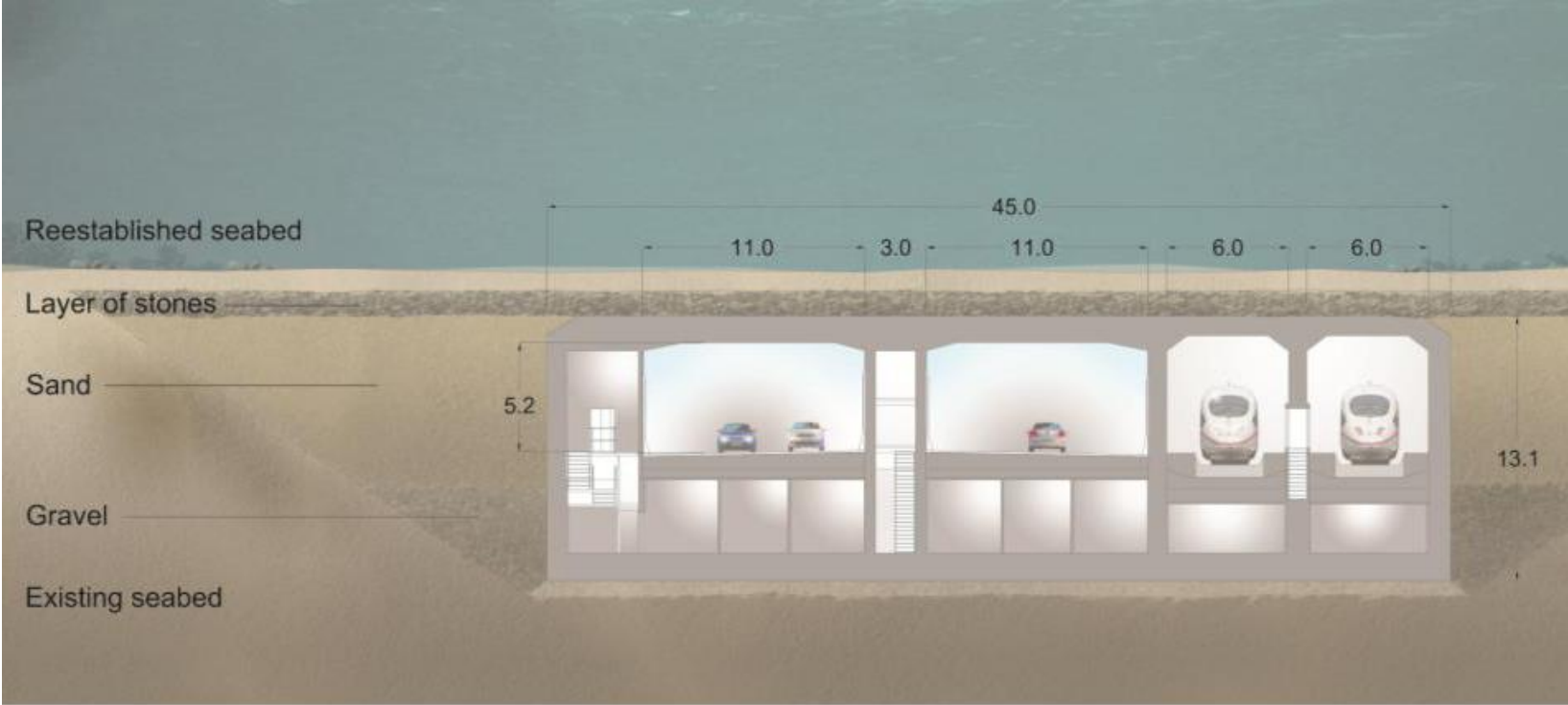
Immersed tunnel



Immersed tunnel, standard element

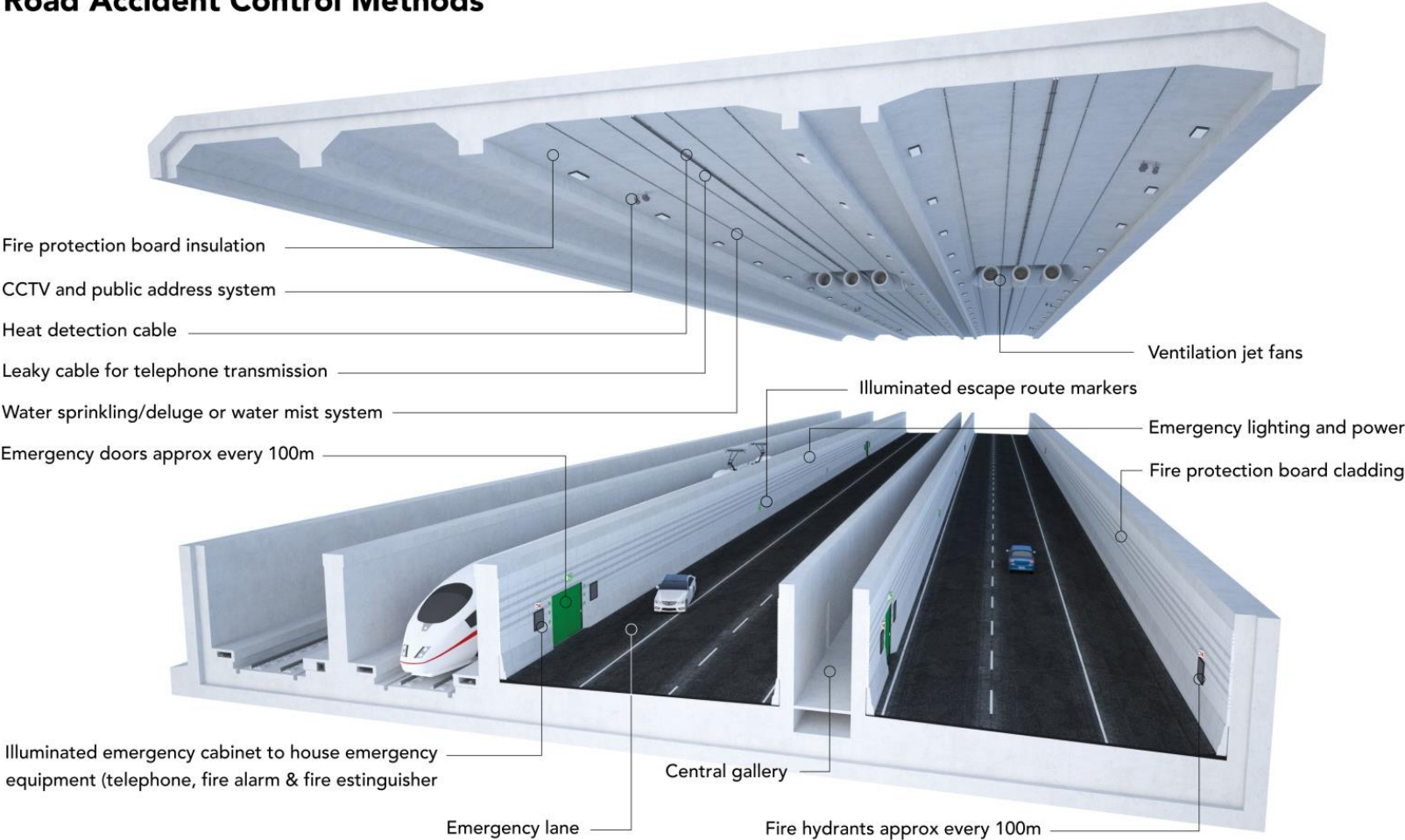


Immersed tunnel, special element



Tunnel installations

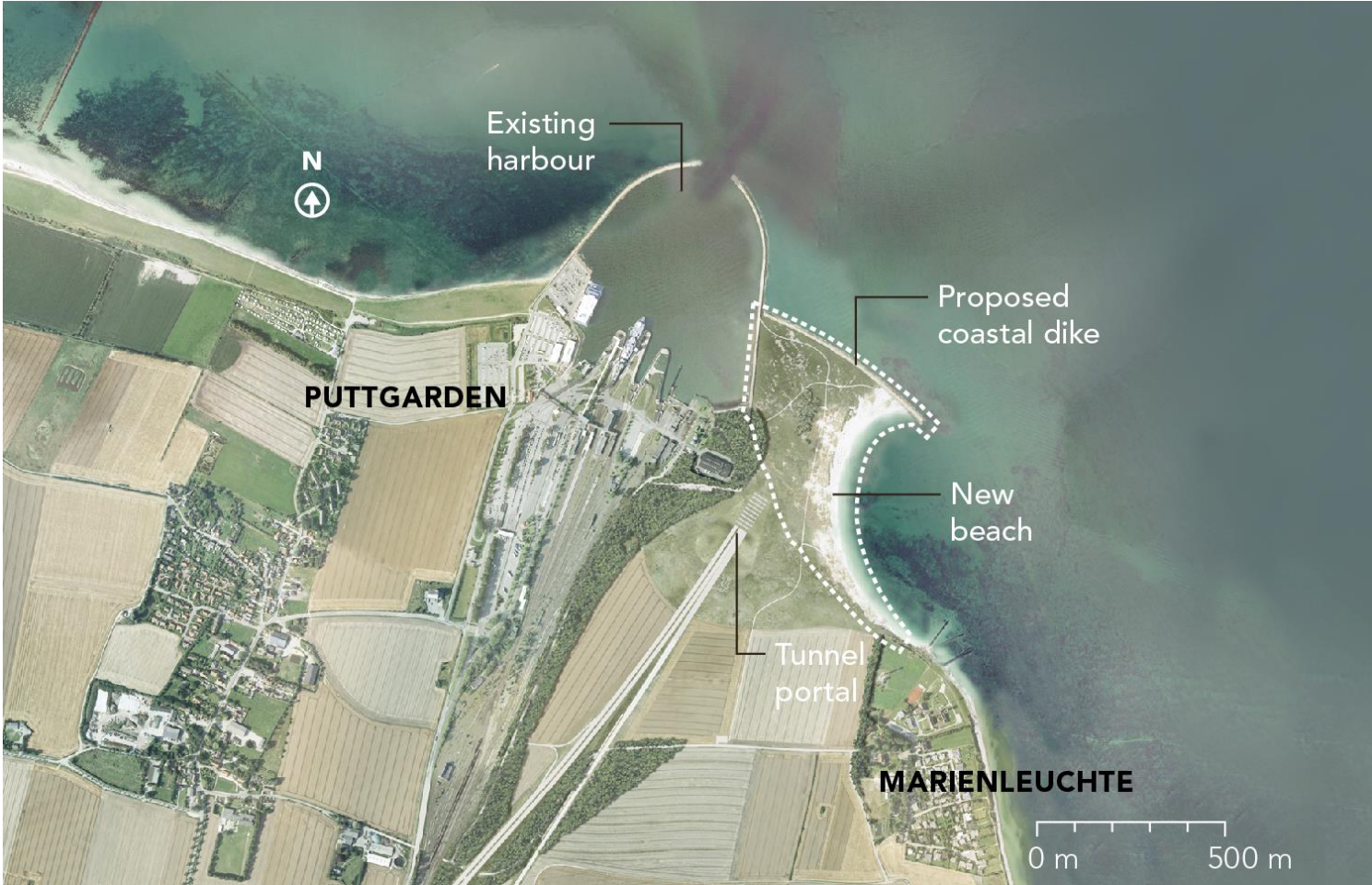
Road Accident Control Methods



New beaches at Rødbyhavn



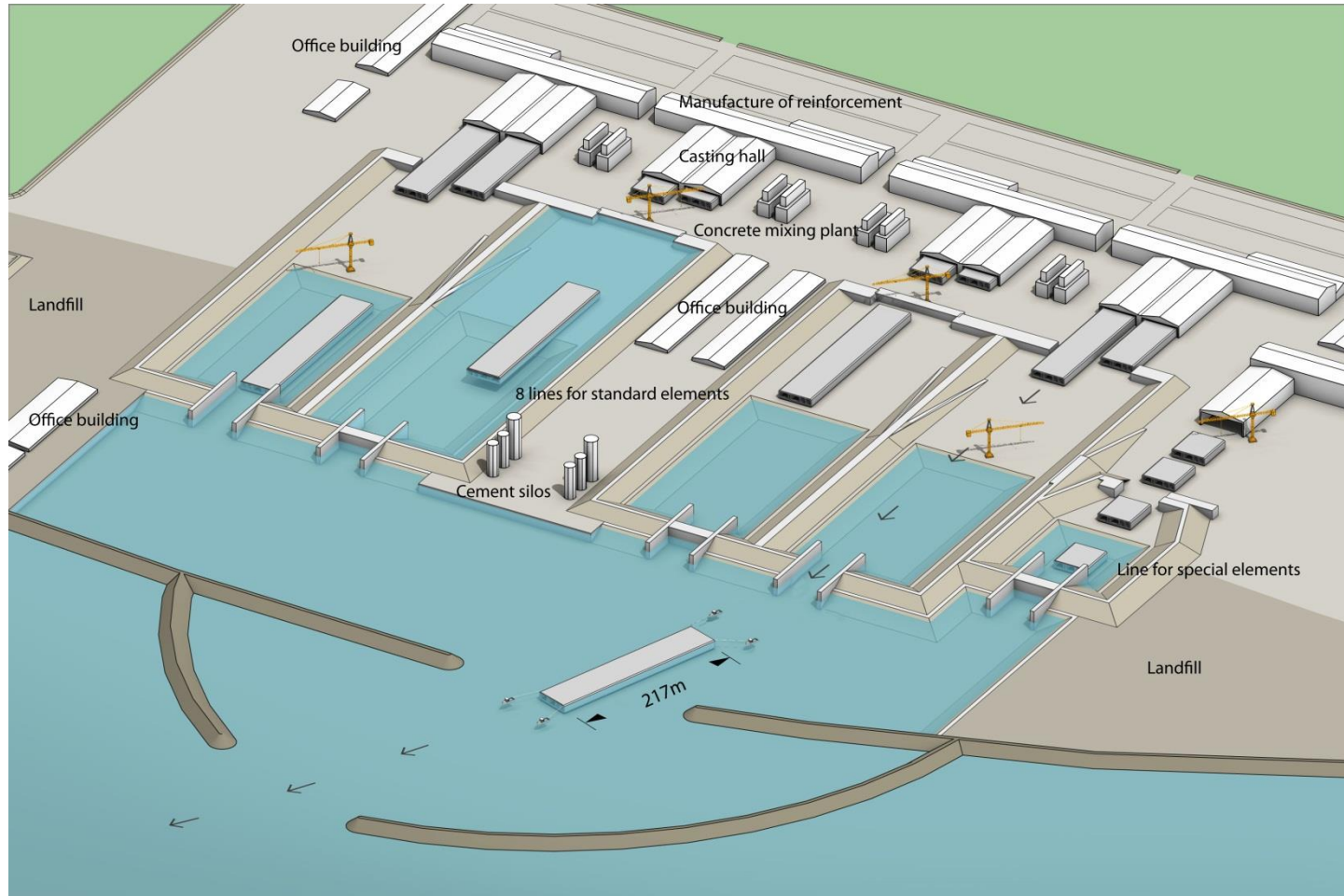
And Puttgarden



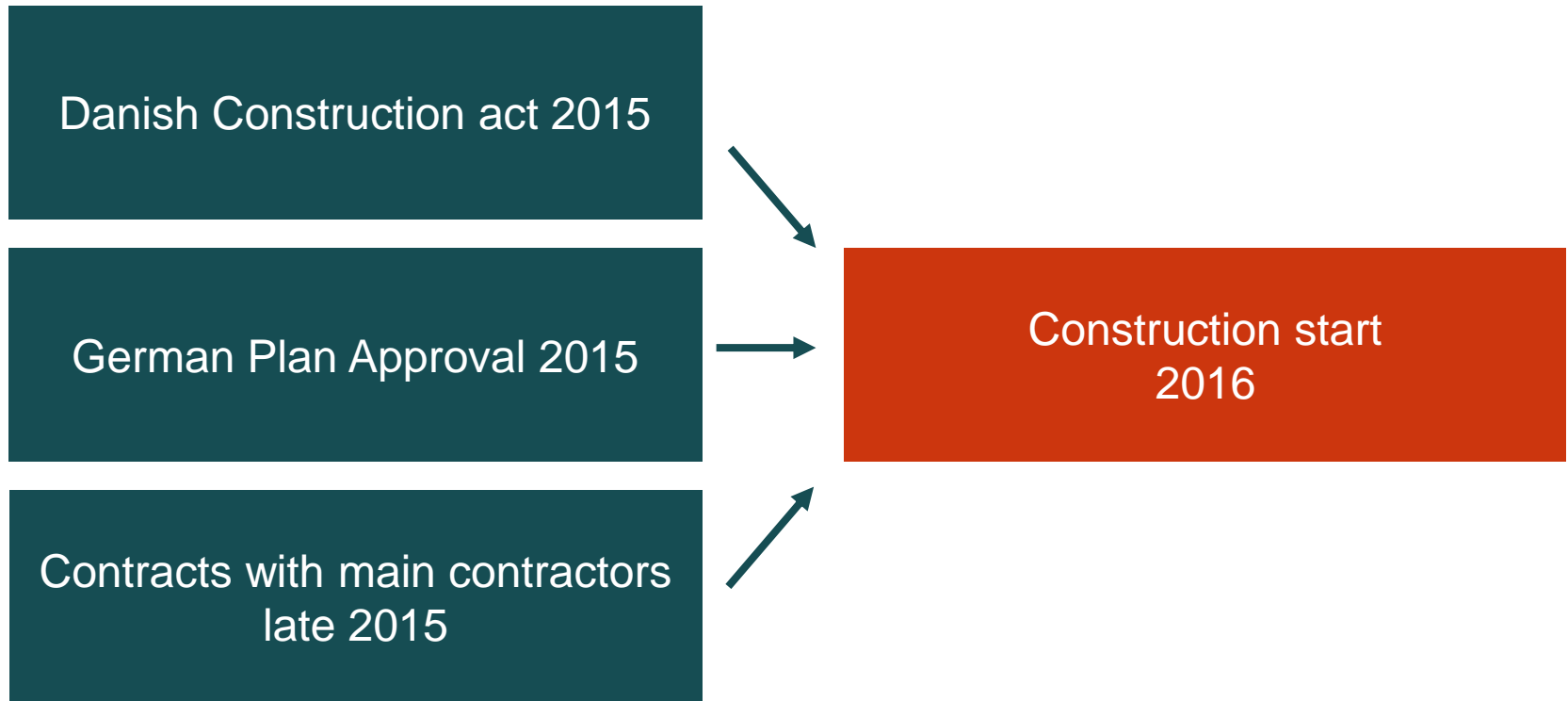
Production plant at Rødbyhavn



Detailed outline of the production plant

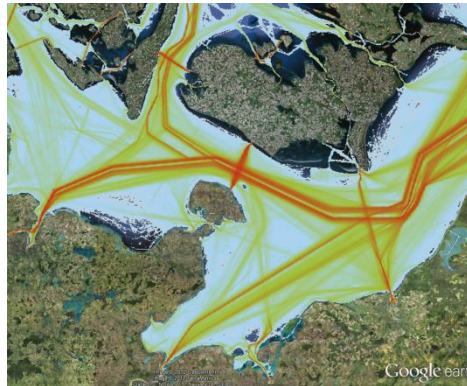


Years of preparation - parallel processes to complete before construction begins



The approval process

- Preparation of design
- Investigations (environmental, navigational, geotechnical etc.)
- Preparation of the plan approval documents
- Formal plan approval process including EIA (Environmental Impact Assessment) in DK and DE
- German approval: "Planfeststellungsbeschluss"
- Danish approval: Construction act



Creating transparency in both countries

Opponents and enthusiasts are brought to the same table...

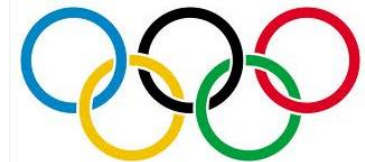


The Fehmarnbelt region

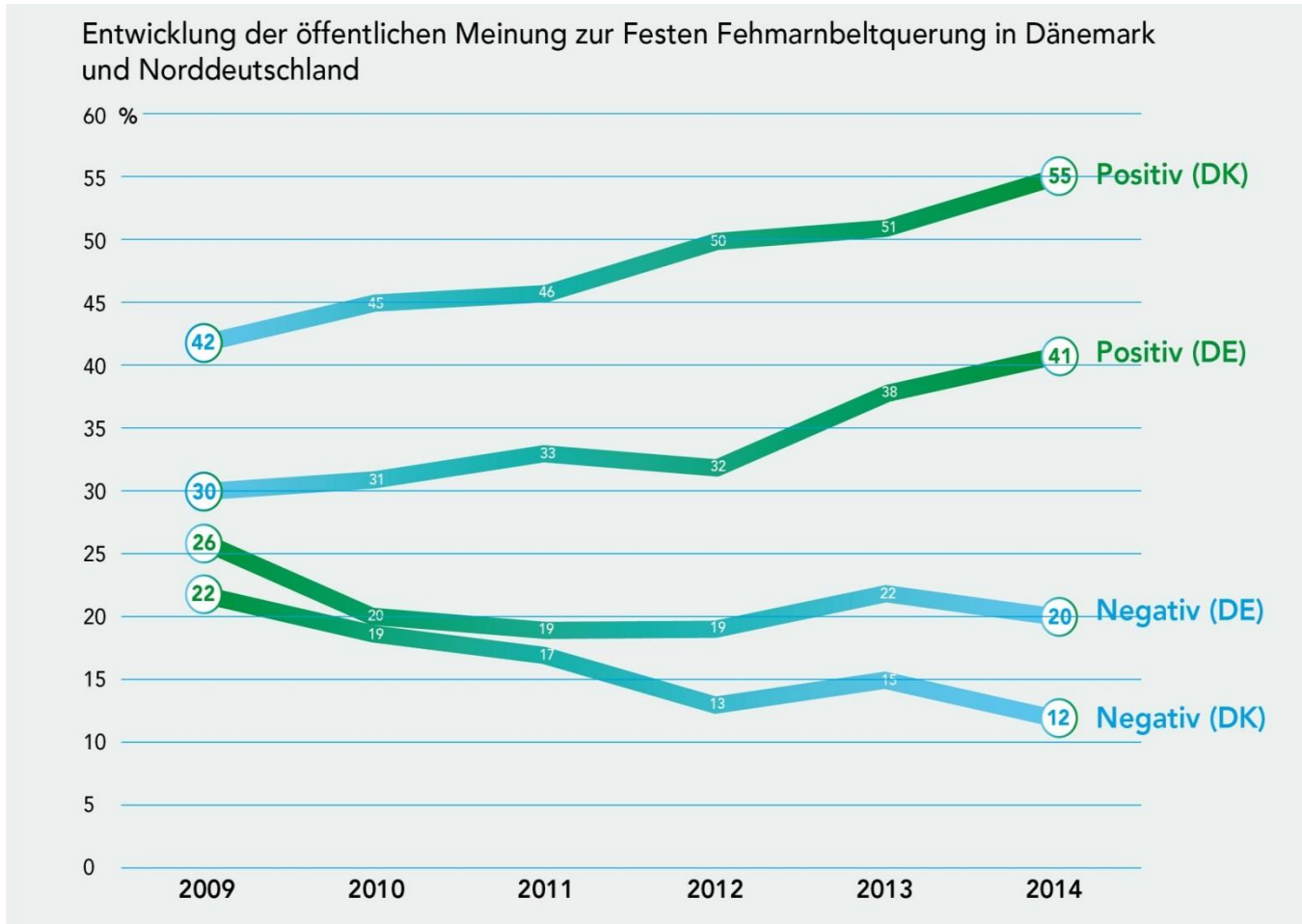
- Repeating the success from the Øresund region
- Potential for increased cooperation in the fields of business development, tourism, cultural activities and urban development
- The region will be geared to new business clusters
- Tourism growth potential for the whole region
- Denmark and Copenhagen share the excitement for Hamburg's Olympic bid



Feuer und Flamme
für Spiele in Hamburg



Public opinion



Danish approval procedure: Construction Act

- The Construction Act was put forward in the Danish Parliament, Folketinget, 25 February 2015
- The first reading of the act took place on 18 March 2015 in Folketinget
- 7 out of 8 parties in Denmark supports the project
=> 166 MPs behind the project, 9 against

German plan approval procedure

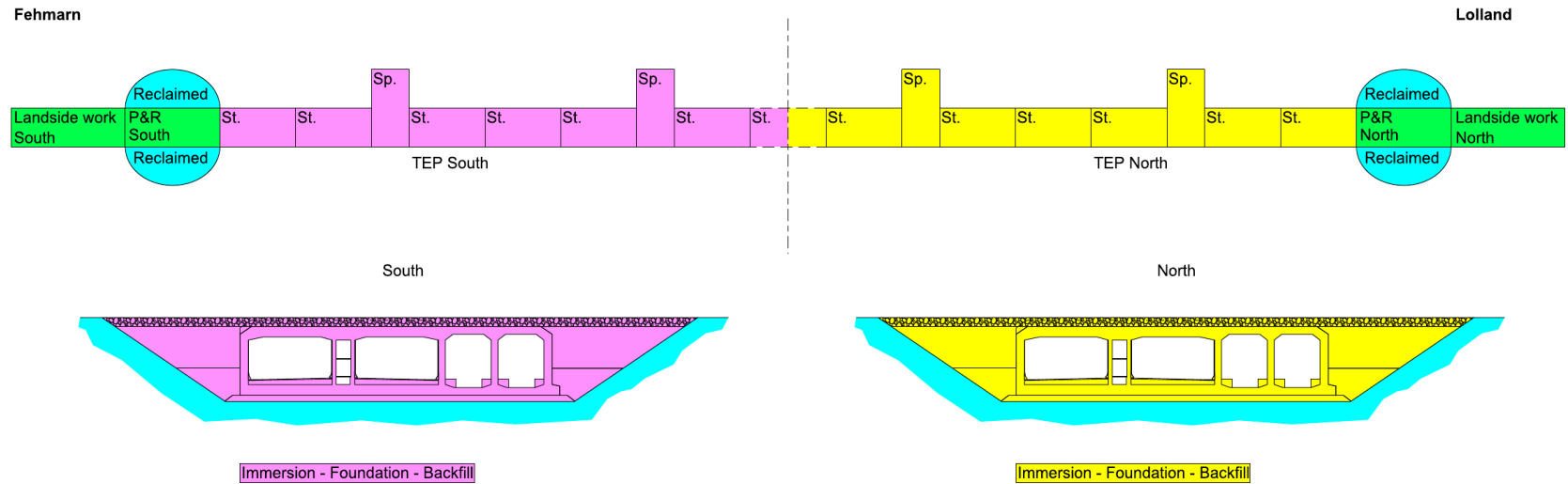
- An 11,000-page plan approval application was submitted to the LBV Schleswig-Holstein in October 2013
- Public consultation of the plan approval documents took place in 2014
- 3.100 statements were submitted. Femern A/S is now helping to answer the statements
- Only the independent German approval authority, LBV Schleswig-Holstein, determines when a plan approval decision can be issued

Major contracts

- Construction of the northern section of the tunnel
- Construction of the southern section of the tunnel
- Dredging of seabed and land reclamation
- Construction of portal buildings, ramps and landworks

- Electrical and mechanical installations
- Rail technical installations

Prequalification for Six Major Contracts



- TEM** – E&M Installation
- TUN**
Immersed Tunnel North
- TUS**
Immersed Tunnel South

- TRW** Tunnel Railway
- TPR**
Portals, ramps and land works
- TDR** Excavation of seabed and land reclamation

A selection of the prequalified construction consortia

Fehmarn Belt Contractors

- *Hochtief Solutions AG (Germany)*
- *Ed Züblin AG (Germany)*
- *Van Oord Dredging and Marine Contractors B.V. (Holland)*
- *Boskalis International B.V. (Holland)*



Femern Link Contractors

- *VINCI Construction Grands Projets (France)*
- *Wayss & Freytag Ingenieurbau AG (Germany)*
- *Max Bögl Bauunternehmung (Germany)*
- *Per Aarsleff A/S (Denmark)*
- *CFE (Belgium)*
- *Soletanche Bachy International (France)*
- *BAM civiel b.v. (Holland)*
- *BAM International b.v. (Holland)*



JV Salini-Impregilo-Samsung-Bunte

- *SALINI S.p.A. (Italy)*
- *IMPREGILO S.p.A. (Italy)*
- *SAMSUNG C&T Corporation (South Korea)*
- *JOHANN BUNTE Bauunternehmung GmbH & Co. KG (Germany)*



The project will create many jobs during the construction phase

- Direct employment:
25,000 man years in total
- Indirect employment:
30,000 man years in total



*Source: Copenhagen Economics,
preliminary estimate*

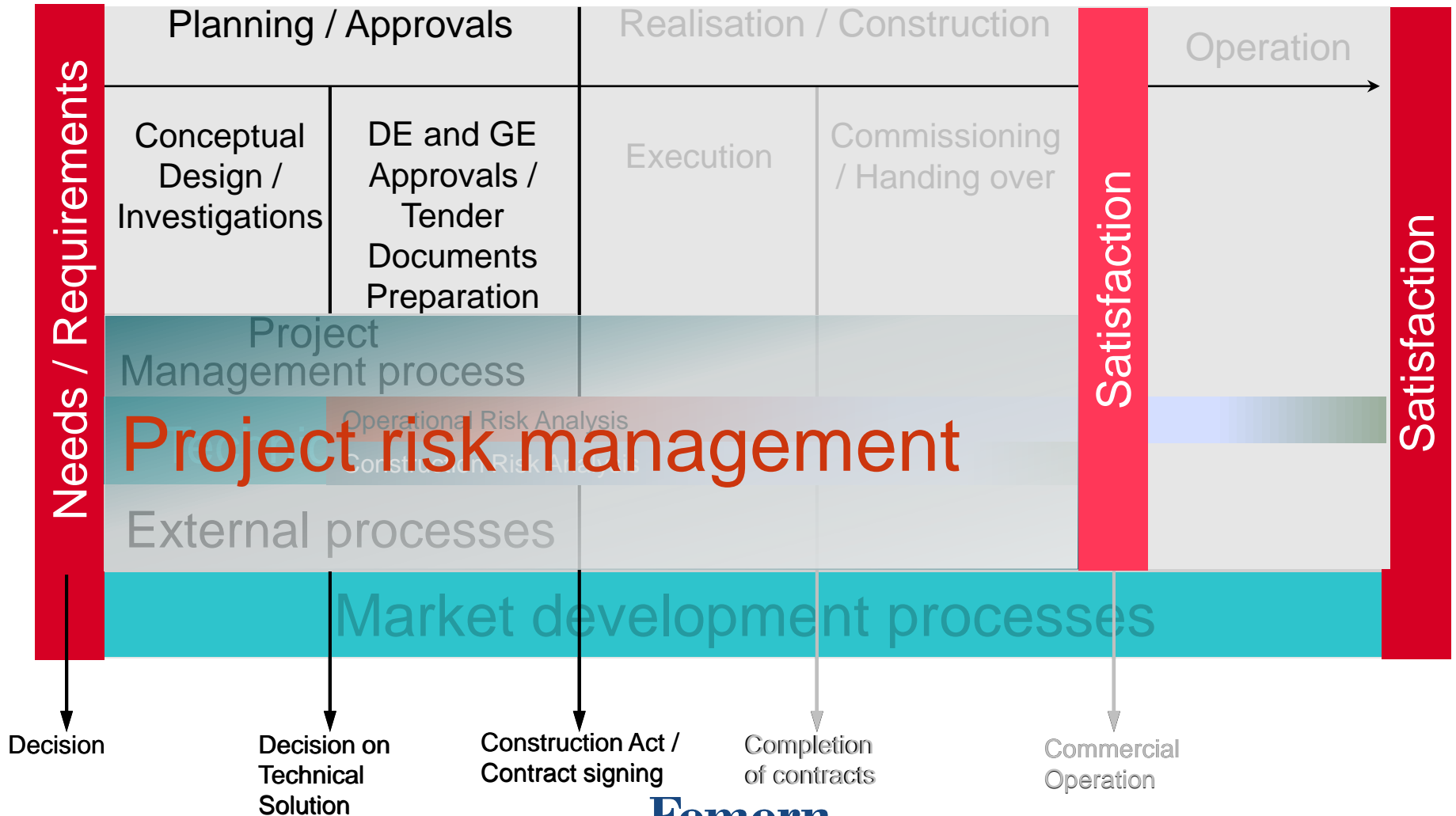
One position with the main contractor will result in one position with the sub-contractors



Success in business, and life, isn't about eliminating risks, it's about managing them

Susan Cramm

ERM Focus on ERM



It is human to fail...

Adverse Incidents

60-80% of all adverse incidents can be related to human error



Large Projects

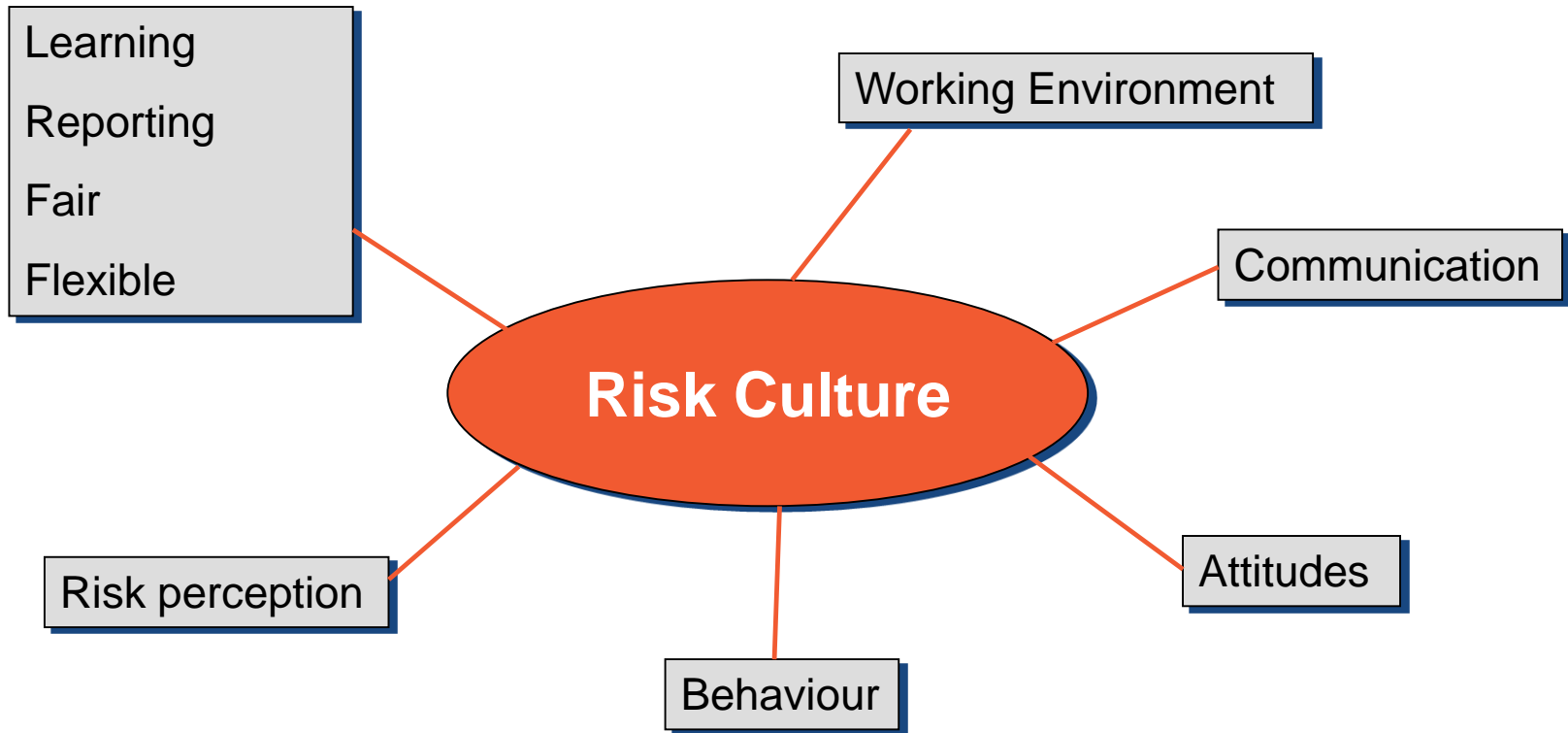
The main risks are:

People

Organisation

Cooperation

Risk Culture



Blame is not part of our culture



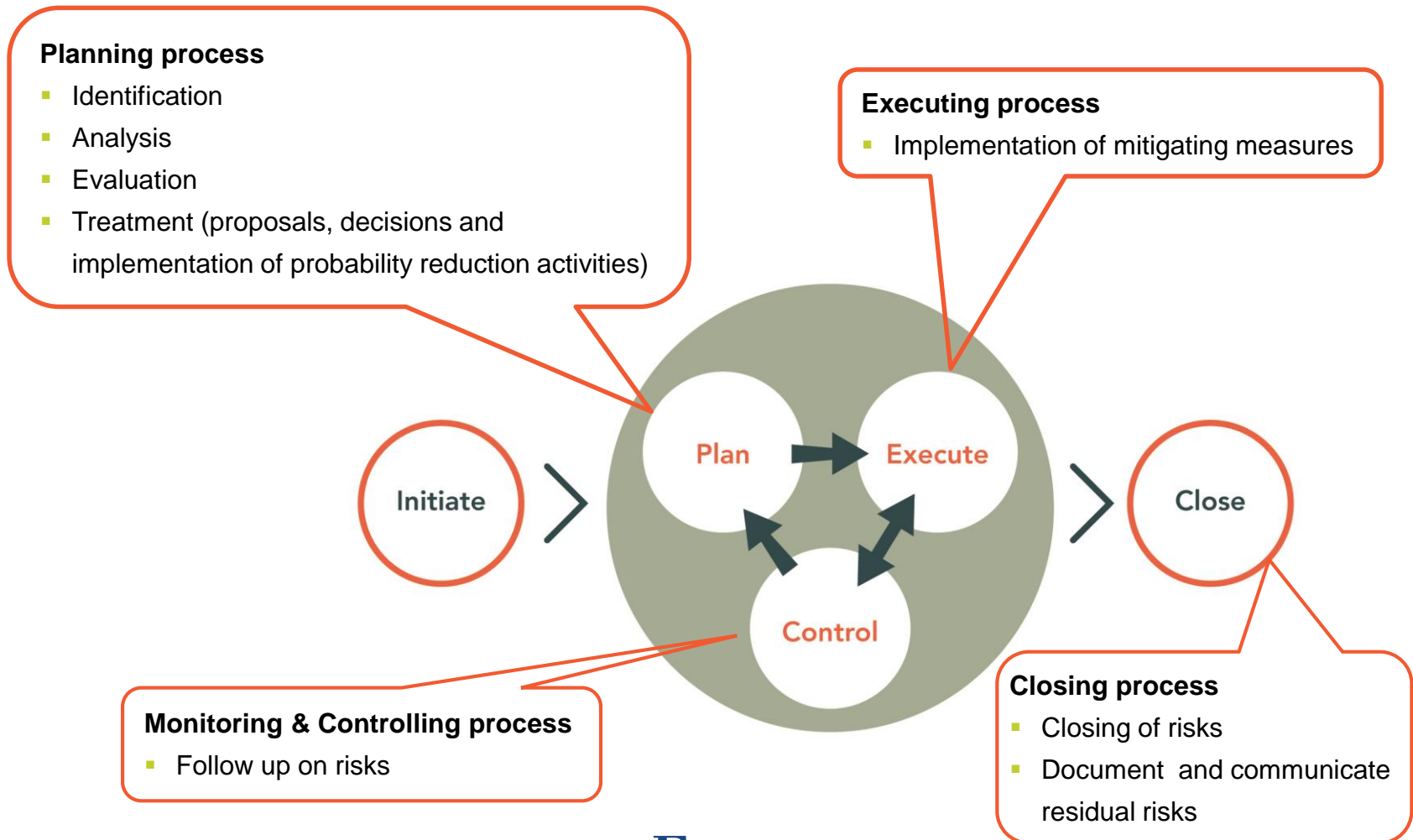
Risk management process

Femern Enterprise Risk Management



Femern Management System

The risk analysis is a planning tool



Responsibility

“Your responsibility for a process makes you responsible for Risk Management in that process”

Analysis and Evaluation of risks

Impact types

- Cost
 - Schedule
- } Quantitative Evaluation
- Goodwill
 - Personal injury
 - Quality and function
 - Surroundings
- } Qualitative Evaluation
(Risk matrix)

Risk Treatment

Consequence \ Likelihood	Insignificant	Considerable	Significant	Severe	Catastrophic
Very likely	Yellow	Yellow	Red	Red	Red
Likely	Yellow	Yellow	Red	Red	Red
Possible	Green	Yellow	Yellow	Red	Red
Unlikely	Green	Green	Yellow	Yellow	Red
Very unlikely	Green	Green	Green	Yellow	Yellow

Practical Risk Management

- ■ Risk management training
- ■ Risk database
- ■ Risk Workshops
- ■ Risk Management Group
- ■ Action plans for improvement

Requirements on contractors

Needs / Requirements

Project Management

Management system

Cooperation / Communication

Planning / Risk Management / QA

Technical processes

Design, Construction and Testing & Commissioning

External processes

Management of authorities, legal requirements and permits, stakeholder management

Documentation
Reporting

Satisfaction

Co-operation with Contractors

- ■ Contract requirements – RM, a management tool within the Contractors Management Systems
- ■ Support the contractor in his RM
- ■ Audits and Inspections

The Contractors Risk Management

The Contractor shall in his RM-process

- ■ ■ As a part of his Management System implement a procedure for RM
 - ■ ■ Overall view
 - ■ ■ Compatibility with Owner's system
- ■ ■ Implement a system for incident- and claim reporting
- ■ ■ Report status on RM



Thank's for your attention!



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