Managing risks in a megaproject

Femern
Sund≈Bælt

Outline:

1. Introduction
2. Why risk management?
3. How risks are managed in Femern A/S
4. How the quantification of risks is used
5. When is risk management a success?

1. Introduction

Who am I?
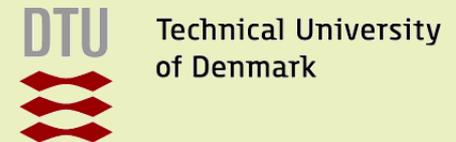
Nis Andersen, Design Engineer and Risk Specialist

M. Sc. Civil Engineering (DTU from 2010-2015)
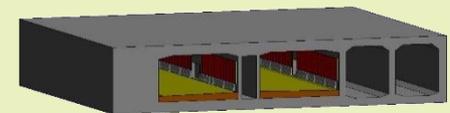
    - Construction Management

Master thesis

Use of BIM in total cost of ownership
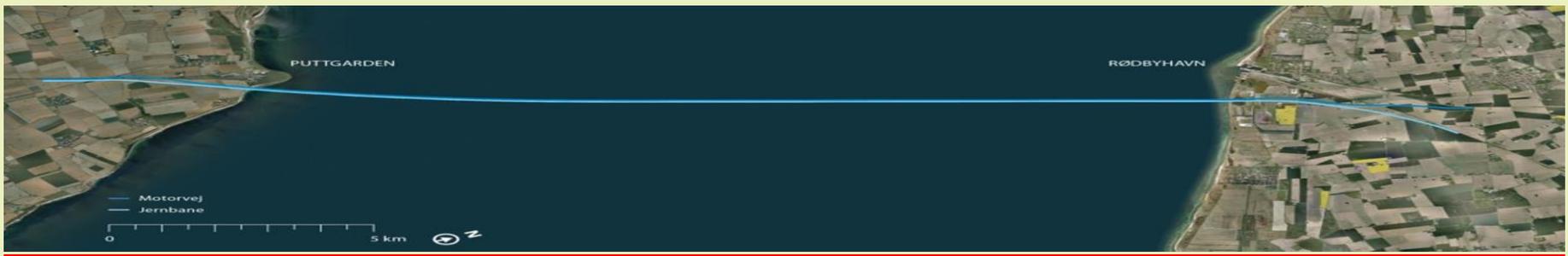
Femern
Sund≈Bælt

DTU Technical University
of Denmark

1. Introduction
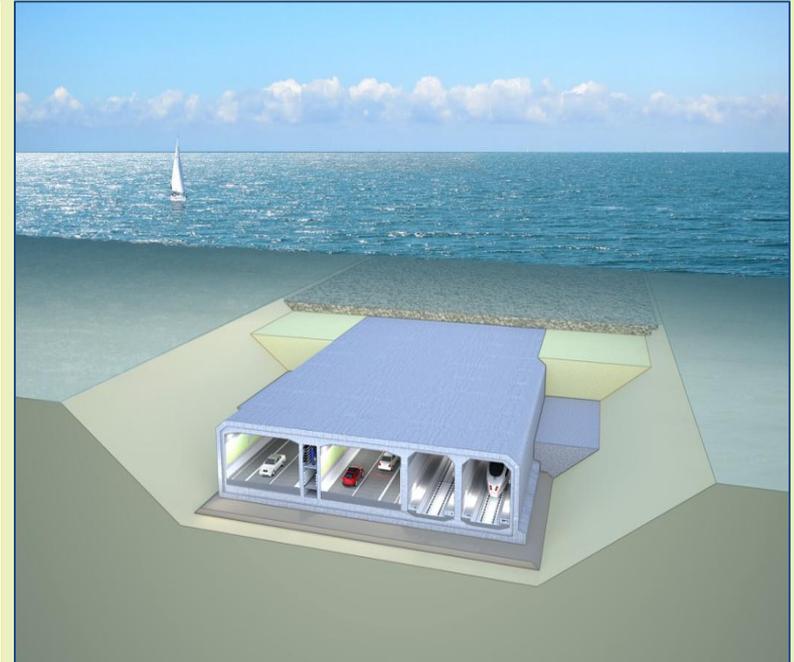
What is Femern A/S?

Owner of the world's longest immersed tunnel

from Denmark to Germany

1. Introduction

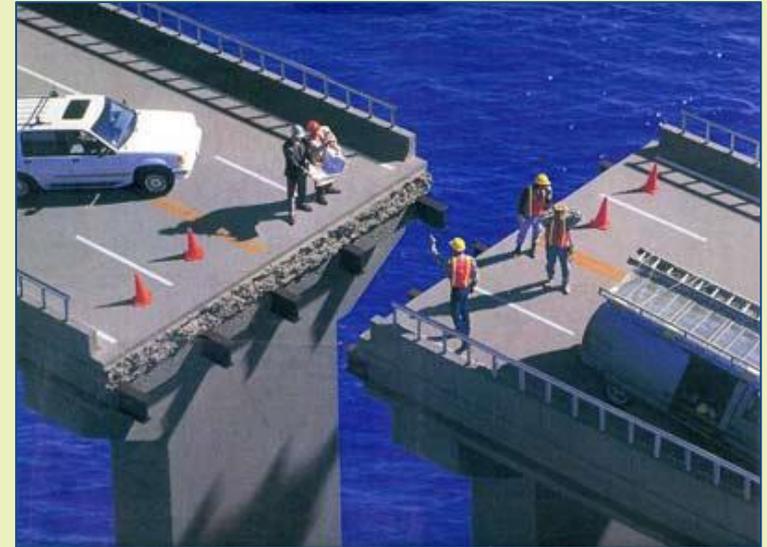### *The Fehmarnbelt Link in Numbers*

18 km

4 lane motorway

2 electrified rail tracks

79 standard elements

10 special elements

3,000 people

8.5 years

55.1 billion DKK (7,4 billion €)

1. Introduction

What is a risk?

"A deviation from the expected

expressed in terms of consequences

and the associated likelihood"

Uncertainty
Impact = x, y or z
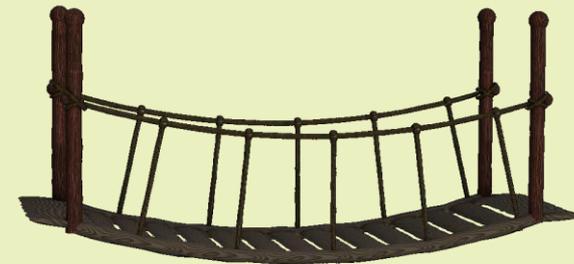Probability = 1

Vs.

Risk
Impact = x, y or z
Probability < 1

2. Why risk management?

Risk Management

A tool in project management

to achieve core objectives

Risks will occur!

Proactive approach to mitigate or avoid risks
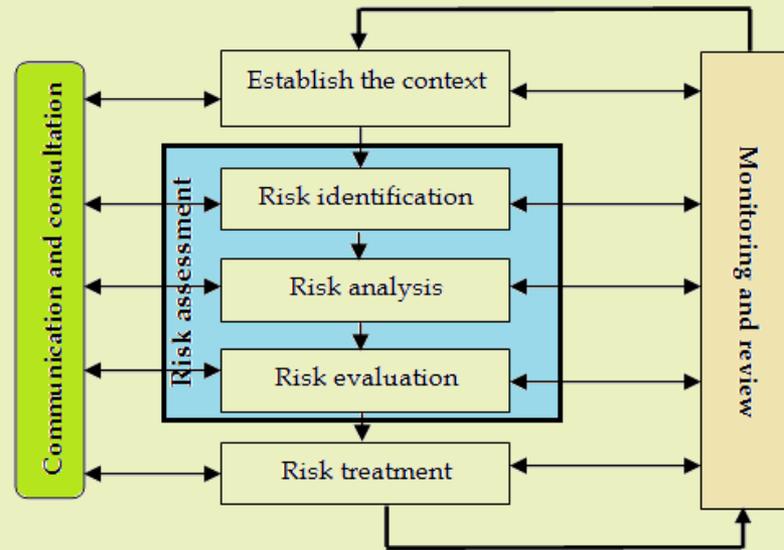
Risk reserve - a precondition for proactivity

"It's expensive to be poor" –
Kim Smedegaard Andersen,
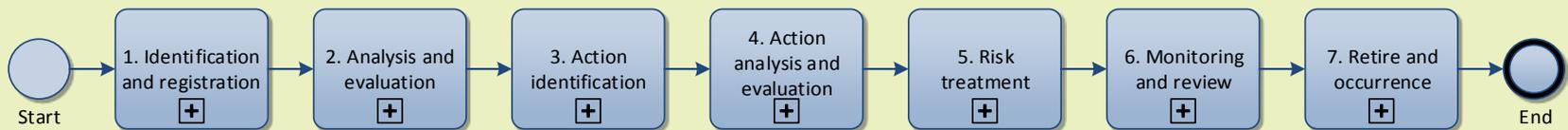*Technical Deputy Director Femern A/S*

3. How risks are managed in Femern A/S

Output of risk process

1. Probability

2. Impact

3. Treatment plan

4. Risk owner to treat and

   monitor & review the risk

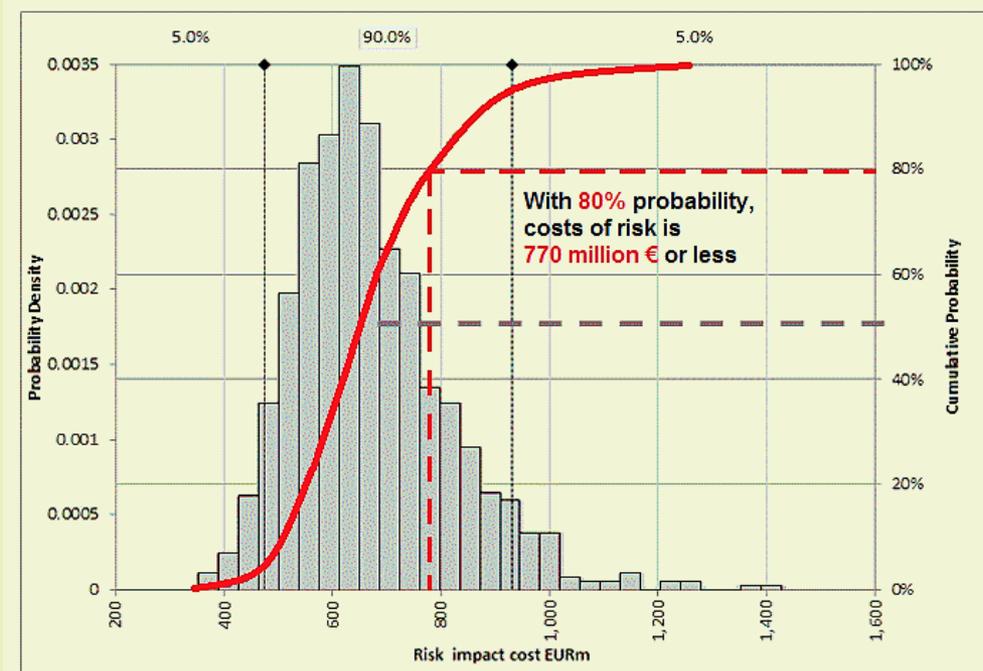*ISO 31000 – Risk Management*

ISO 31000 converted to Femern Risk Management procedure

4. How the quantification of risks is used

Monte Carlo simulation

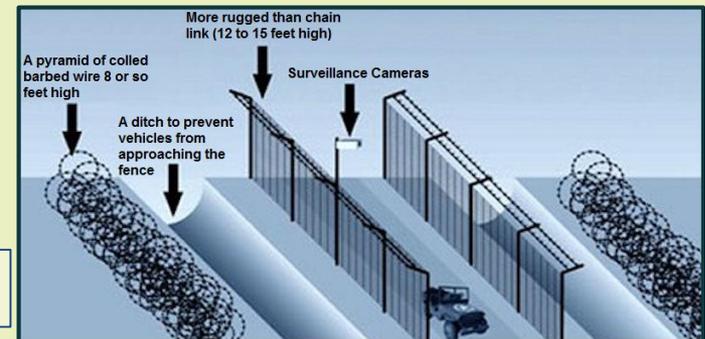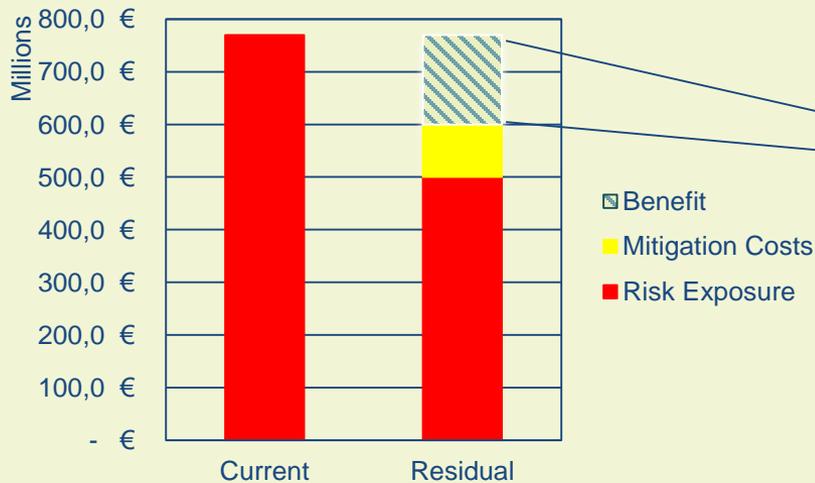10,000 simulations hence 10,000 different results

Random outcomes based on probability and impact distribution

5. When is risk management a success?

As Low As Reasonable Practical (ALARP)

Benefit of risk mitigation

Millions

800,0 €
700,0 €
600,0 €
500,0 €
400,0 €
300,0 €
200,0 €
100,0 €
- €

☒ Benefit
🟨 Mitigation Costs
🟥 Risk Exposure

Current   Residual

Level of Risk

Risk

Money, Time, Resources, Effort

Cost

Treatment

Cost / Benefit   ALARP

More rugged than chain link (12 to 15 feet high)

A pyramid of colled barbed wire 8 or so feet high

Surveillance Cameras

A ditch to prevent vehicles from approaching the fence

NOT ALARP!

5. When is risk management a success?

Risk schedule analyses

- More complex

- Difficult to make cost benefit

- Requires a great understanding

of each single risk, activity and

interdependency