

Status and plans for risk governance of the Energy Islands

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Background

The SDU Maritime Research Platform was established in 2022 based on a donation from A/S Dampskibsselskabet Orient's Fond. The platform consists of maritime research projects in four faculties across the University of Southern Denmark, mostly PhD and Postdoc projects.

Work packages

1. Business History: Development of Maritime Clusters
2. Business Strategy and Logistics
3. Vessel Motion and Vibrations: Crew Health, Safety and Work Environment (CMSS)
4. Performance Analysis – Energy Efficiency and Maintenance
5. Co-Creation of Maritime Regulation
6. Risk Governance Framework for the Energy Island (CMSS)

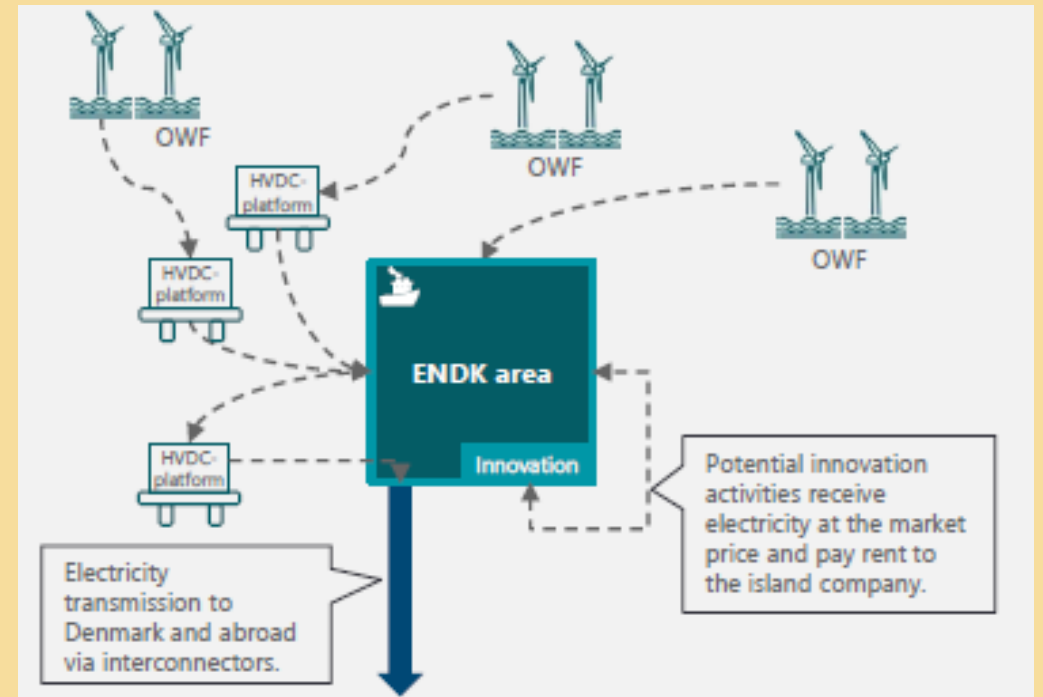
Some facts

An energy island serves as a hub for connecting and distributing power from the surrounding offshore wind farms (OWF)

The energy island in the North Sea will be an artificial island to be built approximately 80 km off the coast of Thorsminde

It is expected to have an initial capacity to serve **3 GW** of offshore wind and later reach full capacity at **10 GW**

Delivery of first power in 2033



What is risk governance?

*Risk governance provides guidance to cope with risks in situations of high complexity, uncertainty or ambiguity. It is not just about **risk management**. It starts at the earlier stage of **risk pre-assessment**, and urges institutions to gather not only knowledge about the physical, economic and social impacts of technologies, natural events or human activities but **also knowledge about the concerns** that people associate with causes and consequences of risks.*

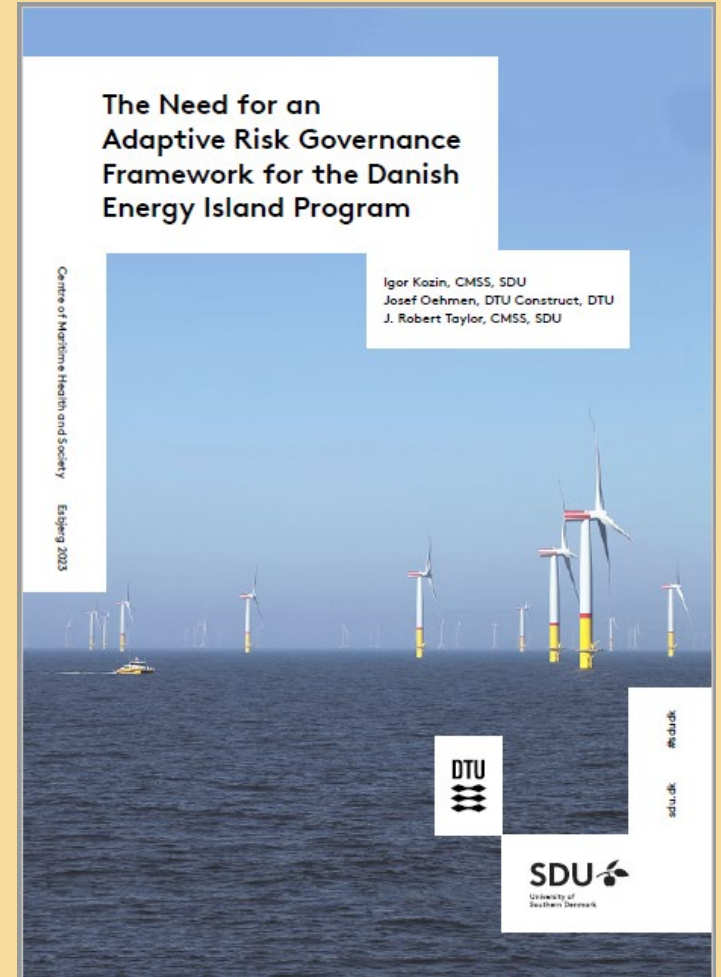
First MRP workshop

Decision was taken to write a White paper that would outline the unique challenges that professional risk management face in the Energy Island Program, and present a best-practice **Adaptive Safety Risk Governance Framework** to make the Program not only commercially viable and green, but also **safe and resilient** to shocks of different nature.



White paper

Insufficiently managed risks - from health & safety to cost - can bring the largest engineering programs to a sudden halt, and we can expect significant public scrutiny regarding promised budgets, schedules, and technical performance.



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One risk has already become true

Press release, June 28, 2023

“In its current form, the costs to the state are too great and the risks too many”

The Danish government has postponed the decision to initiate the tender for the artificial energy island it plans to build in the North Sea. The reason behind the move is that the current concept for the North Sea Energy Island is too expensive, so the government wants to look into other concepts.

White paper (continued)

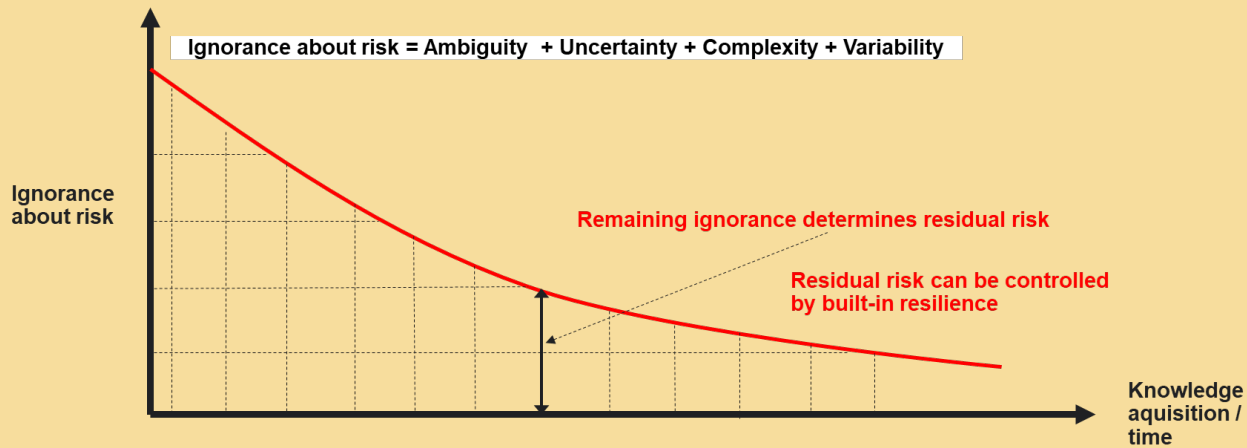
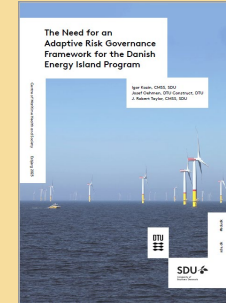
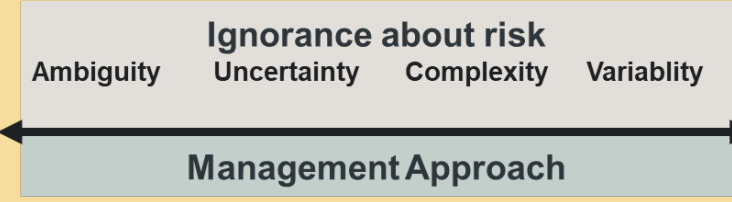


Figure 1. Bound characteristics of risk

- Resilience
- Flexibility
- Adaptive planning
- Monitoring & reactive capabilities

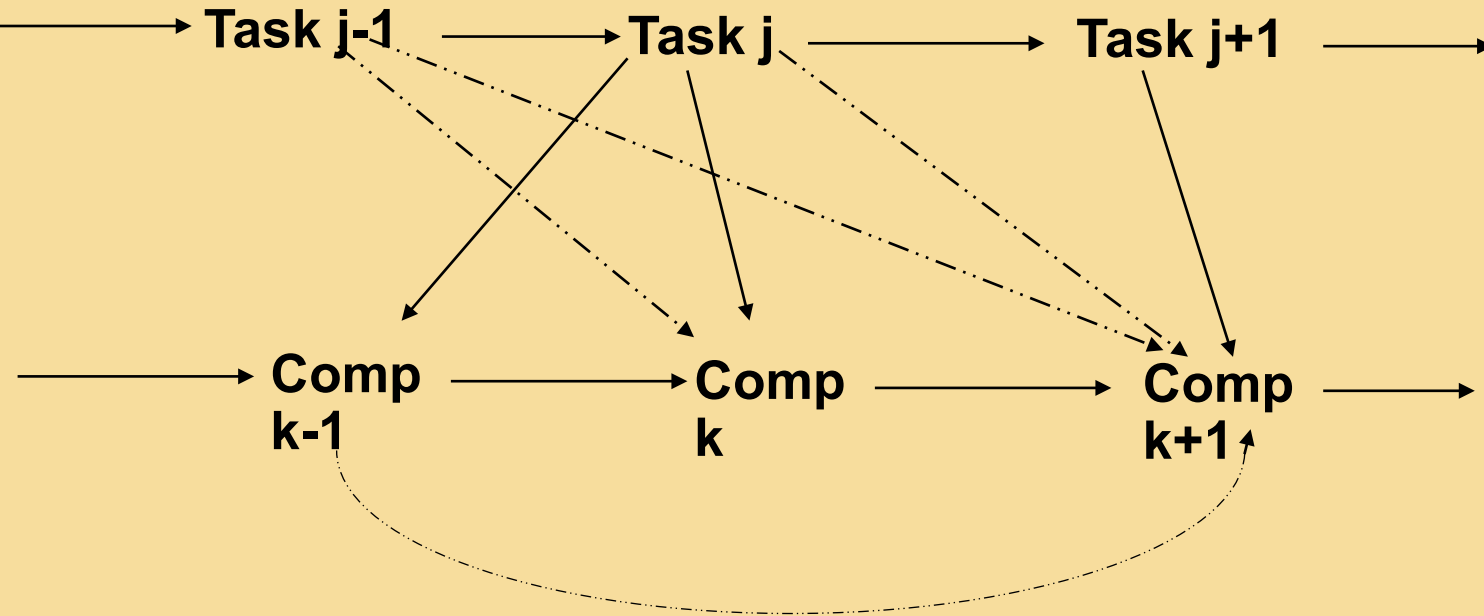


- Traditional RM
- Quantative risk management
- Detailed planning
- Predictive / controlled risk

How to analyse risks in a system which is highly underspecified?

How to address this challenge?

Socio-technical system approaches
– task-based approaches



Risk = f (not specified tasks or suboptimally specified/completed tasks)

Tasks for all phases in the project

Concept

Feasibility

Assessment

#sdu.dk

Task associated with OWF (sample) Design

Specifying the voltage level to 132kV		
Specifying the distance at which a voltage of 275 kV is required		
Specifying cables and numbers of cables		
Specifying cable entry requirements – distance		
Specifying entry tube		
Specifying filter		
Specifying Power-To-X		
Specifying transmission Grid		

Undertaken steps in the research Contributions to science

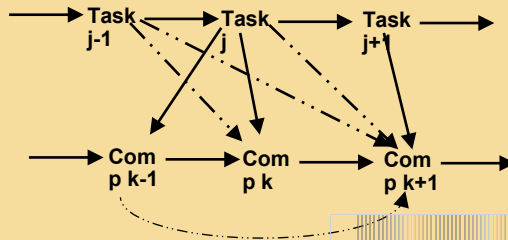
1. Capturing stakeholders' perceptions/concerns



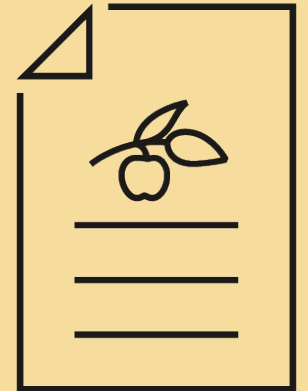
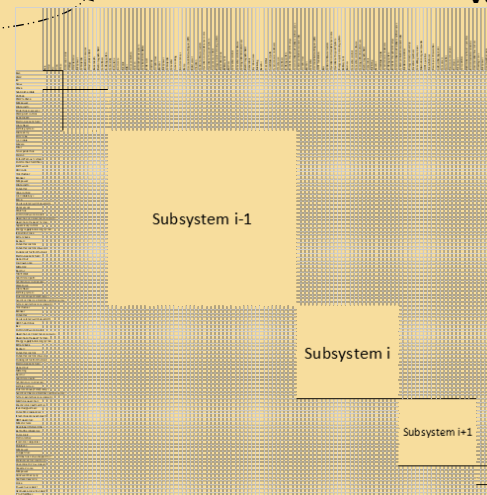
Issues raised by stakeholders



2. A customised approach to understand and analyse underspecified socio-technical systems



experts & stakeholder validation



credible risks

Results so far

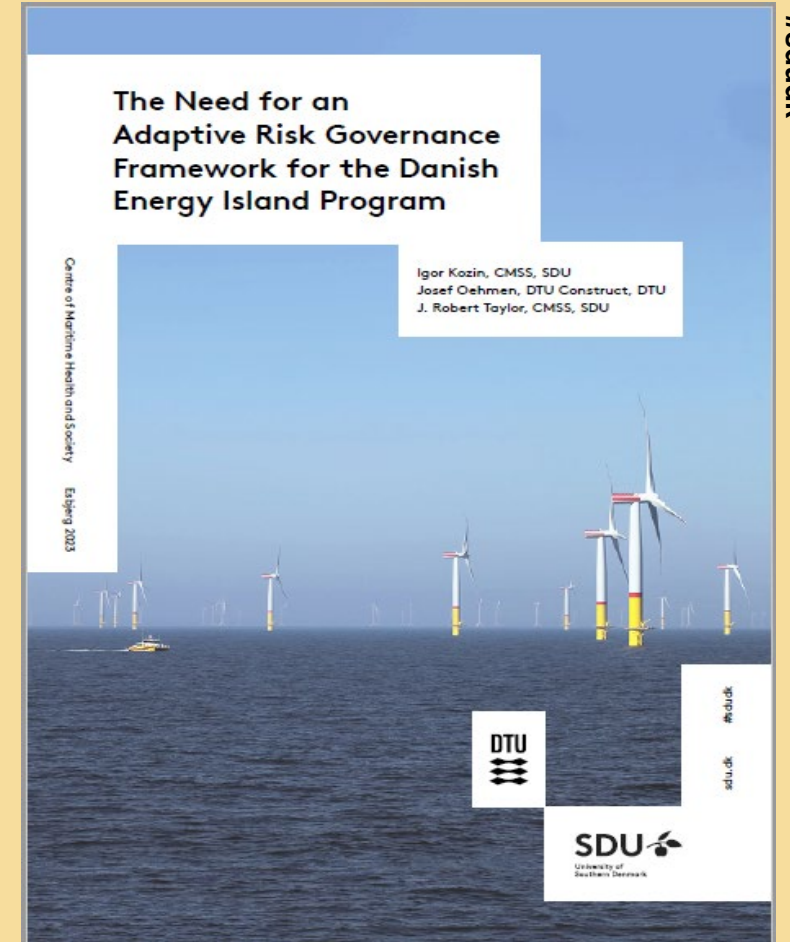
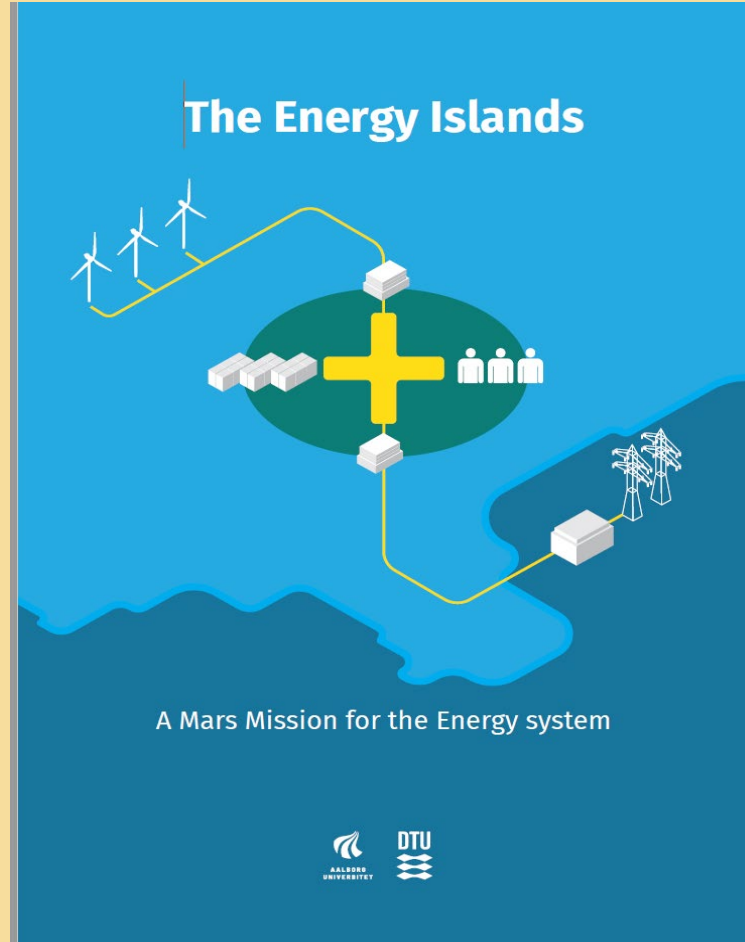
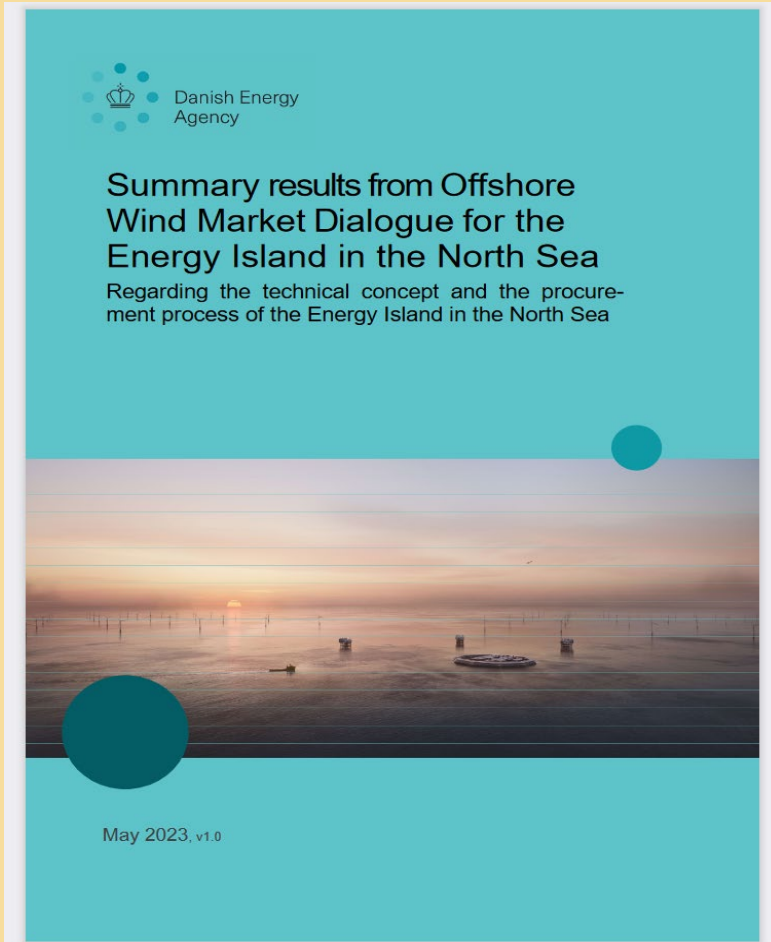
Component/condition	Subsystem	Risk criticality score
Submarine cable	OWF	200
Entry tube	Energy island	121
Filter		114
Cable entry		108
Construction facilities		103
Voltage		99
Land cable	OWF	87
Pull-in/Pull-out system	Energy island	82
Wind turbine	OWF	71
Barge		65
Ro-Ro cargo		52
Heavy load transport vessel		47
Semisubmersible	Water transportation	47
Sheerleg's area	Weather	47
Rain		34
Rain		34
Wind		33
Ice		30
Snow		30
Wave		30
.		
.		
.		
Operation and maintenance rooms	Energy island	3
Battery bank		3
Lay-down area		2
Substituted parts		2
Interface scour-tube		1

Different analyses being tested

- Forward inference
- Backward inference
- Simulations
- Sensitivity analysis
- Loop analysis
- Unexpected/undesired interactions impact analysis

Where does the input information come from?

Market dialogues in the procurement process and experts



Features of the data gathered so far



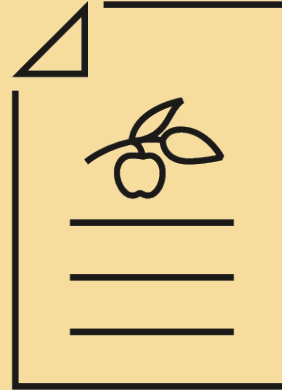
15+

**stakeholder
clusters**



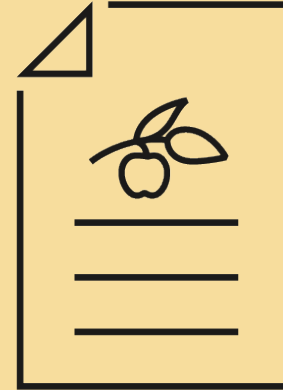
10+

experts



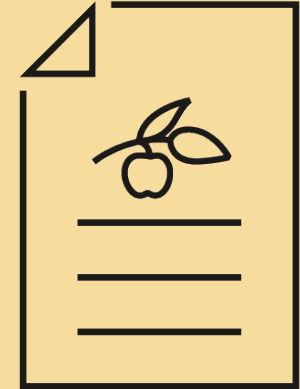
160+

issues



190+

tasks

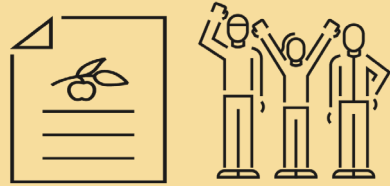


160+

**system
components**

Ongoing steps

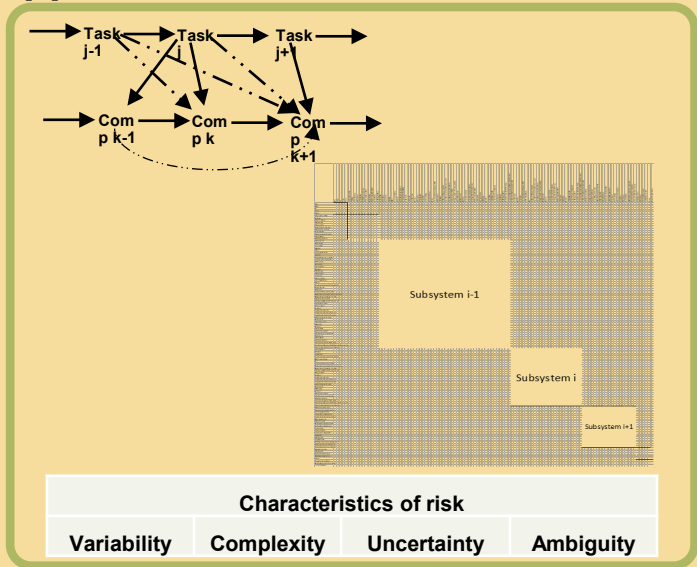
Step 1: Identify issues



+160

issues raised by stakeholders

Step 2: Identify analysis approach



Step 3: Identify credible risks

-Using actual data, e.g., tasks identified by stakeholders

-More numerical analysis

-Experts and stakeholders validation

Step 4: Identify risk management strategies

Step 5: Design considerations

Questions from Advisory Board

1. Belyses den regulatoriske situation om hvilken myndighed der fører hvilket tilsyn?
2. Standard for risk management er øen offshore eller onshore?

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