



25-28 April 2017  
Aalborg

# Knowledge FOR Resilient soCiEty

**Msc. Risk and Safety Management at  
Aalborg University**

*Danish Centre for Risk and Safety  
Management (RISK)*

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# RISK

## Danish Centre for Risk and Safety Management (RISK)

[www.riskcenter.dk](http://www.riskcenter.dk)





# Origin

- § 1. Danish Centre for Risk and Safety Management (RISK) er etableret med virkning fra 2011 efter aftale mellem Syddansk Universitet og Aalborg Universitet som et tværfakultært center
- “The Danish Centre for Risk and Safety Management (RISK) opened on 22 August 2011 as a collaboration between Aalborg University (AAU) and University of Southern Denmark (USD).”
- “It is organized as part of the Department of Civil Engineering under the Faculty of Engineering and Science at Aalborg University and is physically located at Aalborg University, Esbjerg Campus (AAU-Esbjerg).”
- “The Centre is funded by Claus Sørensens Fond and the two universities.”

# Msc. Risk and Safety Management



# Course overview

Semester	Module	ECTS	Assessment	Exam
1st	Systems Engineering	5	Pass/Fail	Internal
	Applied Statistics and Probability Theory	5	7-point scale	Internal
	Risk Analysis	5	Pass/Fail	Internal
	Industry Standards and Legislation	15	7-point scale	Internal
2nd	Risk Management	5	Pass/Fail	Internal
	Decision Making	5	Pass/Fail	Internal
	Risk Communication <sup>1)</sup>	5	7-point scale	Internal
	Maintenance Management <sup>1)</sup>	5	Pass/Fail	Internal
	Risk Analysis and Management	15	7-point scale	External
3rd	Simulation of Emergencies	5	Pass/Fail	Internal
	Emergency Management	5	Pass/Fail	Internal
	Risk and Reliability in Engineering <sup>1)</sup>	5	Pass/Fail	Internal
	Health and Safety Management <sup>1)</sup>	5	Pass/Fail	Internal
	Operational Risk Management in Projects	15	7-point scale	Internal
4th	Master's Thesis	30	7-point scale	External
Total		120		

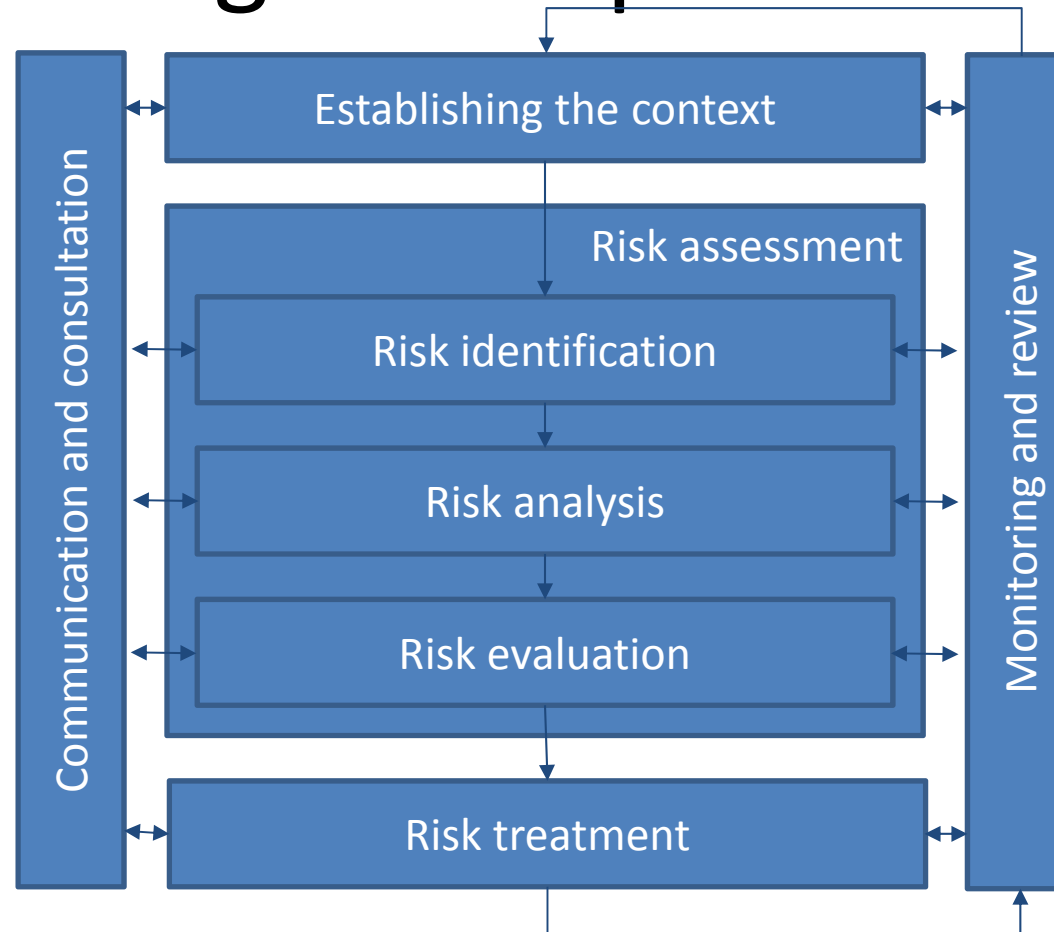
- 1) The student must choose one out of two course modules. The modules will not be given with a small number of students.



# Project outline

- Describing the context (Establishing the context) – ISO 31000:2009
- Introduce and select a research question
- Describe the problem – fact based description, visual description, overall description, need/pain, context
- Problem analysis (Identify risks/risk identification, No-Gos ....):
- Use break-down or road mapping to structure the system you are working with
- Use SWIFT, 6H or brainstorming methods – maybe Bow-tie to populate the breakdown/structure
- Stakeholder analysis to decide on data to be gathered and information seeking strategy (Supply Chain Analysis, stakeholder mapping)
- Legislation
- Use Risk analysis\* and risk assessment\* methods to risk map, prioritize, select the most critical, most influencing, most costly (this can be chosen together with the company/partner) – e.g. FMEA
- Problem formulation (Risk assessment):
- Conclusion to the problem analysis process – qualitative objectives, goals, priorities, road map, gate keeping ...
- Specification of requirements to the solution
- Delimitation
- Solution process (Treatment)
- Use Risk analysis\* and risk assessment\* methods to verify solution or choice of mitigation elements (Monitoring)
- Use report to communicate/disseminate your solutions

# Risk management process



From: ISO 31000:2009 Risk management – Principles and guidelines



# RISK ?





# RISK ?



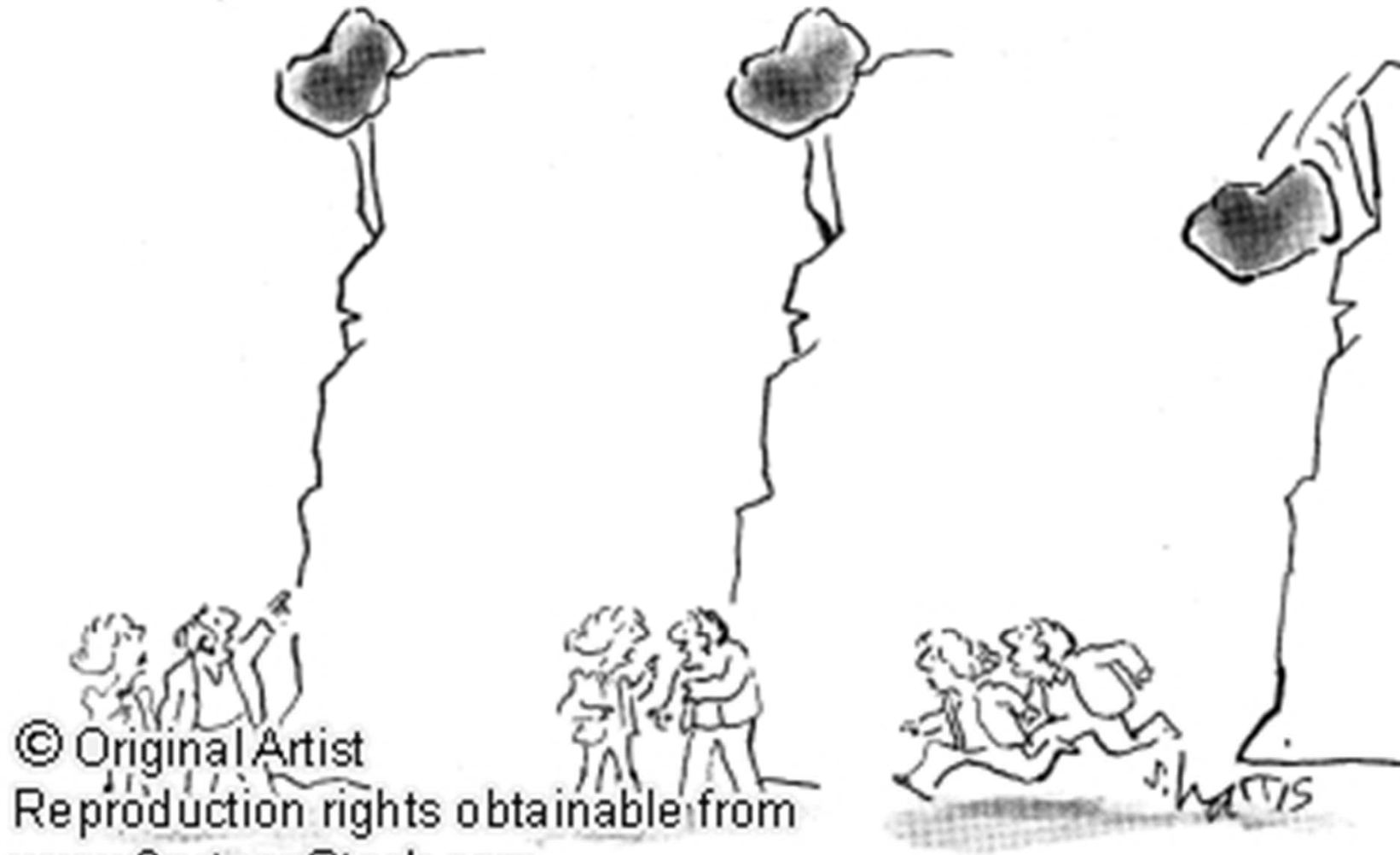
# RISK ?



RISK  
PERCEPTION

RISK  
ASSESSMENT

RISK  
MANAGEMENT



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# PROJECT CORPORATION





# Phases in a project corporation

- Initiation
- Preliminary meeting and clarification of expectations
  - Research value and/or innovation level/relevance
  - SWOT
  - clarification of expectations
  - Project specification and resource allocation



# Initiation

- Personal contact
- Matchmaking
- Students
- Professional
  - Research – formalized agreement
  - Consultancy – by hour



# SWOT

- Strength: New eyes, extra resource, probable solution, transparency/ visualization of problems or inappropriate processes, analysis and results are scrutinized, **ownership**
- Weakness: Steep learning curve, background knowledge, networking in short time, **ownership**
- Opportunities: Analysis, descriptions, documentation, visualization of internal processes, enabling of transparency, data collection, presentations, outreach, CSR, recruitment
- Threats: result dependent of the student or the project team capability, busyness in company, lack of access to data and information





# Preliminary meeting and clarification of expectations

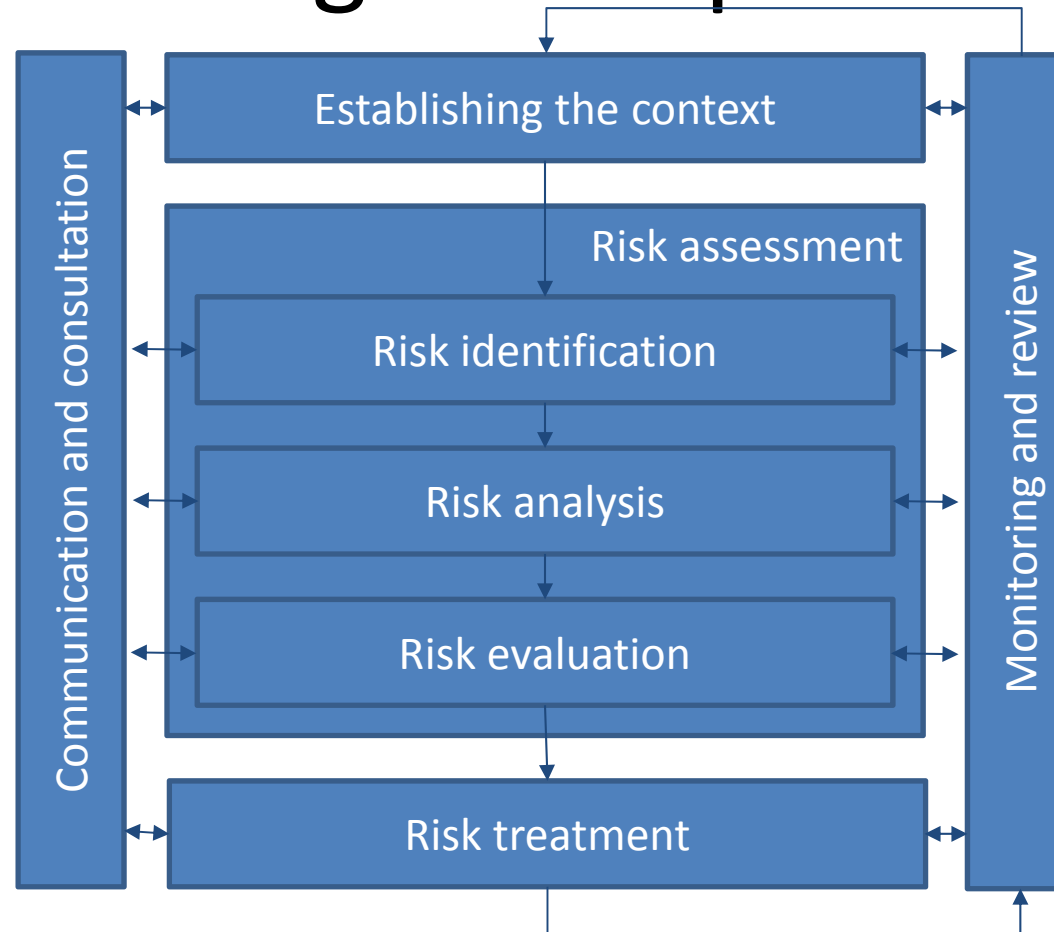
- Supervisors: Advice and coach the students, scientific and technical supportive
- Co-supervisor: Support within a specific or dedicated scientific/technical or research field
- Companies or partners: Provide data and information, ideas, problems, challenges
  - May provide an office space for the student in the organization – workplace
  - May run or facilitate experiments, implement solutions ...
  - May require resource planes, meetings, continuous deliverables, audits and project follow ups
  - May contribute or interact with the students



# The Project Work

- Candidate students (Msc) shall drive the project work
  - provide ownership – be motivated
    - Should develop a project specification and a resource plan
    - Formulate a research statement or hypothesis
    - Should manage communication and meetings with stakeholders and supervisors or experts
    - Shall prepare relevant documentation and presentations
    - Will be examined and scrutinized/audited by a supervisor and censor
    - May present outcomes of the project in a separate arrangement for the company/partner

# Risk management process



From: ISO 31000:2009 Risk management – Principles and guidelines



# Emergency management

- It is the discipline dealing with risk and risk avoidance
- It is integral to the security of our daily lives and should be integrated into our daily decisions - not just called upon in times of disaster
- It must be recognized as an essential role of government

# Emergency management



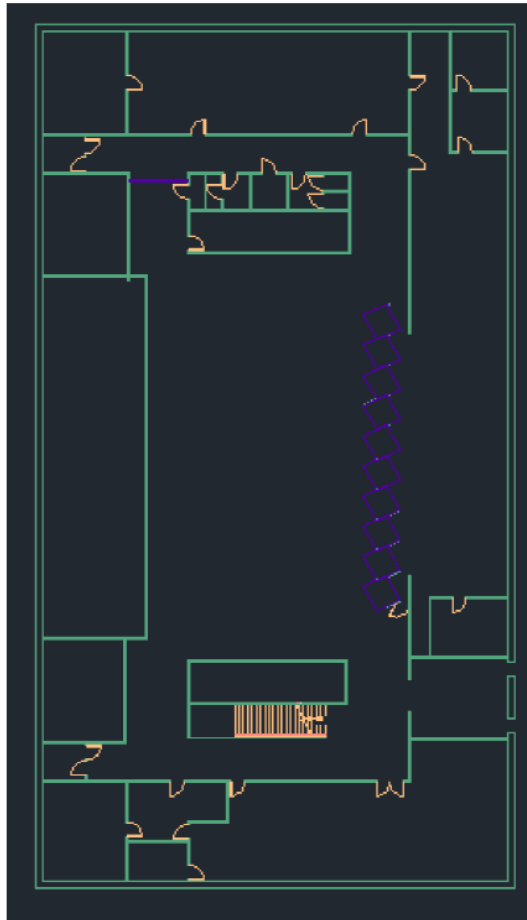


# Simulation of Emergency within the Municipality of Esbjerg

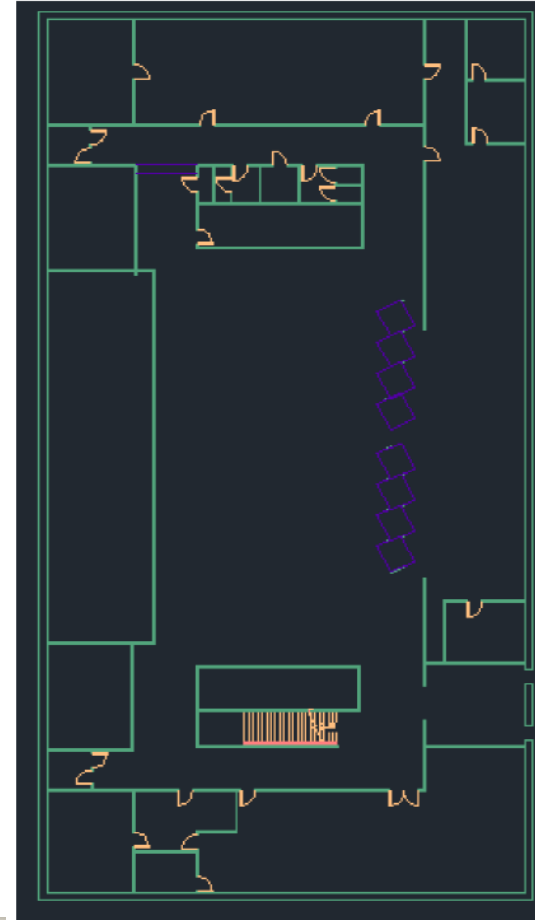
- How is the new general emergency plan of the Municipality built to face the hazard of fire?
- How is a simulation using Simulex representing the personnel and what are the outcomes of it?
- How is a simulation in 3Ds Max representing the personnel and what are the outcomes of it?
- How will the personnel and the visitors react and evacuate in a real life simulation, and what possible improvements can be implemented?
- Could the mitigation measures implemented by the municipality of Esbjerg reduce, if not completely avoid the present situation and its consequences?

# Simulex

Current layout



Modified layout



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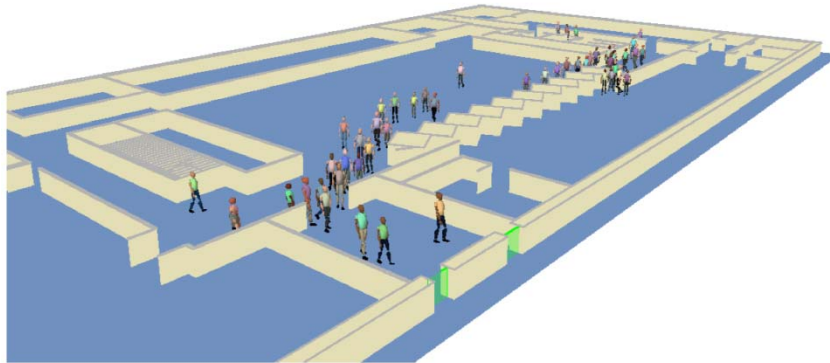
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# Simulex

## Current layout

Simulex: 1:30min  
Beregnet: 5:05min  
Øvelse: 3:33min



## Modified layout

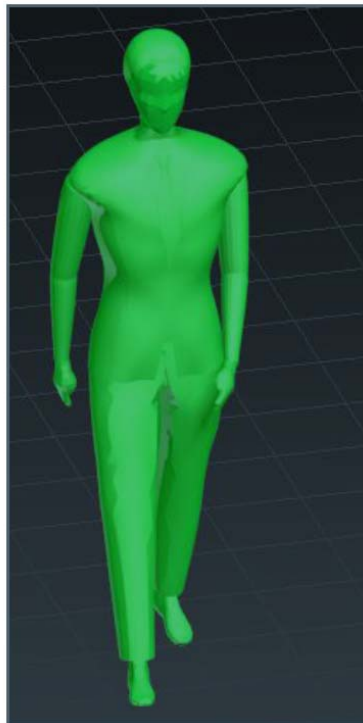
Simulex: 1:05min  
Beregnet: N/A  
Øvelse: N/A



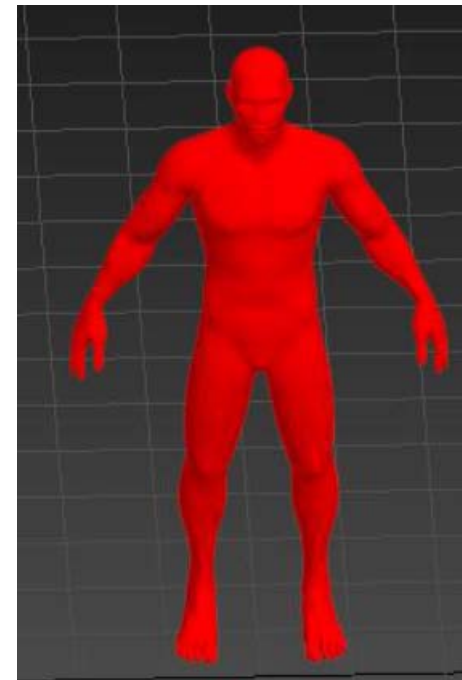
# 3DS Max

## Definition of agents

**Guest**



**Staff/searcher**



# Drill



# Obstacles





# Evaluation of emergency planes

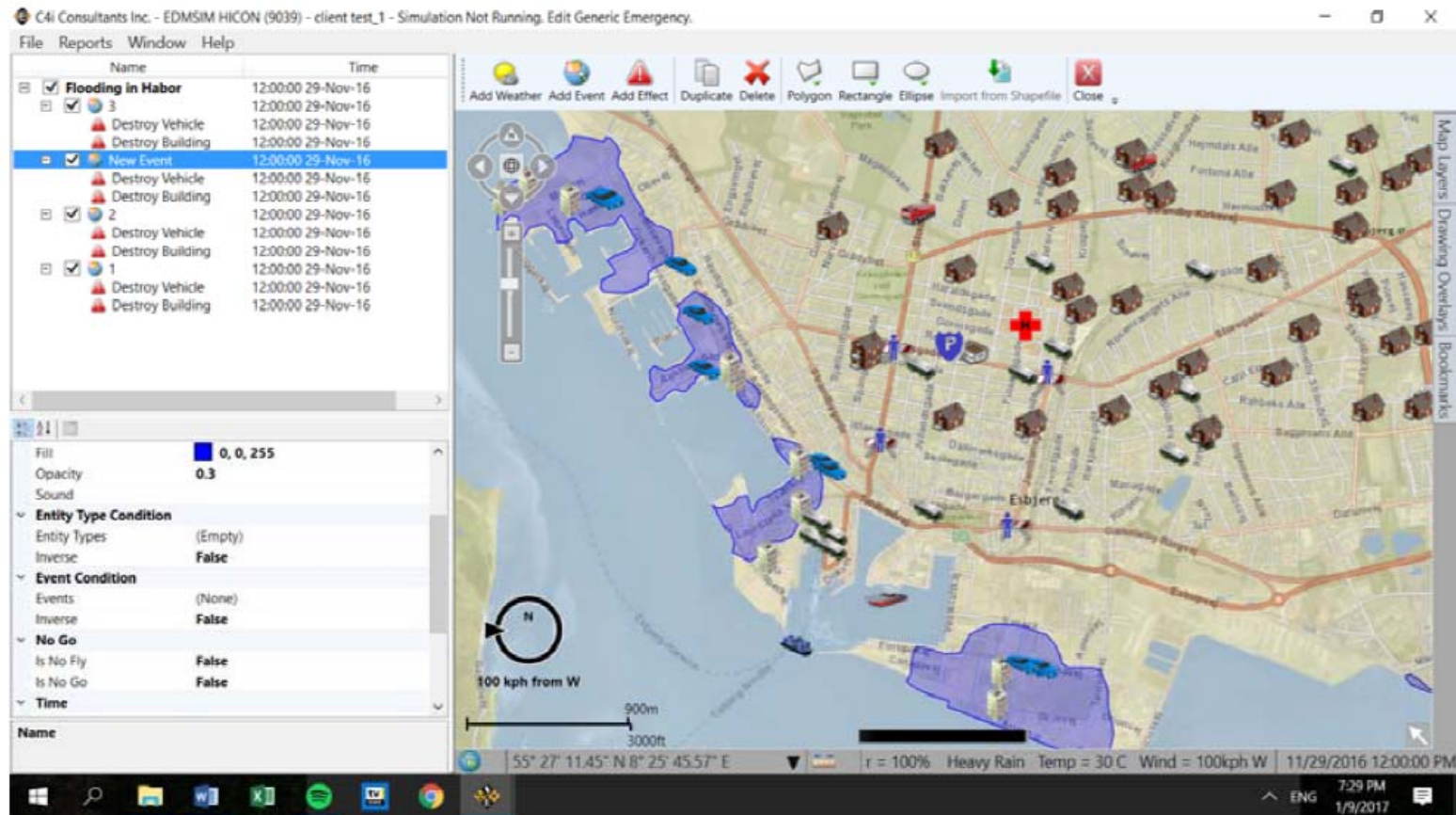
- Emergency management assessment for Esbjerg Municipality
  - How are the current organization and plans setup to deal with emergencies?
  - Is it possible to use simulation software to aid an emergency management exercise?
  - Can an exercise reveal future focus for emergency management?



# EDMSIM

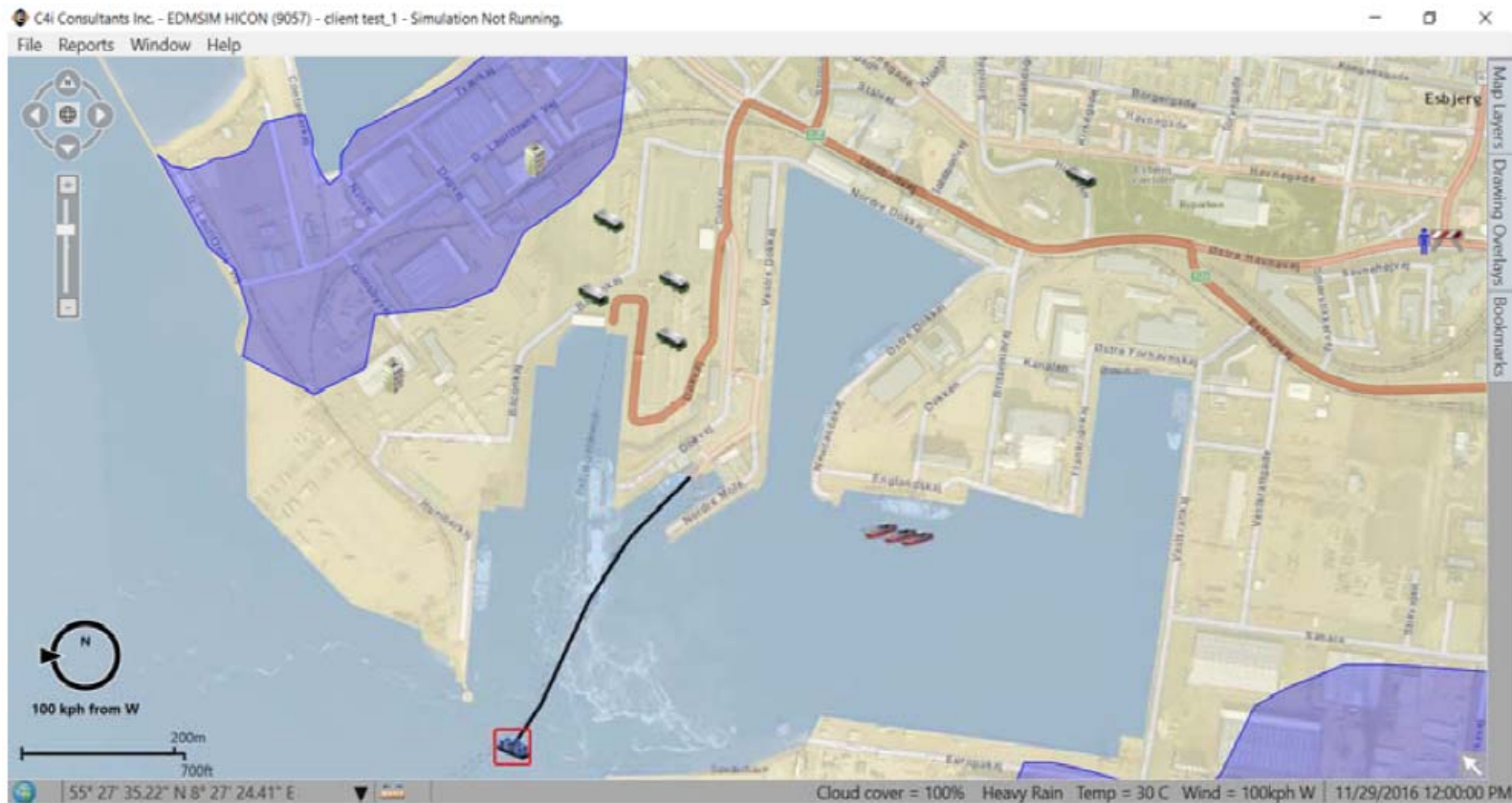


# Overall scenario Flooding





# 3: Ferry





# Participants

<b>Crisis unit</b>	
Søren Abildtrup	Head of City Council Office (Crisis unit member)
Thomas Reil	Head of Communications (Head of joint emergency crisis communication)
<b>Esbjerg Municipal executive board</b>	
Otto Jespersen	City Manager Head of Joint administration
Arne Nikolajsen	Head of Health and Care administration
Lise Plougmann Willer	Head of Citizen and Job Market administration
Hans Kjær	Head of Engineering and Environment administration
Jørn Henriksen	Head of Children and Culture administration
<b>SVJB</b>	
Jens Mølgaard	Head of fire and rescue SVJB
Niels Strandvad Thomsen	Chief of operations Minutes keeper

# Discussion



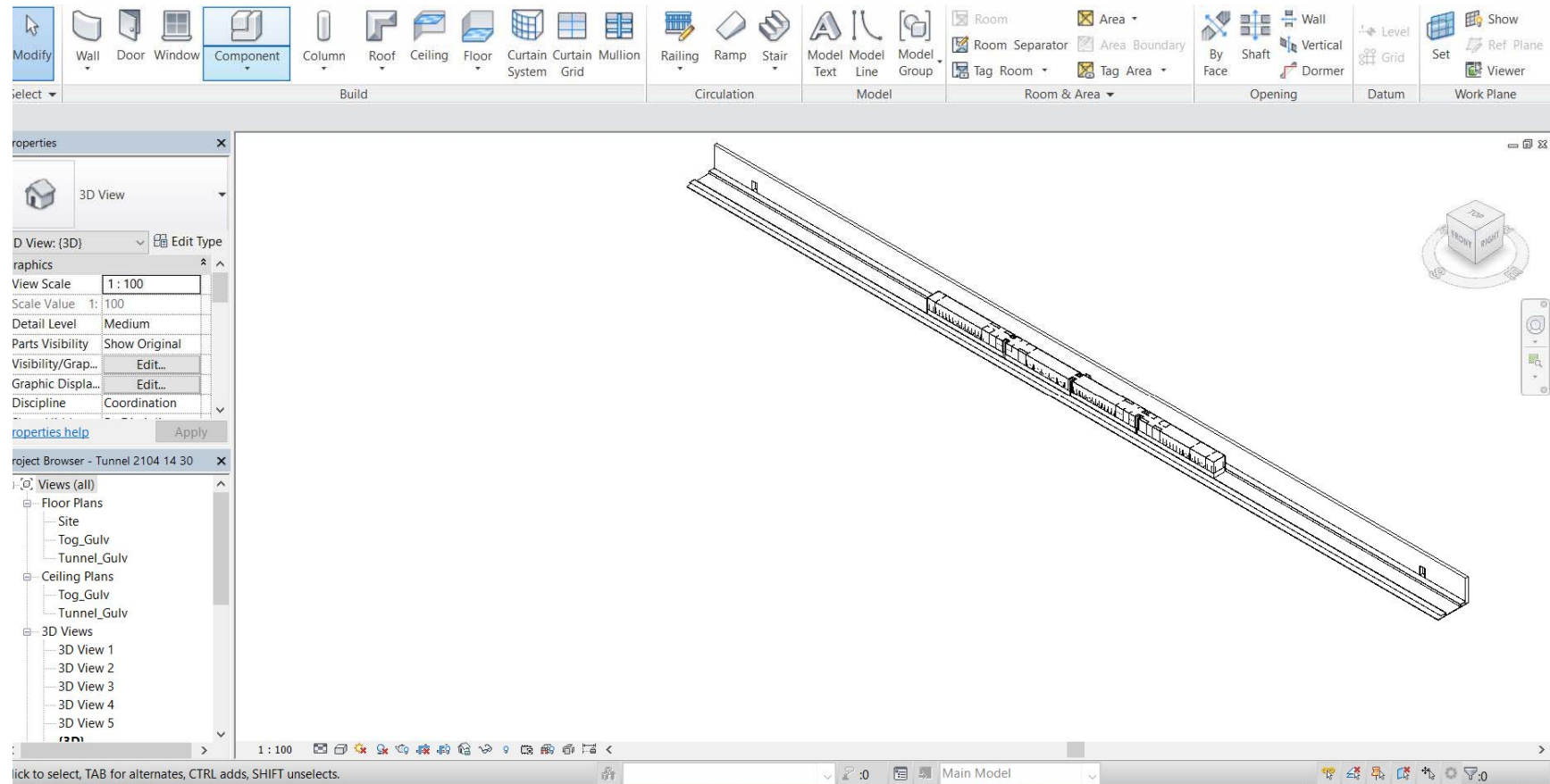


# Student projects

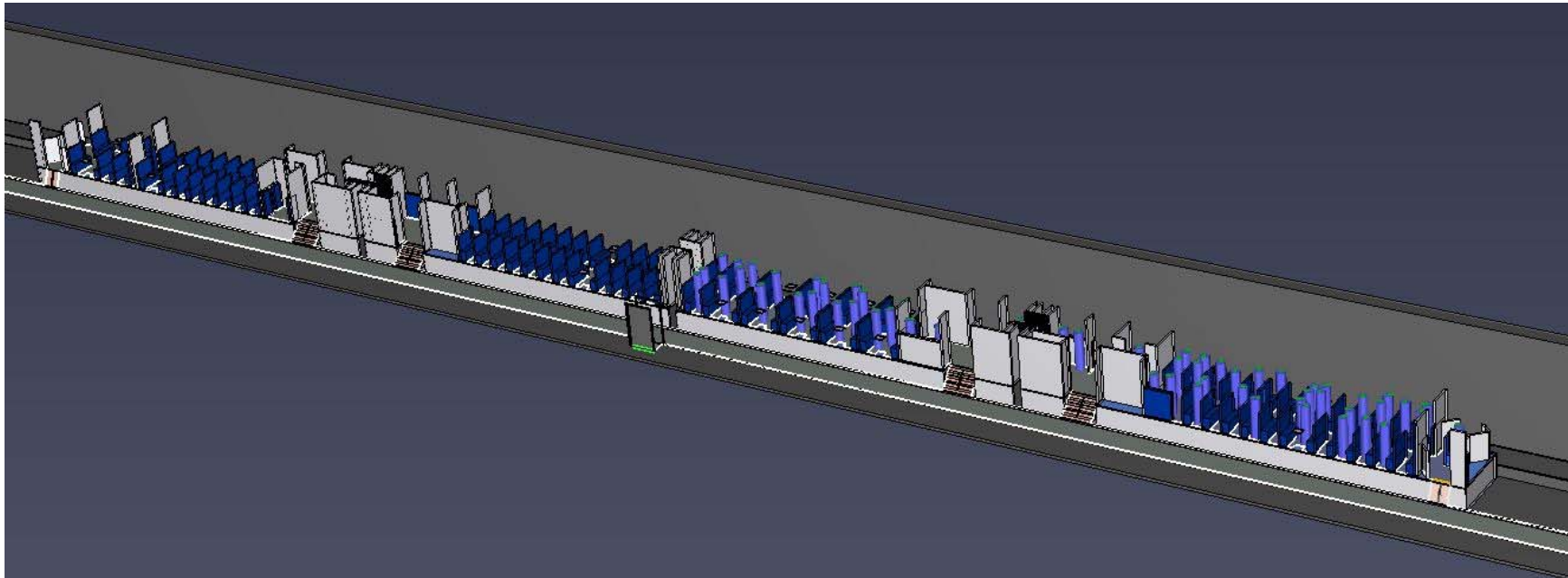
- Analysis of personal protective equipment
- Analysis of Helicopter transport
- Analysis of Transport of wind turbines on roads
- Analysis of Trade between Denmark and Brazil
- Analysis of legislation differences between onshore and offshore WT
- Emergency management in airports
- Fire protection and sensor configuration (Niras)
- Emergency management in offshore maintenance – oil shifting in OWT
- Emergency management – fire and explosive hazards on oil platforms
- Analysis and risk management processes in the Chinese OWT
- Emergency management – case - **Tianjin** – hazardous materials
- Evacuation of campus and hospital
- Evacuation from tunnels
- Drone technology



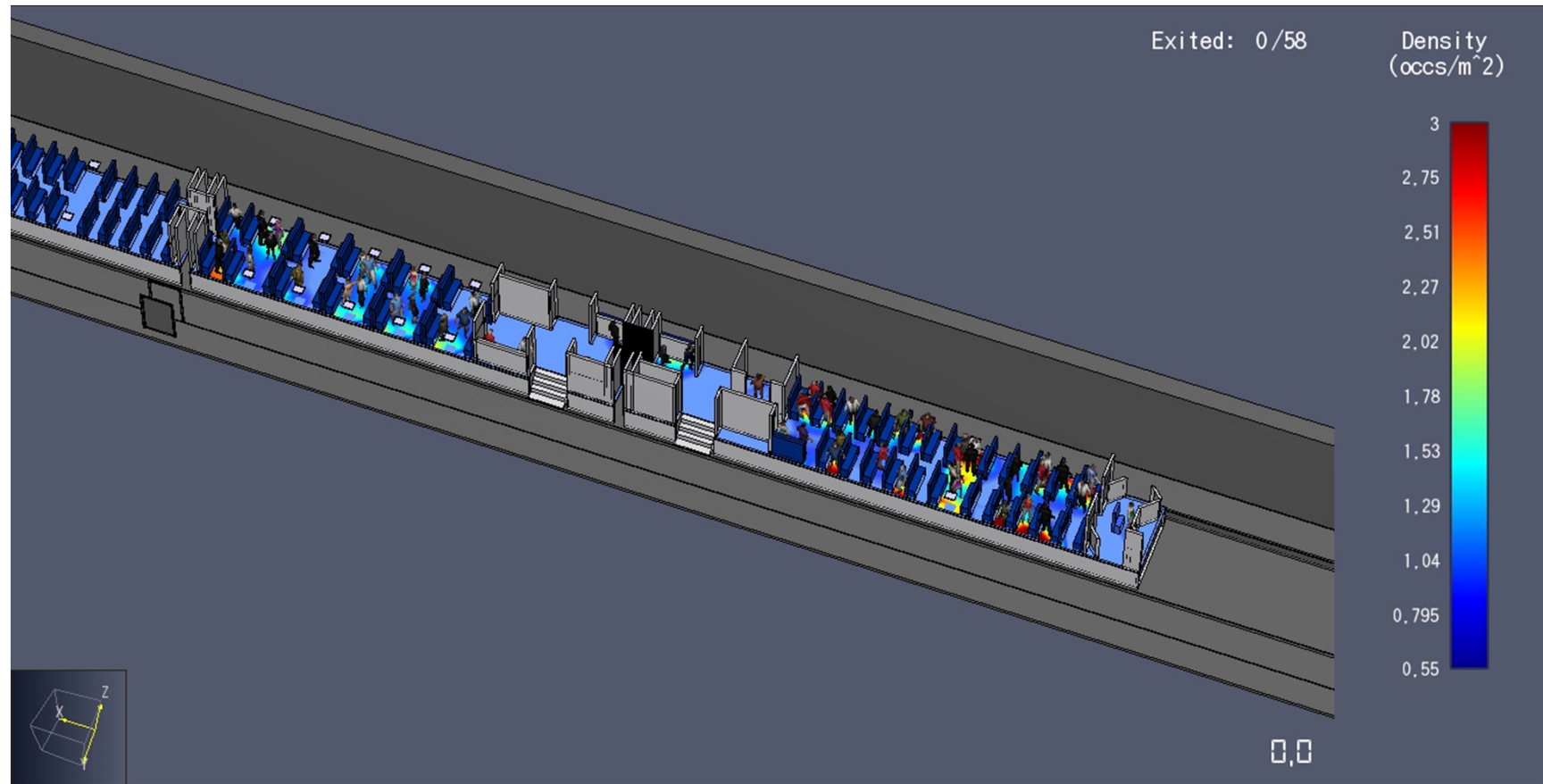
# Example – Tunnel evacuation



# Example – Tunnel evacuation

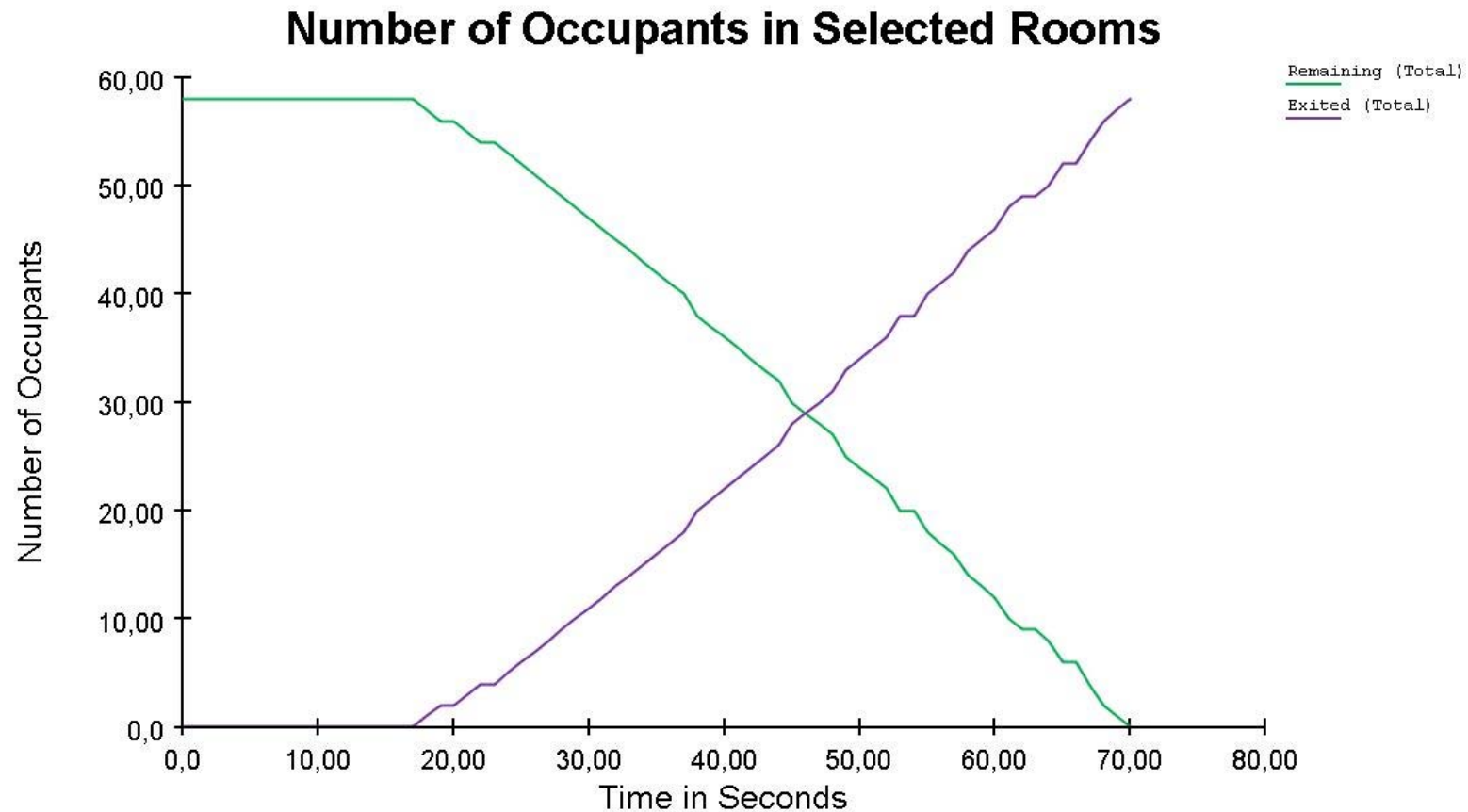


# Example – Tunnel evacuation



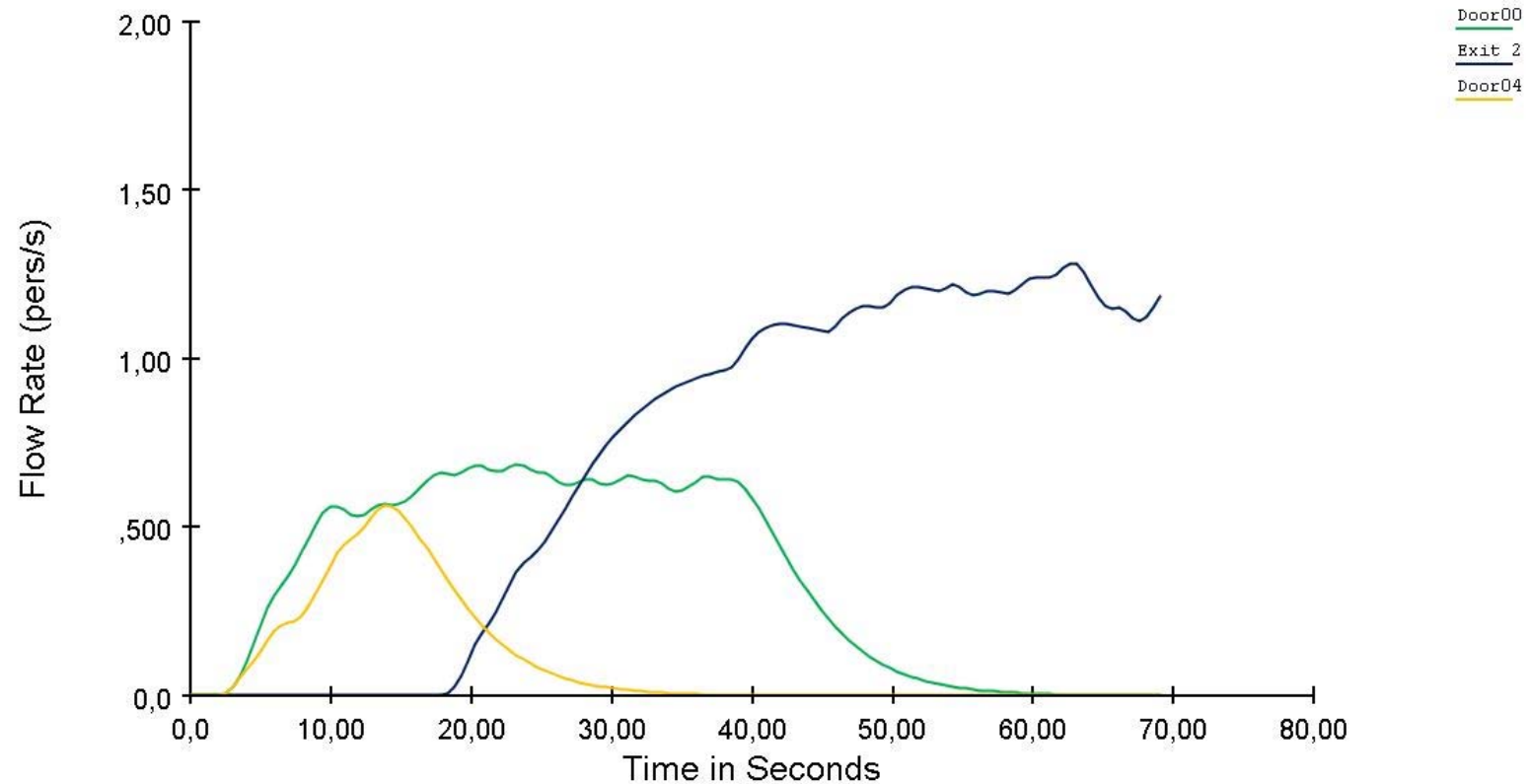


# Example – Tunnel evacuation



# Example – Tunnel evacuation

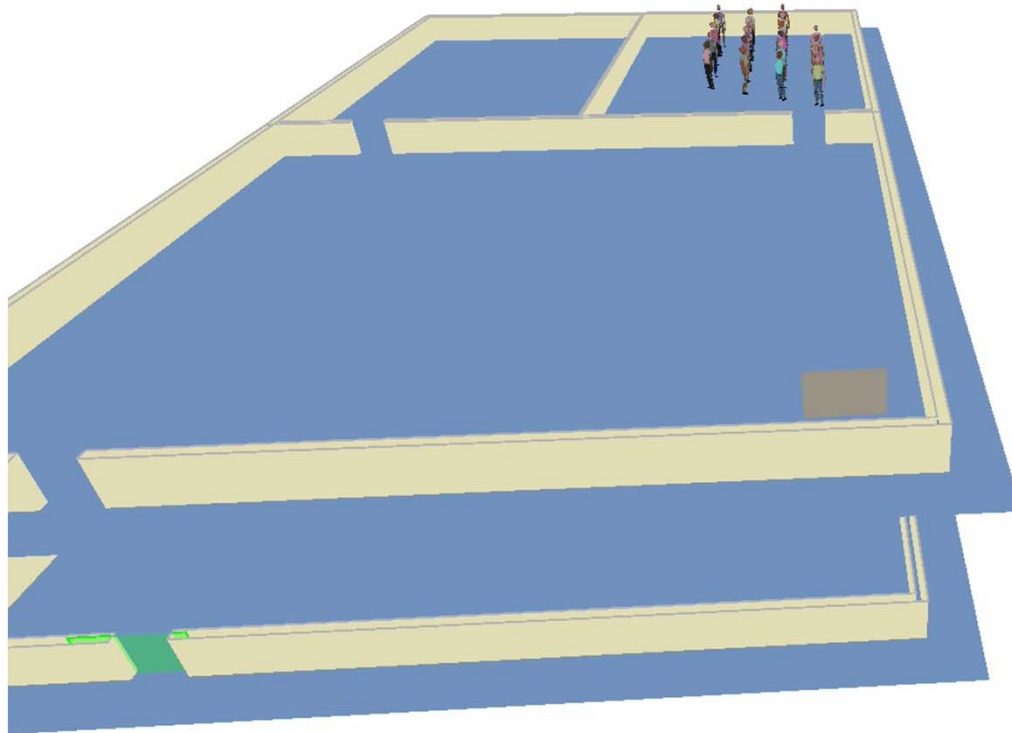
## Flow Rates for Selected Doors



# Example – Building evacuation

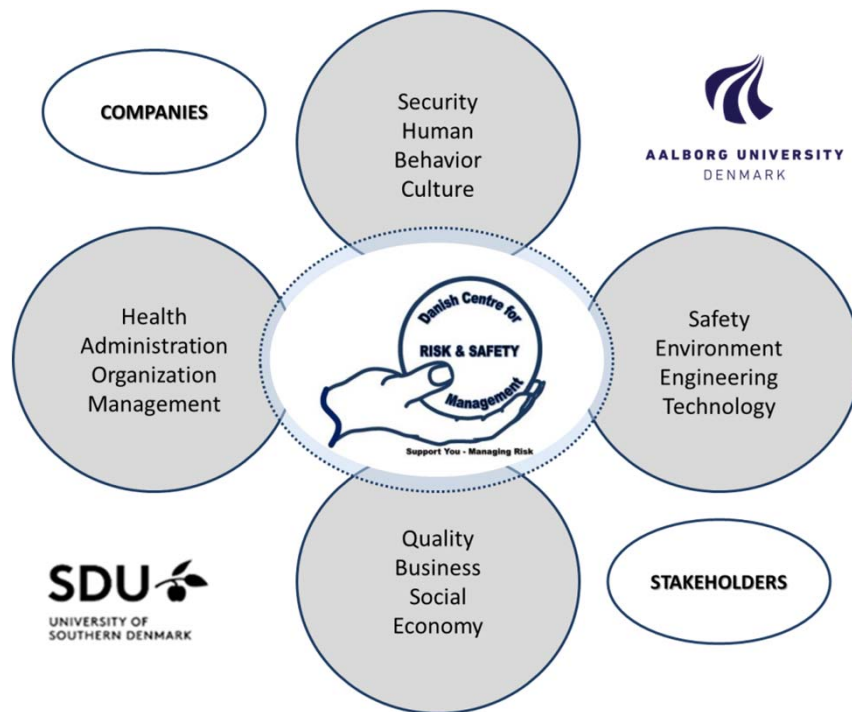
2:13.7

0.0  
47/47





# Research



- Cross-disciplinary research within risk and safety - bridging Health, Social, Business and Engineering Sciences.
- The aim is to demonstrate excellence in identifying and developing methods for identifying risk and hazards in every aspect of the modern technological driven society. It is well recognized and accepted that the grand challenges of the world **MUST** be handled using technological solutions. Assessing the risk associated with these technological solutions requires management and decision making. Furthermore, the impact of an
- Emergency or a Disaster becomes increasingly important and the time for recovery is becoming an increasingly vital aspect of risk management, i.e. earth quakes, flooding, climate changes, hacking, vira, assaults, communication breakdowns – i.e. reduce the loss related to an incident.



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# Example – Building evacuation

