

## jOiNEd For sUsTainability - bUilding climate REsilient communities in WB and EU

# Lund University

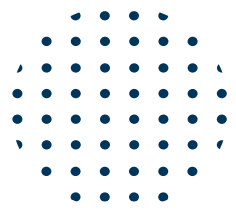
## Study visit

*Date: 20230613*

*Place: Lund*



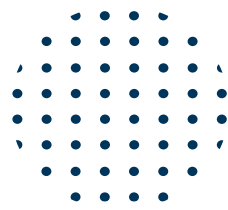
Co-funded by the  
European Union



## Aim of the study visit

- To present how Lund University implement climate and sustainability actions, related to:
  - Curriculum development
    - What we teach?
    - How we teach?
  - Instruments to stimulate teaching and research on sustainability
  - Actions for/examples of research collaboration
  - Measures not related to teaching – university services, campus development, etc.





## AGENDA

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June 13<sup>th</sup> 2023 – Study Visit – Day 1

Venue: Pufendorfinstitutet. Room Hörsalen. Address: Biskopsgatan 3

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**09.00-09.30** Registration, Coffee, Welcome and practicalities

*Henrik Hassel, Head of division of risk management and societal safety*

**09.30-12.00** Overview of Lund University initiatives for sustainable campus and university services & Tour around campus

*Sustainability at Lund University – an overview, Claes Nilén, Environmental manager and Maria Nilsson, Environmental coordinator*

*Sustainability at the university's landlord Akademiska Hus, Li Lövehed, Manager energy and sustainability*

*Circular economy and reuse, Carolina Rijpma, Manager interior design*

*Chemical safety, Anikó Wendler, Coordinator chemical and biochemical safety*

*Sustainable campus and facilities, Ulla-Britt Persson, Facilities planner*

*Walk through campus area with highlights, Ulla-Britt Persson, Facilities planner*

**12.00-13.00** Lunch

**13.00-14.30** Introduction to Sustainability forum and Agenda 2030 Graduate School

*Jenny Hansson, Project manager at Sustainability Forum, Terese Thoni, Education coordinator at Sustainability forum & Ylva van Meeningen, Research administrator for Agenda 2030 Graduate School at Centre for Environmental and Climate Science (CEC)*

**14.30-15.00** H+Forest – The campus of the future – Perspectives for sustainable development based on students' needs and behaviors

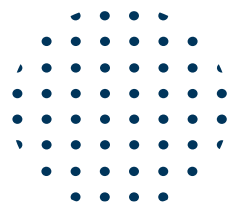
*Sofia Ritthammer, Project assistant at the Division of risk management and societal safety*

**15.00-15.15** Coffee

**15.15-16.00** Lund University Innovation: Strategic-Sustainability-Analysis

*Nicolas Arriagada & Peter Frank, Innovation developers at LU Innovation*





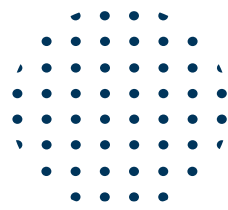
June 14<sup>th</sup> 2023 – Study Visit – Day 2

Venue: LTH Studiecetrum (LTH study center). Room: Pepparholm. Address: John Ericssons väg 4 (500 m walk from the guest house).

- |                      |   |
|----------------------|---|
| <b>09.00-09.50</b>   | <b>Teaching sustainability on the Master program of Disaster Risk Management and Climate Change Adaptation</b><br><i>Magnus Hagelsteen, Program director &amp; Per Becker, Professor in Risk and Sustainability</i> |
| <b>09.50 – 10.20</b> | <b>Teaching sustainability on the Master program of Fire Safety Engineering</b><br><i>Margaret McNamee, Professor in Fire Safety Engineering</i>  |
| <b>10.20-10.50</b>   | <b>Coffee</b>   |
| <b>10.50-11.30</b>   | <b>What are important components when teaching sustainability?</b><br><i>Ann Åkerman, Deputy Director at Lund University Centre for Sustainability Studies</i>  |
| <b>11.30-12.00</b>   | <b>LU support service concerning coordination of cross-disciplinary projects in sustainability</b><br><i>Johanna Generosi – Project manager at LU coordination and innovation</i>                                   |
| <b>12.00-12.45</b>   | <b>Lunch</b>  |
| <b>12.45-13.15</b>   | <b>Supporting teachers at LTH to teach about sustainability</b><br><i>Mirjam Glessmer, Pedagogical developer at Centre for Engineering Education (CEE)</i>  |
| <b>13.15-15.15</b>   | <b>Teaching complex and systemic sustainability topics with serious games and practical focus on biodiversity and climate</b><br><i>Lea Levy, Associate senior lecturer at Engineering Geology</i>                  |
| <b>15.15-16.00</b>   | <b>Summary and final discussion</b><br><i>Mirjam Glessmer and Henrik Hassel</i>   |



Co-funded by the  
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Thank you for your attention

*Contact info about the presenter:*

*Henrik Hassel*

*henrik.hassel@risk.lth.se*





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# MSc in Disaster Risk Management & Climate Change Adaptation

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PER BECKER & MAGNUS HAGELSTEEN  
DIVISION OF RISK MANAGEMENT AND SOCIETAL SAFETY



## Programme overview (MKAT)

Master's Programme in Disaster Risk Management and Climate Change Adaptation, Faculty of Engineering, Lund University

| Semester 1  |  | Semester 2                            |  |
|---|--|---------------------------------------|--|
| Study period 1  | Study period 2   | Study period 3                        | Study period 4   |
| Societal Resilience (7.5 cr)  | Capacity Development (7.5 cr)  | Risk Based Land Use Planning (7.5 cr) | Risk perception, Communication and Human behavior (7.5 cr) |
| Foundations for Risk Assessment and Management (7.5 cr)   | Introduction to Disaster Response Management (7.5 cr)                      | Climate Smart Risk Reduction (7.5 cr) | Preparedness and Planning (7.5 cr)                         |
| Semester 3  |  | Semester 4                            |  |
| Elective courses (15 cr)<br>Students can either choose two courses of 7.5 cr in parallel or one 15 credits course. The elective courses might change from one year to another. Some have a limited number of seats. | Research Methodology (7.5 cr)<br><br>Critical Issues in DRM & CCA (7.5 cr) | Master's degree project (30 cr)       |  |

### Elective courses

Internship-based course (15 cr), Geographical Information Technology - Introduction (15 cr), Critical Infrastructure Resilience (7.5 cr), The Technology and Application of drone Systems (7.5 cr), Fundamentals of Logistics and Operations Management (7.5 cr), Integrated Water Resources Management: International Aspects (7.5 cr), Swedish for exchange students (7.5 cr). *Additional courses might be available.*

# Three categories of learning objectives

Knowledge and understanding

Competences and skills

Judgement and approach



# Four fundamental challenges

1. Complexity
2. Uncertainty
3. Dynamic change
4. Ambiguity

# VRSN01 Societal resilience

Module 1: Our challenges for safety and sustainability

Module 2: Safety, sustainability, resilience and development

Module 3: Operationalising resilience

Module 4: Anticipation and recognition for resilience

Module 5: Grasping complexity

Module 6: Proactive adaptation as prevention, mitigation and preparedness

Module 7: Learning for resilience

Module 8: Why it is so difficult to adapt



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# Sustainability in FSE

Professor Margaret McNamee, Fire Safety Engineering, Lund University  
[margaret.mcnamee@brand.lth.se](mailto:margaret.mcnamee@brand.lth.se)

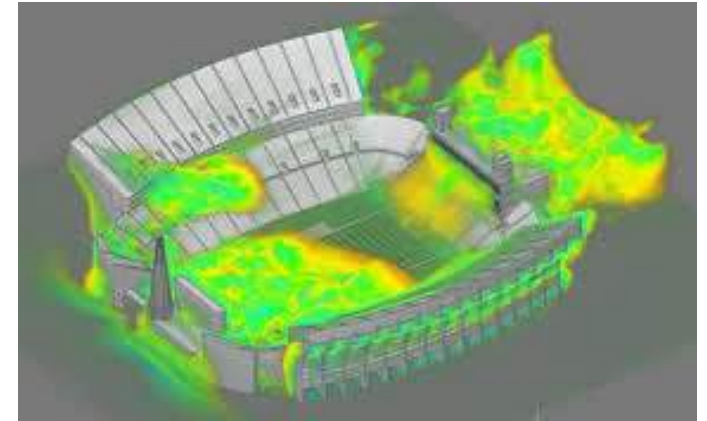


# Why should FSE consider sustainability?



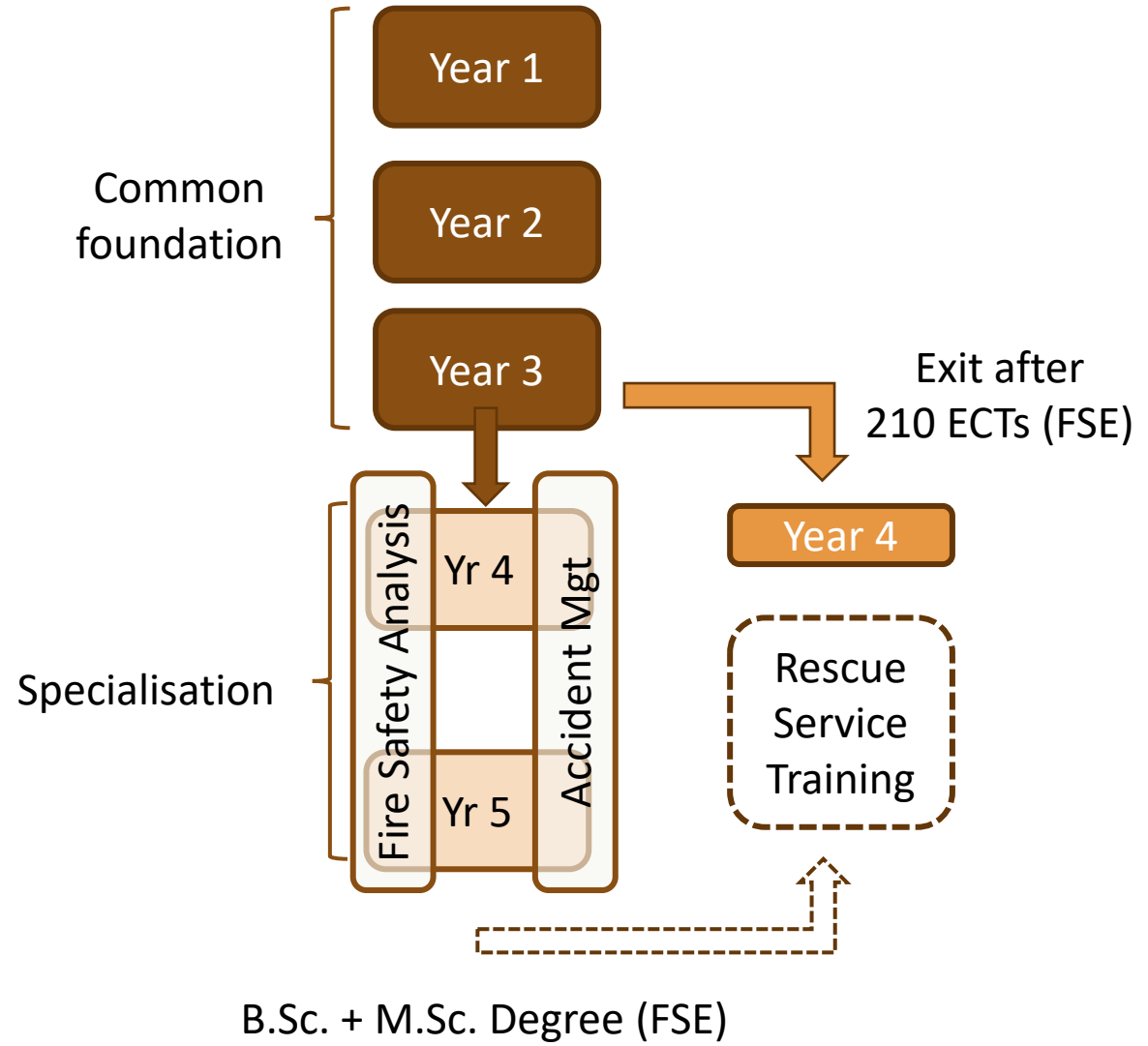
# Fire Safety Engineering Education LTH

- The field of fire safety engineering has expanded (since 1986)
  - Simulation software and capabilities
  - New insights in fundamental fire physics
  - Wild fires
  - Environmental aspects
  - Human behaviour
  - New building material and technology
  - Risk analysis methods
  - Fire and rescue service
- Recruitment for Ph.D. programs requires full engineers
- “Risk” masters is closing



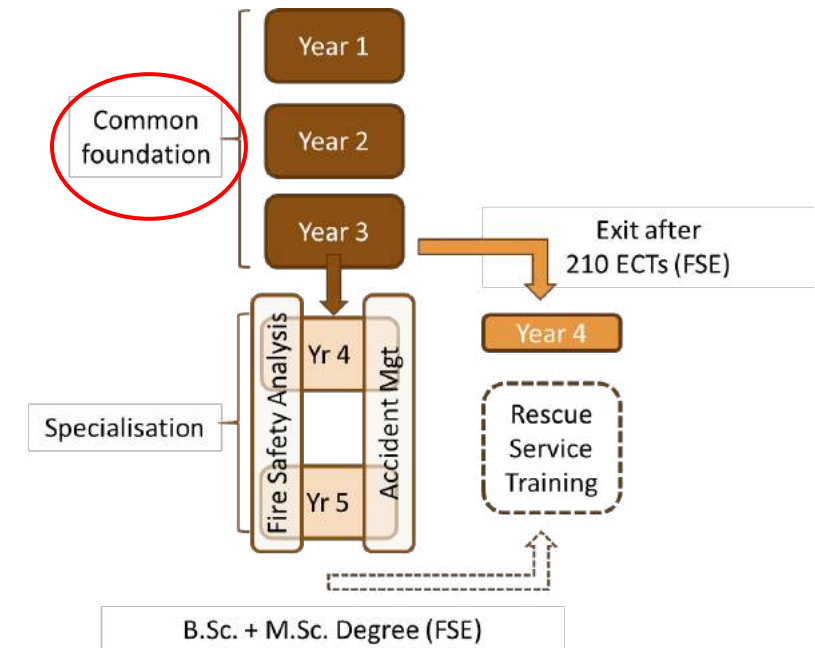
# Five year degree in Fire Safety Engineering

University Guidelines require that *subject specific perspectives on sustainability are incorporated into all engineering degrees* (300 pts)



# Foundational first 3 years

| Year 1   |             |         |      |         |      |      |      |      |
|--|-------------|---------|------|---------|------|------|------|------|
| Course name  | Course code | Credits | Nivå | Obl/Val | Lp 1 | Lp 2 | Lp 3 | Lp 4 |
| Calculus in One Variable B1  | FMAB45      | 7.5     | G1   | O       | 1    |      |      |      |
| Building Technology for Fire Protection Engineers                      | VBFAXX      | 5       | G1   | O       | 1    |      |      |      |
| Introduction to Fire Safety Engineering                                | VBRA06      | 6       | G1   | O       | 1    | 2    | 3    |      |
| Building Materials   | VBMA25      | 5       | G1   | O       |      | 2    |      |      |
| Calculus in One Variable B2  | FMAB50      | 7.5     | G1   | O       |      | 2    |      |      |
| Physics: Electricity - Fluids  | FAFA30      | 8       | G1   | O       |      |      | 3    |      |
| Linear Algebra   | FMAB20      | 6       | G1   | O       |      |      | 3    |      |
| Mechanics  | VSMA25      | 7.5     | G1   | O       |      |      |      | 4    |
| Sustainable Development from a Fire Protection Engineering Perspective | FMIA05      | 7.5     | G1   | O       |      |      |      | 4    |
| Sum  |             | 60      |      |         | 15   | 15   | 15   | 15   |
| Year 2   |             |         |      |         |      |      |      |      |
| Course name  | Course code | Credits | Nivå |         | Lp 1 | Lp 2 | Lp 3 | Lp 4 |
| Calculus in Several Variables  | FMAB30      | 6       | G1   | O       | 1    |      |      |      |
| Thermodynamics and Fluid Mechanics, Basic Course                       | MMVA01      | 5       | G1   | O       | 1    |      |      |      |
| Fire Dynamics Fundamentals   | VBRAXX      | 5       | G1   | O       | 1    |      |      |      |
| Fire Chemistry   | VBRFX       | 8       | G2   | O       |      | 2    |      |      |
| Introduction to Programming Using Python                               | EDAAX       | 9       | G1   | O       |      | 2    | 3    |      |
| Structural Engineering   | VBKFX       | 7.5     | G2   | O       |      |      | 3    |      |
| Fire Dynamics Advanced   | VBRFX       | 12      | G2   | O       |      |      | 3    | 4    |
| Mathematical Statistics  | FMSF50      | 7.5     | G2   | O       |      |      |      | 4    |
| Sum  |             | 60      |      |         | 16   | 14   | 15   | 15   |
| Year 3   |             |         |      |         |      |      |      |      |
| Course name  | Course code | Credits | Nivå |         | Lp 1 | Lp 2 | Lp 3 | Lp 4 |
| Consequence Analysis at Large Accidents                                | VBRFxx      | 7.5     | G2   | O       | 1    |      |      |      |
| Passive Systems  | VBRFxx      | 6       | G2   | O       | 1    |      |      |      |
| Risk Assessment  | VBRFxx      | 7.5     | G2   | O       |      | 2    |      |      |
| Active Systems   | VBRNxx      | 9       | A    | O       |      | 2    |      |      |
| Managerial Economics, Basic Course                                     | MIOA12      | 6       | G1   | O       |      |      | 3    |      |
| Human Behaviour in Fire  | VBRN75      | 8       | A    | O       |      |      | 3    |      |
| Fire Safety Evaluation   | VBRNxx      | 11      | A    | O       |      |      | 3    | 4    |
| The Construction Process   | VBEAX       | 5       | G1   | O       |      |      |      | 4    |
| Sum  |             | 60      |      |         | 13.5 | 16.5 | 15   | 15   |



A combination of subject courses in the core area, subject-related courses and basic engineering courses

All courses are compulsory





# Specialization: Fire safety analysis

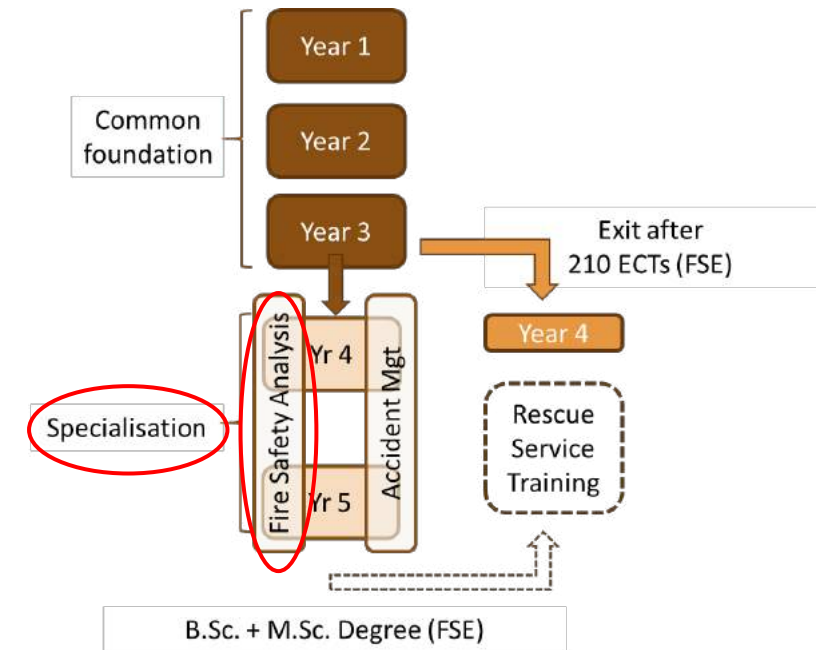
| Year 4-5 Spec. Fire Safety Analysis                  |             |         |      |         |      |      |      |      |
|--|-------------|---------|------|---------|------|------|------|------|
| Course name  | Course code | Credits | Nivå | Obl/Val | Lp 1 | Lp 2 | Lp 3 | Lp 4 |
| The Finite Element Method - Temperature Calculations | VSMNXX      | 7.5     | A    | V       | 1    |      |      |      |
| Severe accidents in buildings                        | VBRNxx      | 7.5     | A    | V       | 1    |      |      |      |
| Evacuation modeling                                  | VBRNxx      | 7.5     | A    | V       |      | 2    |      |      |
| Fire Safety Design                                   | VBRNxx      | 7.5     | A    | V       |      |      | 3    |      |
| Programming - Second Course                          | EDAA01      | 7.5     | G1   | V       |      |      | 3    |      |
| Advanced CFD   | VBRN85      | 7.5     | A    | V       | 1    | 2    |      |      |
| Fire Safety Design of Structures                     | VBRNxx      | 7.5     | A    | V       |      | 2    |      |      |
| Sum  |             | 52.5    |      |         |      |      |      |      |

| Year 5      |             |         |      |  |      |      |      |      |
|-------------|-------------|---------|------|--|------|------|------|------|
| Course name | Course code | Credits | Nivå |  | Lp 1 | Lp 2 | Lp 3 | Lp 4 |
| Thesis      |             | 30      |      |  |      |      | 3    | 4    |

45 credits needed from the list of courses to achieve the specialization

Several courses are available today

Some course development is required

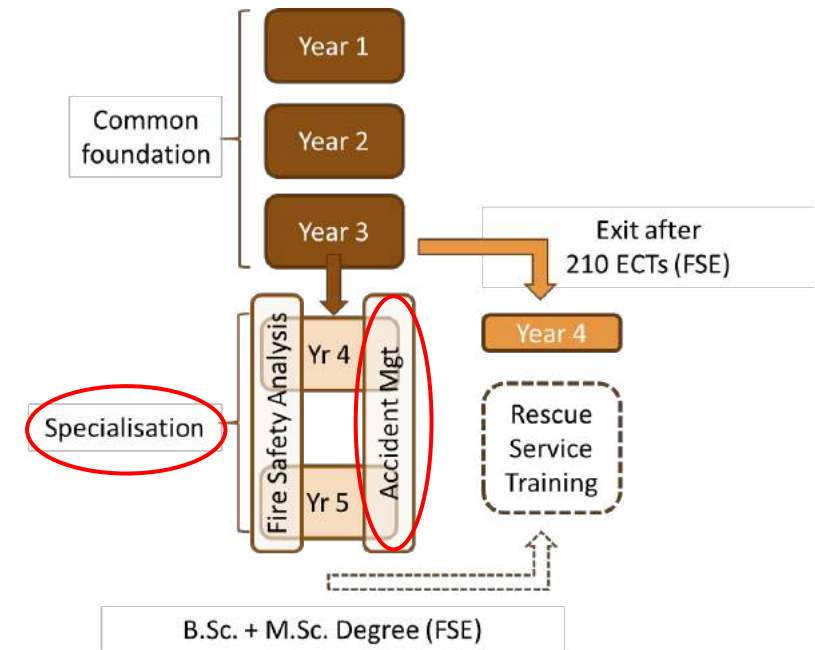


# Specialization: Accident management

| Year 4-5 Spec. Accident Management                   |             |         |      |   |      |      |      |      |
|--|-------------|---------|------|---|------|------|------|------|
| Course name  | Course code | Credits | Nivå |   | Lp 1 | Lp 2 | Lp 3 | Lp 4 |
| Leadership and Group Dynamics                        | MAMFX       | 7.5     | G2   | V | 1    |      |      |      |
| Severe accidents in buildings                        | VBRNxx      | 7.5     | A    | V | 1    |      |      |      |
| Fire Service Methods                                 | VBRNXX      | 7.5     | A    | V |      | 2    |      |      |
| Risk Based Land Use Planning                         | VRSN30      | 7.5     | A    | V |      |      | 3    |      |
| Enviornment and the Fire Service                     | FMINXX      | 7.5     | A    | V |      |      | 3    |      |
| Preparedness and Planning                            | VBRN40      | 7.5     | A    | V |      |      |      | 4    |
| People, Technology, Organization and Risk Management | MAMN45      | 7.5     | A    | V | 1    |      |      |      |
| Advanced Fire Investigation                          | VBRN80      | 7.5     | A    | V |      | 2    |      |      |
| Sum  |             | 60      |      |   |      |      |      |      |

| Year 5      |             |         |      |  |      |      |      |      |
|-------------|-------------|---------|------|--|------|------|------|------|
| Course name | Course code | Credits | Nivå |  | Lp 1 | Lp 2 | Lp 3 | Lp 4 |
| Thesis      |             | 30      |      |  |      |      | 3    | 4    |



45 credits needed from the list of courses to achieve the specialization

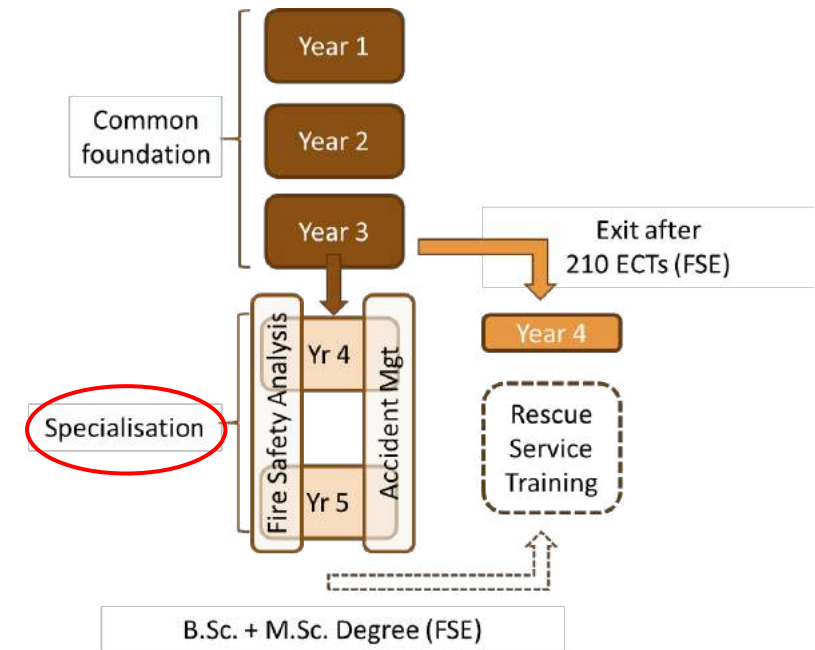
Several courses are available today

Some course development is required

# Elective Courses

| Elective courses                                 |             |         |      |         |      |      |      |      |
|--|-------------|---------|------|---------|------|------|------|------|
| Course name                                      | Course code | Credits | Nivå | Obl/Val | Lp 1 | Lp 2 | Lp 3 | Lp 4 |
| Societal Resilience                              | VRSN01      | 7.5     | A    | V       | 1    |      |      |      |
| Law  | XX          | 7.5     | G1   | V       |      | 2    |      |      |
| Introduction to Disaster Response Management     | VRSN11      | 7.5     | A    | V       |      | 2    |      |      |
| Risk Analysis Methods for Health and Environment | MAMN35      | 9       | A    | V       |      |      | 3    |      |
| CAD and BIM Applications in Construction         | VBEF50      | 7.5     | G2   | V       |      |      | 3    | 4    |
| Human in Extreme Environments                    | MAMF35      | 7.5     | G2   | V       |      |      | 3    | 4    |
| Introductory Course for Firemen                  | VBRA15      | 4.5     | G1   | V       |      |      |      | 4    |
| Engineering Training Course                      | IYT000      | 15      | G2   | V       | 1    | 2    | 3    | 4    |

Courses on the other specialization are also included as elective  
15 credits consist of completely elective courses





Sustainable Development from a Fire Safety Engineering  
Perspective

Course Start 2023, 1st yr FSE

# Aim

- The aim of the course is to give the students basic knowledge on the concept of *sustainable development*, and about the *sustainability problems* that are relevant for fire protection engineering and the work of the rescue services.
- The course shall give *strategic knowledge* in order to meet *future environmental requirements and sustainability challenges*.

# Learning outcomes

- Knowledge and understanding
  - Be able to present an overview of the important environmental and resource issues related to rescue services and the prevention of accidents.
  - Be able to critically analyse the concept of sustainable development.
  - Be able to describe and discuss some basic concepts within environmental legislation and other policies, with a focus on rescue services and the prevention of accidents.
  - Be able to describe and discuss environmental and sustainability challenges related to fire protection and the Fire and Rescue Services.

# Learning outcomes

- Competences and skills
  - Show ability to produce information for effective measures with a sustainability perspective.
  - Be able to write a well structured, concise report in a groups, with correct referencing and language, and in doing this collect and critically evaluate information with the public as a target group.
  - Be able to communicate orally and discuss independent analysis in the subject area.
- Judgement and approach
  - Show an ability to make assessments within the area of the Fire and Rescue Services in relation to relevant sustainability aspects

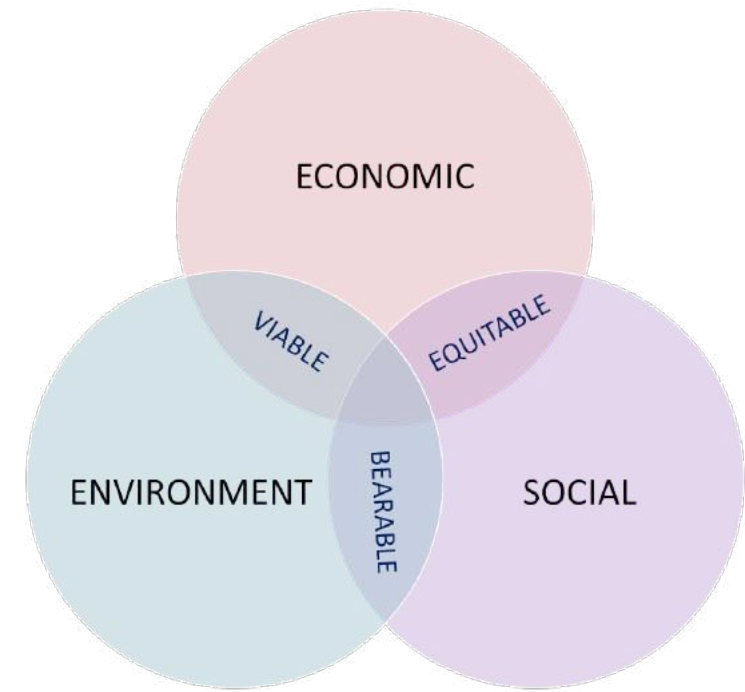


# Examination

- Traditional written examination
  - Focusing on fundamental sustainability knowledge
- Project
  - Focusing on application of the knowledge and understanding of sustainability to analysis of actual large scale incidents
  - Analysing incidents in terms of 3 dimensions of sustainability
  - Analysing lessons learned and how these can be used to improve sustainability in future responses by changing preparedness, response tactics or after incident recovery

# Fundamental concepts introduced

- Approx. 8 hours introduction to sustainability
- 2 hours water management with focus on Fire and Rescue Service



# Relationship between sustainability & fires/accidents

- Approx. 4 hours introduction
- Application in project



Grenfell Tower Fire (Natalie Oxford, 2017)

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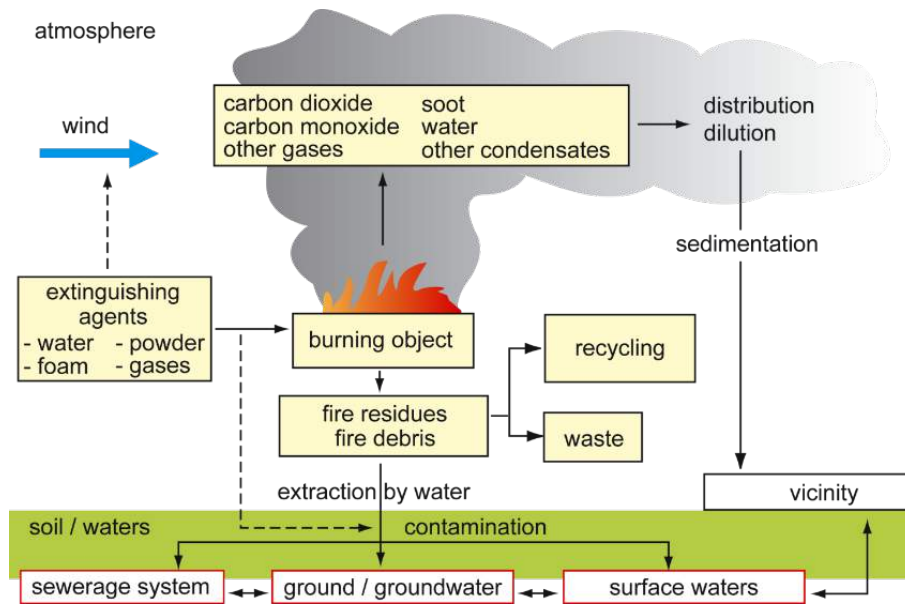


Warehouse Fire, Delanco, NJ  
(Courtesy of New Jersey State Fire Marshal Office)



Fire in Timber Frame Apartment Building Under Construction  
(Source: Captain John Bonadio, Waltham Fire Department, as published at <https://www.enr.com/articles/42484-what-local-officials-want-to-do-about-wood-frame-building-fires-in-massachusetts>), Courtesy of Waltham, Massachusetts Fire Department)

## Example slide from course - translated



| Effect  | Types of emissions   |
|---|--|
| Acute toxic   | CO, HCN, Acid gases (e.g. HCl, HBr), NO <sub>x</sub> , aldehydes, isocyanates            |
| Persistent and potentially bioaccumulative species which can give long term effects | Dioxins, PAH, PCB, particles, metals, large organic species (e.g. some flame retardants) |
| Acidifying  | HCl, SO <sub>x</sub> , NO <sub>x</sub>   |
| Greenhouse gases  | CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O                                     |
| Atmospheric Ozone   | NO <sub>x</sub> , VOC  |

## How can a fire or accident impact on our surroundings (environment)?

- Intimate with the fire (geographical & temporal);
    - ✓ Poisonous gases
    - ✓ Reduced visibility
    - ✓ Heat
  - Close to the incident (further afield geographically & temporally);
    - ✓ Poisonous gases
    - ✓ Carcinogens/particulates
    - ✓ Extinguishing water and additives
    - ✓ Ecotoxic species in the air, ground water and soil
  - Models to assess the impact – LCA (other partial models)
- NB: The significant of the impact of an emission is determined by the sensitivity of the recipient

# What is the economic impact of a fire/accident?

- Direct costs
- Indirect costs
- Relates to the impact of emissions AND the cost of replacement or remediation or damaged material and products
- Models to assess the impact:
  - ✓ Cost-benefit assessment (CBA)
  - ✓ Life-cycle costing (LCC)



Kolding Fireworks fire, Denmark, 2004,  
direct costs ~105€M (Source: Kolding Municipality)

# What is the social impact of a fire/accident?

- Loss of societal function and support systems
- Health impact
- Psychosocial impact
- Can be particularly difficult to assess
- Least studied area
  - Some studies of the social impact of large scale wildfires, e.g. Paradise, Fort McMurray
  - Social impact of the Grenfell Tower fire



Home leveled by the Camp fire, Paradise Ca, 2018.  
(Source: Adobe Stock, Tomy)

# How can fires/accidents impact on all three of the dimensions of sustainability?



Discuss in groups of 2-3, add your input to the padlet. NB Don't overthink it – brainstorm!

(Ca 5-10 minutes)

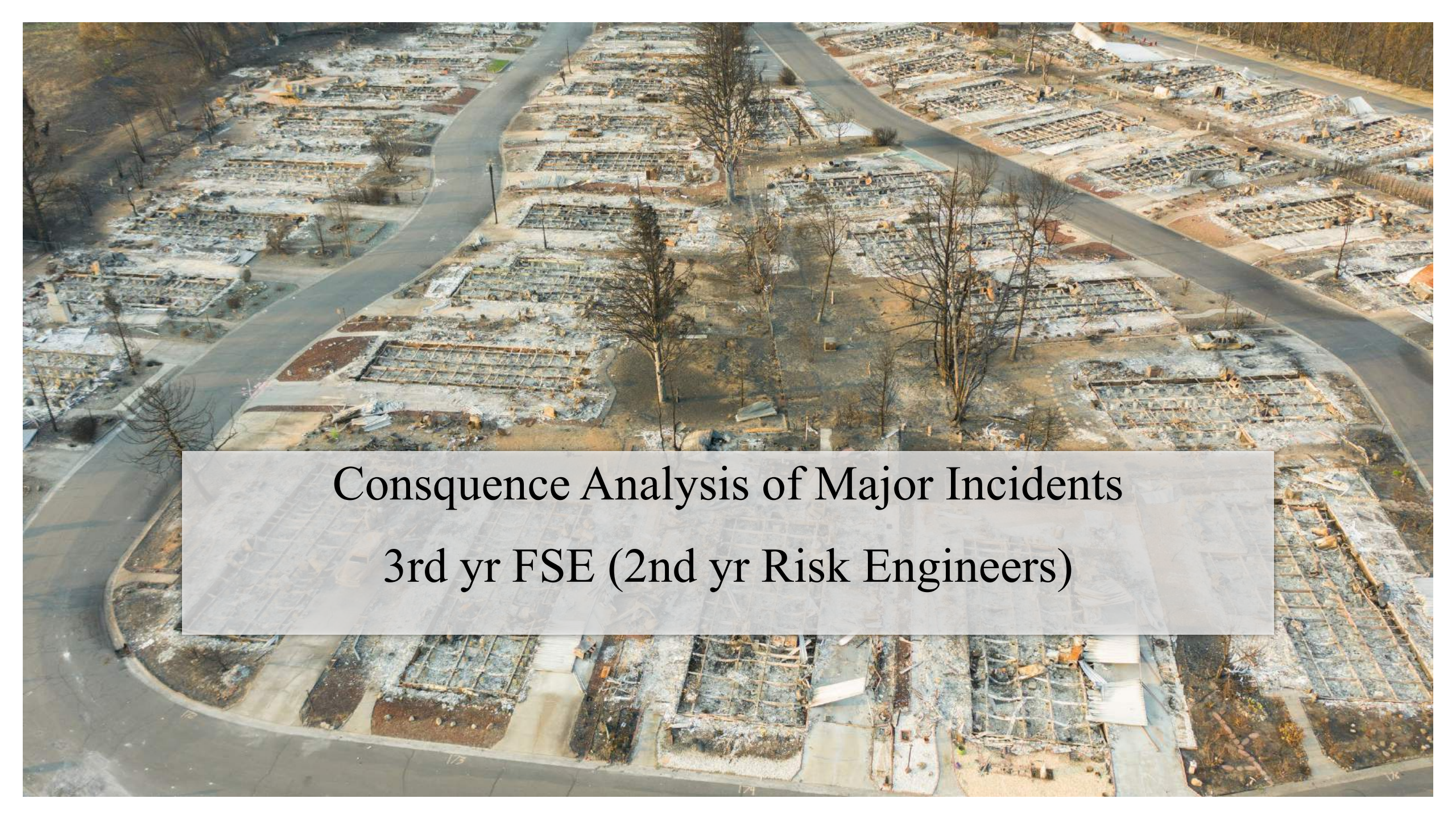
<https://padlet.com/margaretmcnamee/hur-br-nder-olyckor-p-verkar-h-llbarhet-n6u3h9l8c20whamc>

# Project

- Students asked to write a report or create a presentation where they describe a large scale incident to analyse how different ways to prepare for, respond to and recover from the incident can effect how the incident impact on all dimensions of sustainability
- Three seminars
  - #1: Pitch – 5-10 minutes, student group motivates their choice of case
  - #2: Analysis of incident in terms 3 dimensions of sustainability (10-15 minutes)
  - #3: Analyse how different choices (preparedness, response and recovery) could effect the sustainability outcome (15 minutes)





An aerial photograph showing a residential neighborhood that has been almost completely destroyed. The ground is covered in rubble, charred remains, and debris. The outlines of houses and streets are visible, but the structures are mostly reduced to skeletal remains. A few bare trees stand amidst the wreckage. The overall scene is one of total devastation.

# Consequence Analysis of Major Incidents

3rd yr FSE (2nd yr Risk Engineers)

# Aim

- The course will provide an introduction to the field of Consequence Analysis, within the fire-engineering operational field including sustainability.
- It will also form a valuable complement to the course, "Risk Analysis Methods", insofar as the consequences of undesirable leakages of gases and liquids are concerned.

# Learning outcomes

- Knowledge and understanding
  - be able to estimate the magnitude of undesirable leakages of gases and liquids, vaporisation of liquids, and fire occurrences in liquids and gases.
  - be able to describe the evolution of leakages of gases and liquids; spreading of gases.
  - Be familiar with environmental and safety legislation including EU-directives that are relevant for the area.
  - Understand *fundamental sustainability terminology*, including UN global sustainable development goals
  - Understand *holistic life cycle thinking*.

# Learning outcomes

- Judgement and approach
  - Be able to demonstrate capability for making assessments with regard to the relevant scientific, community-related, and ethical aspects.
  - Be able to demonstrate insight into the possibilities and limitations of the subject field.
  - Be able to demonstrate capability for identifying his/her needs for further knowledge and for ongoing improvement of his/her competence.

# Examination

- Traditional written examination
  - Theory part (1/3) and Practical calculations (2/3)
  - Need to pass both parts
- Computer lab
  - Exercises
  - Swedish program for dispersion of toxic species
- Project
  - Analysis of relevance of SDGs to the Fire and Rescue Service and how these are implemented

# Contacts for more information

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- Margaret McNamee, Professor of Fire Safety Engineering  
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# LUCSUS

Lund University Centre for Sustainability Studies

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**LUND**  
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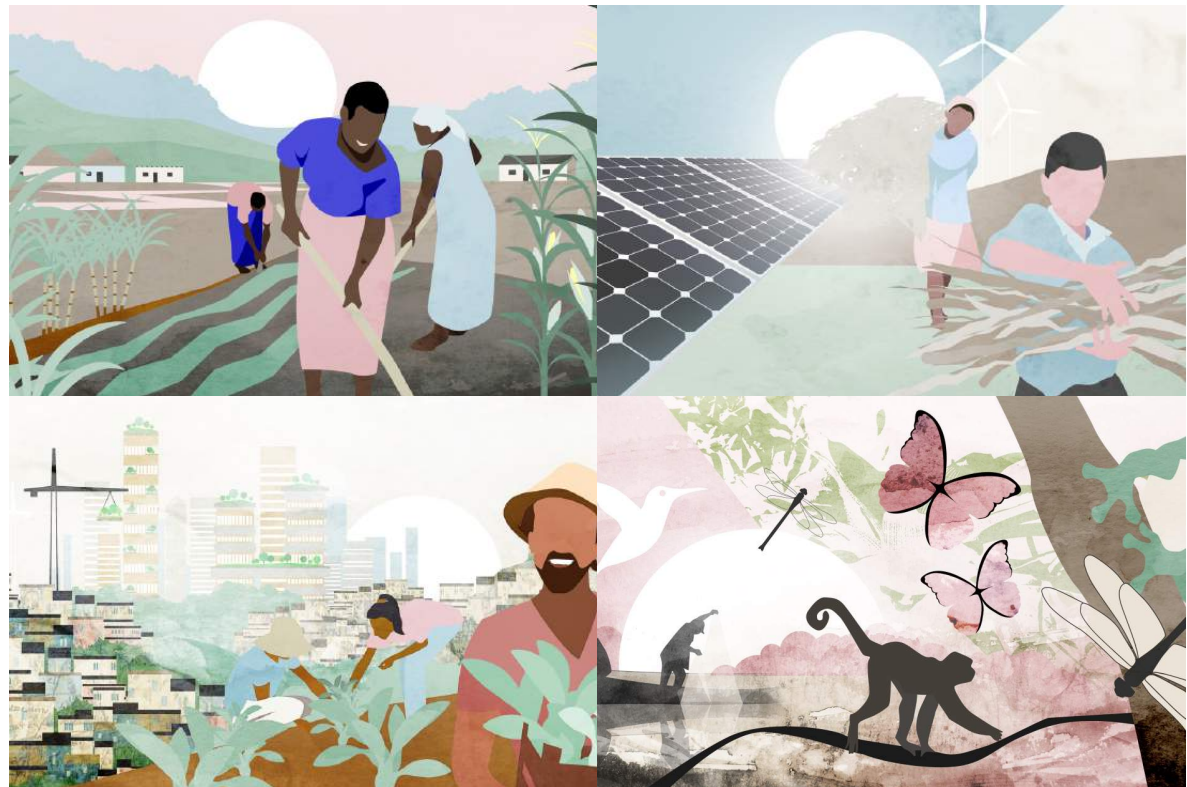
## **LUCSUS Vision**

- A world-class sustainability centre for research, teaching and impact and outreach where we work to understand, explain, and catalyse social change and transformations in relation to material limits in the biosphere.



# Research themes

- Climate Change
- Land Use
- Urban Governance
- Transformation
- Energy Justice
- Biodiversity and Natural Resource Management



# Education

- Interdisciplinary
- International
- Intertwined with LUCSUS research



# LUMES

INTERNATIONAL MASTER'S PROGRAMME IN ENVIRONMENTAL STUDIES AND SUSTAINABILITY SCIENCE

- 2 years Master's programme
- 50 students per batch
- Started in 1997 – more than 1000 Alumni from all over the world

## 1<sup>st</sup> semester

Earth Systems Science  
Social Sciences and Sustainability  
Methodology for Sustainability Science  
Sustainability Science, 7.5 credits

## 2<sup>nd</sup> semester

Politics of Sustainability  
Geographies of Sustainability  
Economy and Sustainability  
Methods and Tools - from Knowledge to Action

## 3<sup>rd</sup> semester

Water  
Climate Change  
Global Health  
Resilience  
Political Ecology  
Energy  
Social Movements  
Gender  
Inner Transformation

## 4<sup>th</sup> semester

Thesis

Courses are taught by teachers and researchers from both the social and natural sciences with the aim of creating graduates that are able to grasp, analyse, and formulate governance strategies and practices for societal change.



Students are taught how to integrate knowledge from a number of fields or disciplines in natural and social science.

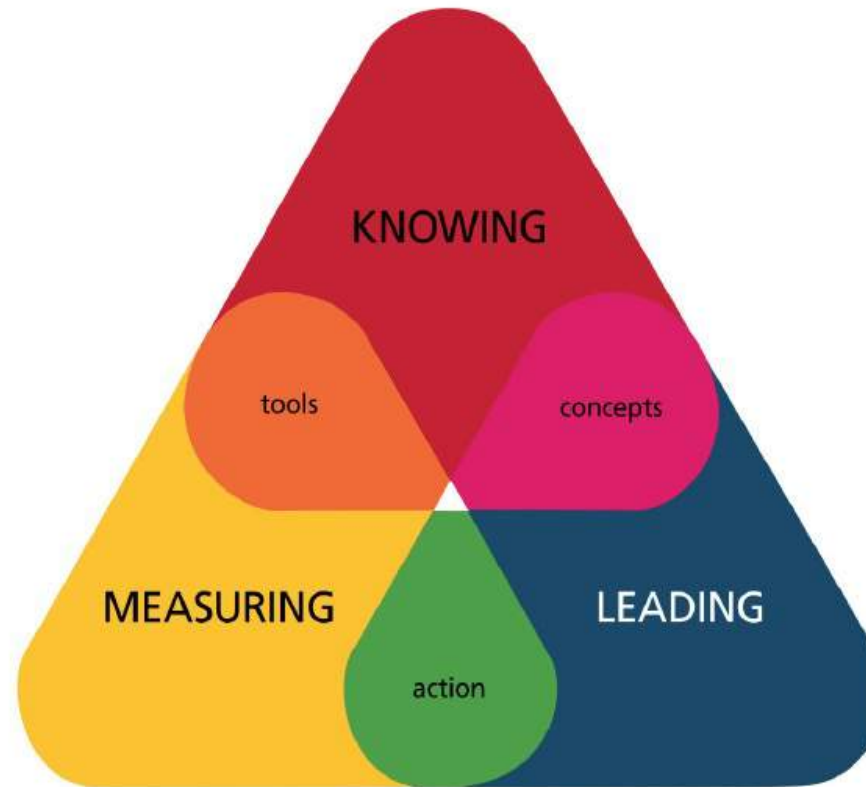
Interpersonal and academic skills are developed through strong emphasis on group work, presentations, academic writing, and direct interactions with society.



Create a safe space in the class room  
Peer teaching and learn from each other



# Knowing, Measuring and Leading



**Figure 2:** The tree core modules: Knowing, Measuring and Leading, and their interlinkages: tools, concepts and action.

# Knowing, Measuring and Leading



## Land is life

Sustainable Development Goal (SDG) 15 – Life on Land  
Future leaders and decision-makers from across Africa



## Agenda 2030 - Knowing, measuring and leading

Online course 7,5 credit



## Universities and the 2030 Agenda

Teachers at Lund university



# Competences

## ***Pedagogical competences in Knowing***

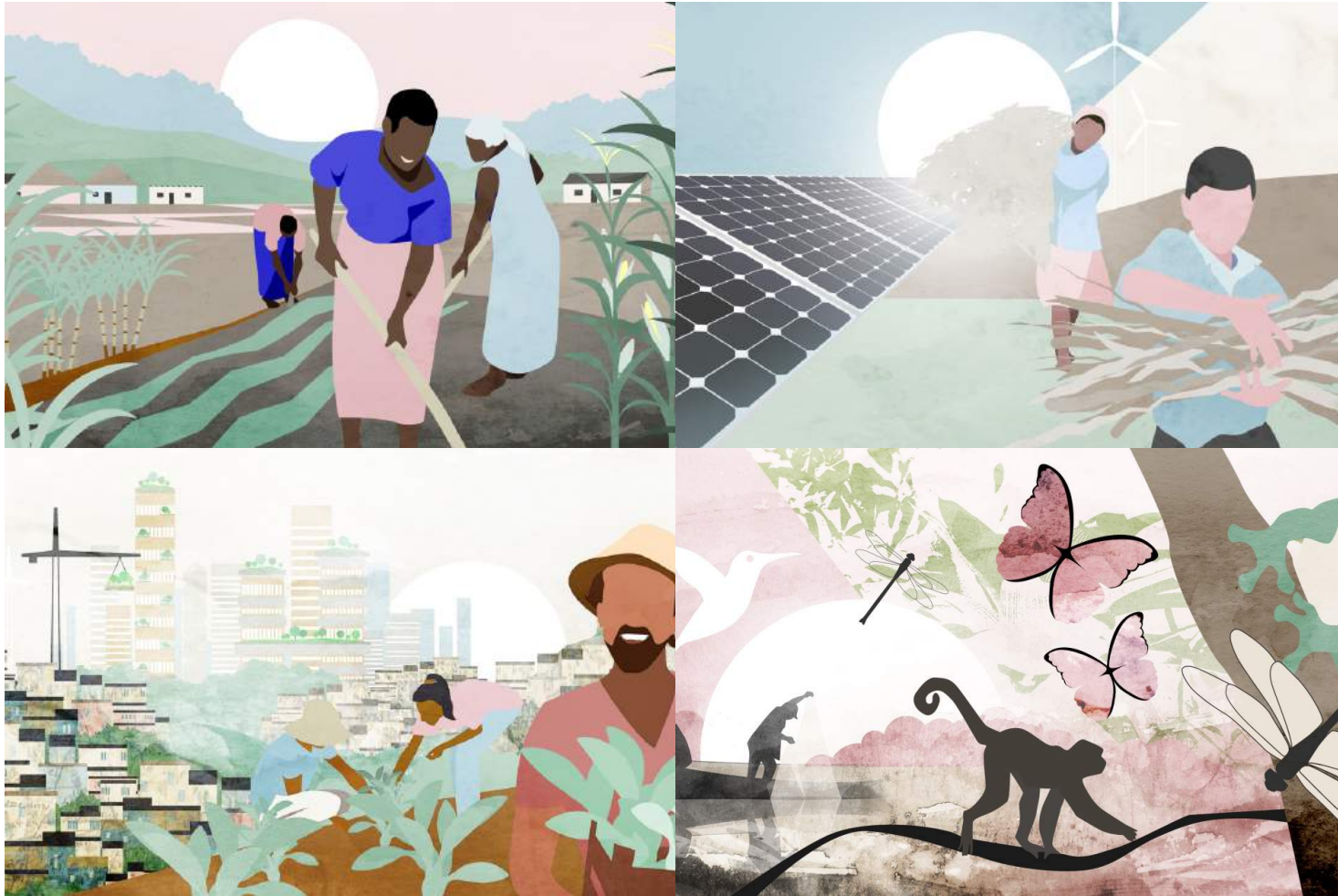
- Systems thinking and complexity.
- Normative skills, including beliefs, values, awareness
- Critical thinking with a focus on whose knowledge counts/what kinds of knowledge matter
- Tolerance for ambiguity and uncertainty (e.g. there is not always data available on land use change)
- Empathy and perspective (field trips; sharing perspective, peers)
- Collaborative and communication skills

## ***Pedagogical competences in Measuring***

- Systems thinking, complexity and dealing with change
- Normative skills (which target counts most)
- Critical thinking: who decides what to measure and the target (performativity)
- Tolerance for ambiguity and uncertainty (when there is no data)
- Anticipatory capacity (foresight, future)
- Integrated problem-solving competence

## ***Pedagogical competences in Leading***

- Systems thinking, thinking, complexity and dealing with change pathy and perspective (justice, responsibility and ethics perspectives)
- Normative skills (which goal counts most)
- Critical thinking (whose interests matter, who wins and who loses, how to navigate conflicts)
- Decision-making under uncertainty (what do you do if there is no data or it is of poor quality)
- Anticipatory competence (future and strategic thinking skills)
- Integrated problem-solving competence
- Interpersonal relations and communication
- Empathy and perspective (justice, responsibility and ethics perspectives)
- Collaboration skills



Thank you!



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# Supporting teachers at LTH to teach about sustainability

MIRJAM GLESSMER, CENTER FOR ENGINEERING EDUCATION



# Center for Engineering Education

Academic development unit at the Faculty of Engineering

- LTH's Pedagogical Academy
- Pedagogical courses
- Consulting and development
- Research

# Center for Engineering Education – Teaching



# Center for Engineering Education – Research

“More and better conversations”

A diagram where the words 'More' and 'better' in the phrase 'More and better conversations' are circled. Two arrows originate from the bottom of these circles: one points down and to the left towards the 'Build and strengthen networks' section, and the other points down and to the right towards the 'Evidence-based' section.

Build and strengthen  
networks

- “Inspirational conference”
- Fika!
- Community of Practice

Evidence-based

- Educational research literature
- Scholarship of Teaching and Learning (SoTL)

# Center for Engineering Education – Teaching



# Teaching sustainability (2 weeks over 3 months)

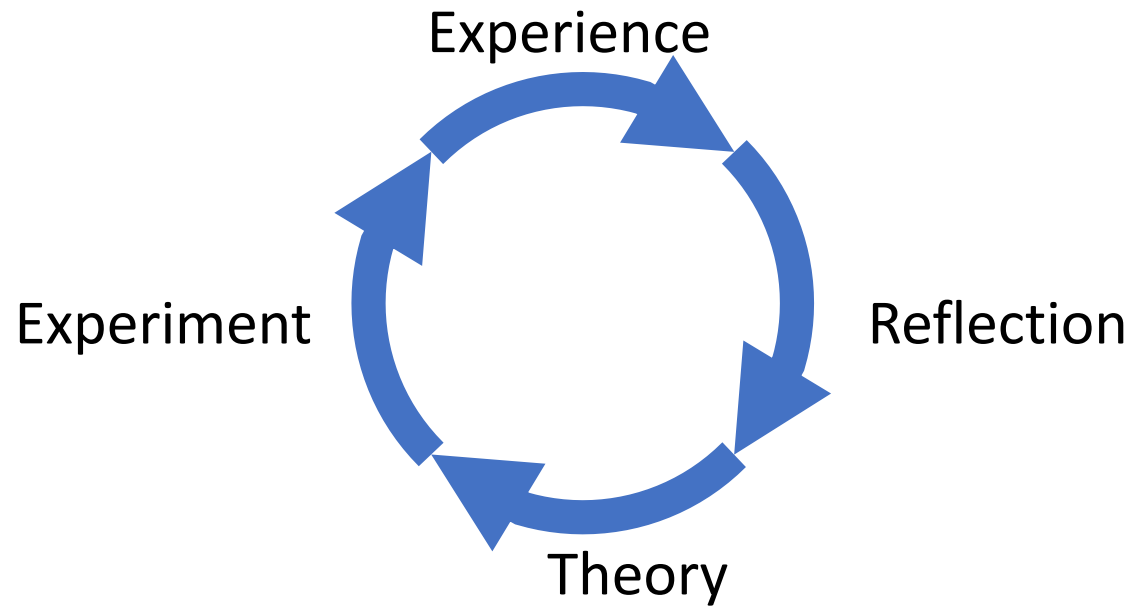
*“provide teachers with the opportunity to discuss and collaborate with peers on the topic, and document their shared reasoning. This could include developing whole courses, course modules, or ways to include aspects of sustainability in any course”*

- Meeting 1 – Inspiration and vision, find project group & topic
- Meeting 2 – Discuss relevant literature
- Meeting 3 – Collegial feedback on project
- Meeting 4 – Final presentation of project

Written report -> conference contributions, publication -> student work

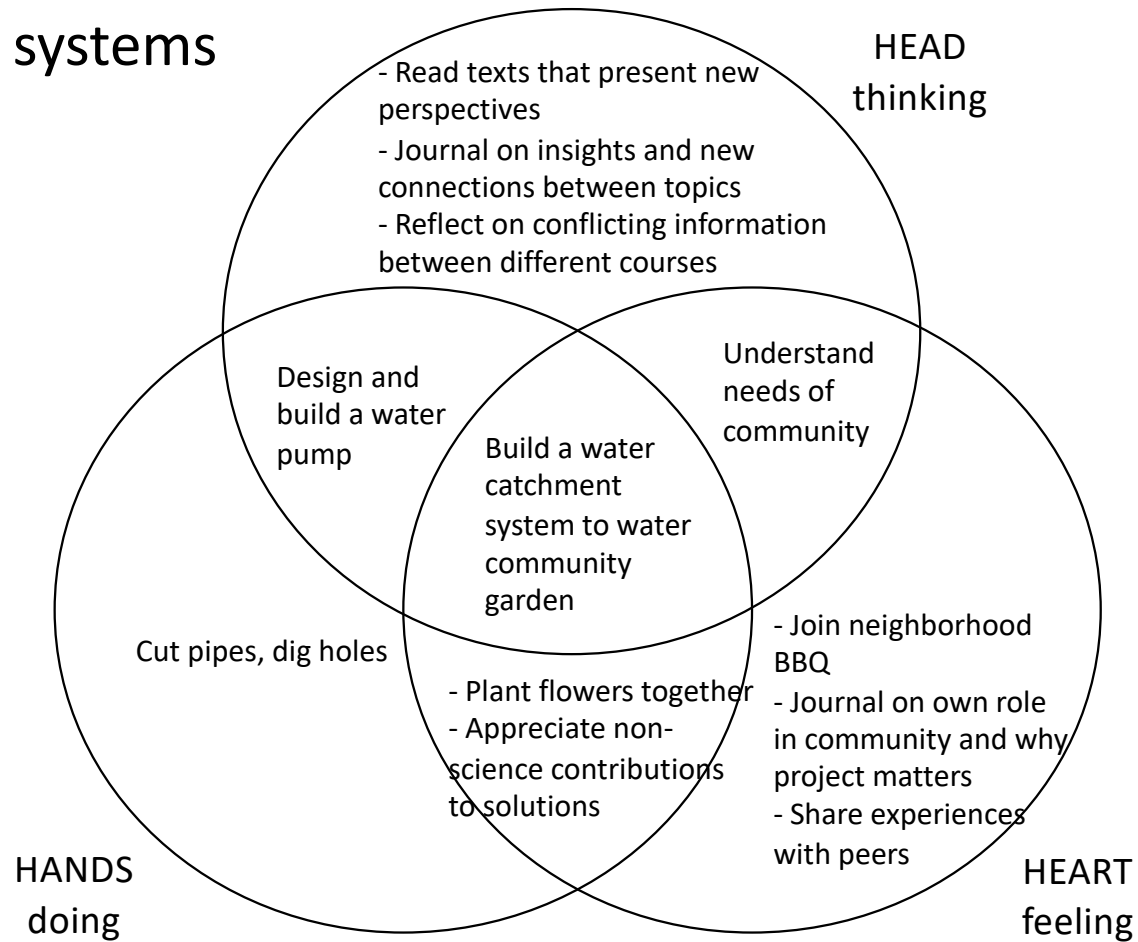


# Kolb's "experiential learning cycle"



Kolb, D. A. (1984). The process of experiential learning. *Experiential learning: Experience as the source of learning and development*, 20-38.

# Water catchment systems

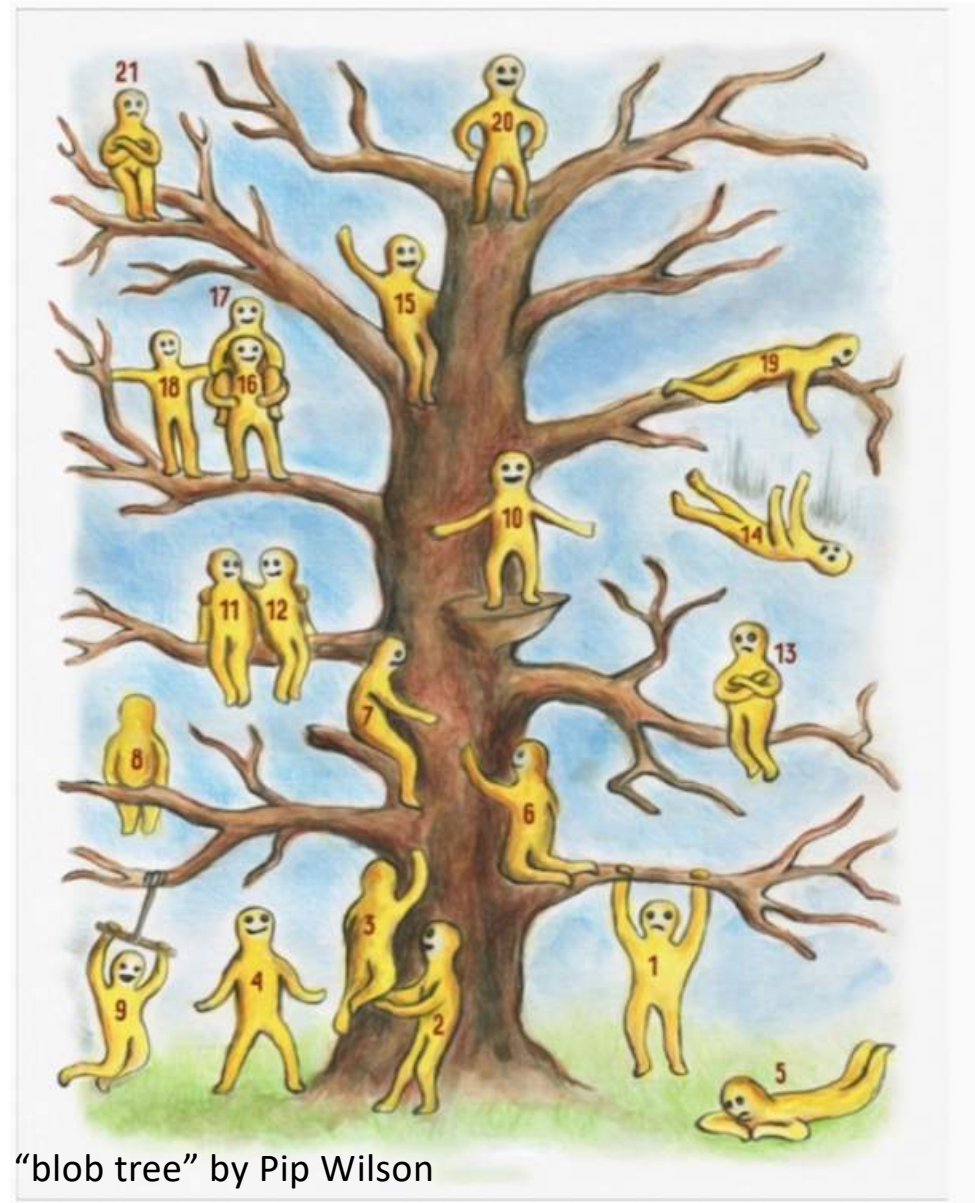


- Sipos, Y., Battisti, B., & Grimm, K. (2008). Achieving transformative sustainability learning: engaging head, hands and heart. *International journal of sustainability in higher education*.
- Öhman, J., & Sund, L. (2021). A didactic model of sustainability commitment. *Sustainability*, 13(6), 3083.

# Biodiversity collage (ref. Léa Lévy's talk!)



Emotions?



“blob tree” by Pip Wilson

# Constructive hope

needs

- a sense of community,
- discussion and visions of the future,
- a sense of agency at the individual, collective and professional level,
- trust toward external actors, and
- space for emotional expression

Vandaele, M., & Stålhammar, S. (2022). "Hope dies, action begins?" The role of hope for proactive sustainability engagement among university students. *International Journal of Sustainability in Higher Education*, 23(8), 272-289.

Now you! 😊

5 minutes individually, then chat with colleagues, then plenum:

Think of a situation where you are teaching sustainability (or want to)

- Fill in the head, heart, hands!
- How can the learning process be supported by an experiential learning cycle?
- Are you creating conditions for constructive hope?
- What are your questions that we should discuss here today?

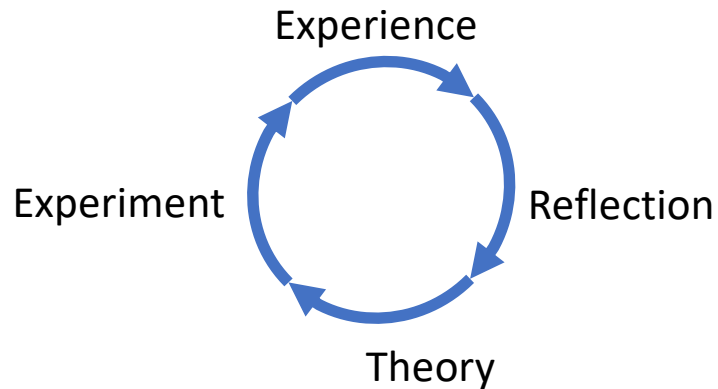


**LTH**

**FACULTY OF  
ENGINEERING**

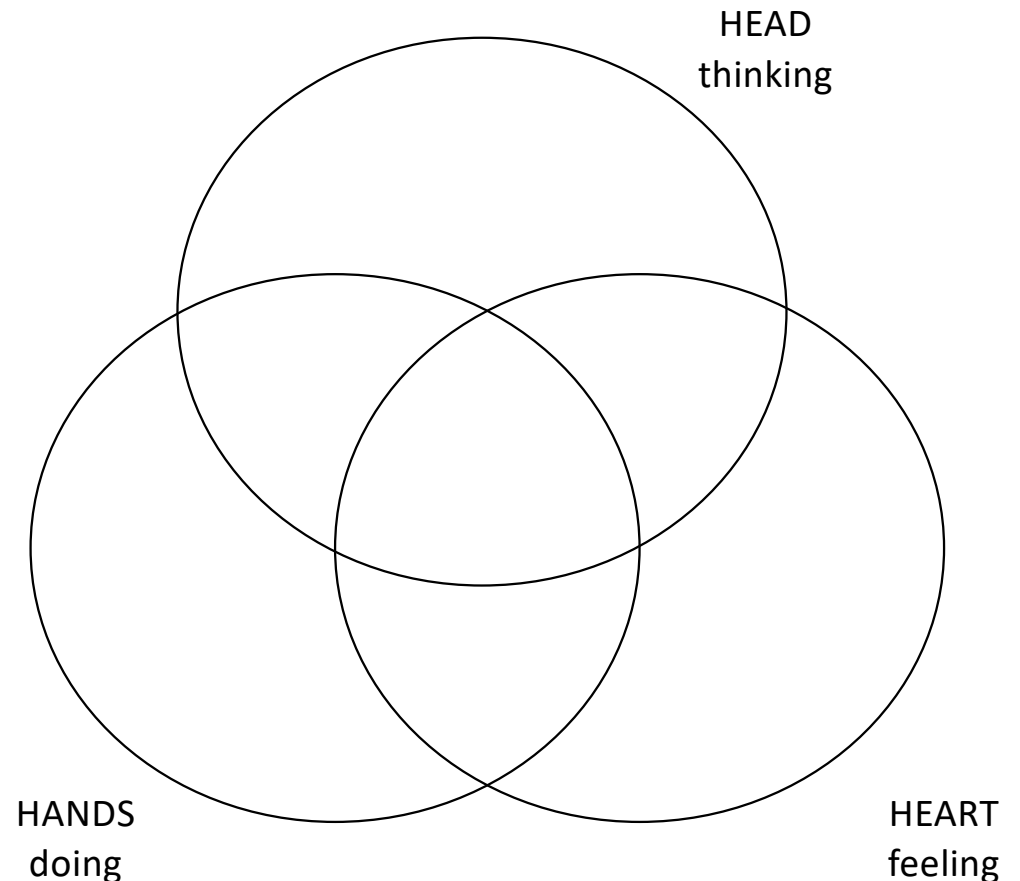
Mirjam Glesmer  
[mirjam.glessmer@lth.lu.se](mailto:mirjam.glessmer@lth.lu.se)

# Teaching sustainability



## Constructive hope needs

- a sense of community,
- discussion and visions of the future,
- a sense of agency at the individual, collective and professional level,
- trust toward external actors, and
- space for emotional expression



- Kolb, D. A. (1984). The process of experiential learning. *Experiential learning: Experience as the source of learning and development*, 20-38.
- Sipos, Y., Battisti, B., & Grimm, K. (2008). Achieving transformative sustainability learning: engaging head, hands and heart. *International journal of sustainability in higher education*.
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- Vandaele, M., & Stålhammar, S. (2022). "Hope dies, action begins?" The role of hope for proactive sustainability engagement among university students. *International Journal of Sustainability in Higher Education*, 23(8), 272-289.





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# Teaching complex sustainability topics with serious games

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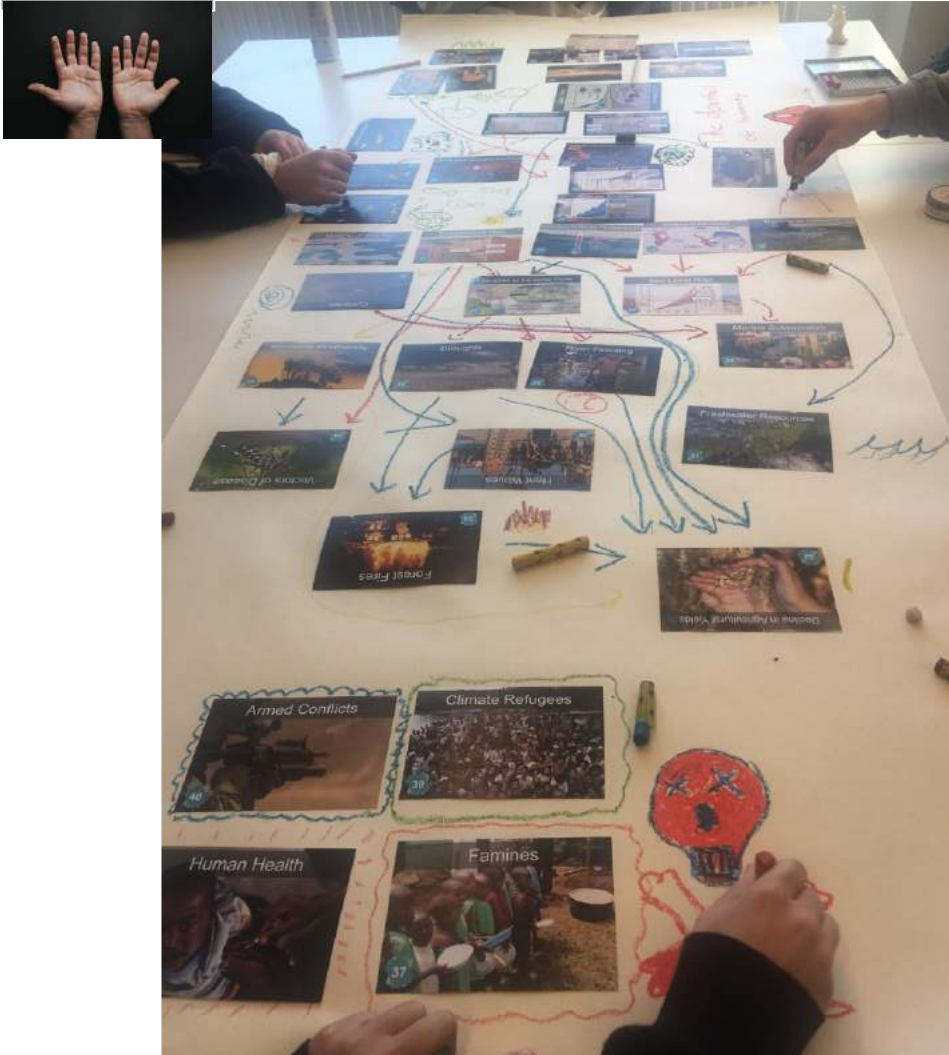
LEA LEVY, ENGINEERING GEOLOGY DIVISION  
[LEA.LEVY@TG.LTH.SE](mailto:LEA.LEVY@TG.LTH.SE)



# After the cards

Hands

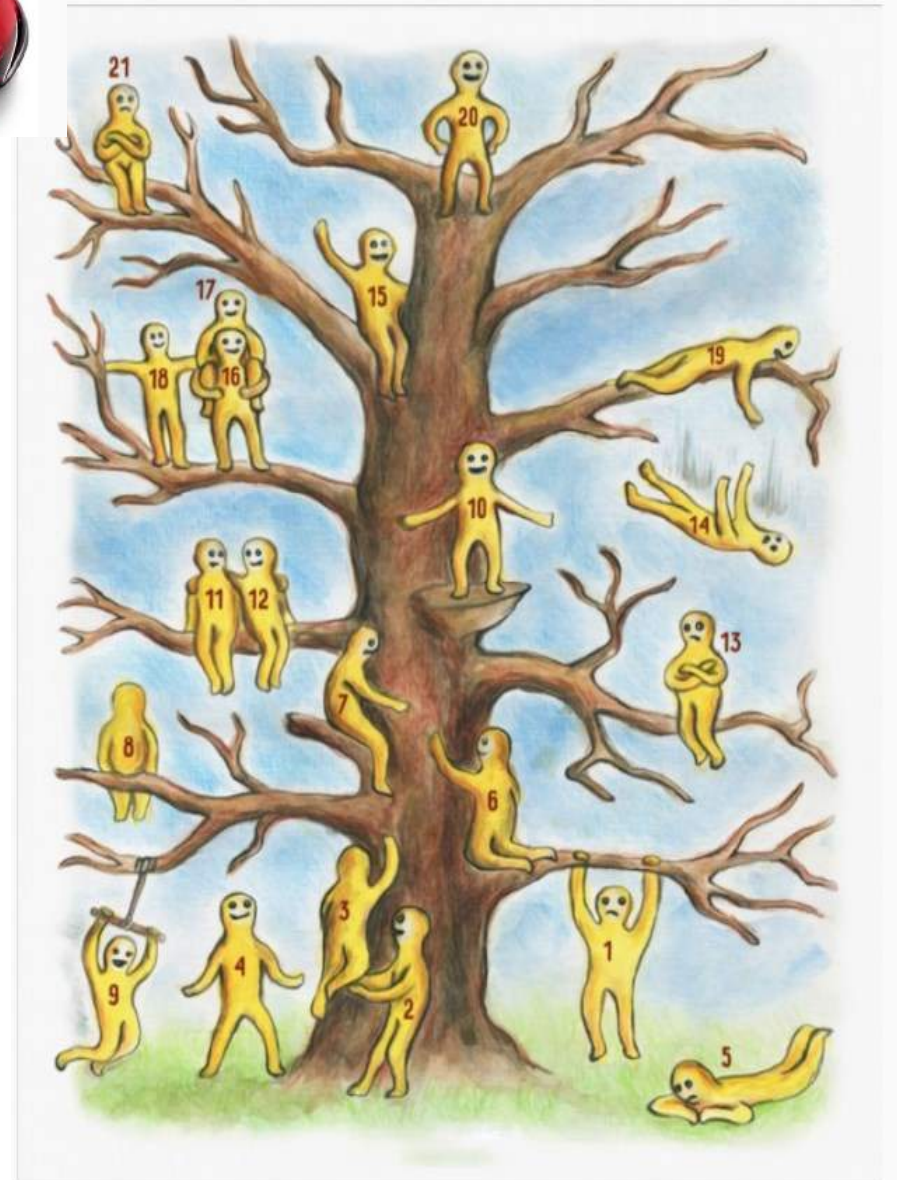
Creativity, hands-on



Heart

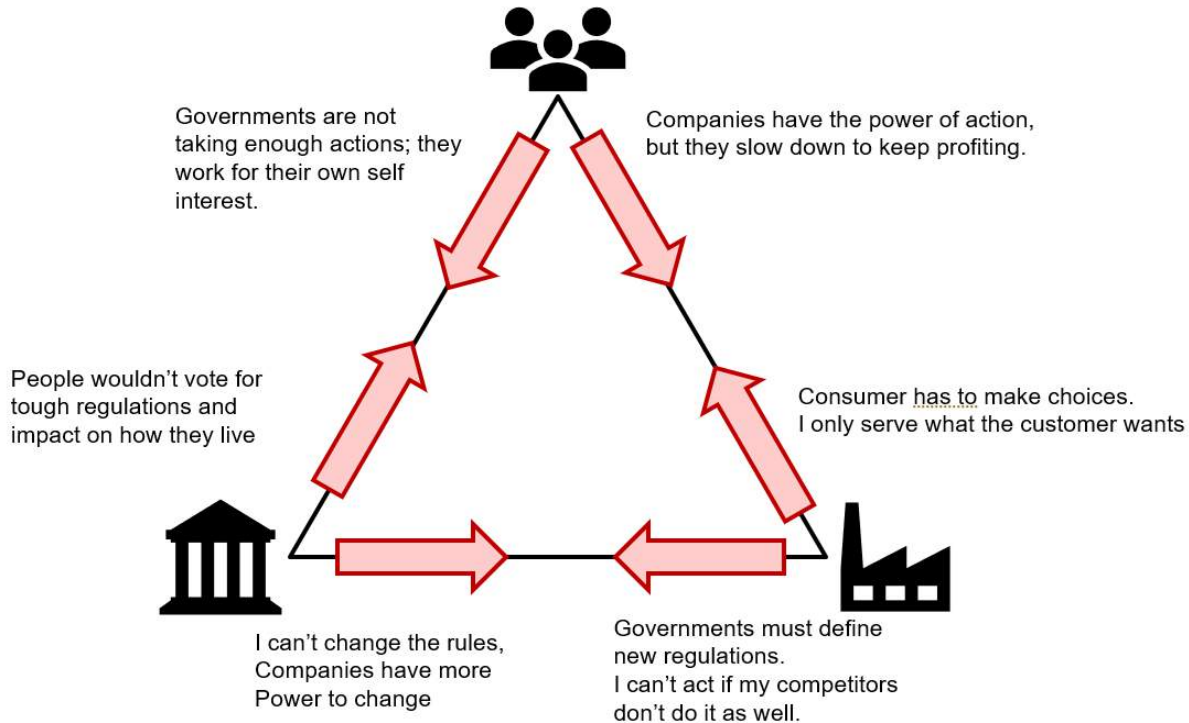
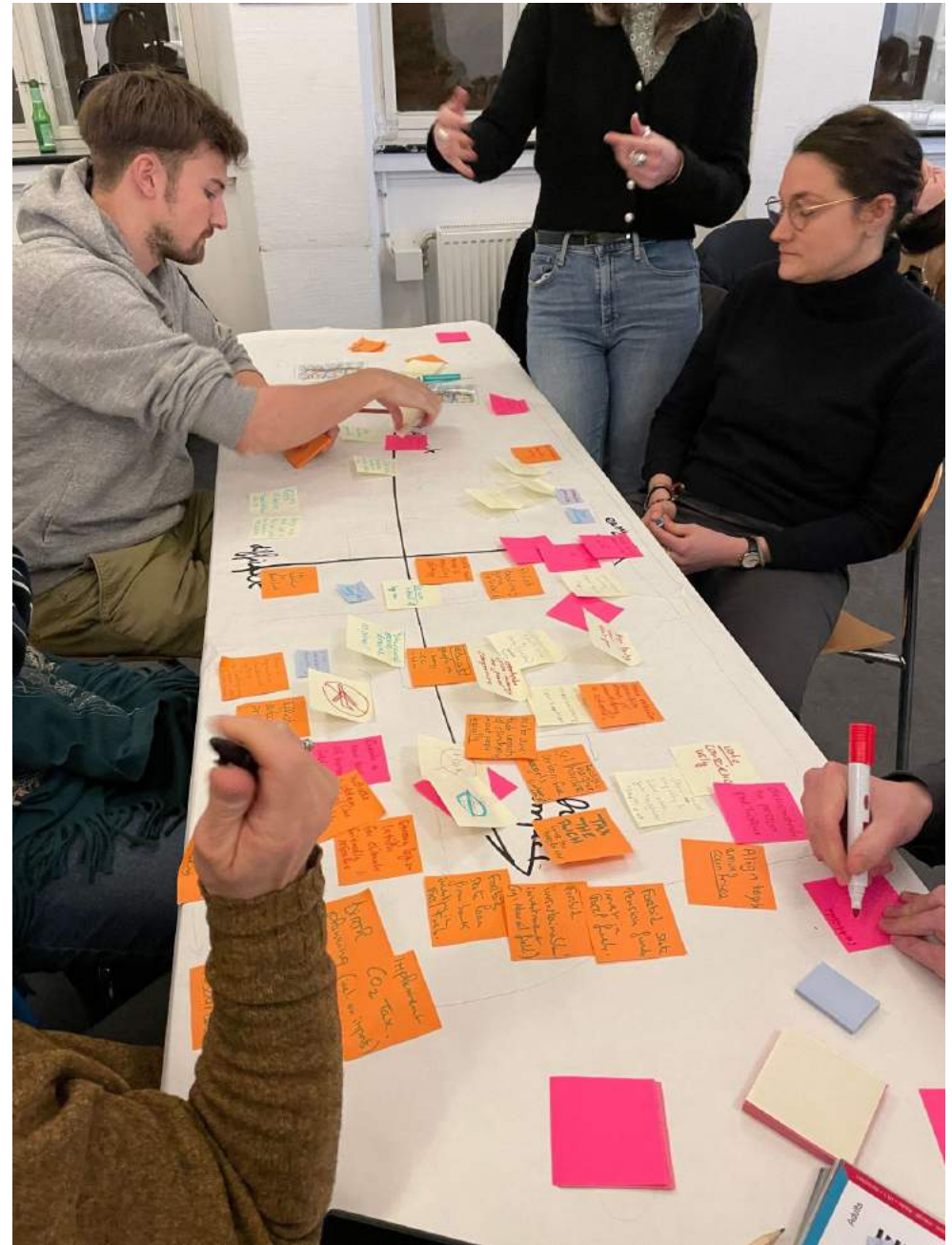
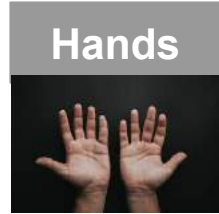


Discussing about emotions



# After the cards

- Discussing about obstacles and « solutions »



# Trying Climate Fresk as a teaching tool

## Awareness level +++

« The different systems that relate to each other is something that I learned from playing the game. Especially the reactions that accelerate each other over and over again. »

“It was fun and extremely informative. Made me realise that we have to do something now and not wait around for someone else to take action.”

“I learned a lot, especially about the connections between different causes and consequences. There were many steps that I have not connected before.”

“I have learned the importance of the climate and what it could lead to if we don't act. In my everyday life I will start valuing what's worth doing to reduce the emissions.”

# Success Factors of the Biodiversity Collage and the Climate Fresk



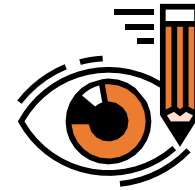
## PLAYFUL

The workshop is playful, fun and educational.



## COLLABORATIVE

The workshop fosters team spirit and collective intelligence.



## VISUAL

Because a picture is worth a thousand words.



## CREATIVE

Time to be creative! Make your Collage unique: give it a title, add drawings etc.



## SIMPLE

You only need the deck of cards, pens, paper, a table, and you are all set!



## SCIENTIFIC

The content is based on the IPBES/IPCC reports - the most reliable source of biodiversity related data.

One more reason I think it is a suitable teaching tool

- Jonas!

Trying Climate Fresk as a teaching tool  
What solutions do students come up with?

# Trying Climate Fresk as a teaching tool

## What solutions do students come up with?

*“Smart people invent stuff all the time”*

*“All engineers work hard to solve all issues”.*

*“Technological advancements give me hope”*

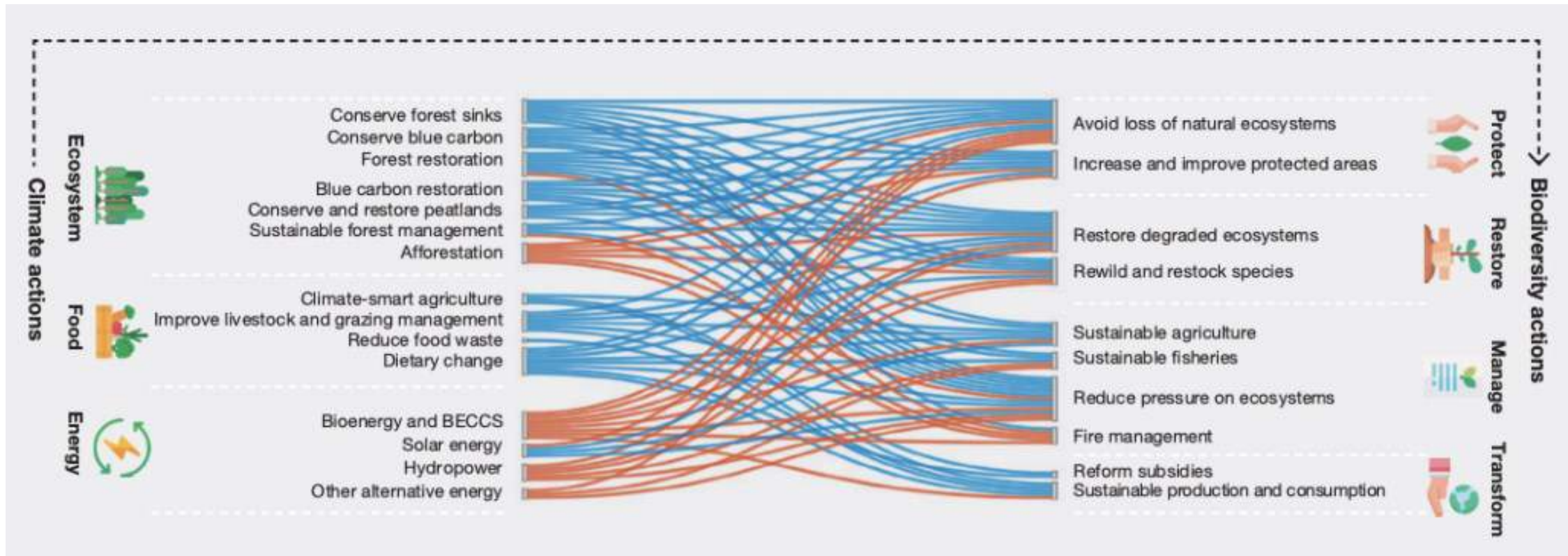
*“Nuclear fusion!!!”*



# Trying Climate Fresk as a teaching tool

## What solutions do students come up with?

**How to go further than individual and engineering solutions?**



Impacts of climate actions on biodiversity  
IPCC-IPBES co-sponsored workshop, 2021

# Going beyond Engineering solutions and individual actions

- Starting with biodiversity before climate
- Doing it during intro week, possibly mixing study programs
  - Feed students' reflection early on on what they are learning, for what purpose
  - Help them stir their studies with better awareness
  - Challenge their teachers
- Action is also about spreading the world in your own circles
  - Train master students, show them that we are together in this
  - Do it with colleagues to foster reflection on how to change courses
- The importance of creating new narratives

# Now within a course not directly connected to sustainability...

- Starting the course with a serious game?
- Groundwater Engineering, Food Engineering
  - The « Living Soil workshop »
- Electrical Engineering, Computer Sciences...
  - The « Digital Collage »



# Links to the various games

- Climate Fresk: <https://climatefresk.org/>
- Biodiversity Collage: <https://www.fresquedelabiodiversite.org/en.html>
- Digital Collage: <https://digitalcollage.org/>
- Living soil workshop: <https://www.ateliersolsvivants.org/>
- Feel free to contact me if you have questions : lea.levy@tg.lth.se



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# Collaborative initiatives to face global sustainability challenges

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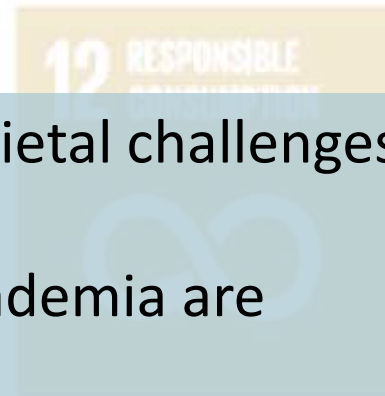
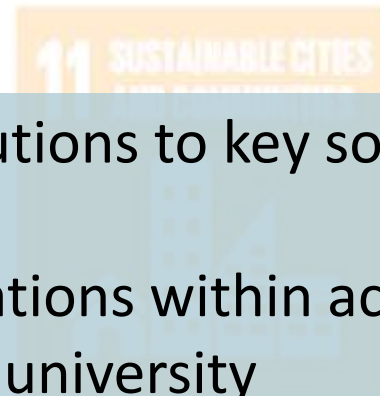
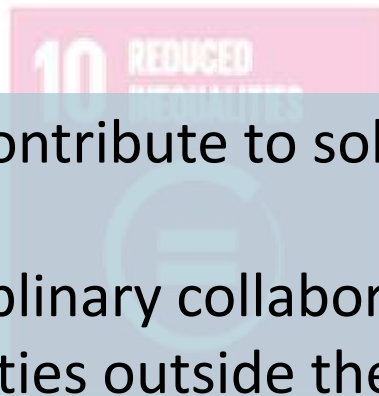
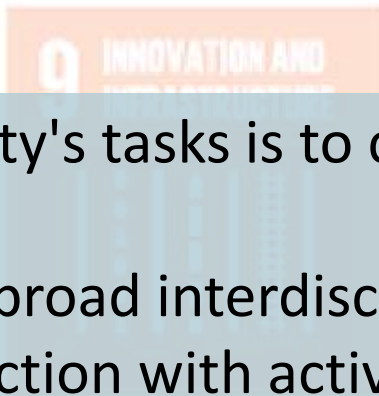
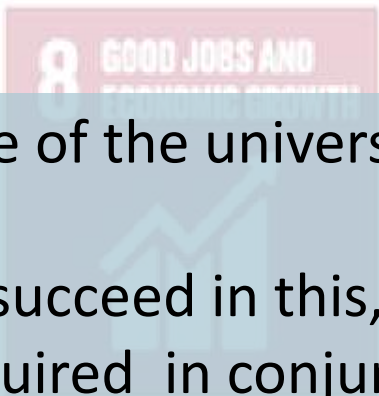
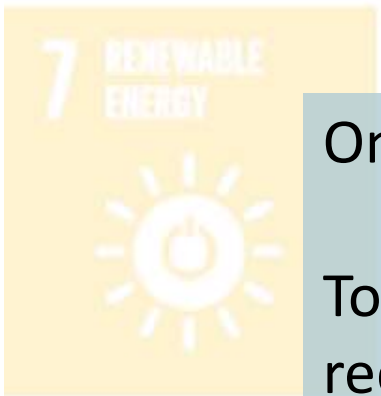
JOHANNA GENEROSI • LUND UNIVERSITY COLLABORATION OFFICE



# LU Collaboration Office

- A department within the university's administrative section for research, collaboration and innovation
- Approximately 25 people who promote collaboration between the university and societal actors
- Starting point in global societal challenges where the university has a key role to play, and together with others contribute to new knowledge, new solutions and innovations
- The department assists with coordination, communication, skills development, action research and other tasks that support the initiation and development of cross-faculty projects and platforms where university researchers or students collaborate with external actors



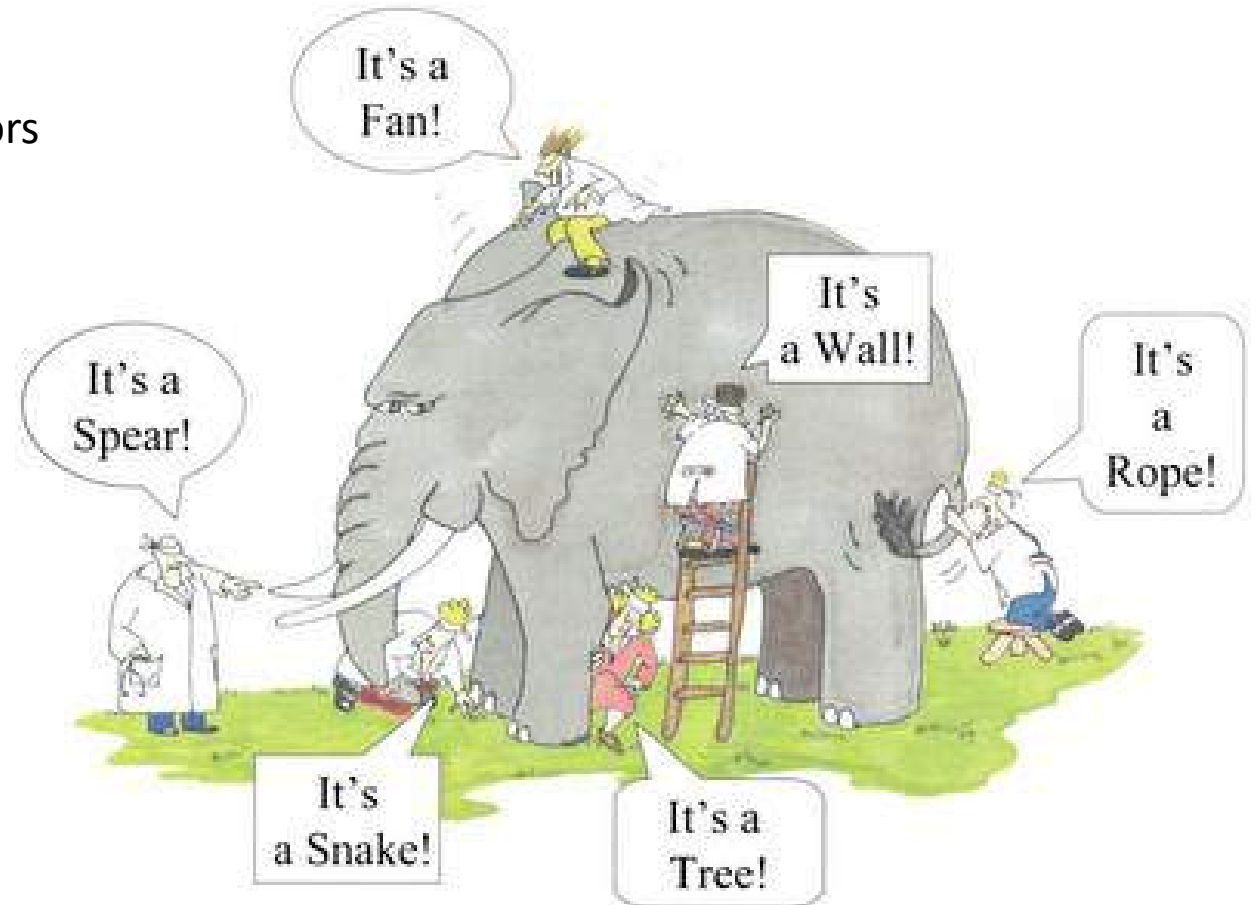


One of the university's tasks is to contribute to solutions to key societal challenges  
To succeed in this, broad interdisciplinary collaborations within academia are required in conjunction with activities outside the university



# Samverkan $\approx$ collaboration, cooperation or external engagement

- Definition
  - Collaboration with industry, public actors and other societal actors
  - Interactions with the surrounding society
- The University's collaboration mission is stated by the Higher Education Act
- Integral part of education and research
- Defined by
  - Common goals
  - Jointly defined activities
  - Different perspectives
  - Mutual benefits or value





# Support to develop strategic collaborations #1

## Mission:

To support the University in the development of strategic partnerships and collaboration platforms

## **Coordination, support and competence enhancement related to development of multidisciplinary projects and platforms involving external stakeholders**

- Provide support in consortia building
- Develop the collaboration mission related to the Higher Education Act e.g.
  - Strategic partnerships
  - Merits of collaboration
  - Mobility concept as a tool for increased, broadened and deepened interaction with external actors
- Support to the Collaborative council
  - Thematic collaborative initiatives

# Support to develop strategic collaborations #2

## **Identification of research funding contributing to University's strategic development**

- Funding under the Ministry of Economic Affairs  
Vinnova (Swedish Innovation Agency), Mistra (Foundation for Strategic Environmental Research), Formas (Swedish Research Council for Sustainable Development), Swedish Energy Agency, The Swedish Agency for Economic and Regional Growth
- Cross-university KIC Office

## **Dialogue with funders and other key stakeholders**

## **Process management of applications in collaboration with external actors**

## **Coordination and management of interdisciplinary research projects**

# Support to develop strategic collaborations #3

## **Specific assignments for the university management**

- Large Scale Research Infrastructures
- Priority setting process related to specific calls

**Provide support and knowledge on issues related to the evaluation of collaboration and the impact of research in society, as well as methods for follow-up**

**Research communication and creating new meeting places between research and the public**

**Research policy and companion research**

# Lund University Thematic Collaborative Initiatives

Lund University's thematic collaboration initiatives is the university's own instrument for developing new collaborative initiatives.

These initiatives are meeting places for knowledge sharing and development within specified problem areas.

After a yearly call for proposal and an evaluation process, approved initiatives are granted 1 MSEK/year for network activities, conferences, knowledge sharing, and other collaboration activities.

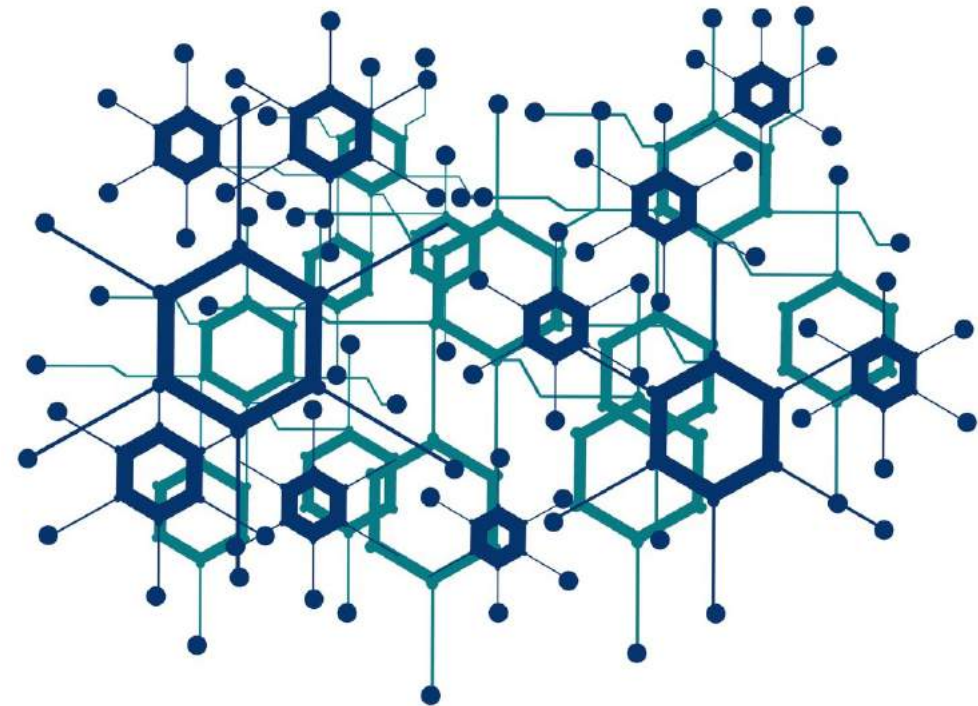
Common to the various initiatives is that they are aimed at a group of actors who want to **jointly address** a societal challenge cross-disciplinary, include at least three faculties of Lund University, as well as external partners in Sweden and the world.



# Lund University Thematic Collaborative Initiatives

All collaborative initiatives run for three years, some for five. Examples of collaborative initiatives:

- AI-Lab
- Circular and biobased economy (LUBIRC)
- E-Health@LU
- Enhanced Value Relevance and Credibility for Sustainable Information
- Sustainable circular building industry
- Sustainable Land Use – LU Land
- Sustainable Water Use – LU Water
- Intelligent intelligence
- Stories of the climate transition



# Lund University Thematic Collaborative Initiatives



## Outcome

- Collaboration has taken place between 3 to 7 faculties in each initiative
- Increased engagement with external partners
- Strengthened research areas and broadened transdisciplinary collaboration, for example by receiving new project funding
- Development of new collaborative activities and increased visibility with a wide range of different target groups
- External partners, involved in the initiatives, have described that participation has led to positive effects for them



# Cross-faculty centres for external engagement

The formation of university centres in which external partners are involved:

- Strengthens the university's role as a resource for the outside world
- Enriches research, development, innovation and education through the efforts of the collaboration partners
- External partners participate in the work on problem formulations and project descriptions
- The center can serve as a platform for applying for research funding where there is a requirement for collaboration with external partners
- External partners can contribute with resources to project funding
- External partners can participate in projects with their own work



# SSCEN – Sparbanken Skåne Centre for Sustainable Enterprising



- A strategic initiative between Lund University faculties LTH and LUSEM
- The centre is initially financed (5 years) by a donation from a Swedish bank Sparbanken Skåne
- Interdisciplinary centre between LUSEM and LTH
- A bridge between academia, industry and the public sector
- Address climate, biodiversity and other sustainability challenges through broad solution-oriented research and teaching
- The research agenda is set in close collaboration with various societal actors.



SCHOOL OF  
ECONOMICS AND  
MANAGEMENT



LTH  
FACULTY OF  
ENGINEERING

Sparbanken  
Skåne





# SSCEN: a collaborative platform for sustainability challenges

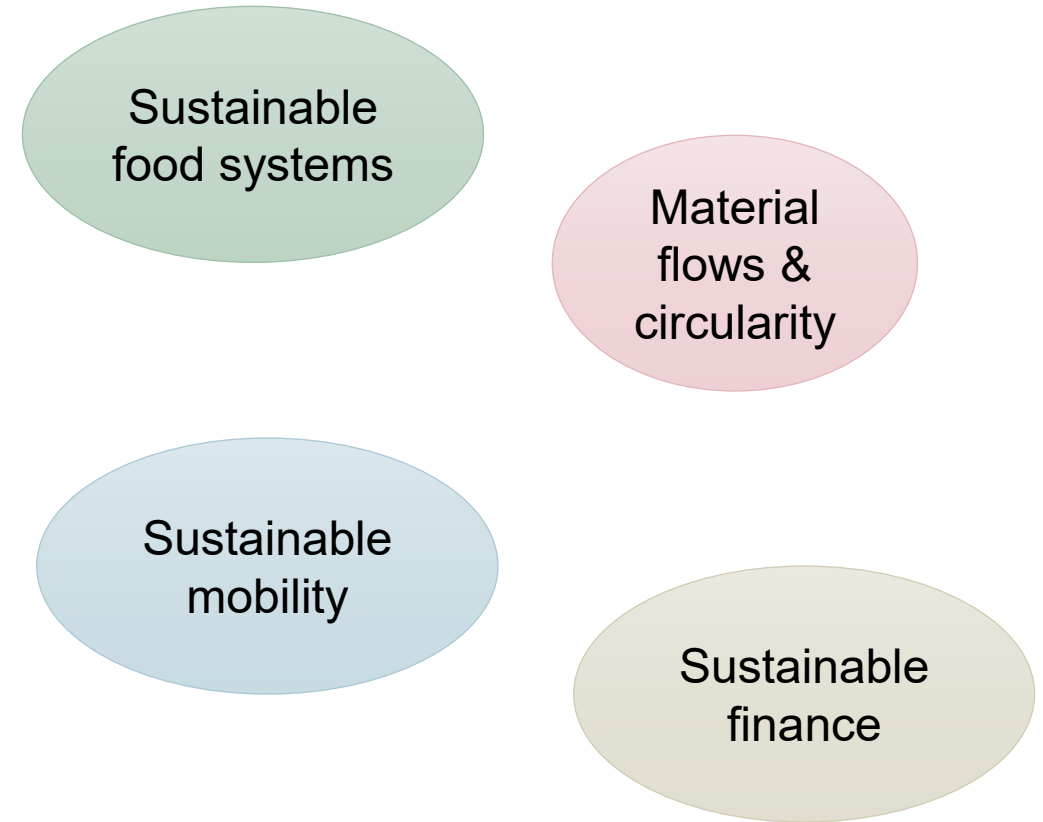
## Aims

- To build knowledge and act as a knowledge platform for the development of a sustainable business sector.
- To collaborate with society, industry and the public sector on issues related to climate, biodiversity and other sustainability challenges.
- To create a long-term sustainable interdisciplinary research and education environment with external grants and co-financing
- To strengthen education in SSCEN's subject area through a new interdisciplinary education at master level
- To establish a clear national profile by creating the conditions for becoming a reference platform in the area
- To highlight SSCEN's activities through public popular science events in the form of lectures, debates, workshops, and to disseminate information about the activities



# SSCEN: research

- **SUSTAINGOVERN**: how private and public organisations integrate sustainability in strategies, steering documents, KPIs etc and how sustainability performance is assessed and evaluated
- **POLICYIMP**: how companies and financial institutions adopt new sustainability regulations (EU Taxonomy, CSRD, TCFD, TNFD) and how this affects decision making, resource allocation and financial flows
- **SUM - Sustainable Urban Collective Mobility**: identify case studies of cities, regions and metropolitan areas that have developed higher levels of sustainable mobility and integration while improving their environmental footprint and energy consumption.
- **Sustainable Innovation in the Food Sector**: mapping the food industry's innovation activities in so-called plant-based foods and proteins. Identify strategic changes and diversification by established players and the design of business and operational models by new, smaller players.





# Success factors & challenges

- Long-term funding allows for renewal and new funding opportunities
- High degree of flexibility
- Early participation of partners, common interests and vision
- Leadership and organisation: a formalised and clear organisation can attract further funding and create more impact in terms of outreach
- Integration of PhD students
- Resources for management and communication
- Time consuming – more demanding than we think combined with a general lack of time for meeting and interacting
- Lack of joint language between disciplines
- Different perspectives on time between academia and practice
- Different goals between academia and other organisations: publish in high-ranked journals vs meet organisational goals



Would you like to receive more information on SSCEN?

[johanna.generosi@fsi.lu.se](mailto:johanna.generosi@fsi.lu.se)

<https://lusem.lu.se/research/centre-for-sustainable-enterprising>



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