

Experiences from a reform project
on education for sustainable
development at
Chalmers University of Technology

Ulrika Lundqvist

Chalmers University of Technology
Sweden

Chalmers University of Technology

Göteborg, Sweden



1,600 faculty and PhD students
800 staff

10,600 students:

- 6,000 students in MScEng and MArch Programmes, 5 years
 - International Master's programmes, last 2 years
- 1,500 students in BScEng and BSc Programmes, 3 years

Ulrika Lundqvist

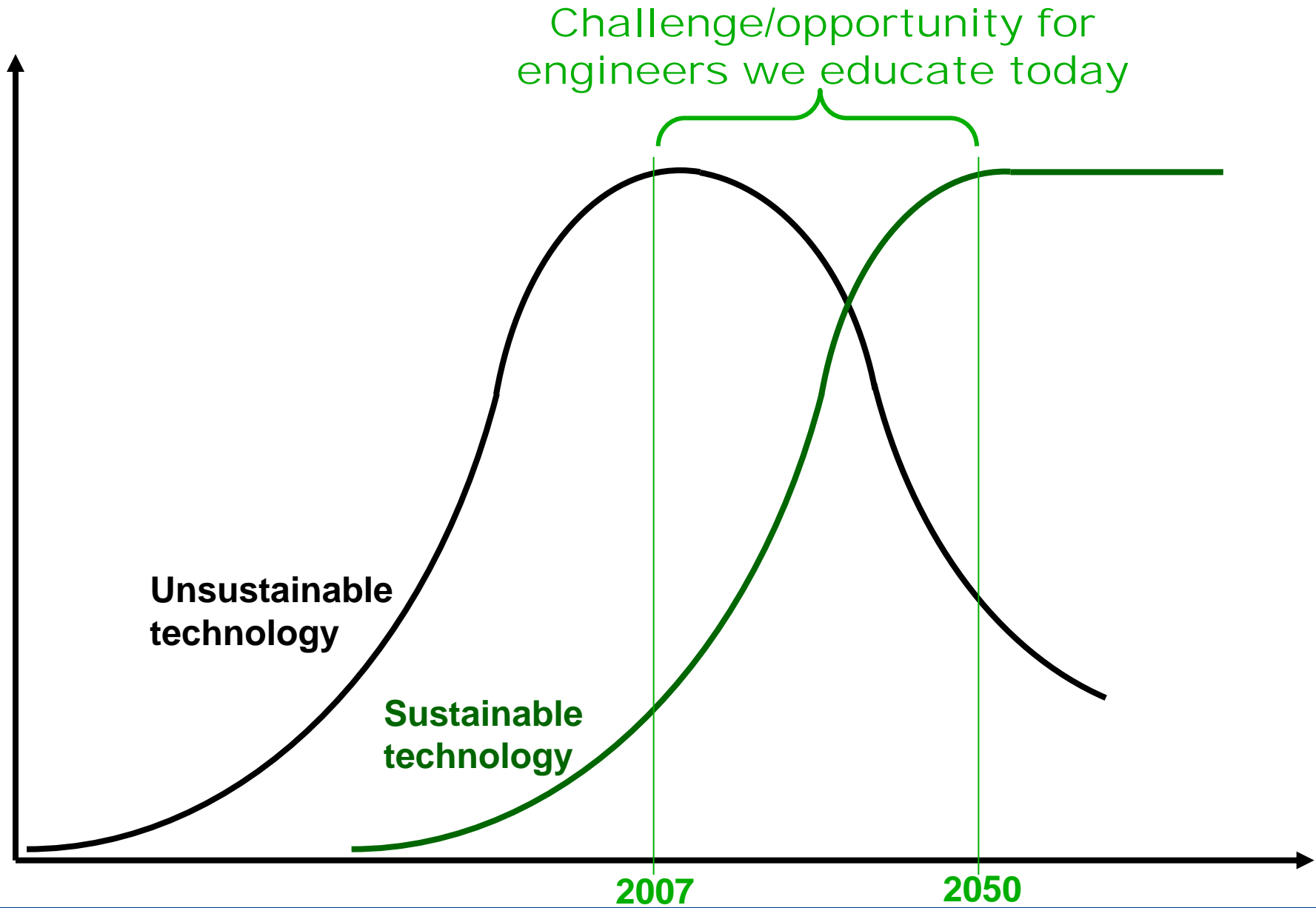
- One of responsible persons in an ESD project at Chalmers
- Teacher in environment and SD (E&SD) courses
- Director of Master's programme in E&SD (Industrial Ecology)
- Researcher in E&SD
- Head of division of Physical Resource Theory, Department of Energy and Environment

Why ESD at Chalmers?

- Chalmers' vision: Chalmers for a sustainable future
- Pull from authorities
- Demand from industry

Pull from authorities

- The Swedish Degree Ordinance for the Master of science in engineering degree contains requirements on student learning related to sustainable development
- The Swedish agency for higher education:
 - Evaluation in 2005
 - Criticized all Master of Science in engineering programmes for *insufficient education on sustainable applications of technology*



ESD at Chalmers

- Welcome to all new students each year with 1 hour presentation on SD
- Compulsory courses in environment and SD (five full weeks study) for all engineers and architects (five and three years long programmes)
- Compulsory courses in “humans, technology, and society” (five full weeks study) for all engineers and architects (five years long programmes)
- Five international Master’s programmes with focus on SD

Challenges at Chalmers

- Decentralized responsibility for the fulfilment of the E&SD requirement:
 - Each programme director decide how the requirement should be fulfilled
 - The teachers in these courses are researchers in different engineering fields. Few of the teachers are researchers in E&SD.
- How to motivate students who do not (yet) think that E&SD is relevant for their educations

The ESD project at Chalmers

- A reform project during 2006-2009 (end June 30)
- Funded by Chalmers
- Connected to a UNESCO chair in ESD:
 - John Holmberg, vice president of Chalmers since 2007
- Engaged persons in sub-projects:
 - Educational programme directors, teachers, students, environmental coordinator, study councillors etc

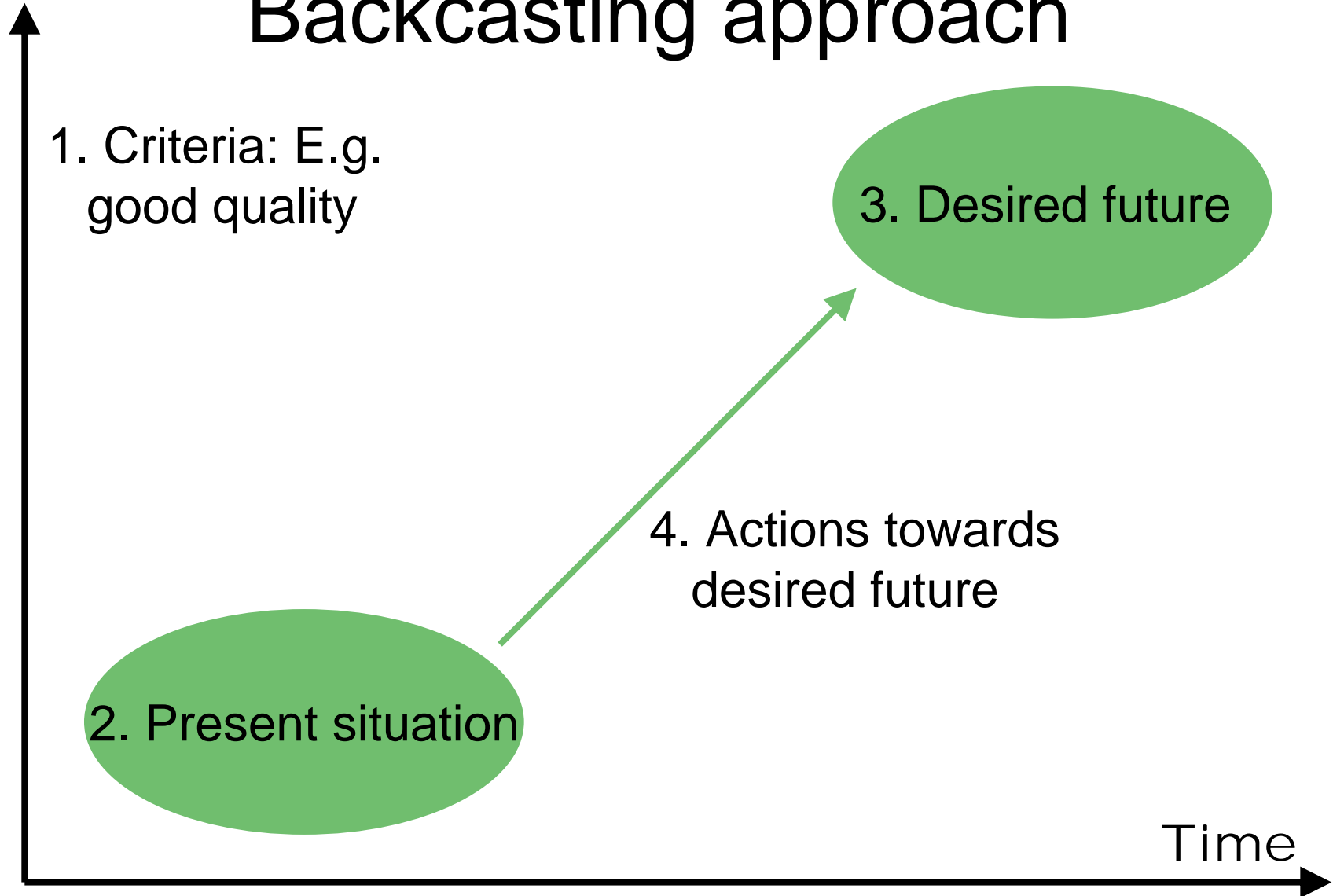
http://www.chalmers.se/gmv/SV/projekt/esd_chalmers

Goals in the ESD project

To develop, in three years, an organization that:

1. Guarantees and continuously improves the quality of the compulsory basic courses in SD at Chalmers.
2. Guarantees and continuously improves the quality of SD content in other courses.
3. Gives support to those who order SD courses.
4. Gives support to students when choosing SD courses.
5. Gives internal and external information about ESD.
6. Handles cooperation with internal and external stakeholders (especially Göteborg University) within ESD.
7. Gives a forum (physical/virtual) to meet for students and for teachers with interests in the area.
8. Supports education of non-teaching personnel within the SD area.
9. Supports the development of a campus reflecting Chalmers initiative for SD.

Backcasting approach



Backcasting in ESD work at Chalmers

Iterative process:

- i.e. the steps are not performed in consecutive order, but sometimes mixes steps and goes back to an earlier step

1. Criteria

Good quality:

- Example of sub-project:
 - Intended student learning outcomes for compulsory basic courses in E&SD at Chalmers
- Aim:
 - Create a shared view
 - Create a common language

Intended learning outcomes

- Compulsory basic courses in E&SD at Chalmers:
 - 7.5 hec at bachelor level
- Two pages document
- Developed during several years in a participatory process:
 - Involving programme directors, teachers, students

Intended learning outcomes for compulsory basic courses in E&SD

- Content in courses should be adjusted to be relevant for the different disciplines of the programmes:
 - E.g. technical systems, methods and examples should be relevant for the programme and professional field
- However, also content not directly relevant for programme disciplines should be included:
 - E.g. concept of SD, natural systems
- Intended learning outcomes divided into:
 - Knowledge and understanding
 - Skills and abilities
 - Attitudes

2. Present situation

Example of sub-project:

- Inventory of compulsory basic courses in E&SD at Chalmers:
 - Content, teaching and learning activities, and student assessment methods
- Aim:
 - How courses relate to quality criteria
 - Identify problem areas

Result of inventory

Often one single course, but in some programmes several parts of courses

	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
A		■										
At								■			■	
Bt	▨	▨	▨					■		▨		
D				■								
E						■						
F								■				
I				▨			▨		▨	▨	▨	▨
IT									■			
K				▨				▨		■	▨	
Kf	▨	▨	▨					▨		■		
M									■			
Td									■			
V					■							
Z					▨							

Analysis of results: Challenges

- Lack of common vision of appropriate student learning outcomes for E&SD courses
- Lack of common language, e.g. different use of terms
- Some teachers and programme leaders express a fear of too strong control from the top management

3. Desired future

Example of sub-project:

- Good examples in ESD:
 - Program curricula, course syllabi, teaching and learning activities
- Aim:
 - Inspire and facilitate for teachers and programme directors in making changes

Good teaching examples

- What is a “good” example?
- Collect examples at Chalmers:
 - Single activities, courses, programmes
- Find a model for presenting them:
 - Is a webpage a good idea?
 - Report
- Collect examples at a forthcoming ESD course for teachers at Chalmers

4. Actions towards desired future

Example of sub-project:

- Resource group to support integration of E&SD in other courses
- Aim:
 - To make things happen!

The resource group

- Includes teachers/researchers from different engineering disciplines/departments at Chalmers, working part time in group
- Purpose: To motivate and support teachers and programme directors in integrating SD in courses and programmes
- Other courses than the compulsory courses on E&SD => challenge:
 - Teachers not used to teach on SD
 - Teachers yet not obliged to include SD

Individual interaction method developed at Delft University of Technology

Approach teachers individually or in small groups

Key question: How does your topic/course
contribute to SD?

- common grounds for further discussion
- teacher immediately starts reflecting on the topic
 - a learning process starts

Some lessons learnt in the ESD project, recommendations

- Valuable to have consistent and durable commitment from the university management
- Valuable to have some body/organisation that have the main responsibility => Centre for Environment and Sustainability, the ESD project
- Cater on parallel processes of change
- Stimulate learning through individual interaction
- Approach all levels in the educational organization
- ESD integration must be a long-term development process – requires patience and process orientation

Chalmers Learning Centre – Learning for Sustainable Development in Engineering Sciences

To increase the understanding of how to create interest, concern and knowledge on technology and engineering sciences, and the consequences for sustainable development – and start up appropriate activities

- Continue improving the quality of learning for sustainable development at Chalmers
- To develop the learning (didactics) of engineering sciences at all levels and for different groups
- To develop programs and courses for education and competence development for "non-traditional" groups
- To initiate and develop cooperation between different learning activities for synergies, rationalisations and knowledge building