Agenda for today: 2 themes

Sustainability science and policies
• Introduction to the day (10 min)
• Group work on the articles, phase 1 (20 min)

-------------- BREAK (10 min)  --------------------------

• Group work on the articles, phase 2 (50 min)

-------------- BREAK (15 min)  --------------------------

• Insights on sustainability & Skills needed for a sustainable future (30 min)
• Delivery of the Task 1 Learning Diary, DL 8th Oct (5 min)

Sustainability appraisal methods
• Introduction to & Delivery of the Task 2, Articles II (10 min)
Learning outcomes of the theme 1

After science & policy session (+ learning diary) you should be able to:

• Follow the global scientific and political discourse on the need for and implementation of sustainable development
• Understand how complex large-scale challenges can be implemented in political level and in practice
• Define what aspects relate to sustainability as a concept
• Locate yourself as a professional in the global framework and understand how your field can contribute to it
The articles
Sustainability discourse

Four concepts in your papers:
1. Planetary boundaries (PBs), 2015 (originally from 2009)
2. The Oxfam Doughnut, 2012
3. The SDGs - Science perspective, 2015 (SDGs)
Group work

Phase 1 (20 min): With your own group
  • Generate joint understanding on your article, support each other’s learning for the next phase

Phase 2 (50 min, 10min/paper + 10min/discussion): Mixing the groups
  • Teach the others your article’s main points and contents (4 x 10 min)
  • Discuss together what you learned or if something remained unclear, was it interesting, beneficial etc., coming up with questions for joint discussion (10 min)
Guiding questions for phase 1, 20min
With you own group

• What is the framework and background of the paper?
• What is the main message/outcome of the paper?
• What kind of arguments/material the author(s) present to justify their key message(s)?
• Who has written the paper?
• To whom the paper is targeted to?
Break 10 min
Phase 2, 50 minutes, mixed groups

Teach the others your article’s main points and contents (4 x 10 min)

Presentation order:
1. Planetary boundaries (10 min)
2. The Doughnut model (10 min)
3. SDG targets, science perspective (10 min)
4. Implementation – The Nexus (10 min)
5. Discussion: what you learned, what remained unclear, was it interesting, beneficial etc. Do you have questions for joint discussion (10 min)

Reminder: Guiding questions from phase 1:
• What is the framework and background of the paper?
• What is the main message/outcome of the paper?
• What kind of arguments/material the author(s) present to justify their key message(s)?
• Who has written the paper?
• To whom the paper is targeted to?
Break 15 min
# Insights on sustainability: short history and some perspectives

<table>
<thead>
<tr>
<th></th>
<th>Never heard</th>
<th>I know the basics</th>
<th>I know very well</th>
<th>Have applied the concept in practice (in work/course), please specify in the textbox how</th>
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<th>Mediaani</th>
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<td>Planetary boundaries</td>
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<td>57,14%</td>
<td>28,57%</td>
<td>0%</td>
<td>2,14</td>
<td>2</td>
</tr>
<tr>
<td>Sustainable development goals (SDGs)</td>
<td>10,71%</td>
<td>42,86%</td>
<td>28,57%</td>
<td>17,86%</td>
<td>2,54</td>
<td>2</td>
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<tr>
<td>Oxfam Doughnut Model</td>
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<td>17,86%</td>
<td>3,57%</td>
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<td>1,25</td>
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<tr>
<td>Nexus approach</td>
<td>78,57%</td>
<td>17,86%</td>
<td>0%</td>
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<td>1,29</td>
<td>1</td>
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<tr>
<td>History of sustainable development - concept</td>
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<td>46,43%</td>
<td>7,14%</td>
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<tr>
<td>Values and perspectives of sustainability</td>
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<td>71,43%</td>
<td>10,71%</td>
<td>3,57%</td>
<td>2,04</td>
<td>2</td>
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From environmental awakening to sustainable development 1/2

Discussion on the connection between carbon acid and global temperature has a long history:


From environmental awakening to sustainable development 2/2

- World wars & ‘Trinity’, the first nuclear test
- Silent Spring by Rachel Carson
- 1970’s oil and energy crisis
- Wide-spread environmental movement

- Something needs to be done?
  → UN Stockholm Conference on the Human Environment 1972

www.collective-evolution.com/2017/02/02/these-15-satirical-illustrations-will-make-you-question-human-evolution
“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” – Brundtland commission 1987

New Paradigm that takes into account the limits of the Earth’s life supporting system

PBs: Earth system sciences

Why to start the course from Earth System Sciences?

- Sustainability is about **spatial scales and perspectives**: to be able to *zoom in* (e.g. sustainability appraisal methods), we need to be capable of *zooming out* (system level)
  - Whatever we do in the lower scale has an effect in larger scale
  - Sustainability action plans and decisions cannot be made (only) in local level

M.Karvinen 2016
About system’s thinking

• The Earth is a part of a planetary system, in which the different system components impact each other. The impact can be either balancing or reinforcing and directing → changes in the system.

• The Earth system comprises of the soil, the seas, the atmosphere, the poles etc.
  • The system includes the flows of nutrient, energy, coal, water etc.
  • Also life on Earth is a component in the system and has an impact on the different flows (and has its own flows)

→ Human with its modern society is at the moment working as a reinforcing driver, directing the system towards major changes

→ The Anthropocene, a new geological epoch
Sustainability is about time:

In order to predict the future, you need to know the past and present

→ short-term low-cost decisions?

→ long-term, more costly decisions that would ensure living in a safe and just space
Changing the game

Science does change the world. Sometimes slowly – but surely.

Sustainability implementation relies on actors who make things happen.

But:
Sustainability is very much about worldviews and values, which may differ between different actors.
Political decisions are compromises influenced by worldviews and values

World as a resource
Anthropocentric

Interconnected
Ecocentric

Regenerative

“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” – Brundtland commission 1987
Interconnections, priorities

Ensuring the safe and just living space for all – Nexus approach

Balancing different resource user goals and interests – while maintaining the integrity of ecosystems

Recognizing the central connections between sectors

Everyone can find a role in the game!

To summarize

Sustainability is about

• Spatial scale and perspective
• Time perspective
• Actors
• Values and worldviews

Science creates the knowledge and understanding. It also facilitates finding common goals and values when exploring and implementing solutions. We all have a role.
Skills needed for a sustainable future
What is environmental field?

The Finnish environmental professionals 2025-report (Suomen Ympäristöosaajat 2025):

• Environmental education should be integrated in every degree
• To solve environmental problems one needs holistic and multidisciplinary awareness and ability to cross barriers

All future scenarios in a way or another emphasize the connection between human and nature

• **Technological innovations** to mitigate, re-build or recover what is already broken, **bottom-up movements** to restore the lost nature-connection, **new business models** to mobilize and reinforce sustainable behavior etc.
What about the other megatrends

Internet of Things IoT
Artificial Intelligence AI
Digitalization & Robotization
Urbanization

... 

65% of the kids entering primary school now will have jobs that do not exist yet (World Economic Forum) 

→ The future is highly unpredictable in many ways
What skills might help?

To recognize and solve the wicked sustainability problems, and to survive in an ever-changing, unpredictable working life, some skills have been recognized essential:

- Know yourself: values, worldview, career targets, means to achieve them, ways you learn, cognitive abilities
- Leadership
- Managing work in multicultural and multidisciplinary teams
- Combining technical and business competences
- Communication skills, responsibility and courage
- Understanding of different worldviews, environments and cultures
What professional skills are expected from engineers?

Conceive-Design-Implement-Operate (CDIO) model:
Engineers are needed in every phase of product life cycle, and they are responsible for the technology for the whole society

→ technical, creative, responsible professionals
  • Ability to work in a multidisciplinary environment, problem recognition and solving
  • Ability to consider the natural, social and the economical environment in the work
  • Ethical standards and Responsibility
  • Ability to implement lifelong learning and recognize the need for it
  • Awareness concerning current issues
  • Communication skills

→ Increasing awareness of the urgent need to integrate sustainability values and awareness to the model

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Lundgren, 2012

For next week

Task 1: Report: Learning diary, DL 8th Nov at 23.55

Task 2: Learn & teach, DL Wed 6th Nov (at 13.00)
Task 2: Report, DL 8th Nov at 23.55
Task 1, Learning diary

Key points:
To reflect what you learned from your paper and from this session:
- What was new / familiar
- Was there something I didn’t understand
- How my learnings connect with my previous studies and experiences

Do NOT write a summary on the article / teaching session, but use your own words and analyze your learnings.

Detailed instructions in MyCourses under Task 1
Sustainability appraisal methods through Task 2
Objective of the task 2

To familiarize you with sustainability appraisal and some methods used in it

Key learning objectives of the task:
• To learn how sustainability can be measured and evaluated
• To learn finding and communicating the key contents of the material given to you
• To learn the basic structure of a scientific article based on research
Terminology

Sustainability assessment
Sustainability appraisal
Sustainability analysis
Integrated assessment
Sustainability impact assessment

→ All these mean practically the same process
Generic about sustainability appraisal

- Involves value judgments (weighting), assumptions, scenarios and uncertainties
- Calls for a system-wide analysis → life cycle approach
- Has different levels (micro-macro) and purposes, involves different stakeholders
- Covers various approaches and variable methods
Variability of sustainability analysis methods

Qualitative – semi quantitative

- Check lists
- Scoring, tabulation
- Indicators (can be scored, e.g. LEED certification)
Variability of sustainability analysis methods

Quantitative

- Life-cycle analysis (LCA) and related methods (e.g. MFA*, MIPS*)
- Cost/risk – benefit comparisons (CBA*, LCC…)
- Foot/handprints (e.g. CO2, water, ecological)
- Methods based on multi-criteria (decision) analysis* (MC(D)A*)

*your papers for next Wed 6th Nov
1) Read the article appointed to you (by family name) so that you can teach it to others on Wed 6\textsuperscript{th} Nov. Use the guiding questions given in MyCourses when preparing.

2) Report the main contents of your article in the form of research process. Include also a short reflection on your key learnings. Detailed instructions given in MyCourses under Task 2, Articles II