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Higher education of transport safety - recognising key issues for future graduates

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Background

- Personal experience of 17 years in higher education and research activities in a technical university and course responsible for Transport Safety* (4 ETSC** credits) 2005 - 2018 with annual course implementation with 20-30 students at TUT***
- After a university merger, Tampere University started 1.1.2019, and as a harmonising practice, new curriculum has been developed with courses of 5 credits as a rule
- Also co-operation in studies related to Bachelor's degree with Tampere University of Applied Sciences was developed in Civil Engineering
- As a result, the degrees cannot include as many individual courses as before
    - **The key issues related to transport safety was decided to be included and educated in a common course with sustainability issues**
- A new course Sustainable and Safe Transport System, is launched in autumn 2019

* Courses are mainly in Finnish, but here the English names are used for clarity

ECTS, where 1 credit equals about 27 hours of study * TUT = Tampere University of Technology

Aim and outline of the presentation

The aim is to describe and discuss,

- what are the learning outcomes and core contents related to transport safety in the new curriculum
- how education related to transport safety is planned to be implemented.

Outline

- Some experiences in higher education
- Transport safety as an issue in transport and logistics courses at Tampere University
- The connections between sustainability and safety
- Learning outcomes and the core contents related to transport safety
- Course implementation - how the learning outcomes are aimed to be reached?
- Discussion and conclusions

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Some experiences in higher education

- There is a tendency towards less “good old-time” lectures
  - **Students find it difficult to keep interest in just listening and watching someone lecturing, even if the topic is of interest and it is presented in an interesting manner**
  - **Lectures are increasingly recorded, especially in the courses with more students, and these can be viewed online => What is the additional value a student can get when participating on-site?**
- Active learning is building more ground
  - **Students feedback: activating elements are seen important for learning and motivation during the learning events and the course**
  - **Flipped classroom concept: E.g. self-study (short videos, reading articles etc.) and some exercises before the learning event and discussion or common problem-solving during the learning event**
- New technology enables individual learning and schedules, e.g. electronic exam, but also the old practices seem to work (assignments and project work during the course)

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Courses in transport and logistics at Tampere University and their connection with transport safety

Analysing Logistics Systems of Trade and Industry	Depending on the case, safety and security may be a issue to be studied
Sustainable Logistics and Global Distribution	The concept of people, planet and profit
Freight Transport Systems	Safety (and security) in freight transport and its different mode
Transport Research	Methods in transport research, statistical analysis and tests
Transport Transformation	Safety as a driver (or an obstacle) for transport transformation, vehicle automation and its implications for future transport system
Public Transport and Transport Services	Safety in public transport and as an element of service level
Urban Transport Planning	Land use and transport planning, sketching a development proposal for an urban area
Sustainable and Safe Transport System	Will be discussed more in next slides
Transport System Analysis	Transport policy goals and measures, economic evaluations related to transport (incl. transport safety)
Introduction to Municipal Engineering	**Introduction** to sustainable and safe transport system, the safety effects of transport, aims related to safety and measures to improve safety

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The connections between sustainability and safety

A study was funded by two Finnish transport agencies in 2013 in order to depict the synergies and conflicts associated with safety and environmental goals and measures related to the whole transport system. The main report is published in Finnish and the key results in English in Pöllänen & Liimatainen 2014*.

Connections include e.g.

- Both traffic accidents and air pollution are among the ten leading contributors to the global burden of disease and injury.
- Measures to reduce (or limit the growth of) the exposure produce positive outcome for safety as well as the environment.

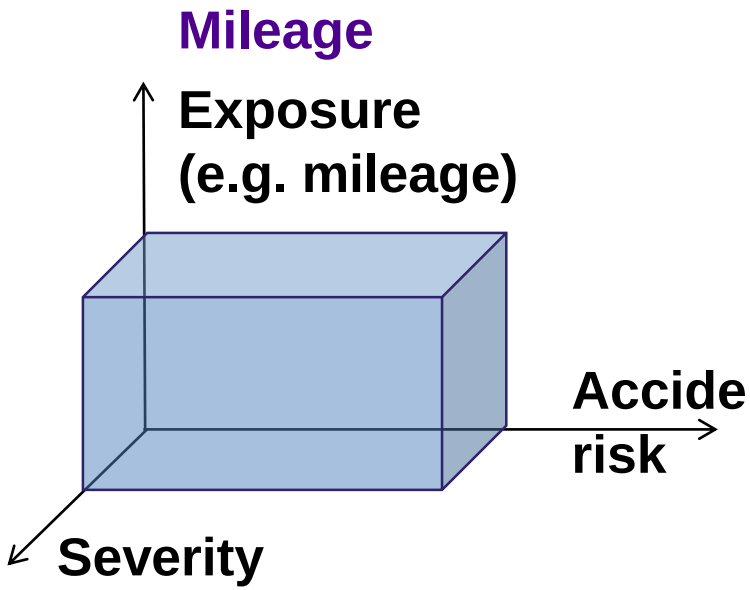
The sustainability has many perspectives, but the main focus is on environmental sustainability related to transport in the course Sustainable and Safe Transport System.

*Pöllänen & Liimatainen 2014. Synergies and conflicts between safety and environmental measures in transport. TRA 2014 Conference.

Synergies and conflicts between safety and environmental measures in transport

Traffic safety dimensions*

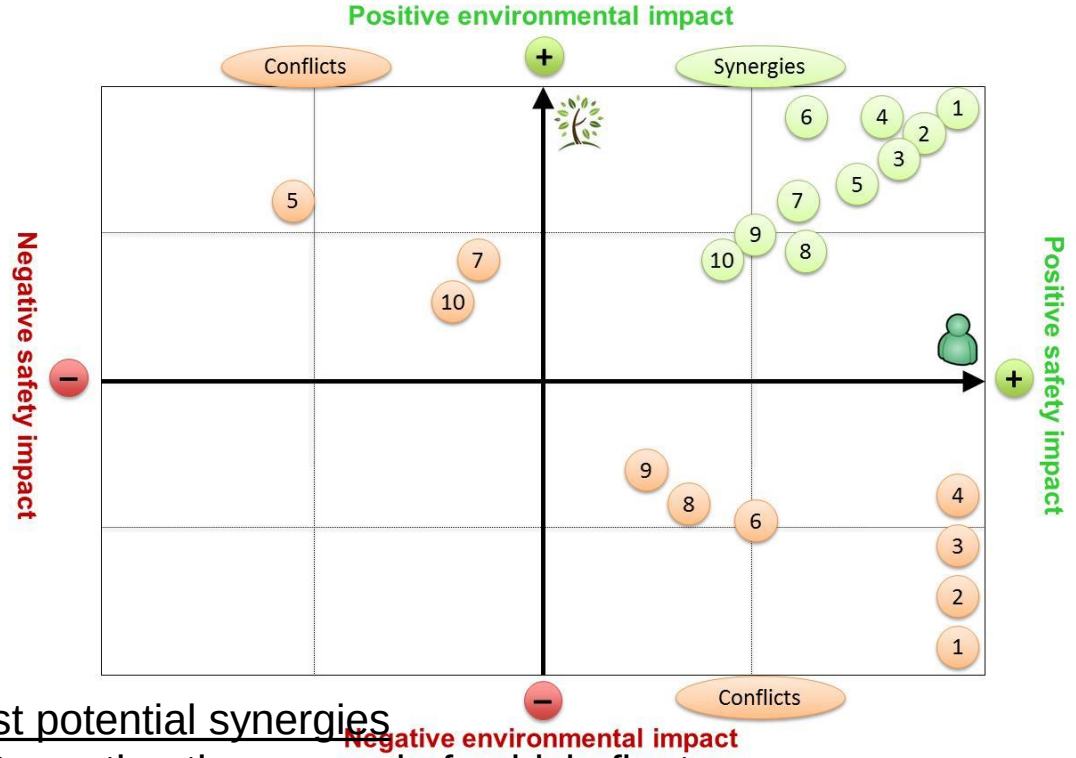
Factors affecting the CO_2 emissions of transport



CO_2 content / energy (e.g. g/kWh)

Energy / mileage (e.g. kWh/100 km)

*Nilsson 2004. Traffic Safety Dimensions and the Power Model to Describe the Effect of Speed on Safety. Lunds Universitet 221.



Most potential synergies

1. Promoting the renewal of vehicle fleet
2. The use on electronic services to substitute transport
3. Telecommuting
4. Improving rail transport's reliability and flow of traffic
5. Decreasing speed limits on rural roads

Most potential conflicts

1. Antiskid treatment of roads
2. Heating of switches on rail network
3. Deicing treatment of runways
4. Airplanes' deicing treatment
5. Limiting the use of studded tyres

Pöllänen & Liimatainen 2014

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Learning outcomes of Sustainable and Safe Transport System

On completion of the course the student

- **can describe the problems** related to sustainability and safety of transport, the most important environmental effects of transport and logistics, **the mechanism by which these arise, the key underlying factors** and **the effects these have** to the wellbeing of people and societies.
- **can describe the aims and key actors** related to sustainable and safe transport system **and actor's possibilities to influence, the measures and strategies as well as the potential synergies and conflicts between these** related to sustainable and safe transport system.
- can describe the relevance and effects of sustainability goals and CO_2 emission reduction targets for developing the transport system and as a part of developing land use, housing, transport, services and businesses (MALPE concept, in Finnish).
- **can assess the goals and measures**, which aim to promote sustainable and safe transport systems, **and the effects these have and their interactions**.

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Learning outcomes of Sustainable and Safe Transport System

On completion of the course the student

- **can** …he most imp… **…y which thes…** well…
- **can** …port syst… **…es as wel…** …stainable and…
- can … …on redu… …ping land use… …).
- **can** …d safe transport systems, **and the effects these have and their interactions**.

is able to understand the transport safety problems (and the sustainability challenges) and knows how to approach the problems and develop and analyse feasible solutions to these

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Core contents of Sustainable and Safe Transport System 1/2

1. Perspectives of sustainable transport system: ecological, **social** and economical.
2. The environmental impacts, energy use and **safety of transport and logistics and in different passenger and freight transport modes**, and **how these are measured** and the **procedure of compilation of statistics** and the **key indicators.**
3. The key **agreements, legislation, regulations and norms, which regulate** the environmental impacts, energy use and safety of transport.
4. Sources of energy used in transport, their qualities, benefits and disadvantages.
5. Circular economy and life cycle analysis in the transport system.

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Core contents of Sustainable and Safe Transport System 2/2

6. **The theories and system models of transport safety.**
7. **Traffic behaviour, psychology and transport safety. The factors, which influence traffic behaviour and how traffic behaviour can be influenced.** Promoting sustainable mobility, mobility management.
8. **Valuation of external effects** of transport (environmental effects, crashes). Application of emission costs and crash costs in decision-making.
9. **The challenges** related to sustainable and safe transport system**, the actors and their viewpoints and possibilities to influence, and the related goals, plans, programmes, strategies and visions**.
10. **Possibilities to influence** and the **measures**, which aim towards a more sustainable and safe transport system, and **their effects, assessing the effects, efficiency and effectiveness,** the **combined effects of measures** (synergies, conflicts) and **adaption to interventions** (rebound phenomenon, theory of risk compensation).

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How to reach the learning outcomes and instruct the core contents?

- The course will be organized in two consecutive periods (7 + 7 weeks).
- Weekly learning events, altogether 14 x 2 hours
- During the course, the students will conduct two assignments, which will run through the course and in which the issues discussed in the learning events will be applied.
- One of the assignments relates to transport safety. Students will have their own topic, which they will focus on. The students will present their key findings to others on one learning event.
- In addition to these course wide assignments, there are two electric exams, of which one will focus on transport safety and its core content areas
- In addition to the assignments, the exams will be used to assess, to which degree the students have reached the learning goals.
- In the assessment, the assignments will mark at least half of the overall course grade.

Examples of possible exam questions

- What is the vision of road safety in Finland and what are the actual (quantified) targets in road safety?
- How are the official statistics related to road crashes compiled and what are the key variables related to the statistics?
- Compare the safety situation and safety work in different transport modes (road, rail, waterborne, air).
- Which actors may influence a specific road safety problem (e.g. risk-taking, speeding, use of intoxicants, disuse of safety devices) and how may these actors influence the problem?

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Course assignment in transport safety

- The assignment will focus on a specific element/part of transport safety (e.g. road safety and single vehicle crashes, or pedestrian crashes/safety, or commercial maritime transport in Finland). The students may choose their issue according to their own wish from available topics.
- On each topic, similar questions are to be answered:
  - **What is the safety problem? What issues affect it? How it can be affected? (The students apply transport safety related theories, paradigms and models, e.g. (safe) system approach/vision zero, Haddon's matrix, 3Es)**
  - **What is the safety situation related to the topic? (The students will look into studies, statistics and data on their topic.)**
  - **What strategies, goals, visions etc. are there, which relate to the topic?**
  - **What are the key actors, which (can) affect the safety situation, and how can these affect? What kind of co-operation do these actors do?**
  - **What are the key safety measures, which relate to the topic? What knowledge is there related to these measures (effects, efficiency)?**

Learning events

- Discussions and small assignments during the learning events - and some lecturing, too
  - **Some of the issues, which have formerly been lectured, will be self-study materials or materials student may look into if they are relevant**
- Strong connection with the assignment
  - **The issues discussed on the learning events are applied, when working on the assignment**
  - **The students present their key results to others on the learning events and the results are discussed together**
- Renewing the set-up for the new course. Old course had 7 learning events:
  - **1. Introduction, 2. Safety in different transport modes, 3. Traffic behaviour and transport safety, 4. Road safety strategies and actors, 5. Regional road safety work (visiting lecturer, always well-liked!), 6. Road safety measures, finally 7. Seminar (students present their results).**

Discussion and conclusions

- At Tampere University, knowledge related to transport safety is planned to be built along many courses and especially during the course Sustainable and Safe Transport Systems.
- Those, who will be employed working tightly with safety issues in the field of transport, will learn more during their careers. The learning during the degree studies should give base, on which further knowledge and learning can accumulate.
- The students consider active learning more engaging compared to traditional lectures.
- Applying the knowledge throughout the course rather than reading to a exam (one or two days before the exam), is considered to lead to learning, which may be recalled after the course is passed. Though, exams are still planned to be kept on this course, but with a smaller weight compared to the assignments.
- More detailed course planning is ongoing, and ideas and suggestions are warmly welcome!

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Suggestion of questions to be discussed

- What should be taken in account to secure proper understanding of and knowledge in transport safety?
- What are the key issues in transport (and esp. road) safety, which you consider are the most relevant for a future graduate in the field of transport (and logistics)?
    - **What knowledge is needed when working in the field of transport, e.g. as a transport engineer?**
- On which issues should special emphasis be placed (to make sure that these are understood correctly/the knowledge is there)?
- Do you have any suggestions related to the implementation of a course related to transport safety (good practices etc.)?

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Thank you!

Feel free to take contact if any ideas still arise!

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