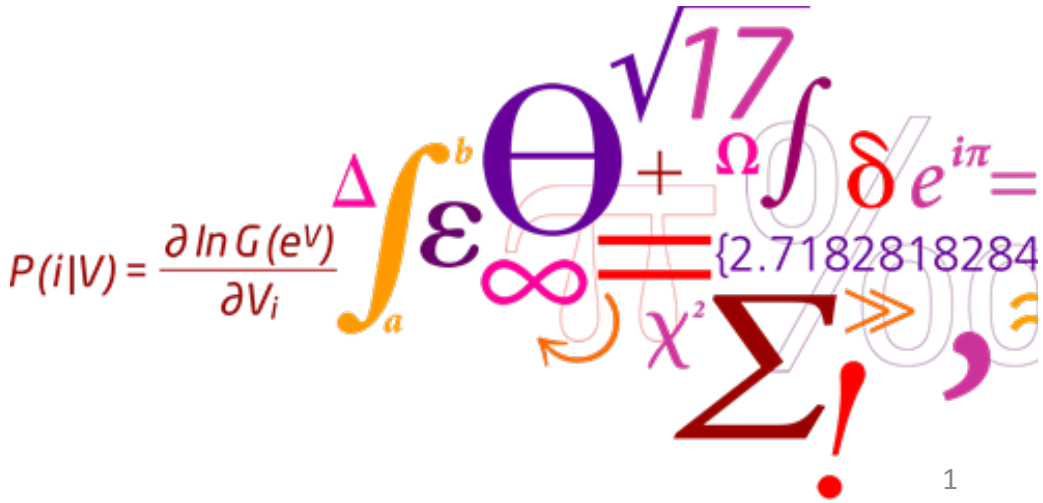
Transport DTU: A gateway for transport research and innovation

Otto Anker Nielsen



About the Key Note

- Trends, challenges and research needs in the transport sector
- Transport Research status in Denmark
- The new Transport DTU

Some of the major challenges

- Congestion
  - Cost 1% of Europe GDP
  - Road, Sky and Rail
- CO2 emissions and energy use
  - Oil become scarcer
- Safety

European Commission - PRESS RELEASES - Press release - Transport 2050: The ma... Page 1 of 3

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MEMO/11/197

Brussels, 28 March 2011

Transport 2050: The major challenges, the key measures

Why it matters

Transport is fundamental to our economy and society. Mobility is vital for growth and job creation. The transport industry directly employs around 10 million people and accounts for about 5% of gross domestic product (GDP). Effective transport systems are key to European companies' ability to compete in the world economy. Logistics, such as transport and storage, account for 10–15% of the cost of a finished product for European companies. The quality of transport services has a major impact on people's quality of life. On average 13.2% of every household's budget is spent on transport goods and services.

The major challenges

Mobility will increase. But European transport is at a crossroads. Our transport system faces major challenges:

- - Oil will become scarcer in future decades, sourced increasingly from unstable parts of the world. Oil prices are projected to more than double between 2005 levels and 2050 (59 $/barrel in 2005). Current events show the extreme volatility of oil prices.
- - Transport has become more energy-efficient but still depends on oil for 96% of its energy needs.
- - Congestion costs Europe about 1% of gross domestic product (GDP) each year.
- - There is the need to drastically reduce world greenhouse gas emissions, with the goal of limiting climate change to 2ºC. Overall, by 2050, the EU needs to reduce emissions by 80–95% below 1990 levels in order to reach this goal.
- - Congestion, both on the roads and in the sky, is a major concern. Freight transport activity is projected to increase, with respect to 2005, by around 40% in 2030 and by little over 80% by 2050. Passenger traffic would grow slightly less than freight transport: 34% by 2030 and 51% by 2050.
- - Infrastructure is unequally developed in the eastern and western parts of the EU. In the new Member States there are currently only around 4 800 km of motorways and no purpose-built high-speed rail lines; the conventional railway lines are often in poor condition.
- - The EU's transport sector faces growing competition in fast developing world transport markets.
- For a comprehensive view of key statistics on transport see: Transport 2050: 50 facts and figures

COPENHAGEN CONSENSUS CENTER

21. FEB. 2012 KL. 11.23

DTU

Mobilitet og fremkommelighed i hovedstaden

Betænkning 1539 | September 2013

Hovedrapport

Trængsels-
kommissionen

The cost of congestion in the Copenhagen Region:

- 10 billion DKK, 160,000 person hours per day*)
  - approximately 22,000 full-time employees
- +Bus congestion (approximately 2 billion DKK)
- +Travel time variation

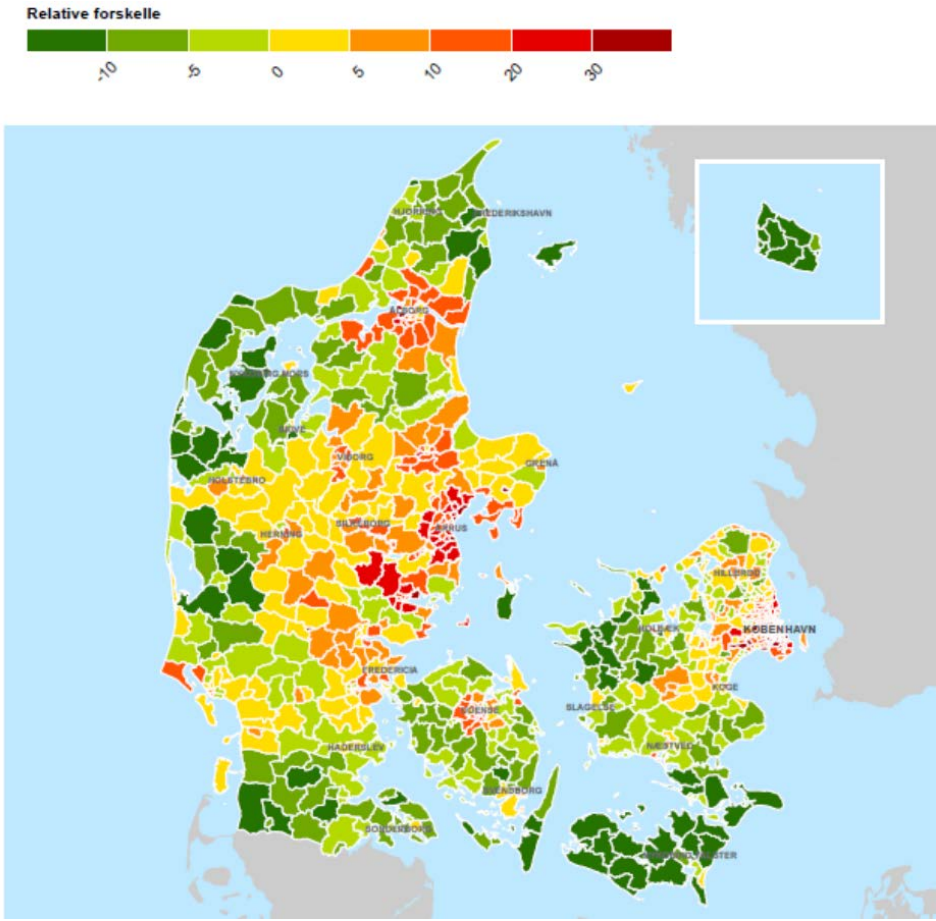
*) AKTA projected with Copenhagen Municipality DTU GPS data, projected OTM matrices + growth in VoT. Projection from 2001 120,000 person hours incl. Derived effects

Forecasted growth in congestion

- Growth in delay time of 98% until 2025
- This could be reduced to a growth of 68% by unrealistically massive infrastructure investments

Recent Demand changes

- Urbanisation
  - Challenges both in urban and rural areas
- Changes in lifestyles, travel behaviour and mobility
- Car ownership
  - Changes due to changed taxation
- Changed goods transport concepts

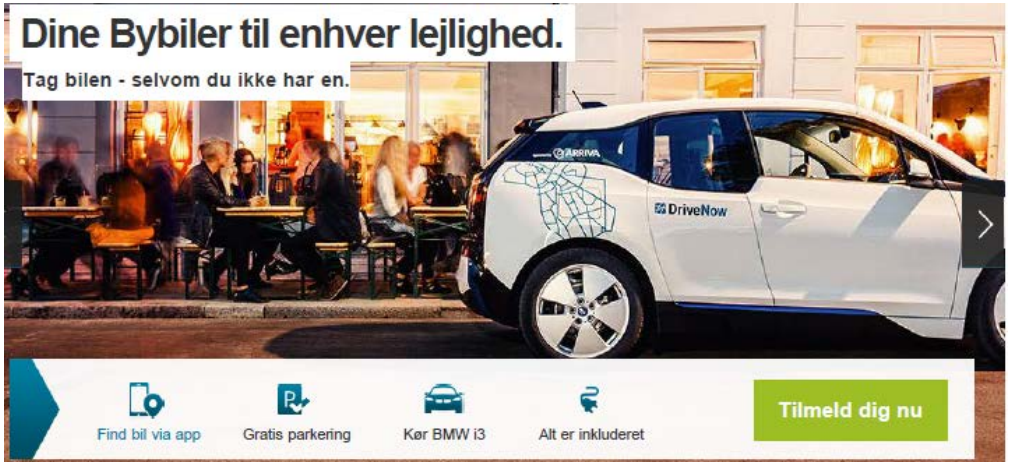


Population forecast in NTM/Statistics of Denmark, 2010-2030

Congestion
– often news in the news,…

Future Demand changes

- Shared economy

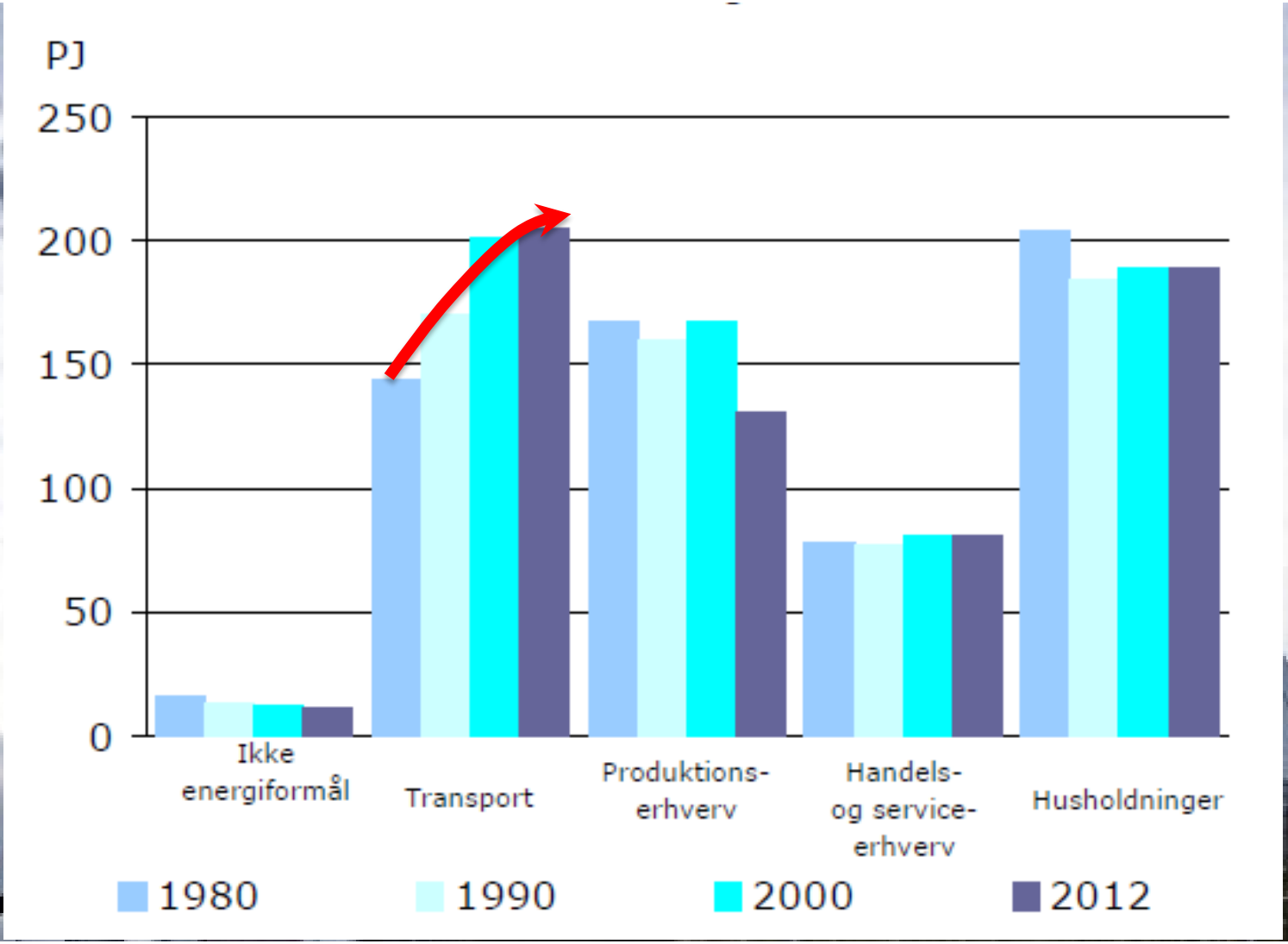


- Automation of transport

Research, innovation and decision support to reduce congestion

- Modelling of transport flows
- Traffic forecasts of policy impacts of measures
- Economics, regulation and economic policies, including pricing
- Opportunities of new technologies, ITS, Traffic Control, Smart Mobility
- Optimisation of the transport system and its operation
- Cross cutting use of register data and new data sources (big-data)

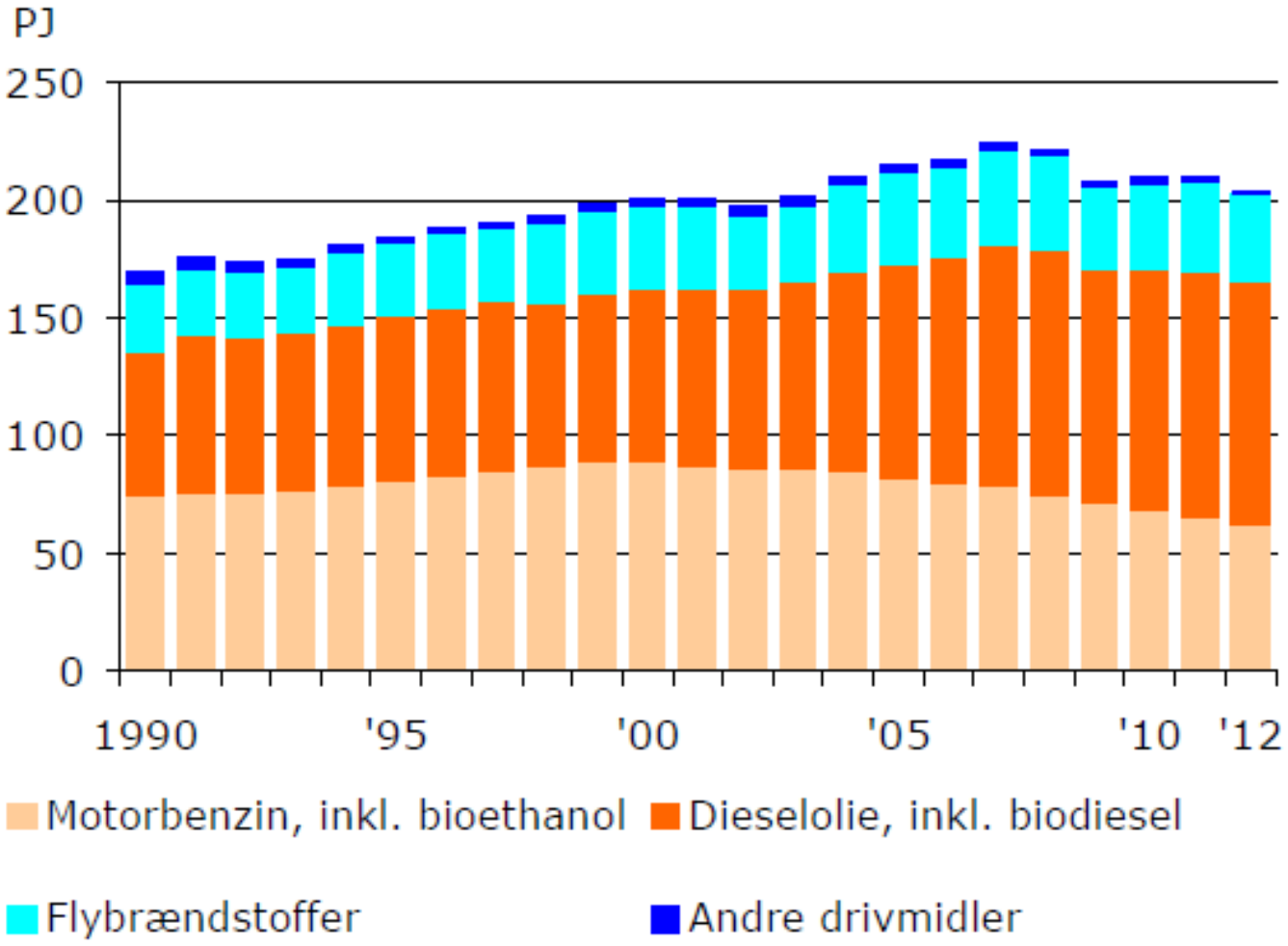
CO2-emmisions, Denmark



Kilde:

http://www.ens.dk/klima-co2/transport/transportens-energiforbrug-co2-emissioner

Danes mainly use fossil fuels for transport



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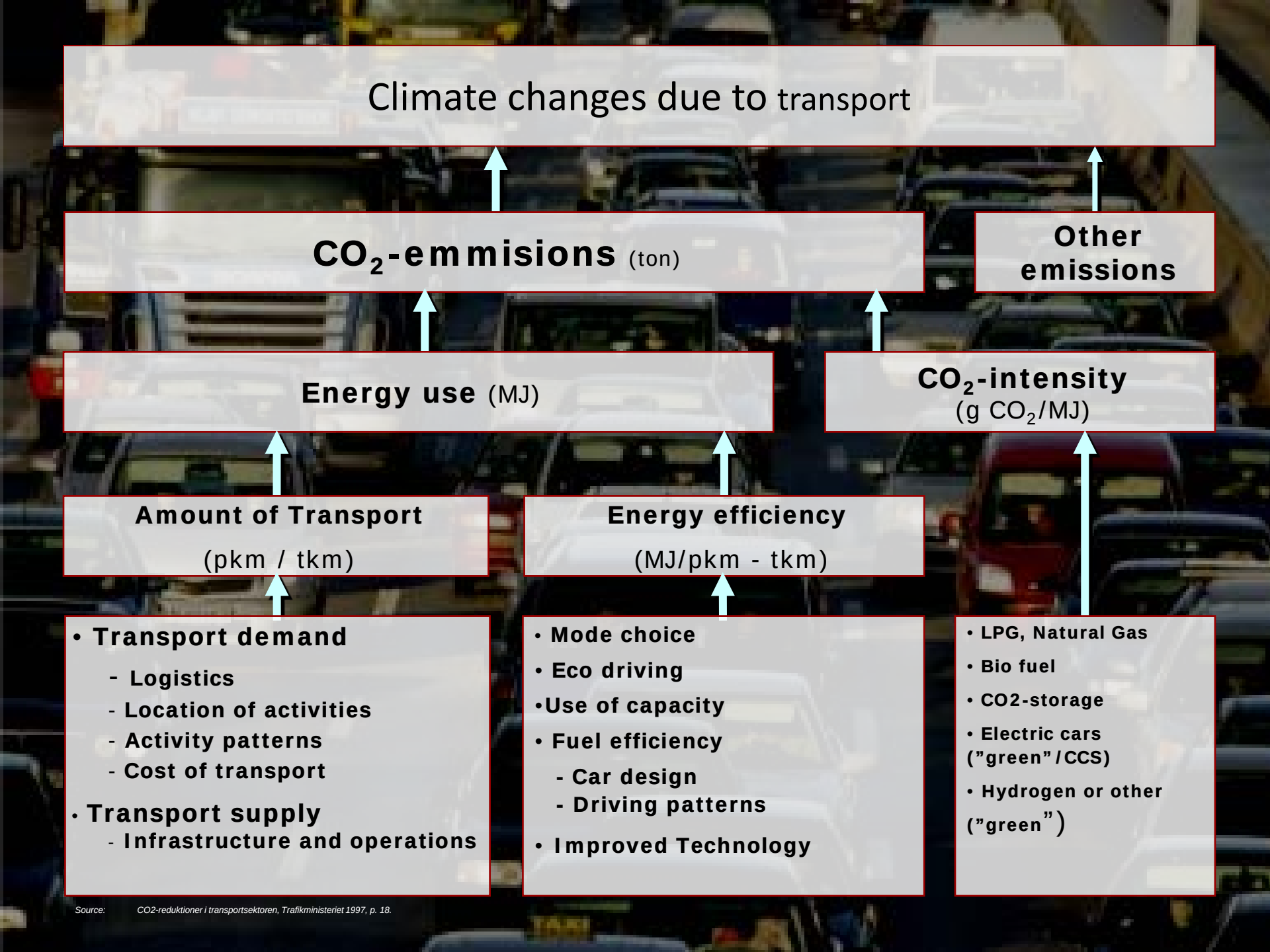
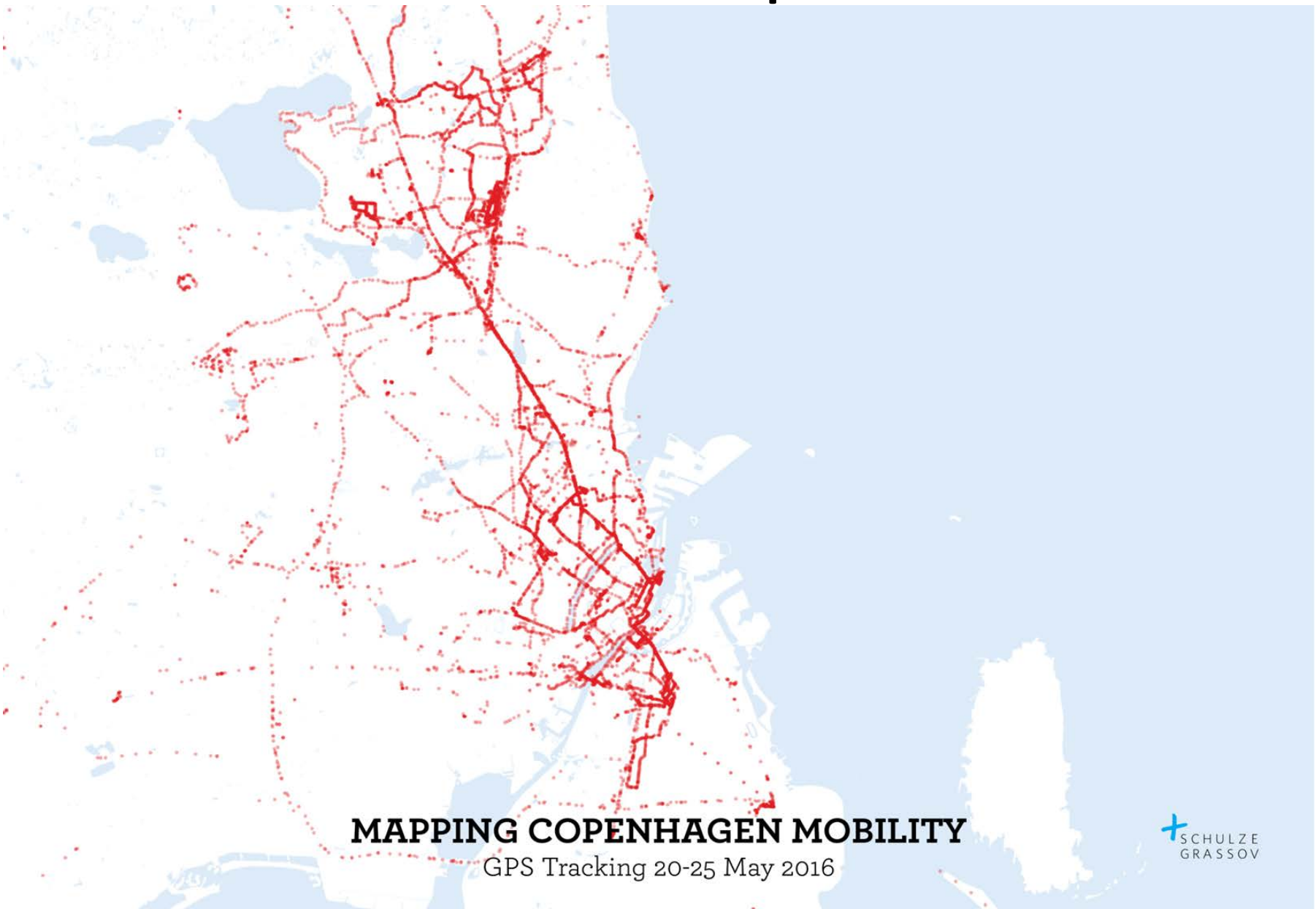
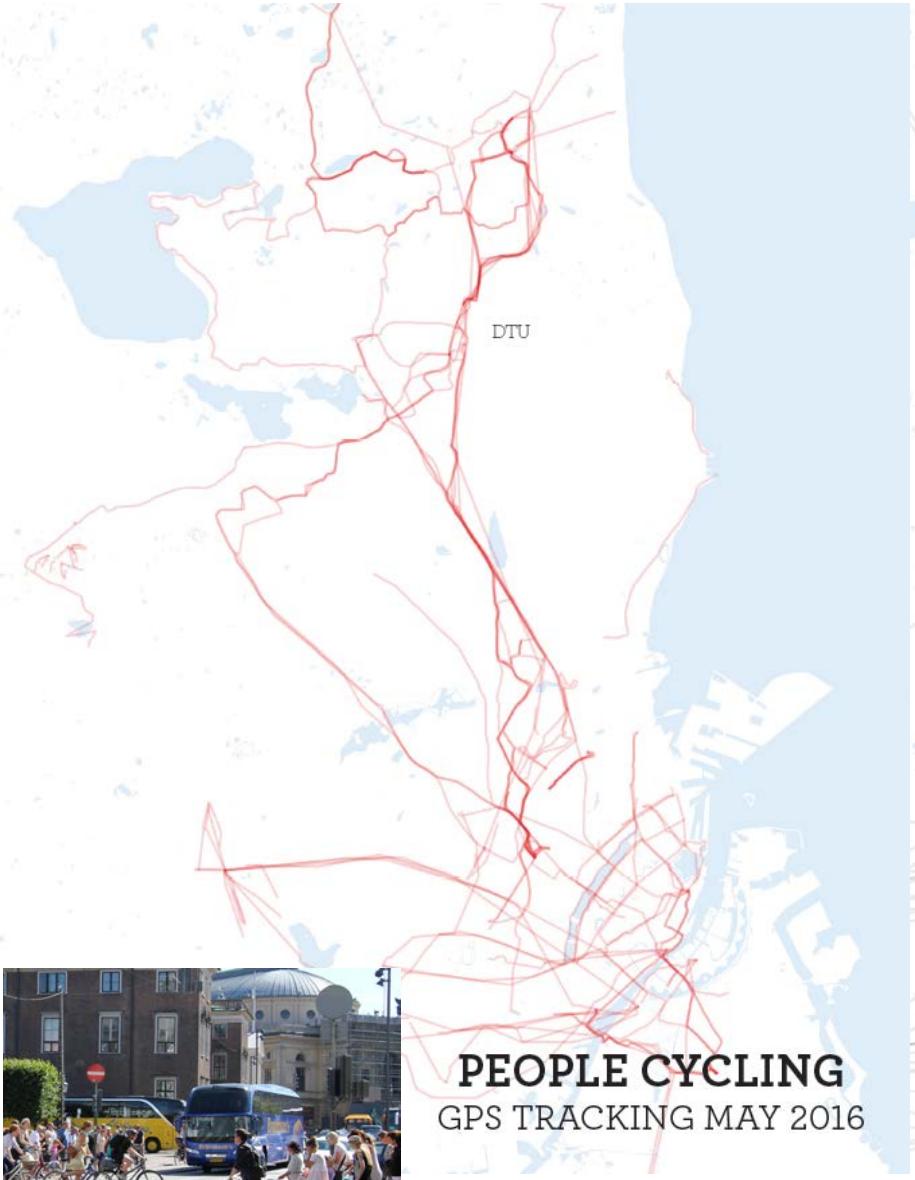


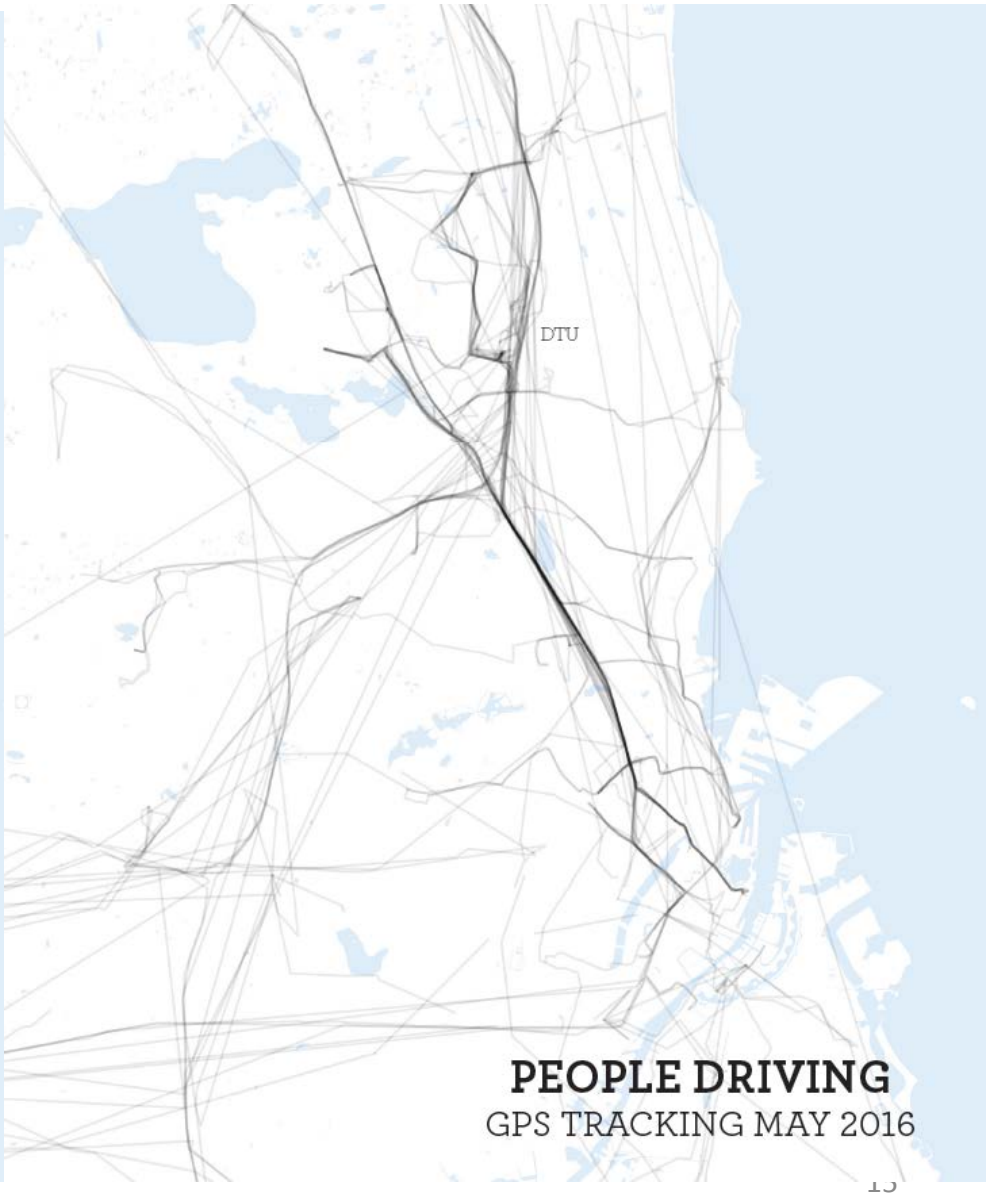
Source: CO2-reduktioner i transportsektoren, Trafikministeriet 1997, p. 18.

Diverse travel patterns

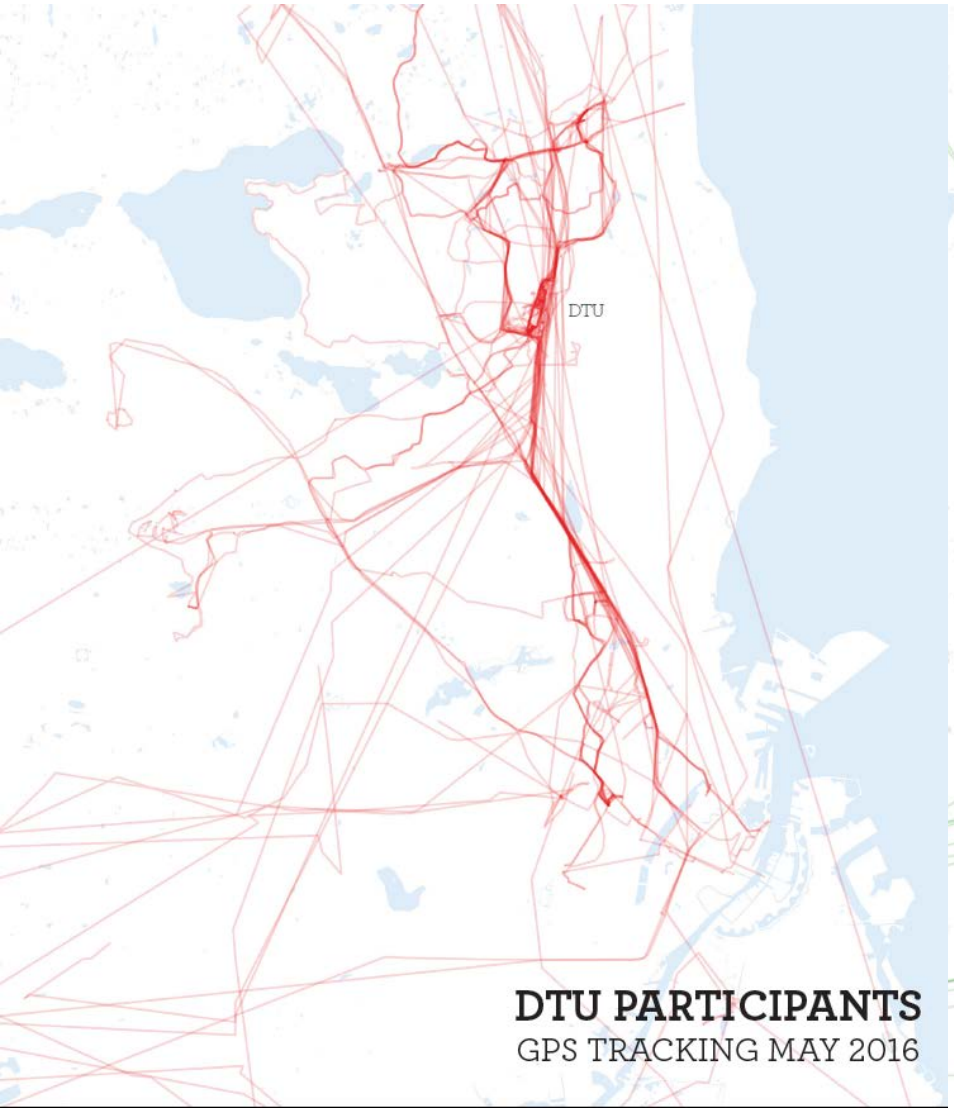


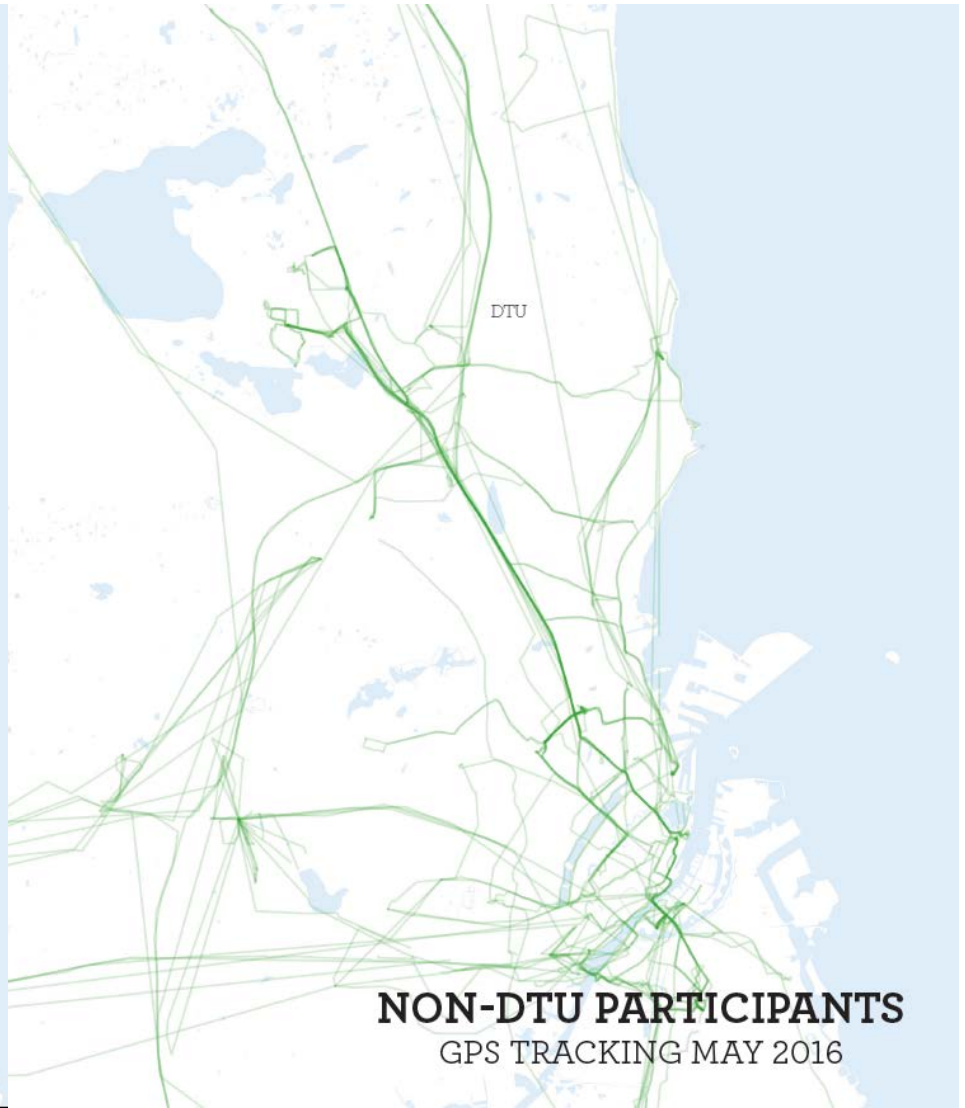
Mode choice


DTU
PEOPLE CYCLING
GPS TRACKING MAY 2016


DTU
PEOPLE DRIVING
GPS TRACKING MAY 2016

Different participants





And quite a lot of walking

See more about the survey in the poster session,…

MobilityPal is a web-based platform developed by Schulze+Grassov to build knowledge about urban mobility behaviour and related individual preferences. MobilityPal draws on a rich set of data sources:

1) Survey-based Data: GPS tracking and ethnological survey questionnaires work with representatives of complex organisations that range from dozens to thousands of survey participants.

2) Big Data Harvesting: MobilityPal establishes site and city profiles by filtering publicly available data sources such as Instagram, Twitter, Four Square, Flicker, and government/open data.

S+G MOBILITYPAL

http://mobilitypal.schulzeplusgrassov.com/

Transport Safety

Killed in Danish Traffic Accidents

https://www.dst.dk/da/Statistik/emner/trafikulykker/faerdselsuheld

Positive news

Antallet af trafikdræbte var rekordlavt i 2015

2015 endte med et historisk lavt antal trafikdræbte ifølge tal fra Vejdirektoratet. »Det viser, at vores arbejde med trafiksikkerhed virker,« lyder det fra transportminister Hans Christian Schmidt.

Af Mathias Skov Johansen 28. jan 2016 kl. 13:30

Med 167 dræbte i trafikken viste 2015 sig som et forholdsvist godt år for trafiksikkerheden. Det viser tal fra Trafikstyrelsen. I april og juli måned var tallet endda under 10.

»Fortsætter den positive udvikling, er der absolut et håb om, at vi kan nå Færdselssikkerheds-kommissionens mål på højst 120 dræbte i trafikken i 2020,« vurderer afdelingsleder for Vejdirektoratets trafiksikkerhedsafdeling Marianne Foldberg Steffensen i en pressemeddelelse fra Vejdirektoratet.

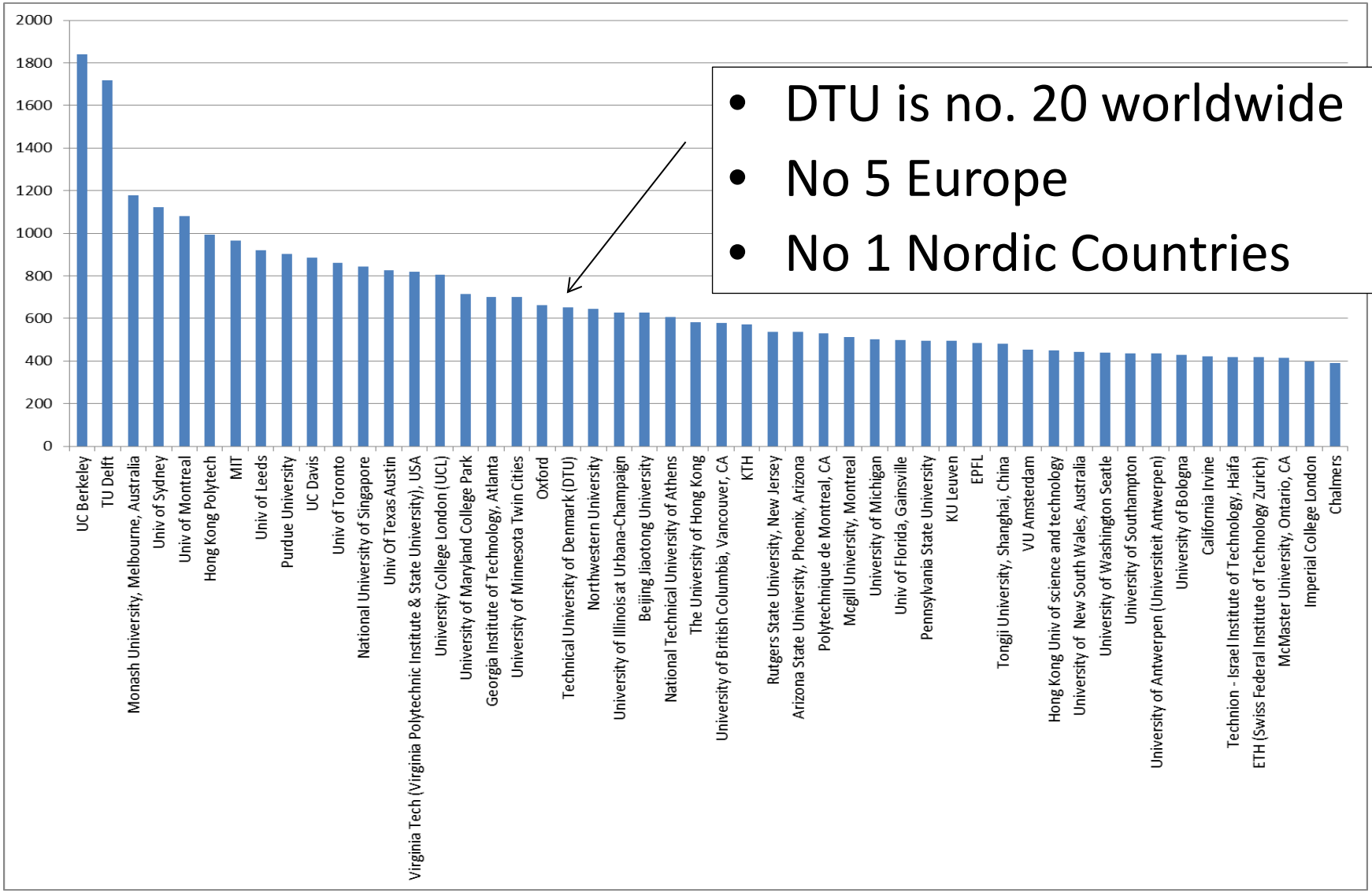
Research, innovation and decision support in traffic safety

- Behaviour and psychology
- Modelling and statistical analyses
- Technology / safer cars
- Automated vehicles
- Road design, control strategies and regulation
- Cross cutting use of register data and new data sources (big-data)

Transport Research Status in Denmark

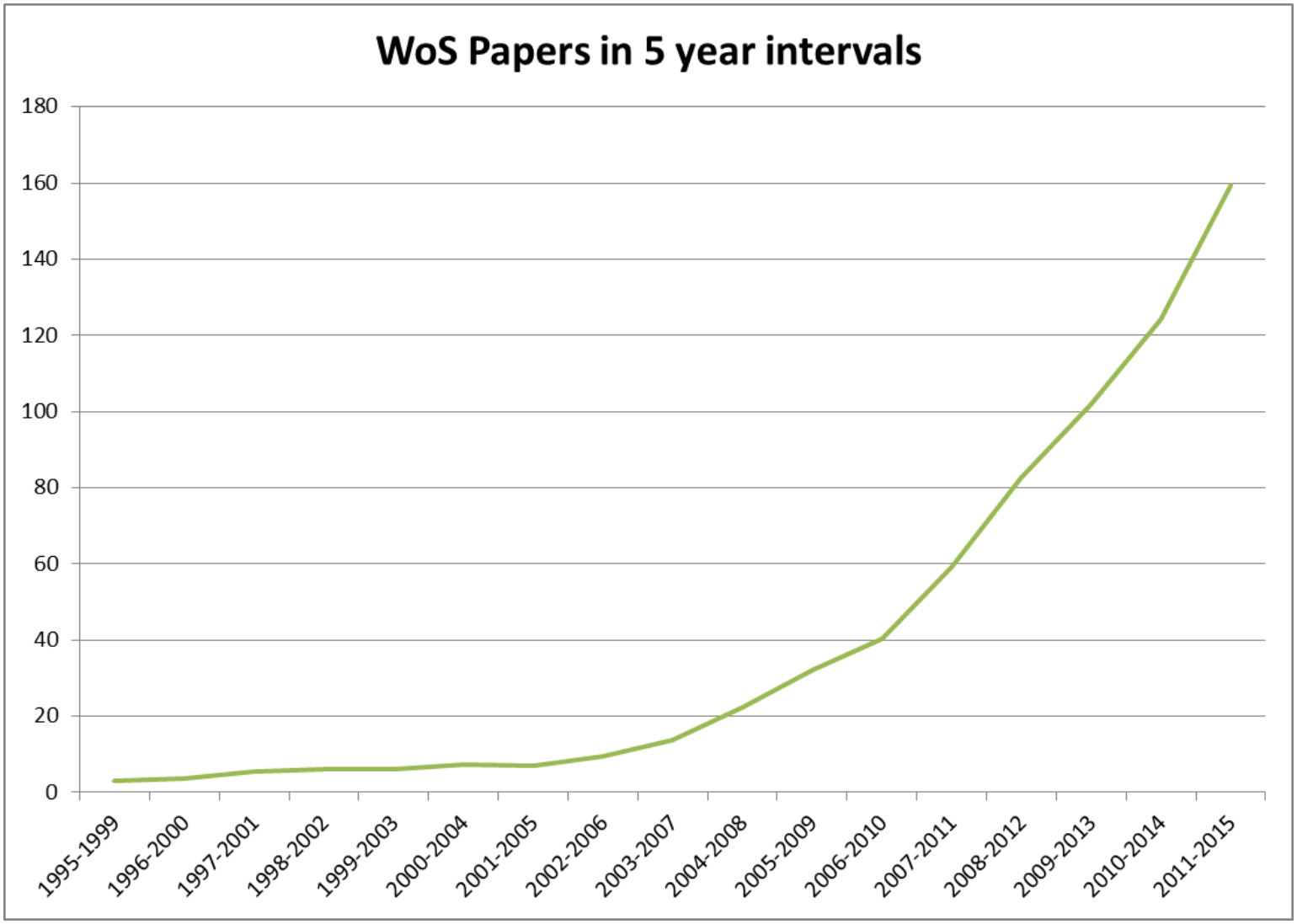
- Is the research prepared to support the sector?

World Ranking Transportation Citations 2010-2014, counted over 2010-2015 (top 50)

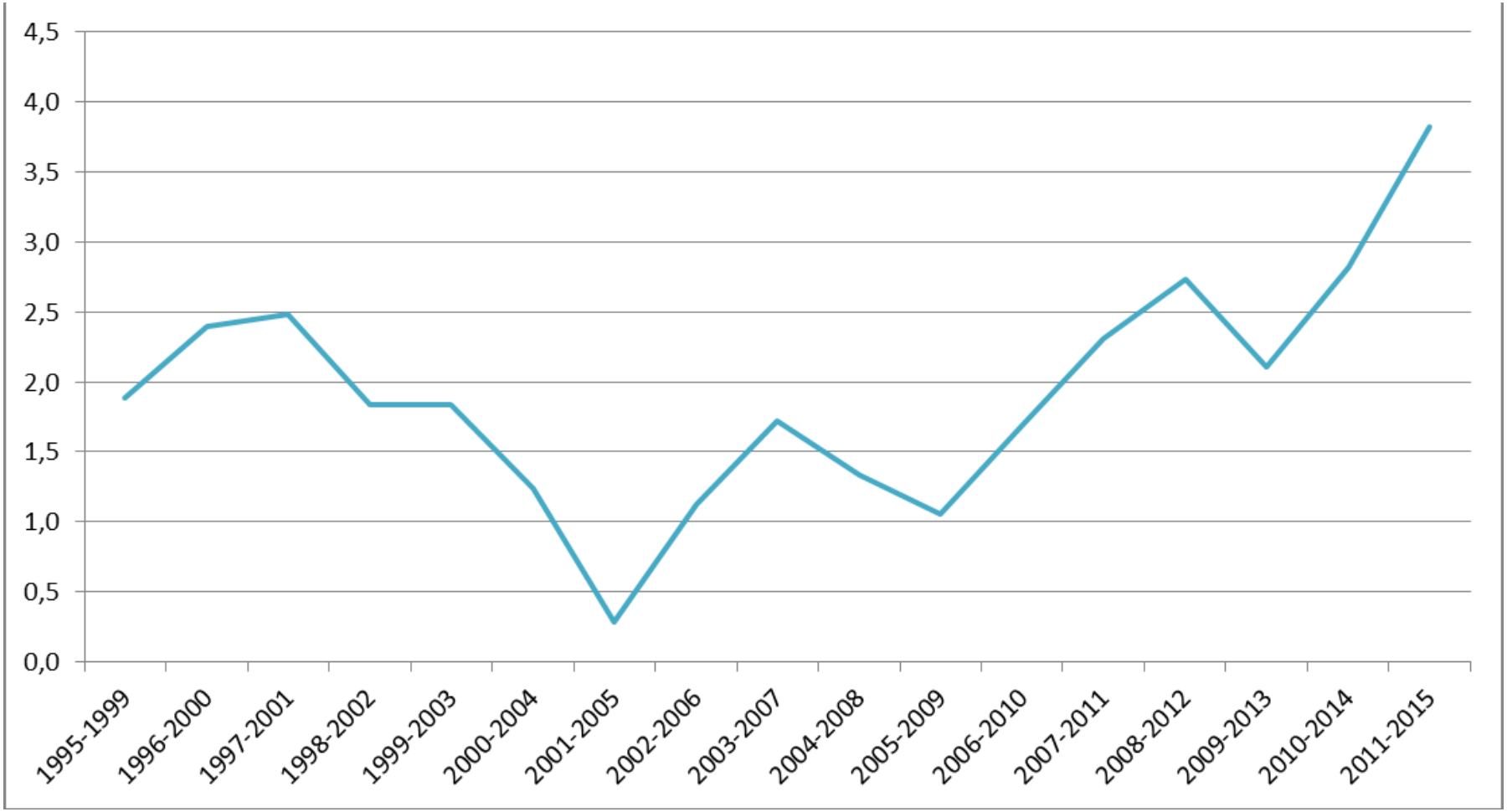


- DTU is no. 20 worldwide
- No 5 Europe
- No 1 Nordic Countries

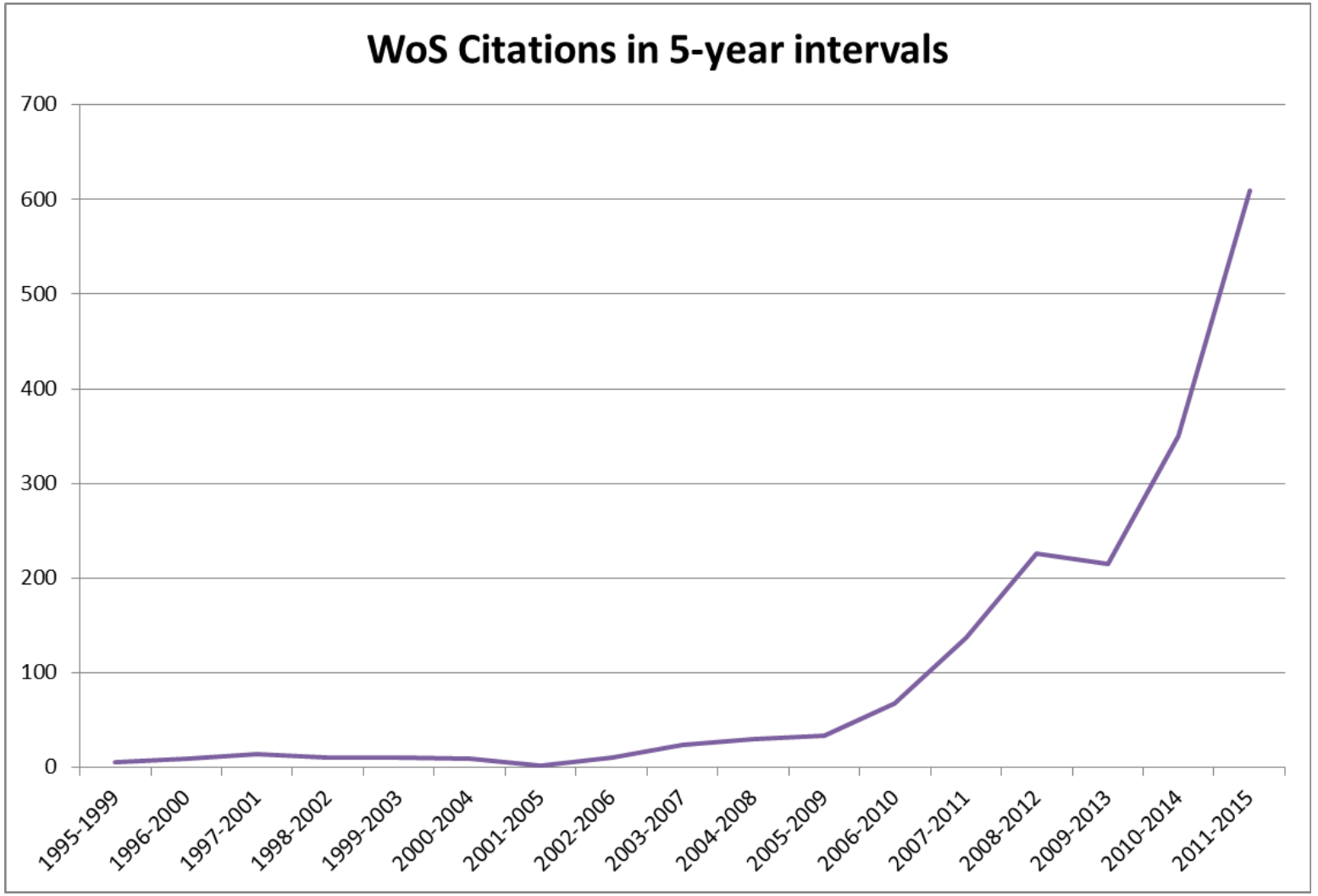
Large growth in transportation papers, DTU



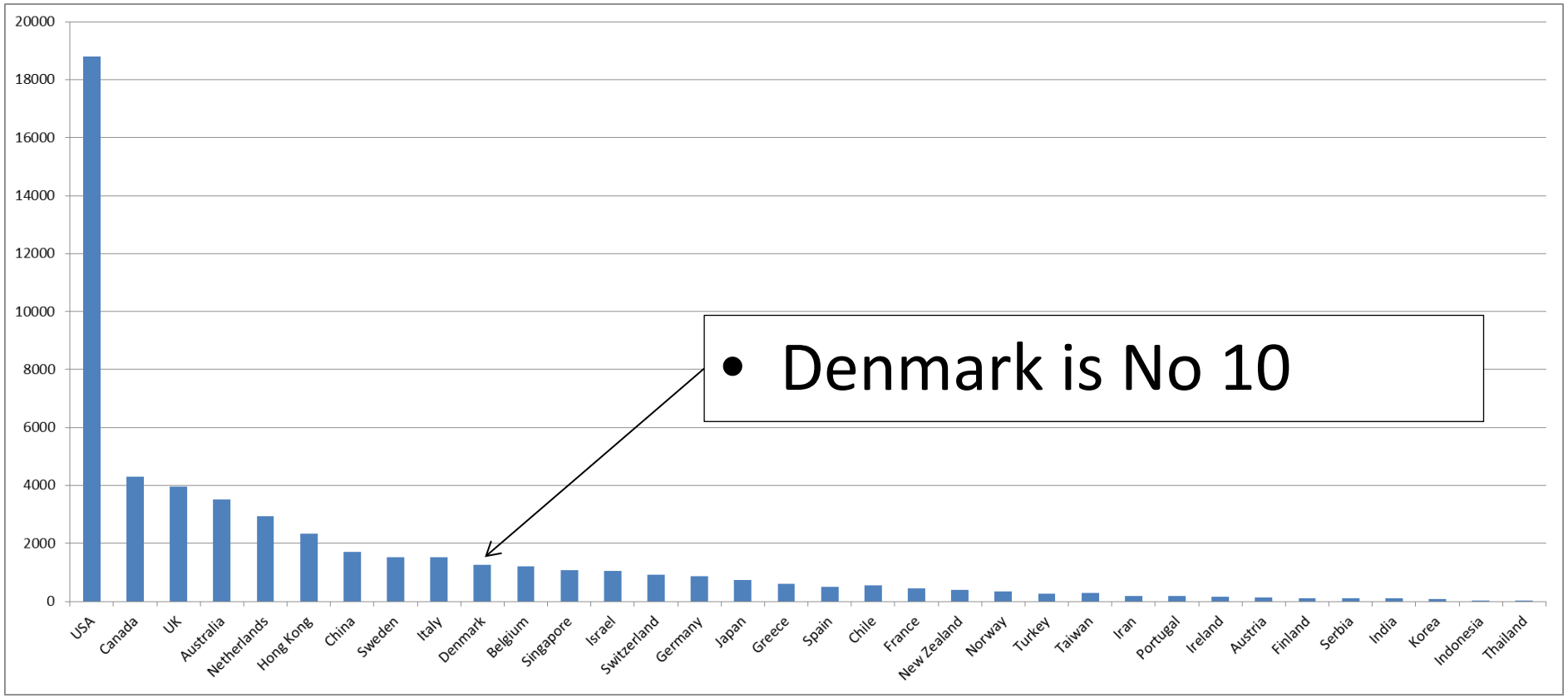
And at the same time growth in citations per transportation paper,…



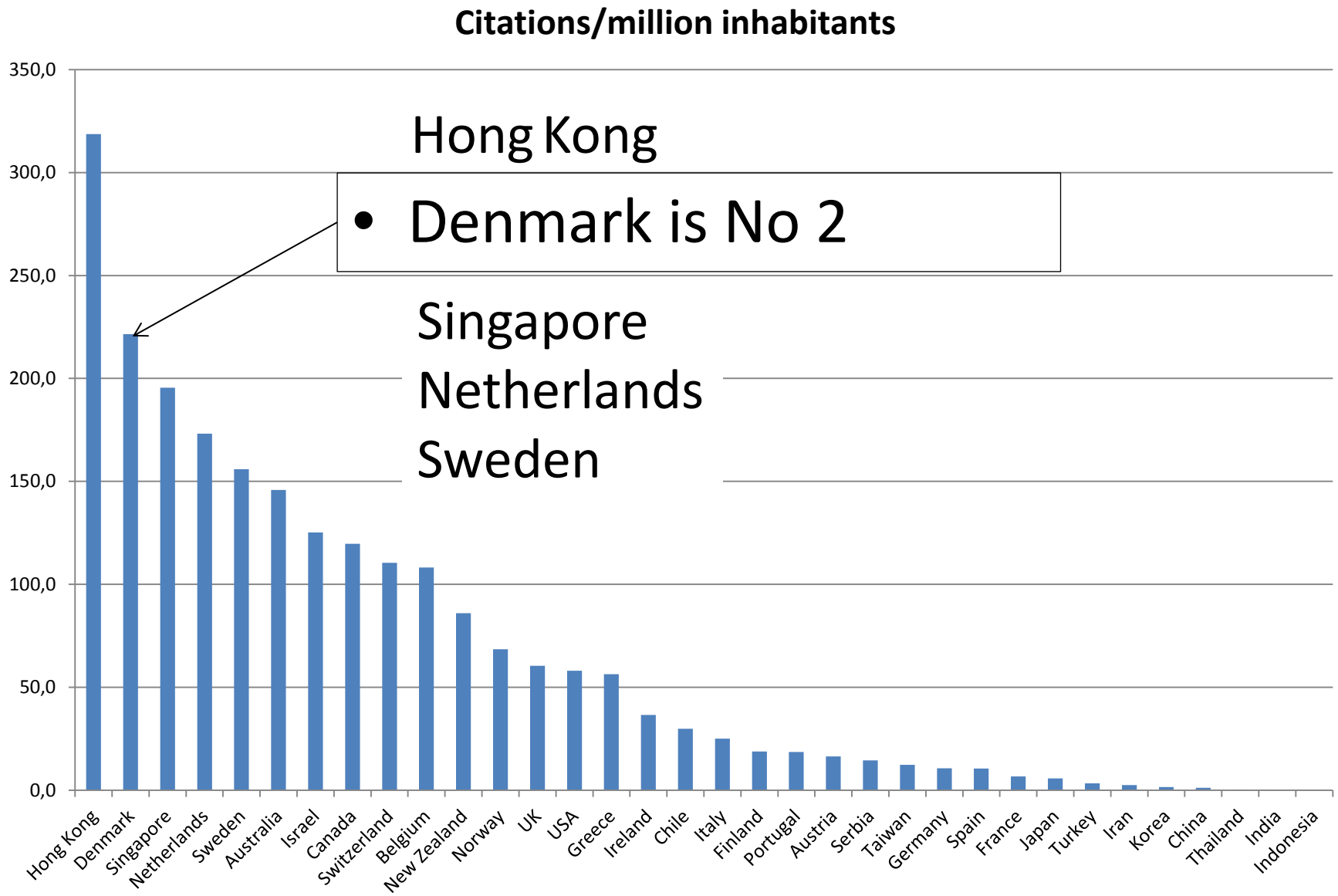
Leads to dramatic growth in transportation citations



WoS transportation citations (2010-2014) per country



Same compared to population



Characterisation of countries with a strong transport research performance

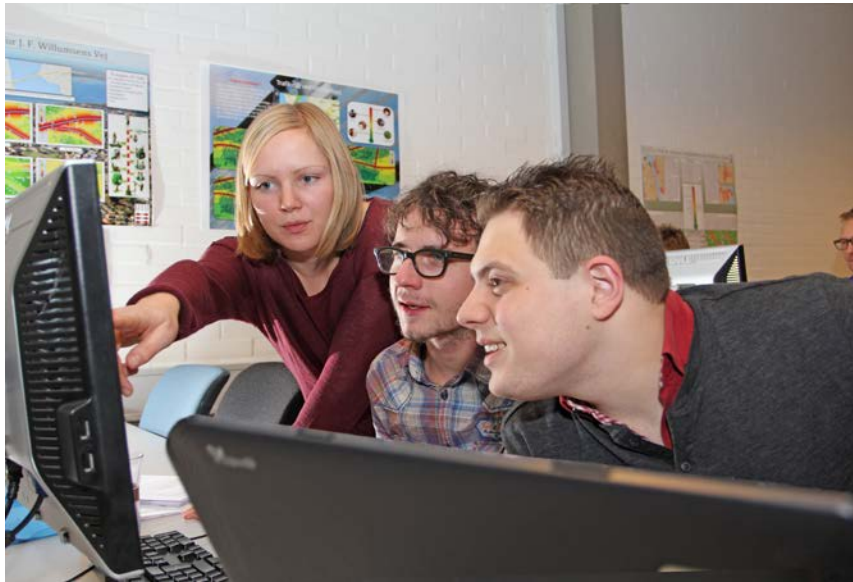
- Strong transport sector
  - Denmark particularly in maritime transport, trucking and haulage contractor business
- Strong transport infrastructure
- Strong ties between research, innovation, public sector and the private sector
- Strong universities and co-operation between universities nationally and internationally

Transport DTU

- Research:
  - Internal and external coordination of cross cutting research activities and large applications
  - Establishing new external contacts and partnerships
- Public sector support
  - Continue and consolidate the existing public sector support
  - Support to new public authorities
- Innovation
  - Promote co-operation with the sector about innovative technologies, solutions and methods
- Does not replace existing direct contacts

What about the education?

- Continues as usual
  - B.Eng. In Traffic and Transport
  - M.Sc. In Transport and Logistics
  - PhD-School
- But new synergies with courses at Management Engineering
- And aim at adding transport cases into other studies



Public Sector Support at DTU

Example of a research project: **IC4-Breake system** (DSB)

Havarikommissionen: Ingen aner, hvorfor IC4-bremserne svigter

Årsagen til den bremsefejl, der fik to IC4-tog til at støde sammen sidste år, er ifølge Havarikommissionen umulig at dokumentere.

Af Adam Fribo 19. jun 2014 kl. 15:51

Det er svært at sige, hvorfor bremserne svigtede på det IC4-tog, der i december sidste år kolliderede med et stillestående tog på Esbjerg Station. Ifølge Havarikommissionen, der har undersøgt hændelsen grundigt, er det faktisk ikke muligt at dokumentere, hvad der ligger til grund for den forringede bremseevne.

»Nej, det kan man ikke dokumentere, og det er også det, vi påpeger i rapporten. Mange har måske deres antagelser, men vi har været inde at tjekke for glatte skinner. Vi har ikke kunnet dokumentere noget unormalt, som ikke skulle være der, og vi har tjekket så godt, som man kan,« siger Bo Haaning, kontorchef i Havarikommissionen.

Public Sector support

DTU COMPUTE
- *Informatics*
- *Mathematics programming*
- *Machine Learning*

DTU ELEKTRO
- *Automation*
- *Error diagnosis*
- *Error tolerance & control*

DTU MEKANIK
- *Mechatronics*
- *Strength and Dynamics of Components*
- *Wheel-Track Interaction*

DTU MANAGEMNT
- *Common Safety Method*
- *Risk Assess-ment*
- *Behaviour*
- *Human Factors*

DTU SYSTEMBIOLOGI
- *Bio-film*
- *Adhesion*

Organisation of Transport DTU

Transport Sector Forum

Transport DTU

Advisory panel

Transport DTU
Otto Anker Nielsen

Innovation
Allan Larsen

Public Sector Support
Jesper Wibrand

The day is planned to show the breadth and depth of the Transport Research at DTU