CLOSER

Nordic HCT Conference 2022

2022-10-11

High Capacity Transport - HCT

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Infrastructure (Trafikverket)

A consolidated regulatory framework (Transportstyrelsen)

Traffic safety (VTI/Safer)

Performance Based Standards (VTI)

International cooperation (Closer)

HCT-program (Closer)

"The program aims to create conditions for introduction of HCT in a designated part of the Swedish road network in describing and developing problem scenarios, development needs, possible solutions and also test and demonstrate these"

Follow up research (KTH)

Access and surveillance (Rise)

Logistics and System effects (Sweco)

Type vehicles (Volvo/ Scania)

Vehicle demonstrators (Skogforsk)

This has happened in Sweden about “dimensions” since the HCT-program started

Year	Weight (ton)	Length (m)
2012	60	25,25
2015	64	25,25
2018	74	25,25
2023(?)	64/74	34,5

Other important steps in Sweden

2013 Roadmap for HCT

2015 Assignment from government about HCT

2018 Introduced PBS (Vehicle regulations for 74 ton)

2019 Updated roadmap for HCT and new assignment from government about 34,5 m vehicles

Program

09.00	**Coffee and registration**
09.30	Introduction, Thomas Asp, CLOSER
09.40	**Future challenges in the freight transport area**, Steve Philips, CEDR
10.00	**Review of 96/53 Weights and dimensions**, Aurora García De Sandoval, European Commission Directorate General for Mobility and Transport
10.20	**Accuracy of weight measurements on heavy vehicles and their impact on bridges**, Heine Töftegaard, Norwegian Road Authority
10.35	**Pause**
10.50	**What is happening within HCT in each Nordic country**, Elin Norby, Norwegian Road Authority, Martin Frimann Mortensen, Danish Road Directorate, Vesa Männistö, Finnish Transport Infrastructure Agency & Kenneth Natanaelsson, Swedish Road Authority
11.50	**Lunch**

Program

12.50	**Learnings from Netherlands about loads and overloading**, Marcel Otto, Ministry of Infrastructure and Water Management
13.00	**Session 1 - HCT-transports in cities**
	HCT-city project in Sweden - an overview, Fredrik Cederstav, RISE
	HCT and the benefits for Stockholm, Amanda Baumgartner, City of Stockholm
	Results from demo of HCT Construction transport in Stockholm, Martin Svedin, M Logistics
	Learnings from Finland, Otto Lahti Finnish Transport and Communications Agency
	Learnings from Denmark, Martin Frimann Mortensen Danish Road Directorate
	Questions and summary of Session 1, Ulf Ceder, Scania
14.10	**Coffee**

Program

12.50	**Session 1 - HCT-transports in cities**
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14.10	**Coffee**

Program

14.10	**Coffee**
14.30	**Session 2 - How we can use Batteries, Electric roads (ERS) and Hydrogen for HCT-vehicles**
	Overview - Batteries, Electric roads and Hydrogen for HCT-vehicles, Anders Grauers, Chalmers
	ERS-development in Sweden, Kenneth Natanaelsson, Swedish Road Authority
	ERS-development in Denmark, Bo Ekman Danish Road Directorate
	Scanias electrified HCT-vehicles, Anna Pernestål, Scania
	Questions and summary of Session 2, Lena Larsson, Volvo Trucks
15.30	**Conference ends**, Thomas Asp, CLOSER

Future challenges in the freight transport area
Steve Phillips, CEDR

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CEDR
Conférence Européenne des Directeurs des Routes
Conference of European Directors of Roads

Future challenges in the freight transport area

Steve Phillips
Secretary-General
Conference of European Directors of Roads (CEDR)
Brussels

GOALS OF CEDR FOR THE ROAD AUTHORITIES

- Help NRAs to keep ahead of the curve, anticipate future trends and prepare them to face new challenges,
- Reinforce NRAs role as key providers of efficient and seamless mobility from an end user perspective within the transport system,
- Facilitate and optimise the efficient use of resources, making the best use of existing infrastructures,
- Improve the safety and sustainability of roads, and reduce their environmental impact and carbon footprint.

CEDR
Conférence Européenne des Directeurs des Routes
Conference of European Directors of Roads

EU Sustainable & Smart Mobility Strategy (SSMS)

greenhouse gas emissions in transport by 2050

European Commission

Reducing its dependence on fossil fuels

By 2030, there will be at least 30 million zero-emissions cars and 80 000 zero-emission lorries in operation.

By 2030, there will be at least 100 climate-neutral cities in Europe. Scheduled collective travel under 500 km should be carbon neutral **by 2030** within the EU.

Zero-emission large aircraft will become ready for market **by 2035**.

Making alternative choices available

All large and medium-sized cities put in place their own sustainable urban mobility plans **by 2030**.

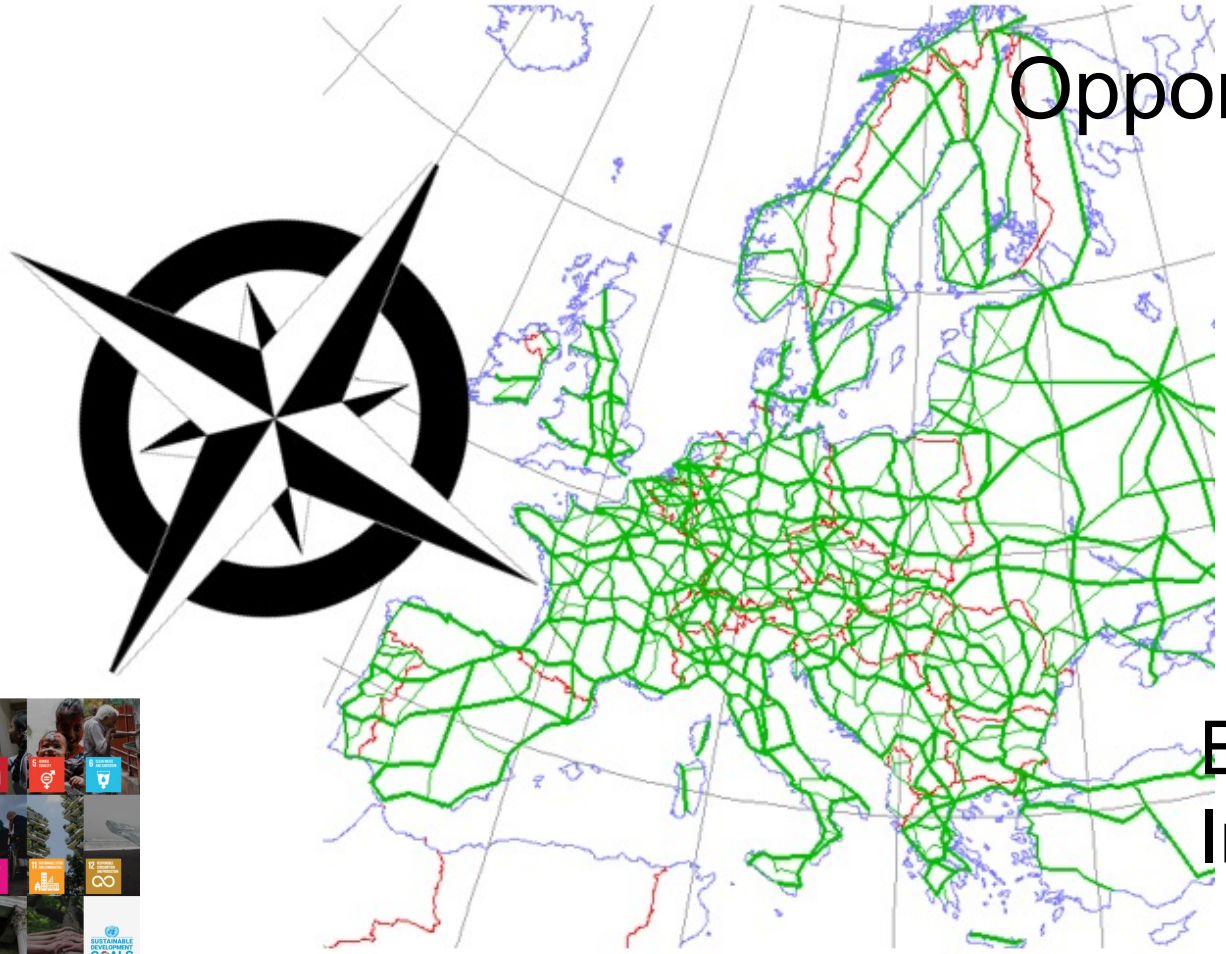
Traffic on high-speed rail will double **by 2030**. **By 2050** rail freight traffic will double.

Transport by inland waterways and short sea shipping will increase by 25% **by 2030**.

Pricing to reflect environmental impact

The internalisation of external costs of transport at the latest **by 2050** will ensure that those who use transport will bear the full costs rather than leaving others in our society to meet them.

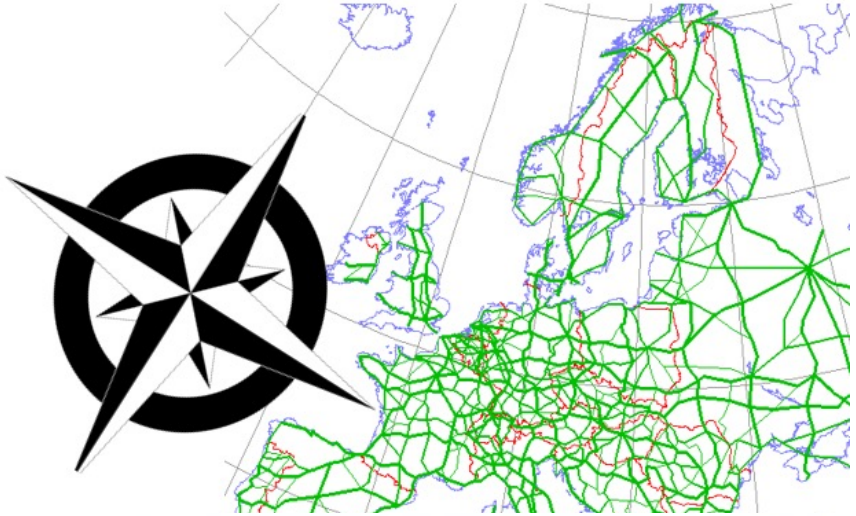
‘COMPASS’ FOR SUSTAINABLE PAN-EUROPEAN ROAD NETWORK



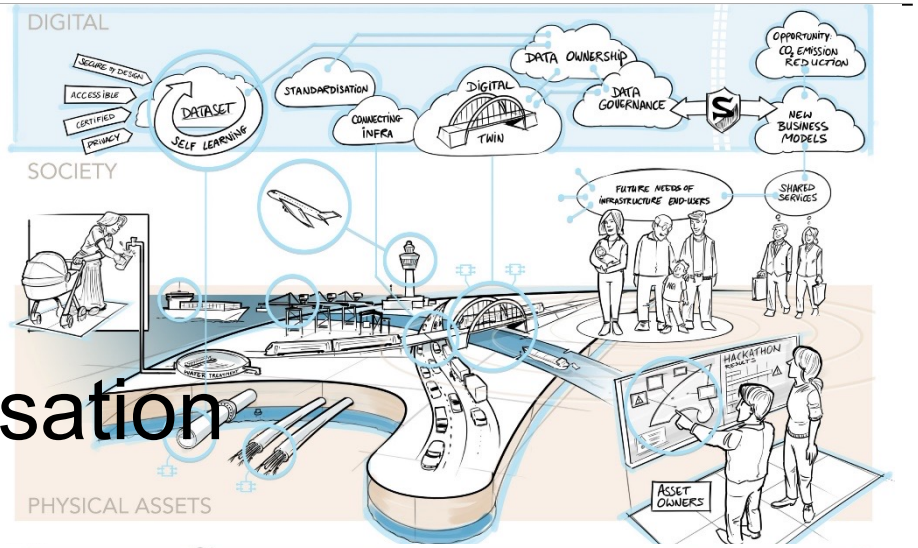
Opportunity to align the activities of the CEDR NRAs

Reduce duplication
Improve efficiency
Strengthen stakeholder engagement
Better inform EU developments
Improve deployment of findings

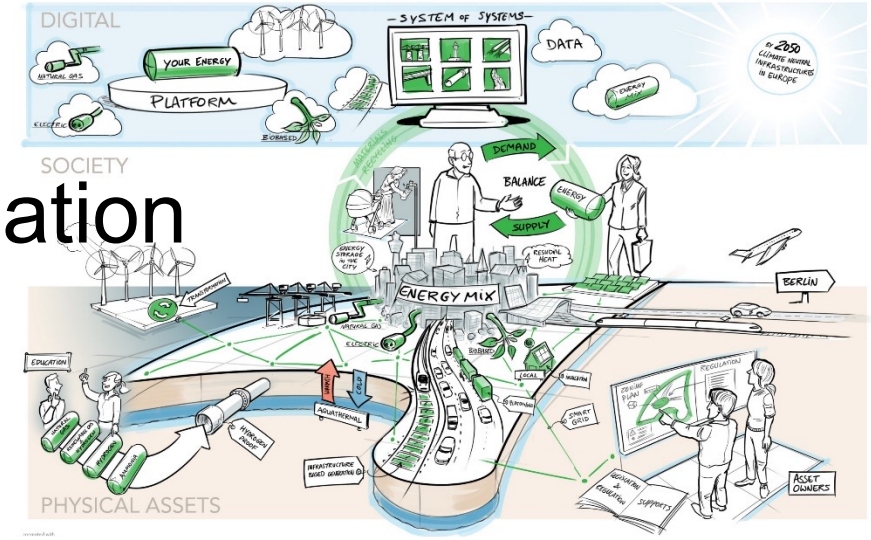
‘COMPASS’ FOR SUSTAINABLE PAN-EUROPEAN ROAD NETWORK



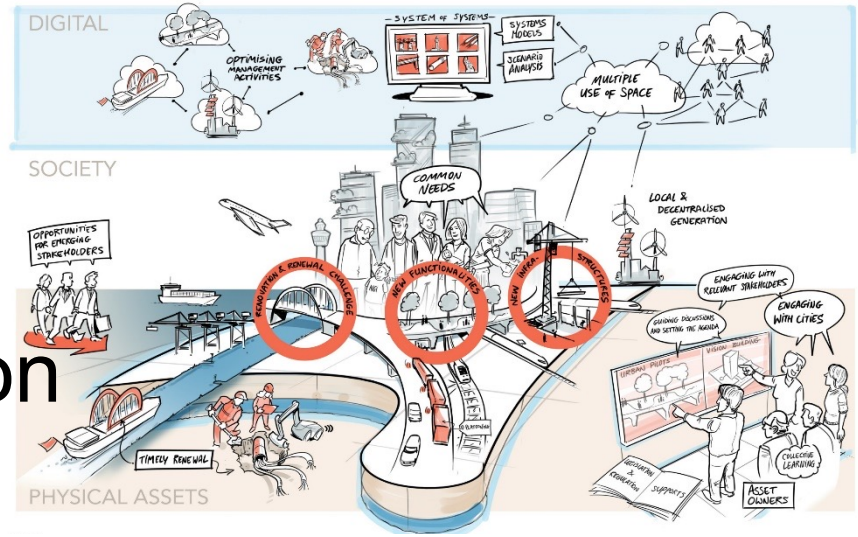
Digitalisation



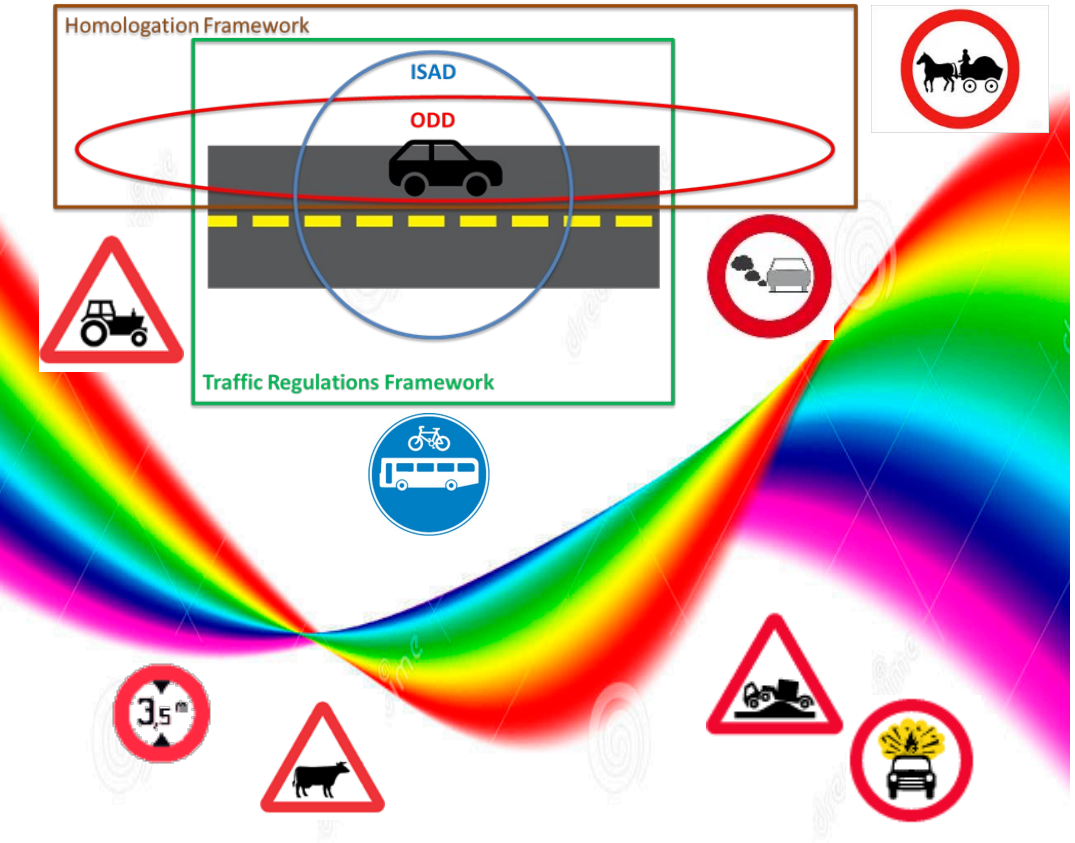
Urbanisation



Energy transition



SPECTRUM OF VEHICLE ACCESS PRACTISES



- Level X Automated passenger car, bus and truck
- Zero and low emission vehicles
- Truck weights and dimensions
  - EMS, HCV (eg 25m+)
- Platooning trucks
- Low noise vehicles
- Winter truck restrictions
- Dangerous goods
- Oversized and abnormal loads
- Animal transport

Digitalisation of <u>infrastructure</u> is the basis for all and the foundations of being an effective NRA

Conférence Européenne des Directeurs des Routes

Conference of European Directors of Roads

TRA OBJECTIVES FOR CEDR

I. COMMON STRATEGIC STAKEHOLDER ENGAGEMENT

II. COMMON INNOVATION DEVELOPMENT ACTIONS

III. COMMON TECHNICAL SPECIFICATIONS AND PROCEDURES

IV. COMMON SUPPORT FOR INNOVATION DEPLOYMENT

V. COMMON PROFESSIONAL COMPETENCE DEVELOPMENT

TRA Lisbon
14-17 Nov 2022

CONCLUSIONS

- Sustainability is increasingly core to all activities – safety, greening and efficiency.
- Digital transition, energy transition and ‘urbanisation’ are three very interconnected elements
  - But the policy drivers for these are not sufficiently connected
- Strengthening stakeholder engagement is important
  - CEDR Priority for 2023 is logistics….

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Review of 96/53 Weights and dimension
Aurora Garcia De Sandoval, European Commission
Directorat General for Mobility and Transport

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Revision of the Weights and Dimensions Directive

- Council Directive 96/53/EC -

Nordic HCT Conference 2022

DG MOVE, European Commission

Policy objectives

- European Green Deal calls for a **90% reduction in greenhouse gas emissions from transport by 2050**
  - Need to assess the legislative options to boost the production and supply of sustainable alternative fuels for the different transport modes.
- The Commission adopted a Sustainable and Smart Mobility Strategy in December 2020.
  - Sets ambitious milestones for 2030 and 2050 that are needed to reach the EGD goals
  - Calls for making all transport modes more sustainable
  - Stresses the need for an irreversible shift to **ZE mobility** and to revamp **intermodal transport**

Initiatives

- **What it means:**
  - Accelerate the uptake of ZE HDV
  - Fill the gaps and colaborate with more sustainable modes
- **Greening Freight Package (Q1 2023)**
  - Weights and Dimensions directive
  - Combined Transport directive
  - Train Drivers Directive
  - CountEmissions EU
  - Rail Freight Corridor Regulation

Main challenges of the W&D directive

- **Road safety**
- **Infrastructure damage/investments**
- **Current low loading factor of standard HDV**
- **Modal shift vs cooperation**

Need for an adequate legal framework

Evaluation and IA of the W&D directive

Possible levels of ambition to explore

1. **To adapt the W&D standards to the needs of ZEV, improved aerodynamics and intermodal transport**
2. **To harmonise W&D rules for international transport** (incl. abnormal indivisible loads and vehicle carriers)
3. **To create the conditions for a better business case for ZEV** (and better aerodynamics).

Horizontal objectives: To ensure road safety, protection of the infrastructure, the right modal share and an overall reduction of GHG emissions from transport.

CONCLUSIONS

- **Accelerate the uptake of ZE HDV**
- **Modal cooperation:**
  - ✓**Dialogue with railway sector**
  - ✓**Solid evidence** to clearly and undoubtedly identify the **niche for road transport**, i.e.:
    - The areas where increased loading capacity of road transport will revert in a reduction of less efficient trucks
    - The areas/circumstance under which it can complement (and not compete with) more sustainable modes. Trials and experience with HCV are particularly valuable

European Commission

Thank you

European Commission

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Accuracy of weight measurements on heavy vehicles and their impact on bridges

Heine Töftegaard, Norwegian Road Authority

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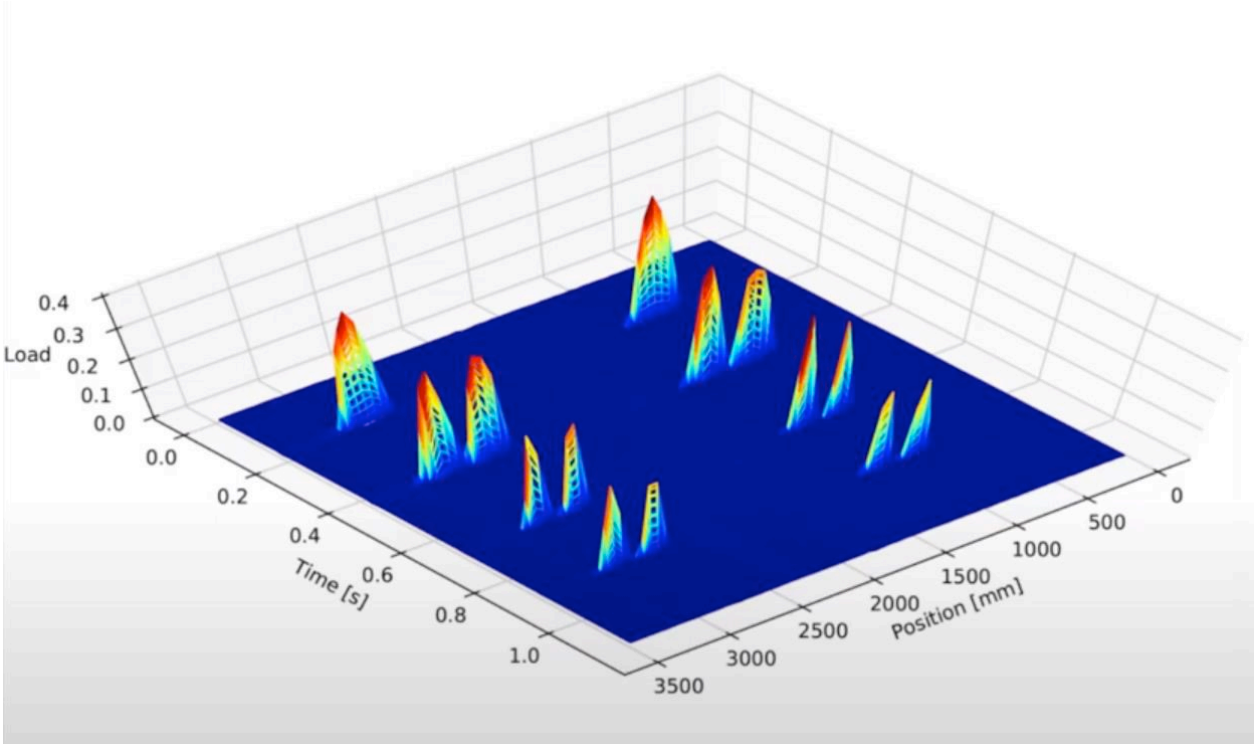
Norwegian Public Roads Administration

Accuracy of weight measurements on heavy vehicles and their impact on bridges



WIM used for controlling heavy vehicles

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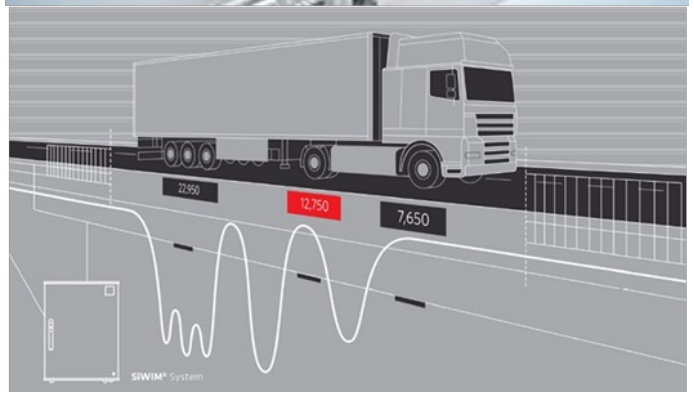
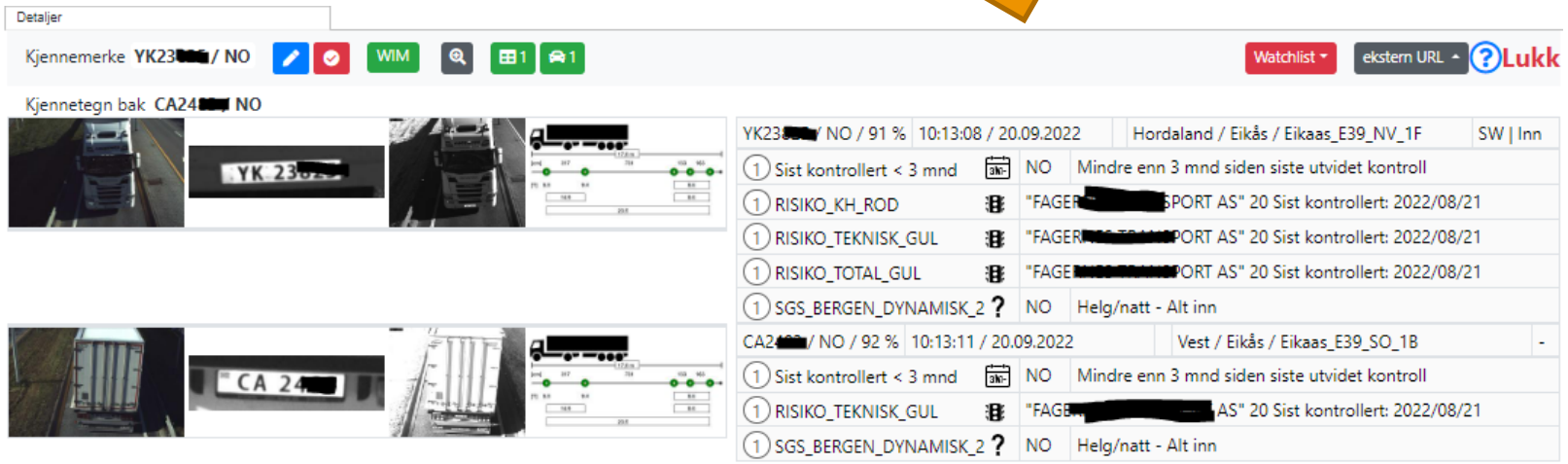
Norwegian Public Roads Administration

Type of sensors for pre-selecting vehicles for control:





Wim result with classifications and rules:

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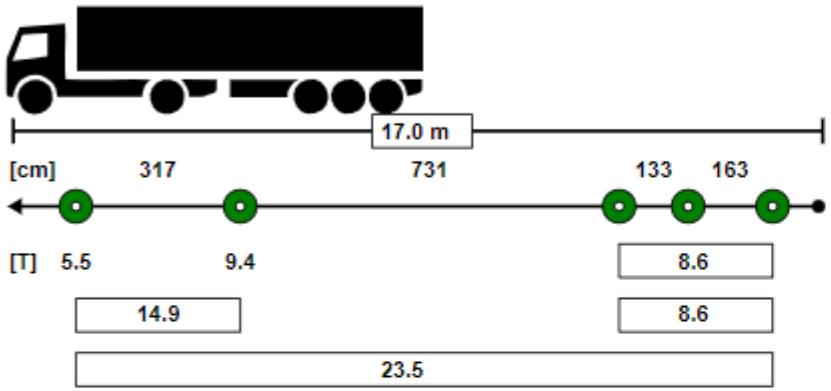
Friendly	Axle Count	Speed[kph]	Max. Weight[kg]
H11S3 - Trekkbil 2 Semitrailer 3	5	47	43000



WIM detaljer

Result WIM	Unit	% Max.	Measured	Min.	Max.	
Foraksel [Foraksel]	kg	60.9	5481.0	0.0	9000.0	
Drivaksel [Drivaksel]	kg	82.0	9429.0	0.0	11500.0	
Totalvekt Motorvogn [TotalvektMotorvogn]	kg	35.8	8599.5	0.0	24000.0	
Totalvekt Henger [TotalvektHenger]	kg	78.5	14910.0	0.0	19000.0	
Totalvekt Vogntog [TotalvektVogntog]	kg	54.7	23509.5	0.0	43000.0	
1.5 regel [1.5regel]	kg	38.5	0.6	0.0	1.5	
Vogntoglengde [Vogntoglengde]	cm	91.7	1696.0	0.0	1850.0	
Totalvekt Vogntog [TotalvektVogntog]	kg	54.7	23509.5	0.0	43000.0	

Axle number	Separation	Weight	Left Weight	Right Weight	Type	Has Issues?
Front Overhang	150					
1	0	5481	2940	2541		False
2	317	9429	5040	4389		False
3	731	2908.5	1522.5	1386		False
4	133	2961	1554	1407		False
5	163	2730	1732.5	997.5		False
End Overhang	202					

Experience using WIM:

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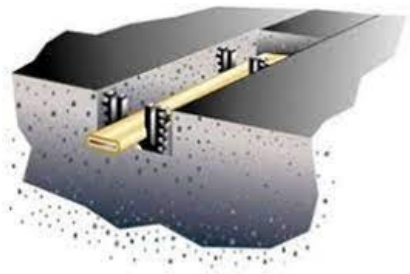
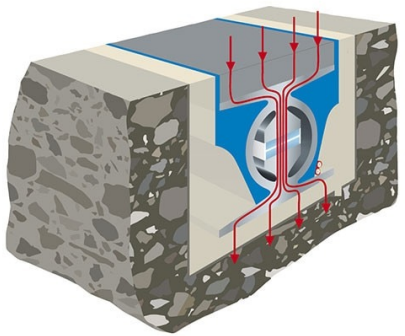
- Two types of technologies in use:
  - Piezo Polymer 20 lanes +/-15% accuracy
    - More flexible to be installed in roads with wear
    - Accuracy varies with temperature
    - Less cost
  - Piezo Quarts 8 lanes +/- 5 % accuracy
    - Surface needs to be flat, no wear.
    - Expensive
    - Stable





- Suppliers IRD, Kistler and Q-Free
  - Same sensors
  - Different controllers
  - Different software
  - Different calibration approach
  - Different method for auto calibrate.
  - Different data output to back office.

How do we maintain accuracy?

The biggest “pain” with weight in motion is to keep it calibrated.

To use WIM as preselection tool, we need an accuracy as close as possible to zero. We don’t have direct enforcement of overweight, so we accept +/- 5 % (2 500 kg variance on a heavy vehicle) and look at the measurement as an indication.

We have different approaches to keep the WIM accurate:

1. Calibration with a known vehicle (passes over WIM 12 -20 times).
   - Expensive and time consuming.
   - Good accuracy when done for both technologies (+/- 3%)
2. Using traffic with a specific axle combination at control station and calibrate by static measurements (compared to WIM).
   - Time consuming and needs good coordination's between systems and people.
   - OK accuracy, done correctly with 7 -15 vehicles (+/- 5%)
3. Linear adjustment of axle weights (%) using the Backoffice system Metabof.
   - If we can identify that the axle weights are consistently + 10%, we can set a value in the Metabof that corrects all weights.
   - Using 3 – 10 vehicles in ac Excel sheet to calculate the average we get a good accuracy

Wishlist future WIM solutions

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Norwegian Public Roads

- Calibration solutions:
  - Possibility to automatically use static weights from traffic to calibrate
  - Ideal solution to auto-calibrate
  - Reduce the need for calibration on an annual basis

- Tire pressure measurement with detection of type of tire (single, super single and twin)

- Accuracy of +/- 5% or less

- Ability to detect line change over sensors.

- Combining WIM technology with other sensors like
  - Thermographic scan of wheel hub (cold and warm)
  - Width of vehicle
  - Tire tread depth

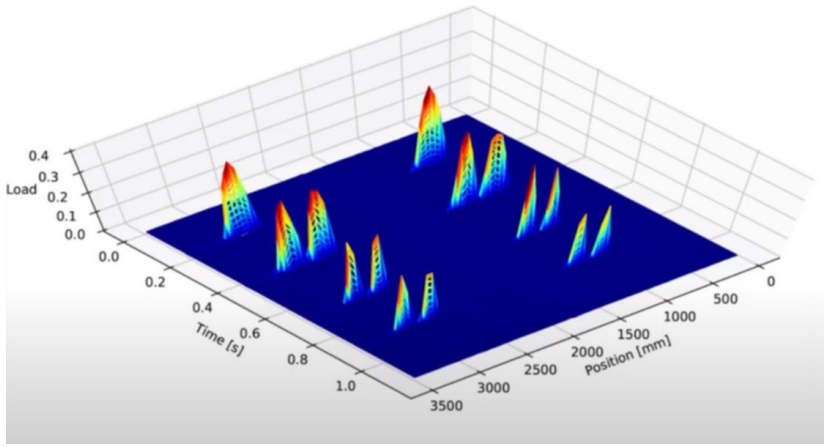
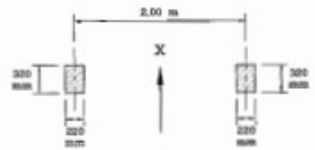
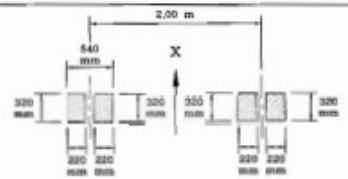
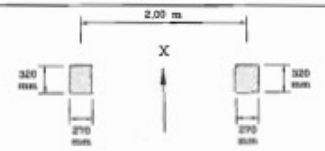


Table 4.8 - Definition of wheels and axles

WHEEL/ AXLE TYPE	GEOMETRICAL DEFINITION
A	
B	
C	

Important for the NPRA when installing WIM:

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- Type of asphalt pavement and substructure:
  - The best quality = stable readings and long life
- Curvature roadway, strait road
- Traffic: rolling, no speed changes or traffic jams.
- Good cooperation with the operating contractor for road and equipment maintenance.

NTNU | Kunnskap for en bedre verden

Using data from speed enforcement systems (ATK) in order to determine spread of gross vehicle weight (GVW)

Master thesis by Tor Andreas Blom Solheim

The Norwegian Speed Enforcement System (ATK)

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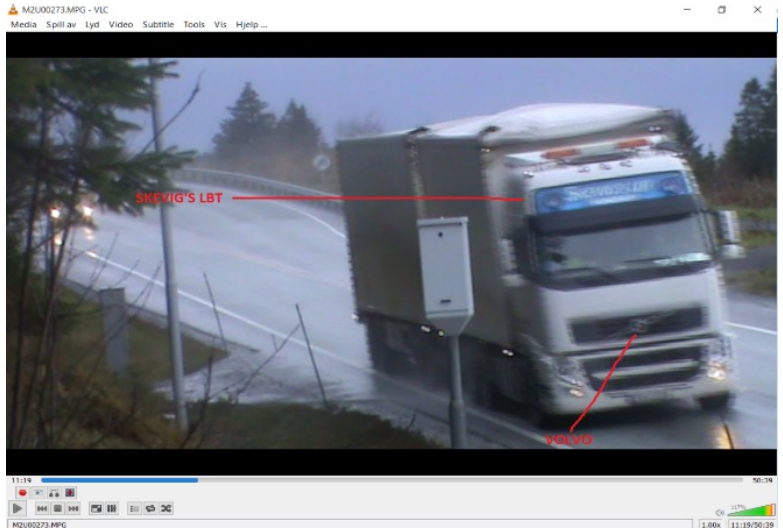
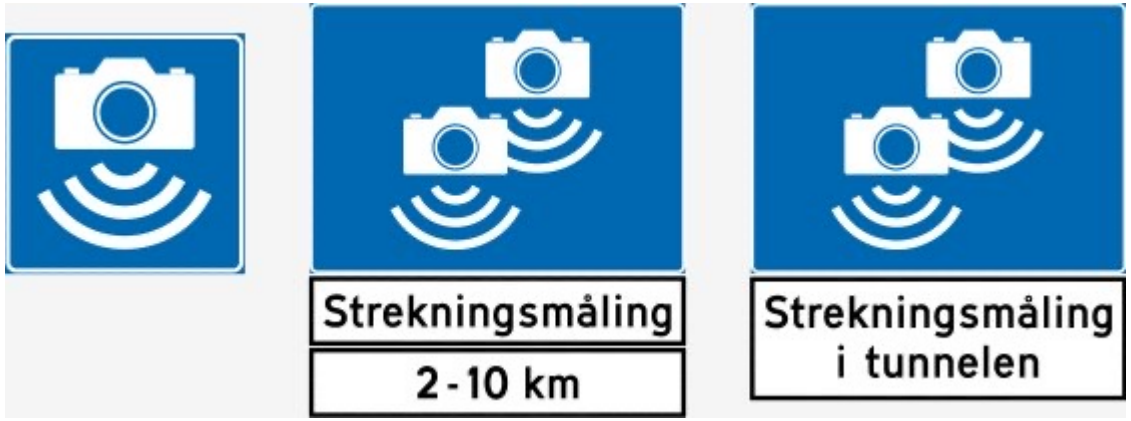
- Used for speed enforcement in Norway
- More than 250 units across the whole country
- Operated with piezo electrical cables
- Weight data is collected but not further utilized





ATK signs

ATK Units

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- Consist out of a camera unit and two piezo electrical cables

Piezo electrical cables PATK E18 Dørdal

Camera unit PATK E18 Dørdal

Results from master thesis – using timber trucks as test vehicles

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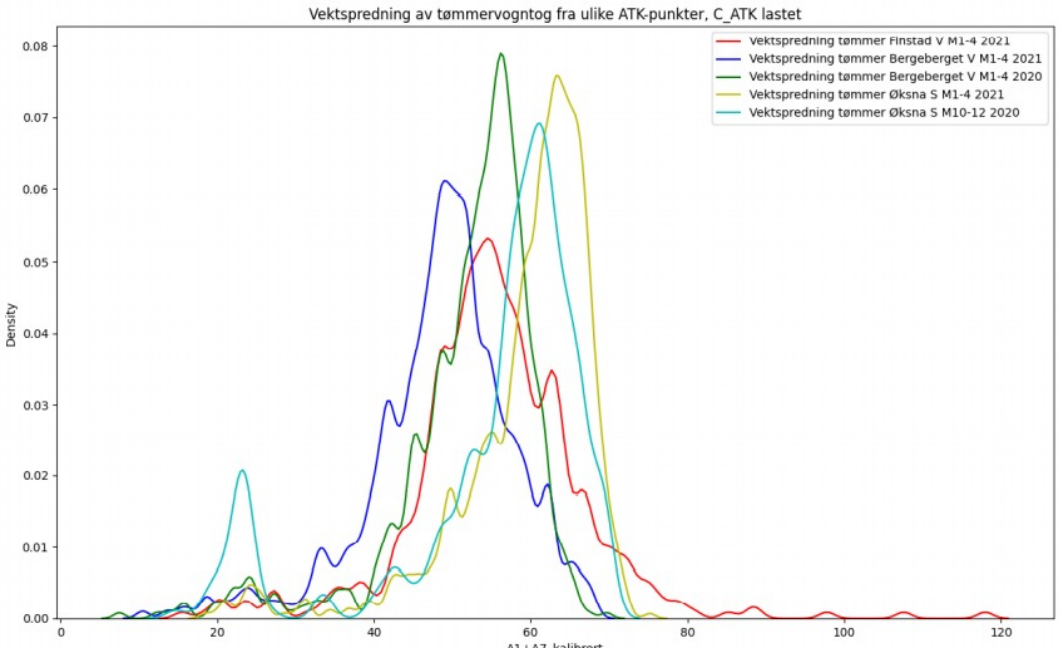
- Accurate registration of wheelbase
- Mostly underestimation of real weight
- ATK units appears to be suitable for extracting weight data from timber trucks
- ATK units are a valuable source of traffic data and should be exploited further



Source; Solheim

	60 tonn		40 tonn	
	Avvik [%]	σ [%]	Avvik [%]	σ [%]
Øksna N	-7,76 %	2,29 %	8,67 %	4,37 %
Øksna S	-18,55 %	3,56 %	-9,16 %	2,63 %
Finstad Ø	-31,20 %	3,66 %	-27,95 %	6,79 %
Finstad V	-	-	-	-
Bergeberget Ø	-26,64 %	3,98 %	-26,02 %	5,02 %
Bergeberget V	-35,58 %	9,76 %	-32,29 %	7,91 %

Source; Solheim

Bridge Wim

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Norwegian Public Roads Administration

- Bridge Wim will be a supplement to other types of wim
- Never tried in Norway before
- Two concrete bridges/culverts are chosen:
  - Brynjordsveen on rv. 3
  - Tangensvingen on rv. 25
- First series of measurements in mid-October 2022

Foto; Trafikia

Foto; Trafikia

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Norwegian Public Roads Administration

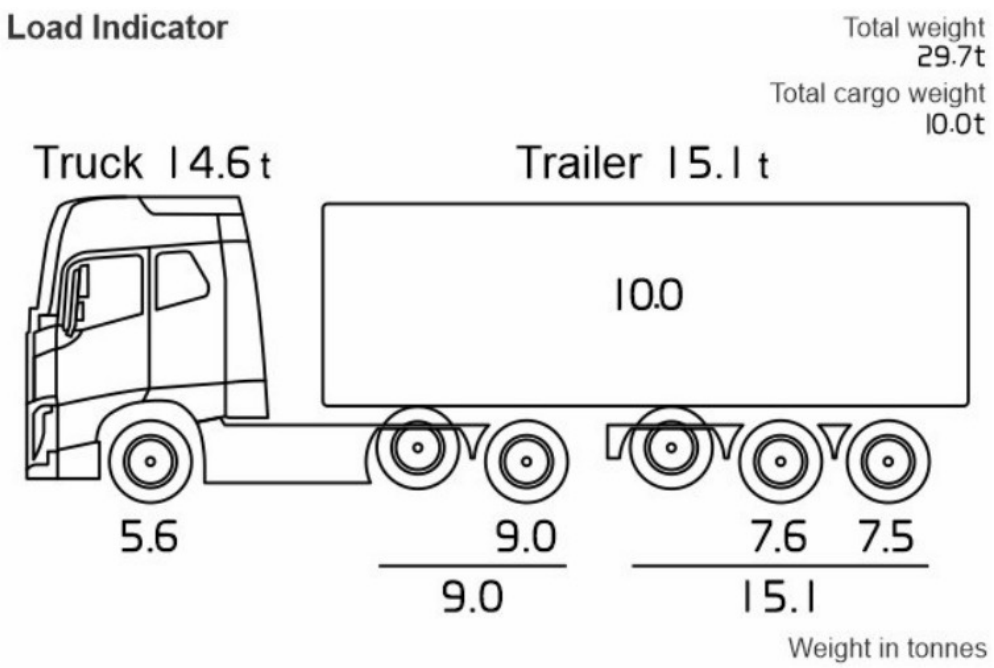
How heavy vehicles measure weight

Weight measurements on a truck is measured in different ways:

1. From a sensor on an axel with leaf spring
2. From a pressure sensor in the air bellows in a truck with air suspension
3. A trailer's total weight is measured by a sensor in the gearbox.

A tolerance of maximum can be guaranteed, if the system is calibrated accordingly

- ±250 kg per axle with air suspension and
- ±500 kg per front axle with leaf suspension.



Source: Volvo Trucks

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Weight logging preconditions

Many of the truck companies log weight data together with positions, the weight measurement can thus be linked to a specific position

This assumes that the car is equipped with the right technology and that a subscriber has been set up for data transmission from the manufacturer

Weight data logged each position is:

- Total weight (truck and trailer)
- Axle weight truck front
- Axle weight truck rear
- Axle weight trailer front
- Axle weight trailer rear

Vekt

Tillatte vekter

Egenvekt u/sjåfør:	15 320 kg
Tillatt totalvekt	30 000 kg
Maks nyttelast:	14 605 kg
Maks vogntogvekt:	70 000 kg

Aktuelle vekter

Total:	23 000 kg
Beregnet lastet vekt:	-
Akselvekt foran:	5 940 kg
Akselvekt bak:	10 023 kg
Tilhenger foran:	0 kg
Tilhenger bak:	0 kg
Prosent av total:	80 %
Prosent av vogntogvekt:	32 %

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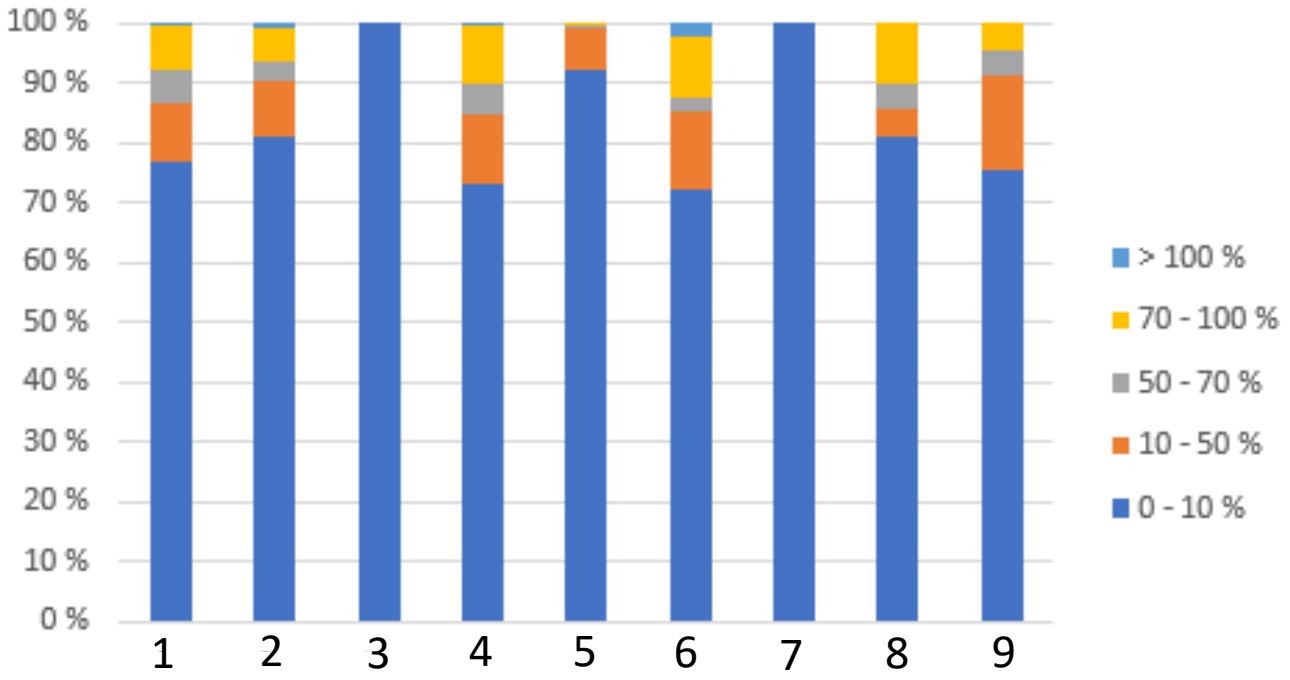
Raw data analysis

Weight data from 9 different trucks and trailers from 5 different timber transporters has been analyzed

Data is logged in the period from February to May 2022

The number of observations per crew varies from approx. 1,000 to 3,500 in total during the period. The cut is approx. 2,000 observations per crew for the period

The distribution of the error rates for each of the cars



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Error sources

If we look at the raw data that is logged, there are sources of error both when the vehicle is stationary and while driving.

A source of error is when the sum of total weight that is logged is compared with the sum of axle weights that are logged and these are deviant

The delta has proven to be able to go both ways.
Sometimes the measured total weight is the highest and sometimes the measured sum of axle weights is the highest. No analysis has been made of what occurs most frequently

Delta totalvekt	%-feil
43019	62,6733683
34794	58,5264929
28026	68,5903084
6279	37,8207445
4404	20,4837209
6261	48,6177978
6318	38,9375077
7384	48,1293182
6242	38,2147667
2021	10,105
6295	37,4925551
6302	47,0790378
5709	34,1692602
6281	37,8145695
9977	41,5708333
31766	56,6946279
46308	66,0222412
7081	12,03065
6759	10,1513923
9914	16,0109819
8969	30,8425034
28322	53,9055957
7835	45,3834569
6382	37,879867
7733	43,375589
42311	325,369117
42772	257,41454
6536	36,5957447

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Norwegian Public Roads Administration

Analyze of deviants

At first glance, it may appear that there are many deviations between measured total weight and axle weights

On closer analysis, many of the incorrect measurements can be linked to certain vehicles and situations

The following hypotheses/reasons have been investigated for each individual vehicle:

- need for calibration
- examination of truck/trailer connection
- number of axles included in the calculation or checking of sensors is necessary.

Each individual vehicle and its data is analyzed to find reasons for deviant and inaccurate weight measurements:

Bil model	FH4B-16	Aksel-konfigurasjon	8x4 Tridem	Fjæring foran	Luft
Reg dato	15.06.2021	Km.stand		Fjæring bak	Luft

Findings
27 cases of missing weight on one or both suspension axles. All in 0-15 km/h. Many at the same location. Car is driven without a trailer. By filtering out measurements < 20 km/h, all measurements are within tolerance.

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Norwegian Public Roads Administration

Findings

Truck spesifications

Could the measurement deviations be due to differences in the car's specification, age or suspension system?

- All the cars have air suspension on all axles and are no differentiating factor
- No connection found between model and error measurements
- No connection found between the car's age and incorrect measurements

Speed at the moment of measurement

Why are many of the deviations at stationary or low speeds?

- Many incorrect measurements at standstill or low speeds occur at the loading/unloading area or when switching the trailer on/off.
- Measurements >20 km/h have a significantly greater accuracy

As a measure, it is proposed to filter out all measurements < 20 km/h

Statens vegvesen
Norwegian Public Roads Administration

Findings

Missing weight from trailer

In the analysis, it has been observed that on the remaining incorrect measurements there is a large incidence of missing weight (blank or 0 kg) from the trailer. By also filtering out measurements where the trailer weight is 0 kg or missing, the measurement accuracy is further increased.

Some trailers may also have faults in their weight system permanently or periodically. If necessary, these must be checked.

Also suggests regular documented calibration of the weight of the car and trailer (at least every 6 months).

Additional error measurements

After the filtering described in the previous points, some error measurements remain where there is relevant data from all axles, but the sum weight does not match the total weight.

In the random tests that have been carried out, it may appear that only the weight from only one axle on the trailer is included (usually the front axle).

The cause is unknown and must be investigated further. Pt. no further investigations have been carried out.

Statens vegvesen
Norwegian Public Roads Administration

Conclusion

In order to use the weight data that is logged, it is necessary to perform the following steps:
Processing and quality assurance of data

- Establish rules for filtering out "invalid" data
- Routines for calibration and control of axles and sensors on vehicles and trailers
- Control measurements of weight and comparison with vehicle / trailer

An important tool in the work with collecting data from the manufacturers is a data platform and API integrator that can collect data from various manufacturers, carry out quality assurance and filtering, analysis and presentation of the data. In the 74-t project, the Linx platform from Cognia Technology is used.

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Norwegian Public Roads Administration

Structural impact of heavy vehicles on bridges

Structural safety = sufficient capacity to resist loading

Heavier vehicles = increased loading

- Fatigue limit state
  - Primarily steel bridges
- Serviceability limit state
  - E.g. Cracking of concrete which will accelerate deterioration processes
- Ultimate limit state
  - Increased axle weight affects bridges with all span lengths
  - Increased total weight affects bridges with long spans
  - Increased number of heavy vehicles and increased weight may effect the *traffic load model*

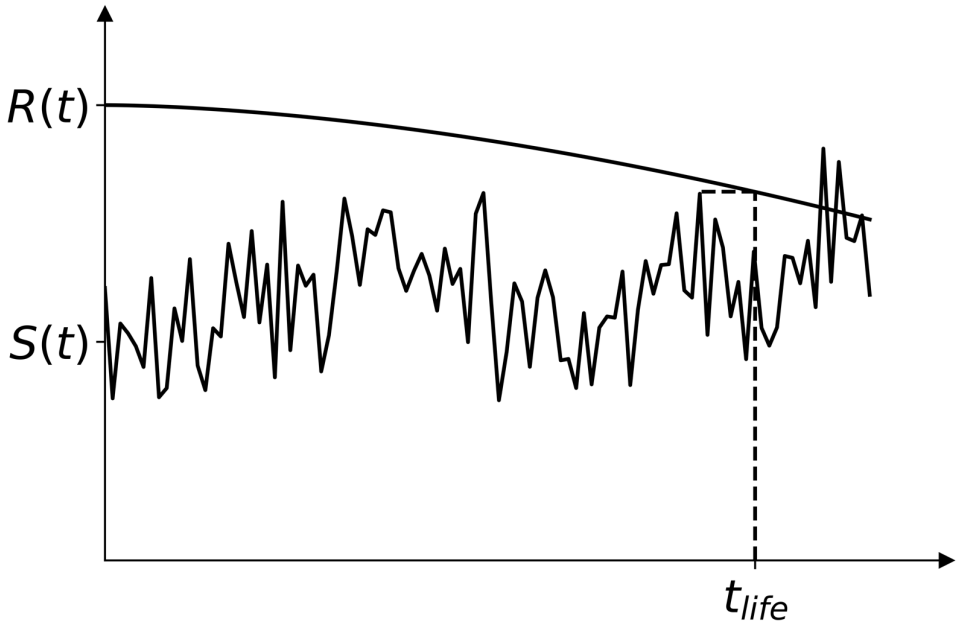


Figure. Decreasing capacity and varying load during lifetime.

Statens vegvesen
Norwegian Public Roads Administration

Impact of heavy vehicles on traffic load modelling for bridges

What is the maximum load we can expect within a year? Within 50 years?

- Typically addressed by characteristic value and safety factors
- Can also be addressed in more detail as a probability distribution function
  - WIM and B-WIM measurements can be used to establish such probability distributions which can be used directly in assessment or to calibrate/update the characteristic value and safety factor.

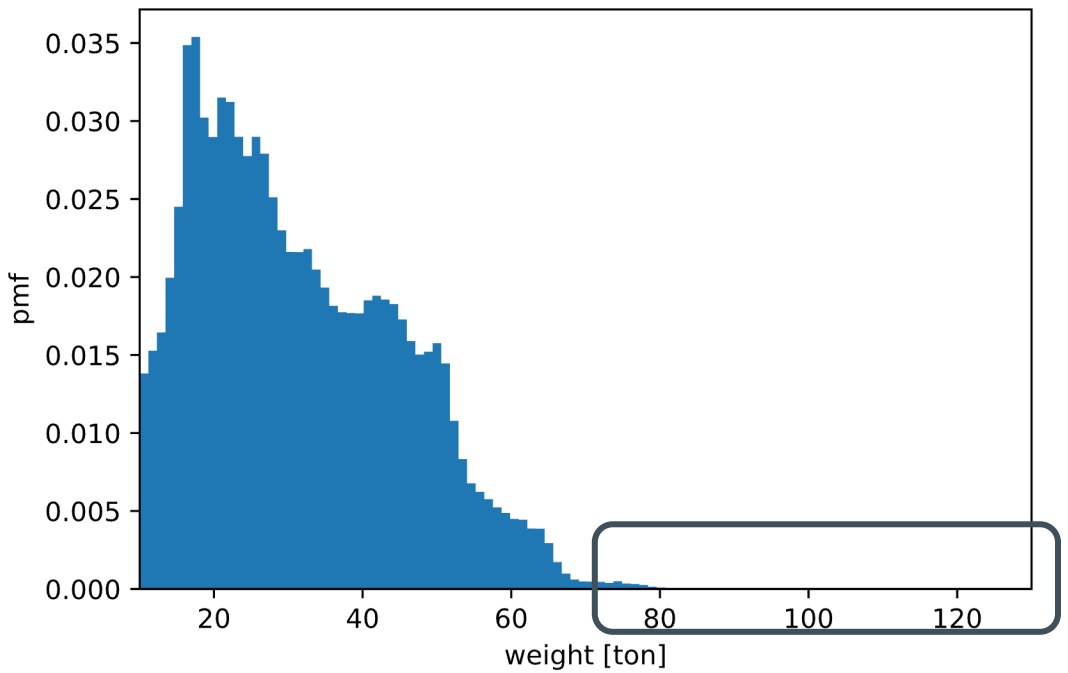


Figure. Truck weight probability function for one year.

NTNU Frida Liljefors, PhD student in Structural assessment of existing bridges

Impact of heavy vehicles on fatigue in bridges

- Fatigue loading
  - Number of heavy vehicles
  - Vehicle weight (axle weights)

- Fatigue load effect
  - Stress calcuated from structural model

- Stress cycle in one of the tension rods
  - Stress fluctuation 40 MPa when truck is passing in nearest lane
  - Stress fluctuation 17 MPa when truck is passing in farthest lane

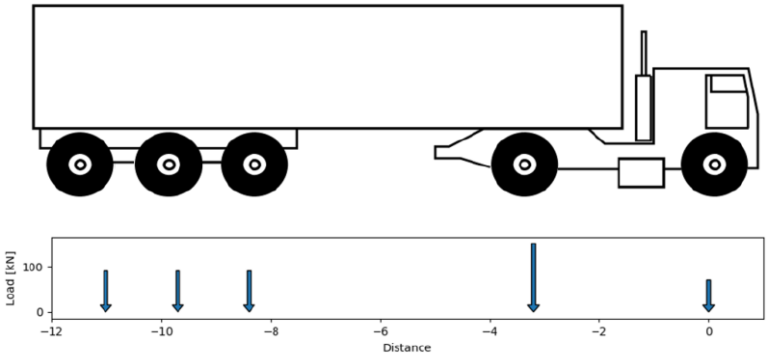
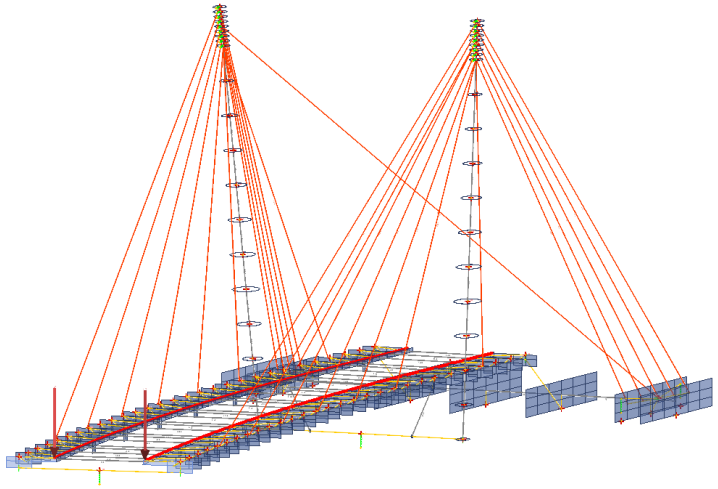
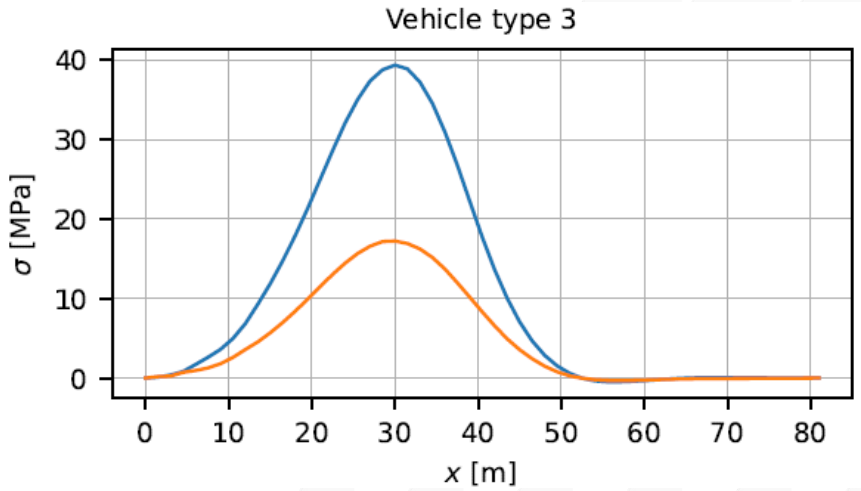


Figure 2-4 Axle-loads for lorry type 3 in FLM4





Impact of heavy vehicles on fatigue in bridges

- Fatigue damage $D_d = \frac{\text{number of stress cycles experienced}}{\text{number of stress cycles until fatigue failure}} = \frac{n}{N}$
- Sufficient fatigue resistance – fatigue damage $D_d \leq 1{,}0$

- n – number of cycles with stress range $\Delta\sigma$
  - Proportional to number of heavy vehicles
  - Increasing number of heavy vehicles by a factor 1.2 would increase fatigue damage by a factor 1.2

- $N = N(\Delta\sigma)$ – number of cycles until fatigue failure for cycles with stress range $\Delta\sigma$
  - Stress range $\Delta\sigma$ is essentially proportional to vehicle weight
  - $N(\Delta\sigma)$ is given by SN-curves which are highly nonlinear – typically $N(\Delta\sigma)$ is proportional to $(\Delta\sigma)^{-3}$ for steel
  - Fatigue resistance decreases rapidly with increasing vehicle weight
  - Increasing the weight of heavy vehicles by a factor 1.2 would increase fatigue damage by a factor $1.2^3 = 1.7$

Impact of heavy vehicles on fatigue in bridges

- Fatigue damage depends both on number of heavy vehicles and vehicle weights
- Fatigue damage is very sensitive to increased vehicle weights

Statens vegvesen
Norwegian Public Roads Administration

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Nordic HCT Conference 2022

2022-10-11

Nordic HCT Conference 2022

The Conference starts again 10.50

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What is happening within HCT in Norway?
Elin Norby, Norwegian Road Authority

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2022-10-11

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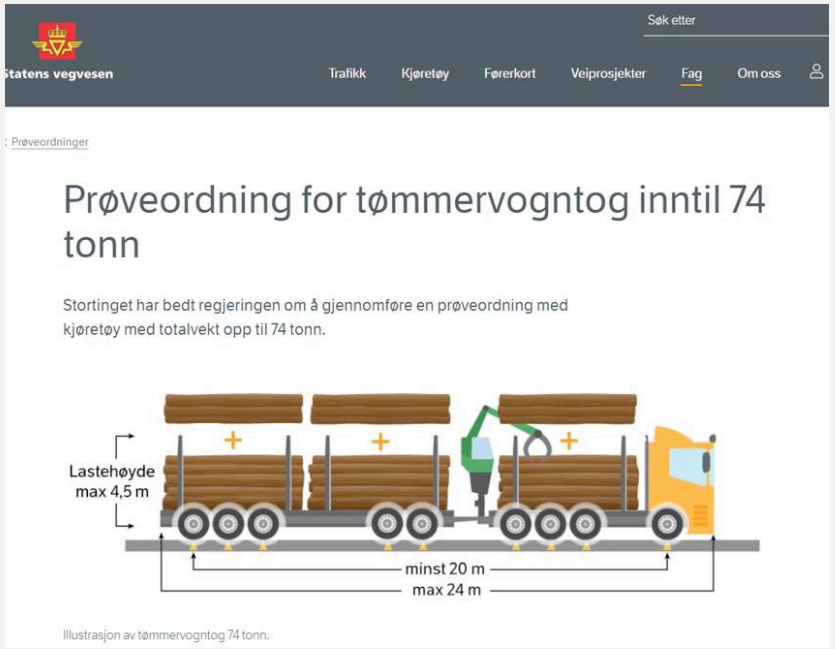
HCT – Status Norway 2022

Foto: Statens vegvesen / Silja Lena Løken

74 tonne timber transport trial

The report from the Load Bearing Capacity test is finished - and can be downloaded here, and from the project website

Foto: Statens vegvesen / Silja Lena Løken



Statens vegvesen

60 tonnes on roads limited to 8 t axle load

- BkT8 = 8 t single axle load
- County roads ≈ 30 %, municipality roads ≈ 15 %
- Public consultation March – May 2022
- Entry into force 1 November 2022
- Permitted weights
  - 9 axles (4 + 5) 60 tonnes
  - 8 axles (4 + 4) 58 tonnes
  - 8 axles (3 + 5) 55 tonnes
  - 7 axles (3 + 4) 52 tonnes
- Requirements more or less as proposed
  - Distance from first to last axle at least 19.00 m
  - Motor vehicles must have two driving axles
  - Trailers must have twin mounted tires

Foto Norges Skogeierforbund

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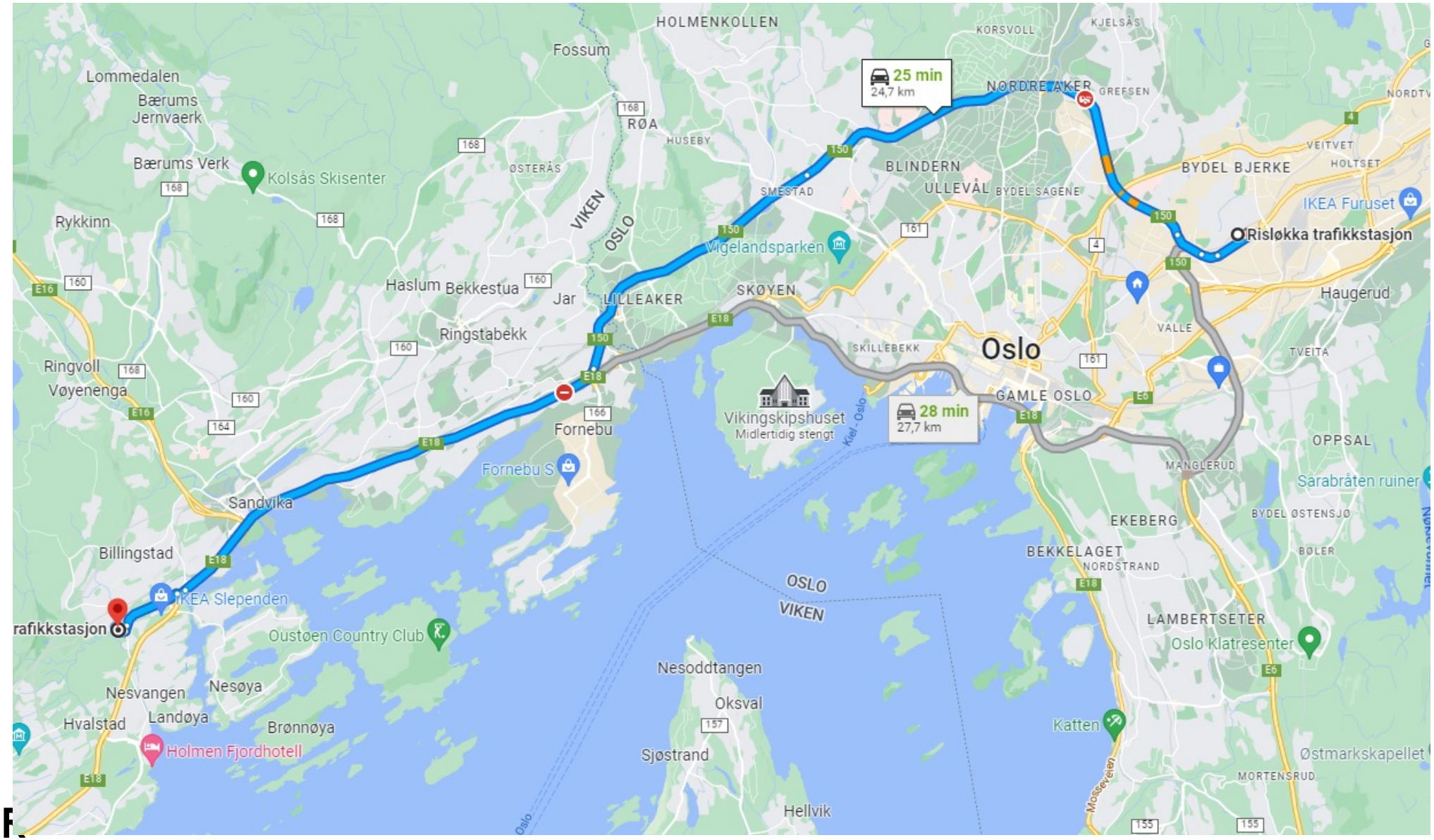
60 tonnes on roads limited to 8 t axle load cont.

- *Potentially* county roads ≈ 30 % and, municipality roads ≈ 15 % ...
- ... But it is the road owners' (counties and municipalities) decision to permit 60 tonnes on their roads.
- Road lists for timber transport will show permitted roads
  - Publication 1 November 2022

Veg	Vegstrekning	Veglengde (km)	Bk/totalvekt (tonn)	Bk/totalvekt vinter (tonn)	Tillatt vogntoglengde (m	
Fv. 2222	Arm til Alvdal sentrum (Steia)	0,031	Bk10/60		24,00	
Fv. 2222	Alvdal x rv. 3 arm—Alvdal/Tynset	12,573	BkT8/60		24,00	
Fv. 2224	Sølna bru—Underegga x fv. 2230	0,999	BkT8/60	Bk10/60	24,00	
Fv. 2226	Baugen—Sørhus x rv. 3	1,853	Bk10/60		24,00	Ja
Fv. 2228	Kveberg x rv. 3—Kveberg bru x fv. 2228	1,525	BkT8/50	Bk10/60	24,00	Nei

Legal routes for heavy vehicles - Road lists – VegKart – Route planner



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Road lists – VegKart – Route planner for heavy vehicles

Statens vegvesen

Vegliste 2022

Normaltransport

Riksveger

Vedlegg 1 til forskrift om bruk av kjøretøy

Normaltransport
og
Nærmere bestemmelser om tillatte vekter og dimensjoner for offentlig veg

Mai 2022

www.vegvesen.no/veglister

Oslo fylke
Riksveger

Veg	Vegstrekning	Veg-lengde (km)	Bk/total-vekt (tonn)	Bk/total-vekt (tonn) vinter	Tillatt vogntog-lengde (m)
E6	Viken gr. Åsland–Viken gr. Tangerud	46,980	Bk10/50		19,50
E6	Arm x E6 rkj. Ryen–x arm E6 Gamlebyen (Svartdalstunnelen)	4,023	Bk10/50		19,50
E6	Arm Alnabru x E6–Sørenga x E18	10,124	Bk10/50		19,50
E18	Viken gr. Mastemyr–Viken gr. Lysaker bru	34,357	Bk10/50		19,50
E18	Arm til Vippetangen Via Skippergt. og Akershusstranda	2,240	Bk10/50		19,50
Rv. 4	Sinsen S V rkj. Fagerheimgt.–Sinsenkrysset–Viken gr. Gjelleråsen	18,406	Bk10/50		19,50
Rv. 150	"Ring 3" Hovin (Ulvensplitten)–Viken gr. Granfosstunnelen	31,116	Bk10/50		19,50
Rv. 159	Karihaugen x E6–Viken gr. Robsrudenga	1,076	Bk10/50		19,50
Rv. 162	"Ring 1" Grønlia–Vaterland Ø–Filipstad x E18	8,290	Bk10/50		19,50

Viken fylke
Riksveger

Veg	Vegstrekning
E6[1)]	Riksgr. Svinesund–Oslo gr. Åsland
E6	Oslo gr. Tangerud–Innlandet gr. Budalen
E6	Arm til Moss Lufthavn Rygge
E16	Innlandet gr. Nes i Ådal–Hønefoss–Oslo Lufthavn Gardermoen–Kverndalen x E6
E16	Skibakk x E6/fv. 1488–Innlandet gr. Dysterud
E16	Arm Nymoen–Sollihøgda–Kjørbo x E18
E18	Vestfold og Telemark gr.–Oslo gr.
E18[2)]	Oslo gr.–Vinterbro x E6–riksgr. Ørje
E134	Vestfold og Telemark gr.–Bangeløkka x E18

Vegliste 2022

Statens vegvesen

NORMALTRANSPORT

Fylkes- og kommunale veger

Mai 2022

Viken

www.vegvesen.no/veglister

Foto: Knut Opeide

Viken, Asker kommune
Kommunale veger

Veg	Vegstrekning	Veglengde (km)	Bk/totalvekt (tonn)	Bk/totalvekt (tonn) vinter	Tillatt vogntoglengde (m)
Kv. 1	Skatvedtveien, Røyken	0,524	Bk10/50		19,50
Kv. 5	Sundbyveien	5,368	Bk10/50		19,50
Kv. 8	Filtvetveien	0,195	Bk8/32		12,40
Kv. 11	Sætre skole	0,049	Bk8/32		12,40
Kv. 16	Tofte brygge	0,091	Bk8/32		12,40
Kv. 101	Nesbruveien	1,075	Bk10/50		19,50
Kv. 281	Storsandveien	0,171	Bk10/50		19,50
Kv. 1015	Nye Vakås vei	0,562	Bk10/50		19,50
Kv. 1016	Askerveien	0,370	Bk10/50		19,50
Kv. 1019	Solbråveien	0,706	Bk10/50		19,50
Kv. 1036	Borgenveien	1,900	Bk10/50		19,50
Kv. 1043	Trettestykket	1,449	Bk10/50		19,50
Kv. 1073	Solliveien	5,487	BkT8/50	Bk10/50	19,50
Kv. 1102	Arvid Andresens vei	0,347	Bk8/32		12,40
Kv. 1106	Arne Garborgsvei (del)	0,251	Bk8/32		15,00
Kv. 1118	Torstadveien 5-7	0,088	Bk8/32		15,00
Kv. 1122	Bergerveien	0,522	Bk10/50		19,50
Kv. 1124	Halvard Torgersens vei	0,266	Bk10/50		19,50
Kv. 1129	Fiolveien	0,428	Bk8/32		19,50
Kv. 1134	Skustadgata (1 bru, Skiltet 3t)	2,130	Bk8/32		19,50
Kv. 1144	Billingstadåsen 25-37	0,051	Bk8/32		15,00
Kv. 1144	Billingstadåsen 1-13	0,137	Bk8/32		15,00
Kv. 1155	Landøyveien	1,150	Bk10/50		19,50
Kv. 1158	Nesbukta	0,571	Bk10/50		19,50
Kv. 1170	Nesbruveien	0,296	Bk10/50		19,50

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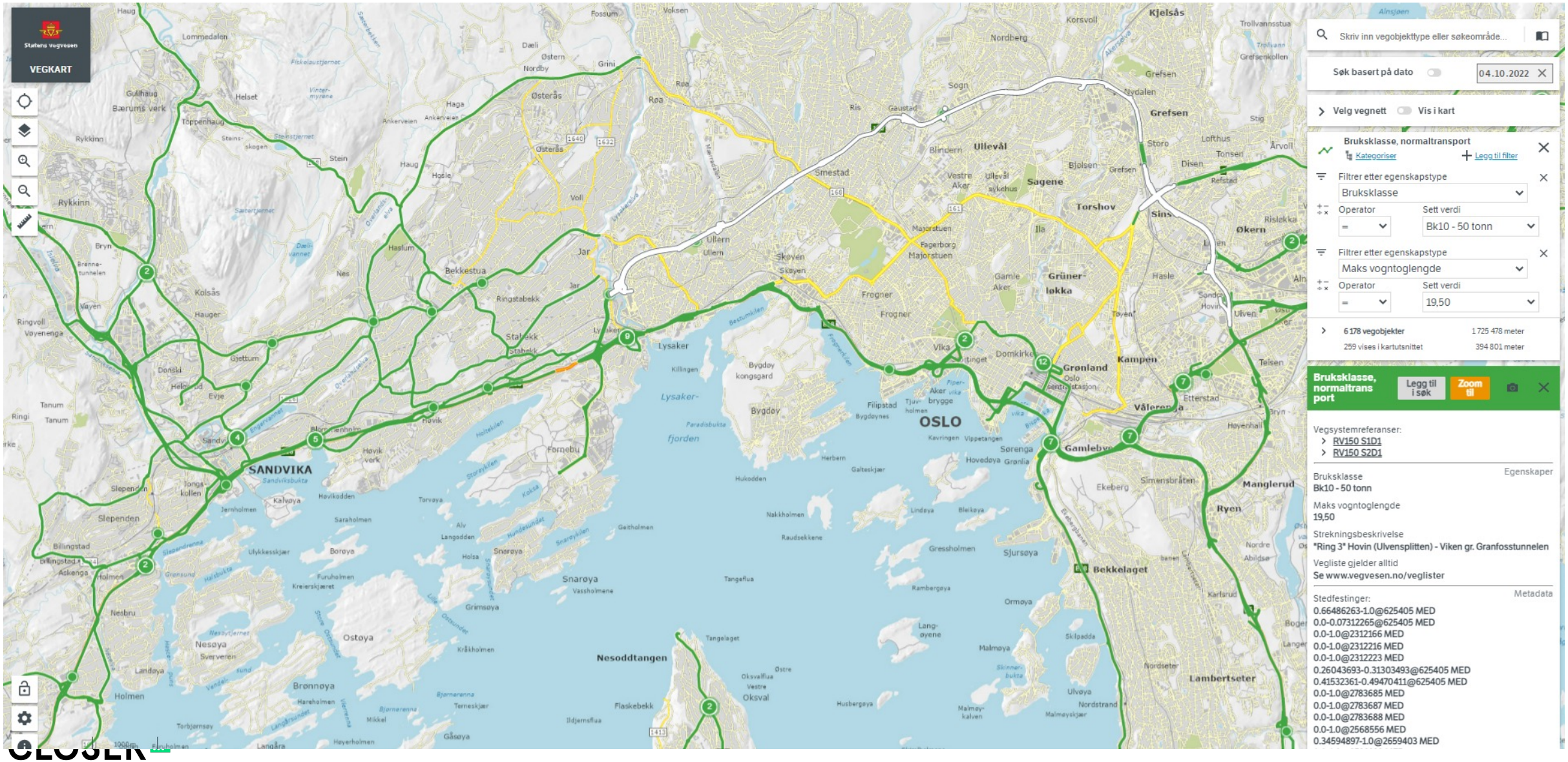
Road lists – VegKart – Route planner for heavy vehicles



Statens vegvesen

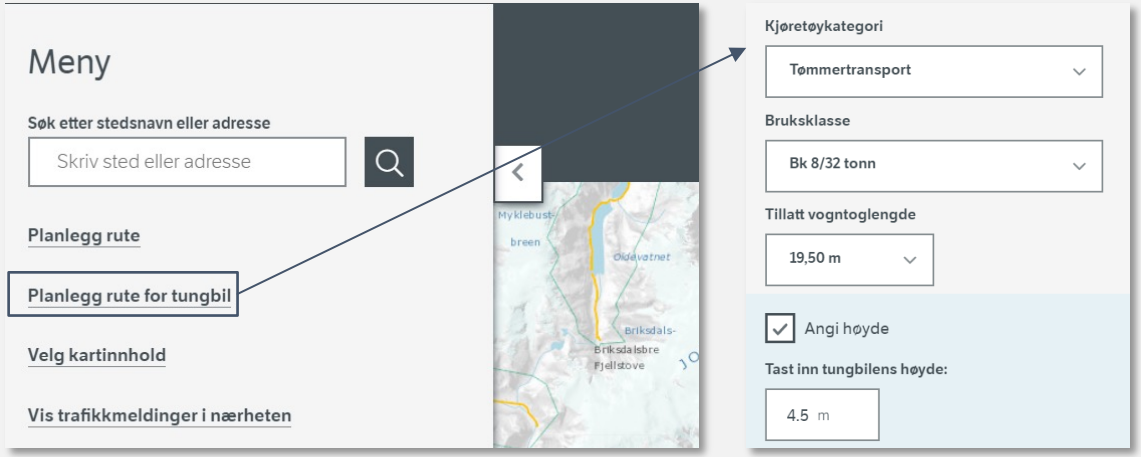
Route planner for heavy vehicles

The route planner for heavy vehicles calculates a permitted route based on:

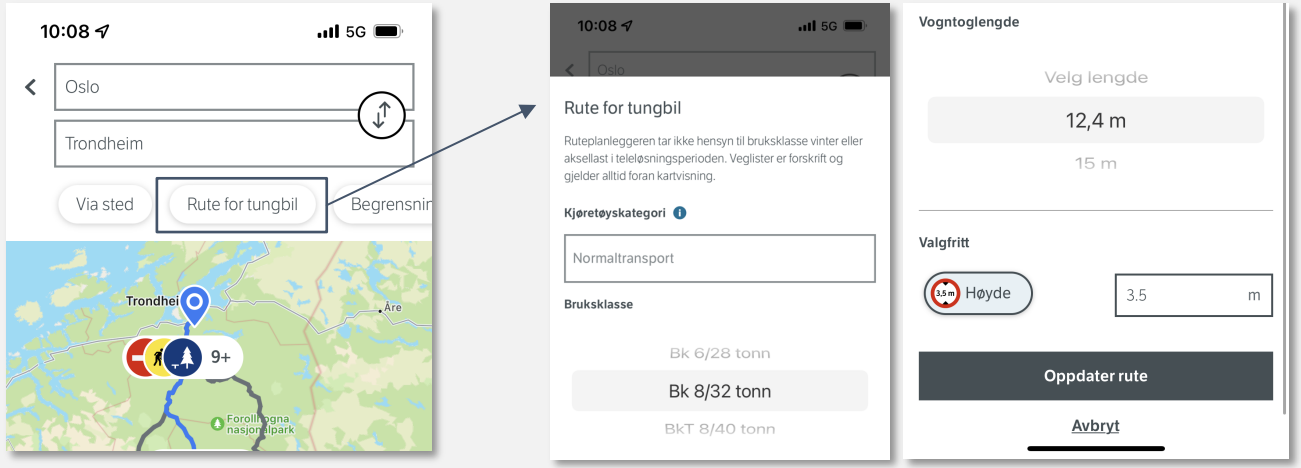
- **Vehicle category**
- **Use class (permitted axle load and total weight)**
- **Length of vehicle combination**
- **Vehicle height**

Clicking your selected route, will show information along the route.

Vegvesen trafikk web



Vegvesen trafikk App



Finnes på **web** (vegvesen.no/trafikk) og **app** ("Vegvesen trafikk" i App Store og Google Play)

Road lists – VegKart – Route planner for heavy vehicles

Statens vegvesen

Digitalisation of road lists

Currently 6 different types of road lists

- Normal transport, timber transport and EMS
- Abnormal transport, abnormal transport 12/100 t and mobile cranes etc. 12/65 t

Separate publications for each 11 counties and national roads

- 72 lists in total
- 2x per year, ca. November and May

Veg	Vegstrekning	Veglengde (km)	Bk/totalvekt (tonn)	Bk/totalvekt vinter (tonn)	Tillatt vogntoglengde (m)	Tillatt for modulvogntog 1 og 2 med sporingskrav
Fv. 2188	Åmot/Stor-Elvdal—Neta bru	13,500	Bk10/60		24,00	Nei
Fv. 2188	Neta bru—Evenstad x jernbanen	8,760	Bk10/60		24,00	Ja
Fv. 2188	Arm Evenstad—Evenstad bru x rv. 3	0,679	Bk10/60		24,00	Ja
Fv. 2188	Evenstad x jernbanen—Kjemåa x fv. 30	17,529	BkT8/50	Bk10/60	24,00	Nei
Fv. 2188	Stai bru Ø x fv. 2188—Stai bru x rv. 3	0,255	Bk6/28		24,00	Nei
Fv. 2198	Opphus V x rv. 3—Opphus bru Ø	0,204	Spesiell begrensning		24,00	Nei
Fv. 2198	Opphus bru Ø—Opphus øst x fv. 2188	0,389	BkT8/50	Bk10/50	24,00	Nei
Fv. 2200	Nysted x fv. 30—x kv.	0,528	Bk10/60		24,00	Ja

A digital solution for an simplfied update process and more flexible updates

- Easily accessible information for road users
- Predictability across county and municipalities – a more coherent road network for longer/heavier vehicles
- Increased update frequency

Correct in-data from all counties and municipalities → Improved competitiveness, environmental benefits and traffic safety

Statens vegvesen

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Nordic HCT Conference 2022

2022-10-11

What is happening within HCT in Denmark?
Martin Frimann Mortensen, Danish Road Directorate

CLOSER

2022-10-11

HCT-conference in Gothenburg

October 6th., 2022

Martin Frimann Mortensen

Danish Road Directorate (DRD)

DUO2

Trial including longer EMS in Denmark

Færdselsstyrelsen

Vejdirektoratet

Background

- Analysis made in 2021 on the possibilities for having a trial with longer EMS in Denmark

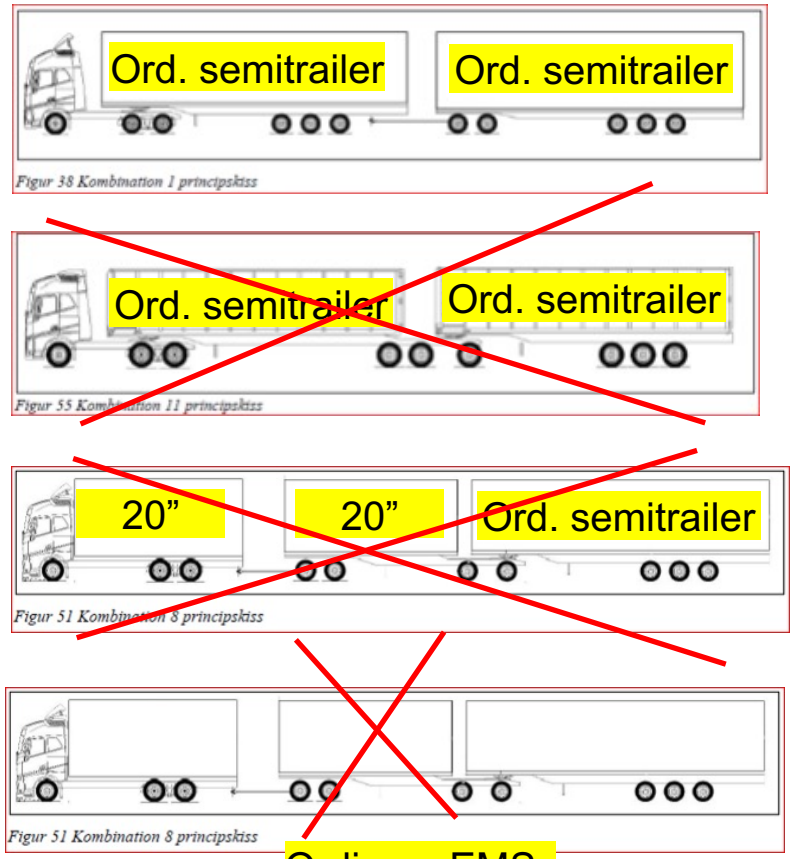
- Political agreement from April 22nd, 2022:
  - *A trial with longer EMS must take place between Aarhus og Høje-Taastrup (west of Copenhagen). The preparations must also investigate the possibilities of including the Öresund-bridge connection to Sweden.*

- We will use the term DUO2, men other countries also use terms as SEC / EMS2 / A-double

- Expected start of the trial in the first semester of 2024

Færdselsstyrelsen
Vejdirektoratet

Types, weight and dimensions (proposal)



- Relevant types:
  - **A-double (DUO2)**
  - *B-double*
  - *AB-double*
- Maximum weight for the DUO2
  - Three-axle semitractor og minimum 10 axels in total: 70 tons
  - Add using alternative fuels: 1 tons (max 71 tons)
  - Add using zero-emission engine: 2 tons (max 72 tons)
- Maximum length for the DUO2
  - 2 pcs. 45” ship-containers = approx. 32 meter
  - Aerodynamic driver cap or alternative fuels = up to 34 meters

DUO2 – road net in the trial

- Approx. 340 km highways
- Approx. 10 km other roads*
- Access to 2 parking-areas along the highways
- Access to 2 omkoblingspladser
- Access to Sweden

* = access from highways to decoupling areas

Færdselsstyrelsen
Vejdirektoratet

Preparations

- Road projects
  - Detailproject of the 4 areas and physical changes to be conducted
- Regulation
  - EU-notification
  - Regulation for the approved road net for the DUO2
  - Regulation for the technical specifikations for the DUO2 vehicles
  - Change of the overall traffic-regulation
- Systems, communication and follow-up
  - Trafficmap for the EMS on the homepage
  - Changes to the automatic traffic counts (using magnetic coils) on the trial road net
  - General communication

Thank you for listening.

Martin Frimann Mortensen
Vejdirektoratet
(Danish Road Directorate)

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Tel.: + 45 7244 2711

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Nordic HCT Conference 2022

2022-10-11

What is happening within HCT in Finland?
Vesa Männistö, Finnish Transport Infrastructure Agency

CLOSER

2022-10-11

Finnish Transport Infrastructure Agency

What is happening within HCT in Finland?

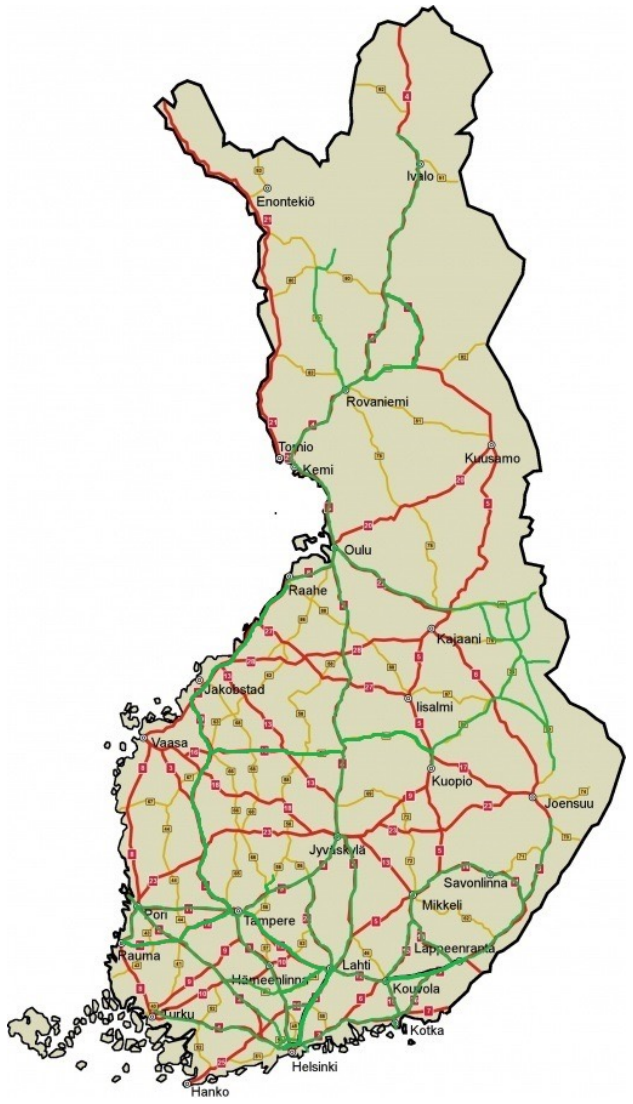
Vesa Männistö

Nordisk HCT Conference 2022

6.10.2022

Topics Today

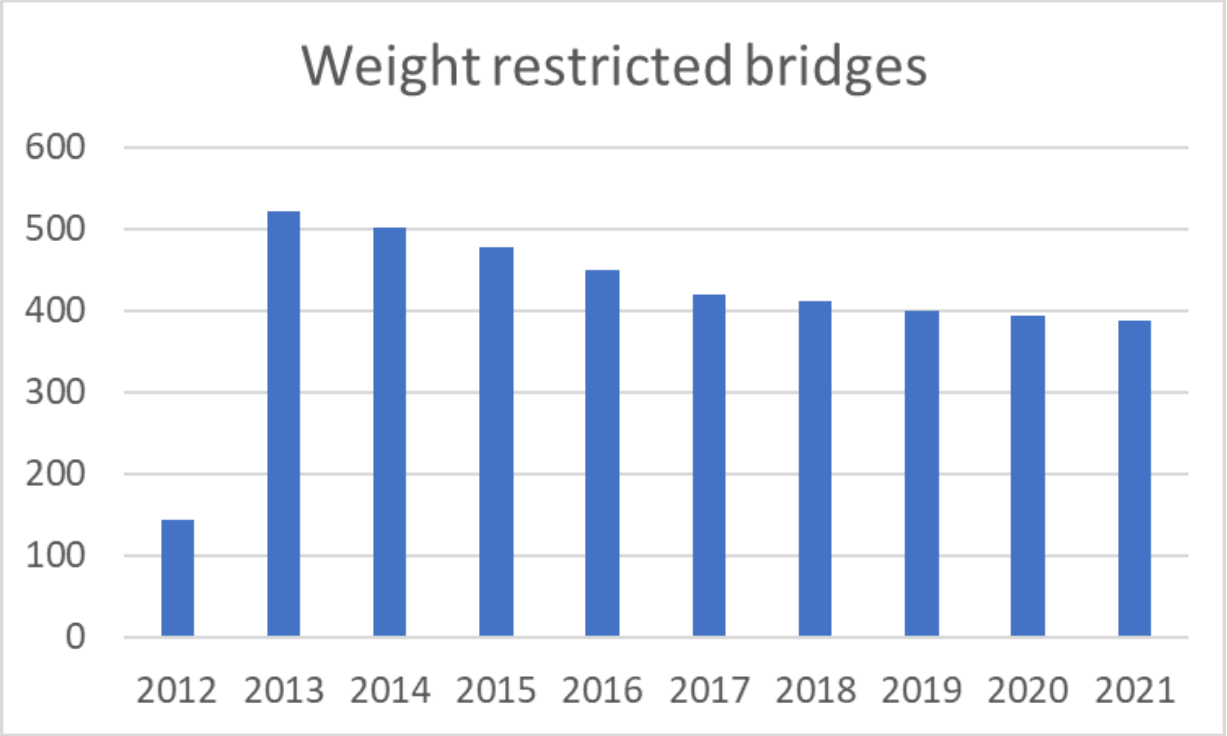
- What has happened?
- Current affairs
- Ongoing research
- Future issues



What has happened?

The Decree of Masses and Dimensions 1.10.2013

- Maximum allowed total weight was increased from 60 to 76 tonnes
- Maximum permitted height was increased from 4,2 to 4,4 meters
- The purpose of the reform was to improve Finland's competitiveness and reduce transport costs
- Well and rapidly adapted by industries

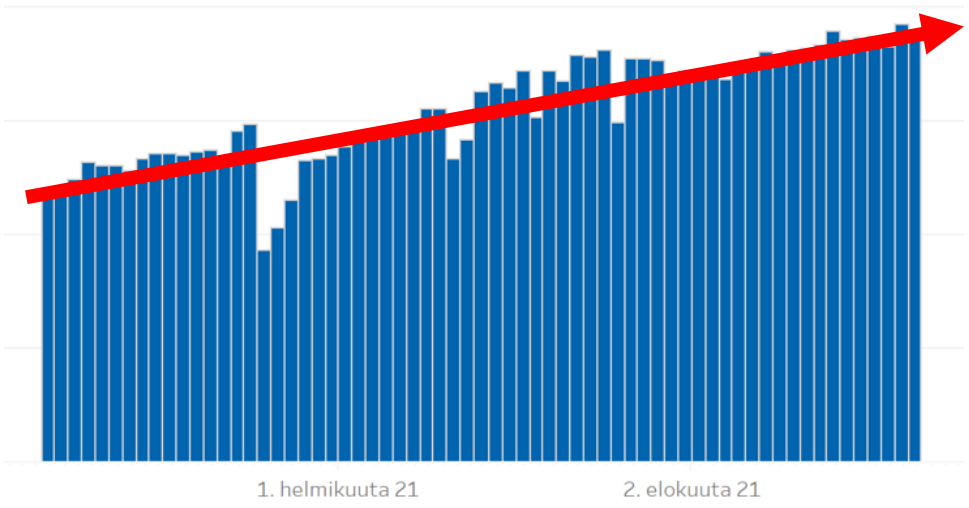


Business as usual

The Decree of Long Vehicle Combinations 21.1.2019

- Based on the experiences from the HCT trials and needs of industries
- The new decree came into force on 21.1.2019, the main contents were
  - The maximum length of a vehicle combination increased from 25,25 to 34,5 metres.
  - Applies to the entire road, street and private road networks

Business as usual
Volumes are increasing steadily



HCT Trials

- Finnish Transport and Communications Agency has granted permits for HCT trials since 2013
- The goal of trials was to develop technology of bigger vehicles and/or vehicle combinations and their suitability to Finnish transport system
- The trials have fulfilled their function and only few are being started
  - Benefits of short-term pilots are modest, pilot combinations might become useless, practical operation sometimes difficult
  - Industries want to have "more permanent permits", without any development issues
    - The current law does not allow this

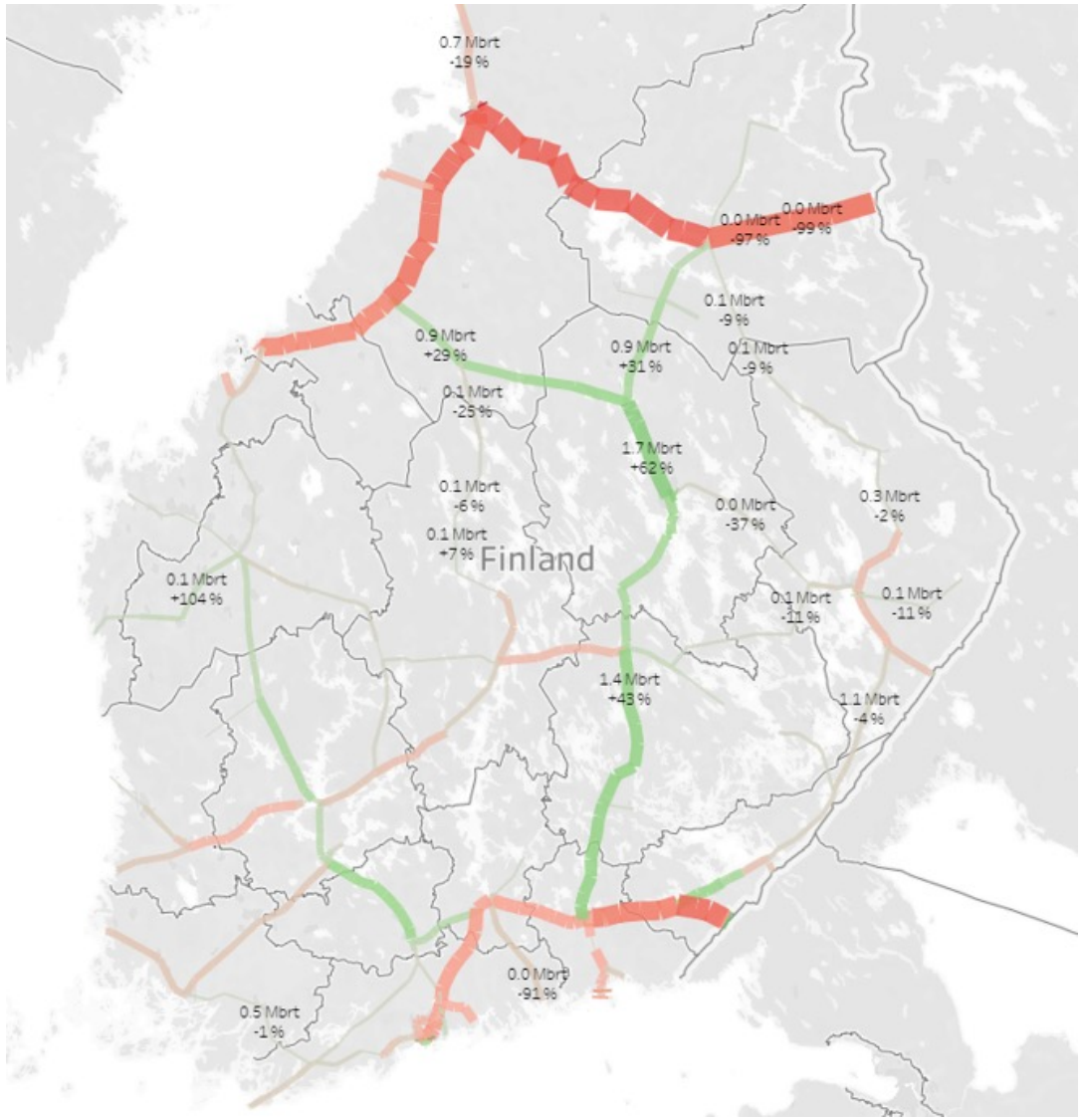
Current issues

DIRECTIVE 96/53 ON WEIGHTS AND DIMENSIONS

- Finland generally supports the revision of the Directive and the objectives set in it.
- From the Finnish point of view, our national situation that allows using heavier trucks with large cargo spaces has been working very well.
- Using EMS and EMS2 trucks is a crucial part of our national freight logistics system and our road transport is largely based on the use of these heavy trucks.
- The efficiency of road transport also determines the environmental impacts of transport
- The cross-border transport needs clarification. Uniform minimum dimensions and weights should continue to exist for cross-border transport, which all Member States should allow.
- Transport operations across borders that exceed these minimum dimensions and masses should be allowed, if they meet the national requirements of both countries, such as Finland and Sweden.
- The long distances, low population densities, scattered industries, low traffic volumes and climatic characteristics stress the need for highly efficient freight transport. This should be taken into consideration when reviewing the Directive.

Changes in traffic flows

- Cargo traffic between Finland and Russia has stopped
- Train traffic on certain transition routes has decreased
- More demand on domestic transportation of timber, both on rail and road
- -> forest industry is asking for higher masses



Current issues from FTIA

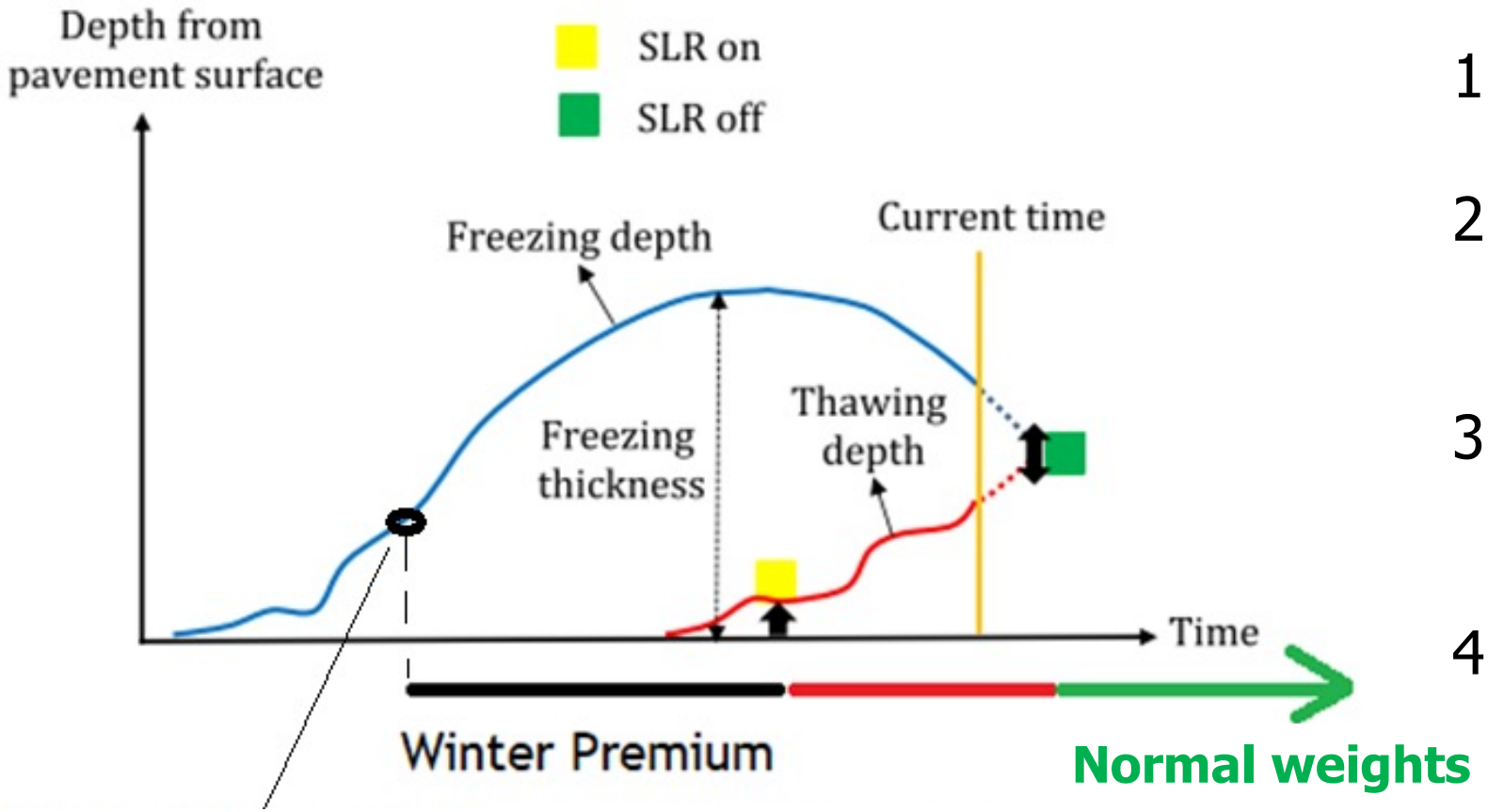
- WIM measurements of border crossing traffic started – first results available, some development actions are needed
- Long combinations in junctions and the effects of widening of junctions on road safety (wide access > high speeds)
- HCV's (long) at railway level crossings
  - Safety Investigation Authority recommends that rail traffic should stopped
  - Should these roads to be length-restricted, or
    - Longer protection periods for barriers
    - Other means if there are no security facilities

Minna Torkkeli
Head of Technical Department

Väylävirasto
Trafikledsverket

Ongoing research

Winter Premium: Utilisation of frozen road structures in heavy transport



What is sufficient depth of frost ?

Thaw period
Possible weight restrictions

Research questions:

1. How deep frost is needed for Winter Premium ?
2. How can the frost depth be measured in a reliable way ?
3. How to evaluate road network bearing capacity in a larger scale ?
4. Would a road section based maximum allowed weight be feasible in the future ?

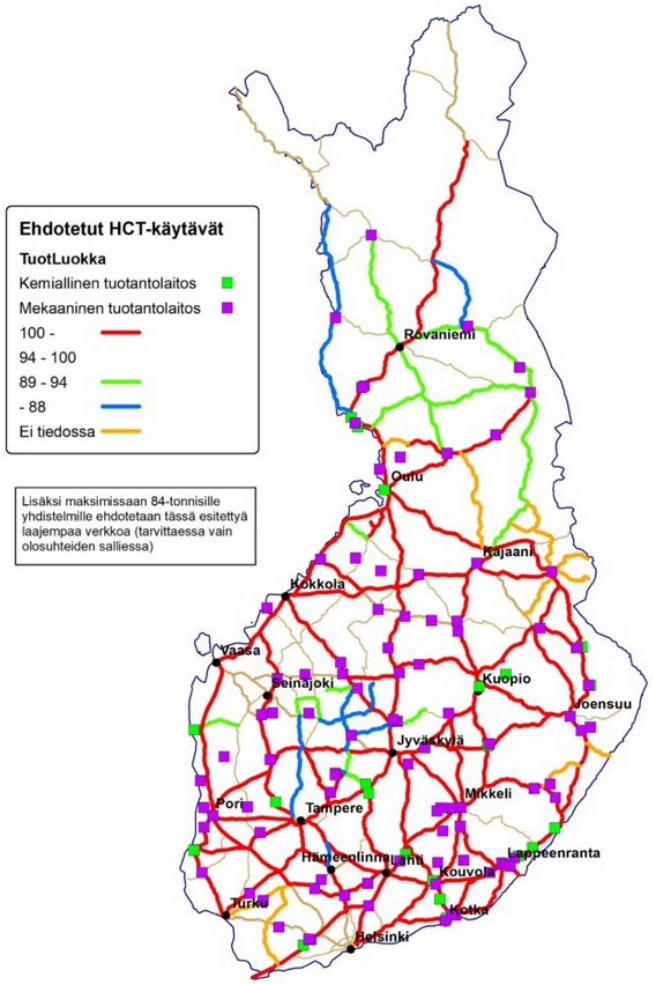
Effect of > 76 tons on weak road structures

- The forest industry has a desire to further improve the efficiency of transport, especially on certain routes critical to timber transport, by introducing total vehicle masses exceeding 76 tonnes
- Partly critical transport routes are located on sections of roads with poor construction, and it is therefore necessary to find out under what conditions vehicles may cause rapid damage to road structures and where they do not do so
- The aim is to carry out test load runs of the type of previous HCT truck studies with vehicle weights corresponding to and above the current maximum permissible weights
- The rutting caused by vehicle loads is closely compared from at least one weak and one stronger road cross-section, based on the rutting measured by laser scanning.

- Research unit: Terra, Tampere University

Plans for the Future

Higher maximum weights?



- There is a demand for higher (84/90/XX t) maximum weight
- A more complicated issue than increase of other dimensions
- Can not be allowed to the entire road network
- No political decision made so far – was not included in the new long term transport plan
- Under investigation:
  - Bottlenecks for current dimensions – any actions needed?
  - Examples of 84/90 ton combinations

Thanks!

More info:
vesa.mannisto@vayla.fi

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2022-10-11

What is happening within HCT in Sweden?
Kenneth Natanaelsson, Swedish Road Authority

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2022-10-11

TRAFIKVERKET

HCT in Sweden

Nordiska HCT- dagen
2022-10-06
Kenneth Natanaelsson, Trafikverket

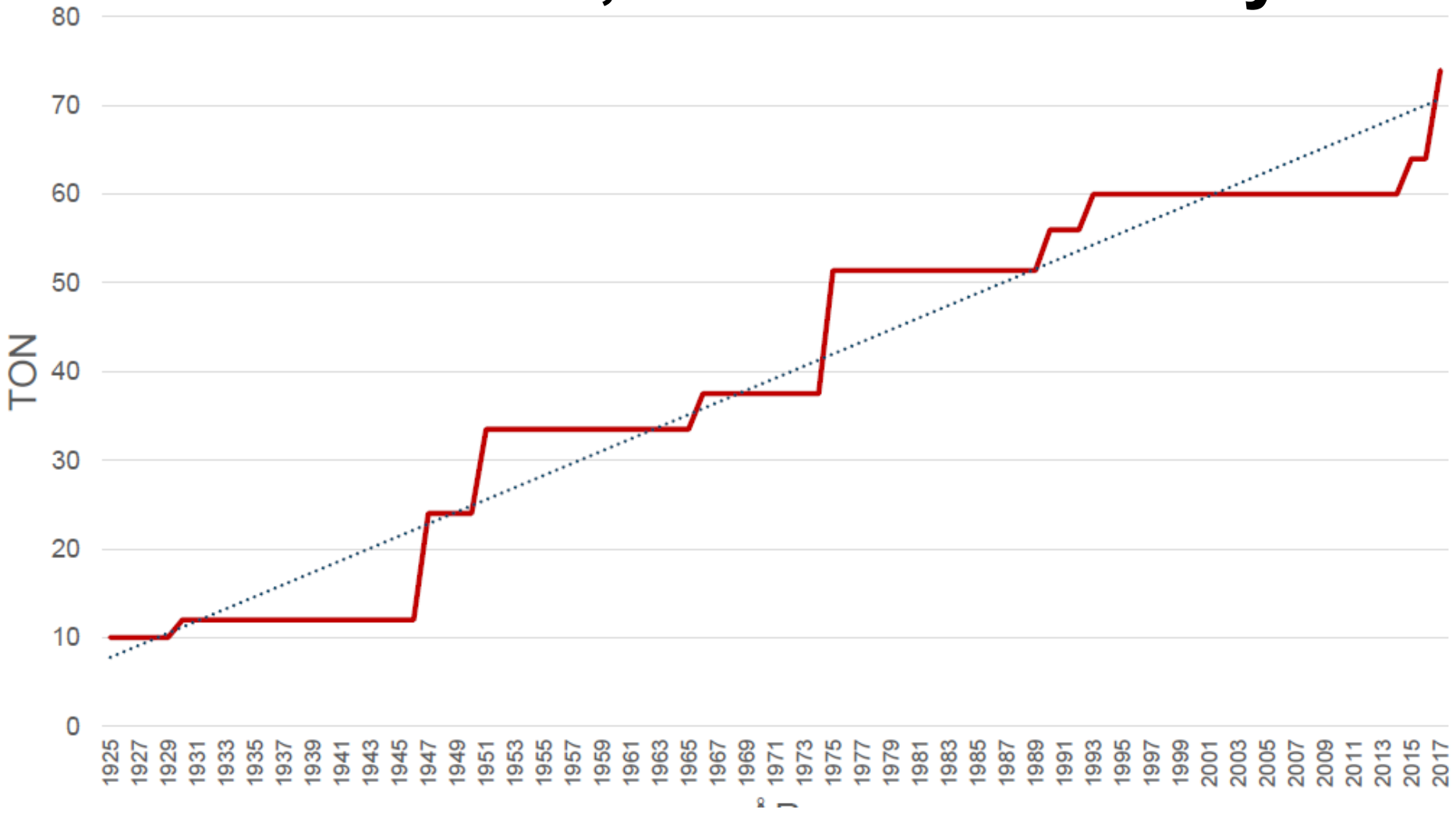
TRAFIKVERKET

Objectives for High Capacity Transport

- Higher transport and energy efficiency for freight transport
- Lower energy use and CO2 emissions per transported volume/ton
- Reduced need for new infrastructure investments
- Safety is increased by the use of the best technology and less exposure (fewer vehicles).

TRAFIKVERKET

Development of permitted gross weight in Sweden, the last hundred years



Status and future plan for BK4

Status –2020/2021

- Cirka 26 % av statliga vägnätet
- Cirka 40 % av det strategiska vägnätet för tung trafik

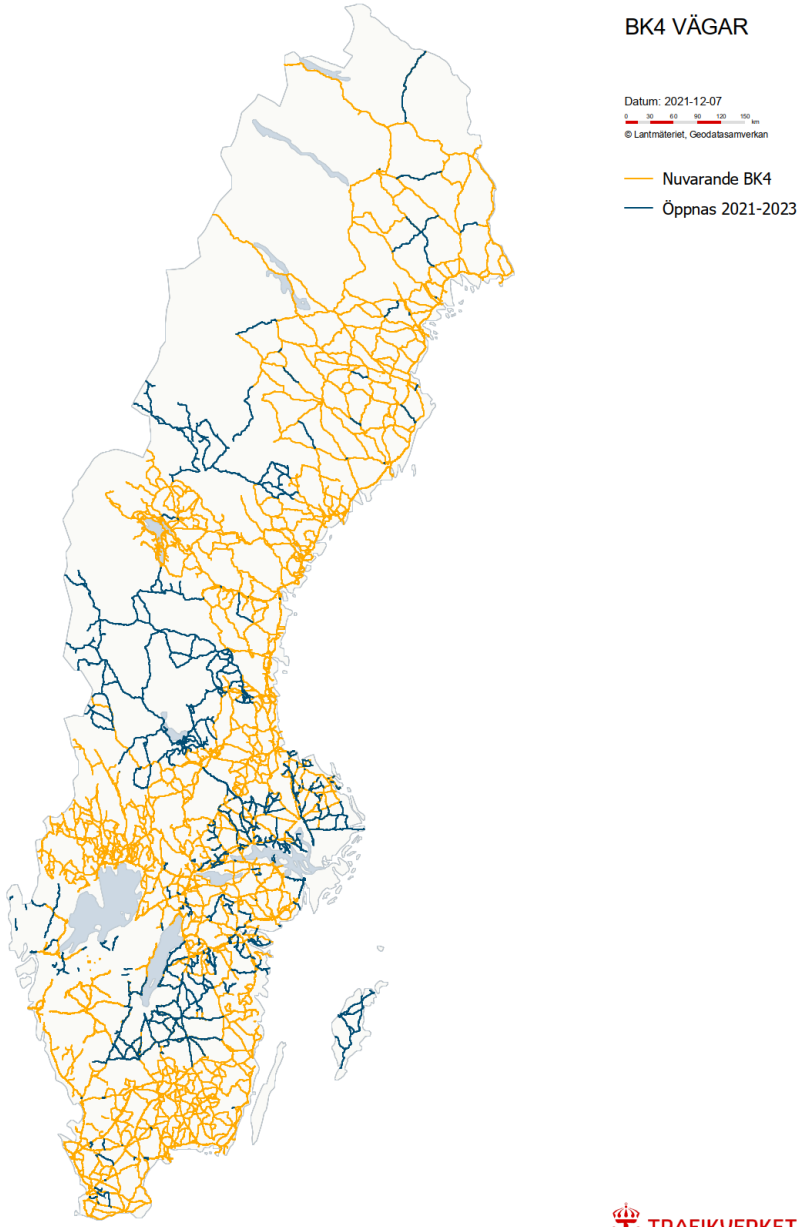
Status –2021/2022

- ≈ 33 % of state road network
- ≈ 50 % of the prioritized road network for BK4

Deployment plan for 2022 - 2024

- Ambition to open 40 % of the state roads for BK4 until the end of 2024
- Ambition to open 60 % of the prioritized roads for BK4 until the end of 2024

Link to deploymentplan: https://www.trafikverket.se/for-dig-i-branschen/vag/bk--barighetsklasser-pa-vagar-och-broar



TRAFIKVERKET

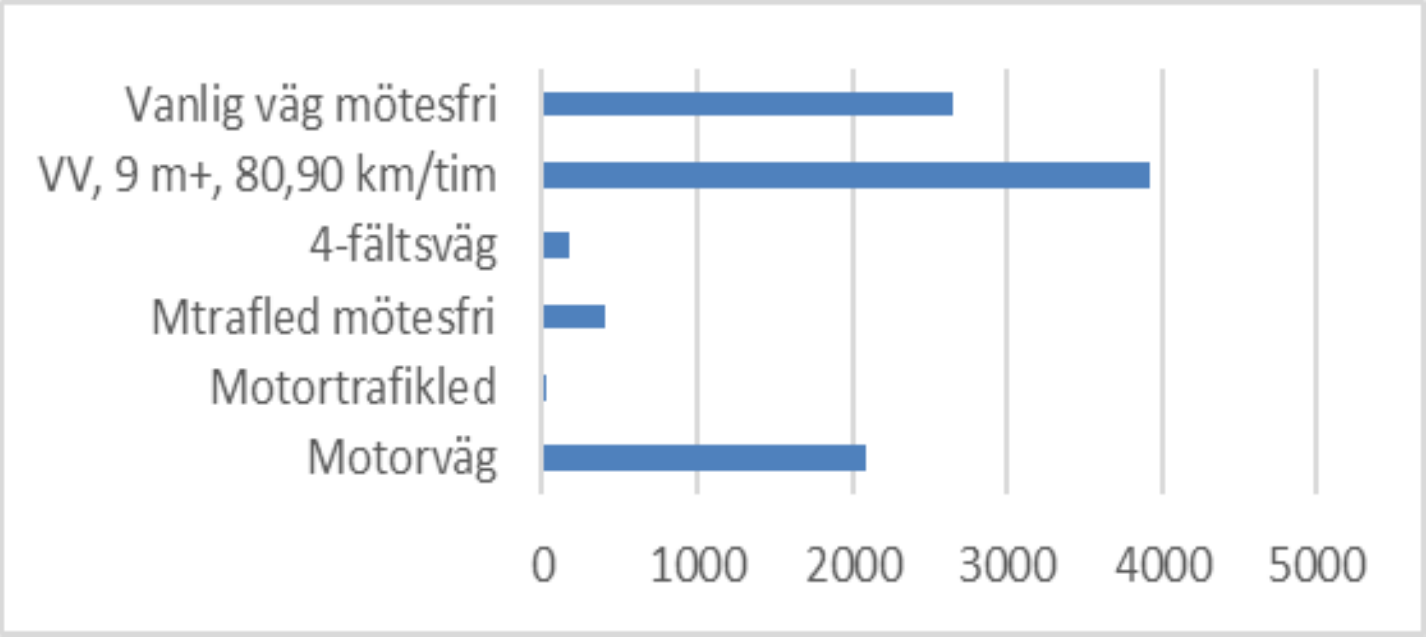
Longer vehicles

TRAFIKVERKET

Roads that fulfills the criterias

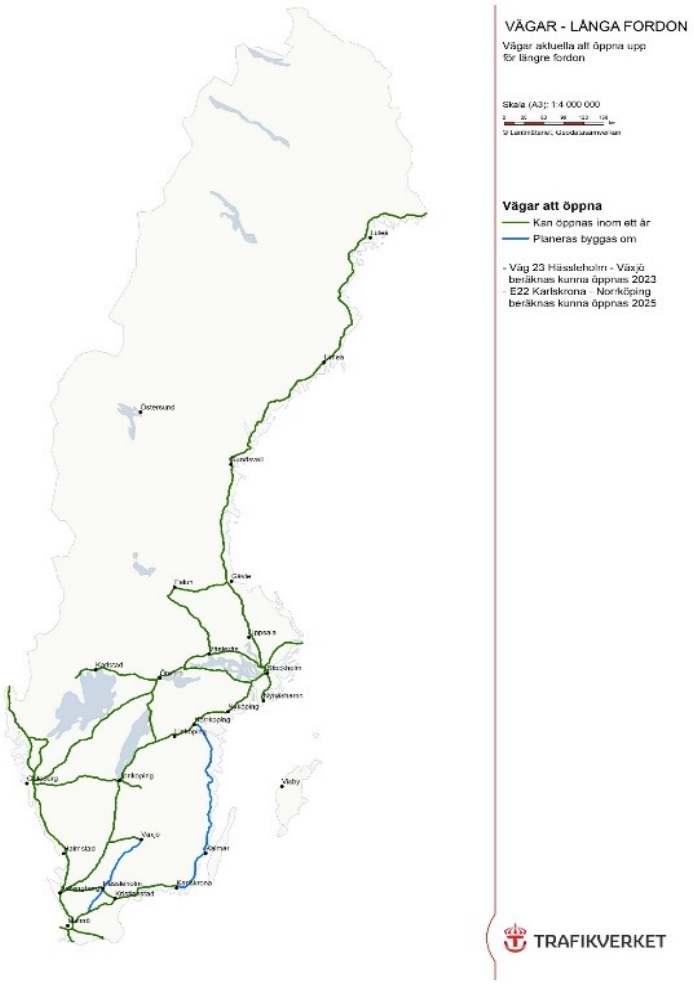
Type of roads

- ca 2000 km motorways
- ca 3000 km med separated roads
- ca 4000 km normal roads



TRAFIKVERKET

Report – Longer (up to 34.5 m) vehicles at Swedish road network



- Approximately 4 000 km could be opened within a year from decision
- On the proposed road network should the road safety not be affected negatively
- The effects on the climate and the environment are positive
  - Overall 4-6 % less energy use
  - For each transport up to 30 less energy use
- There will be a risk of goods moved from rail to road that you need to handle
- Socio-economically very profitable proposal
  - Benefits = 1 – 1,4 billion Euro
  - Costs = 5-10 million Euro (roundabouts, road width in urban areas)

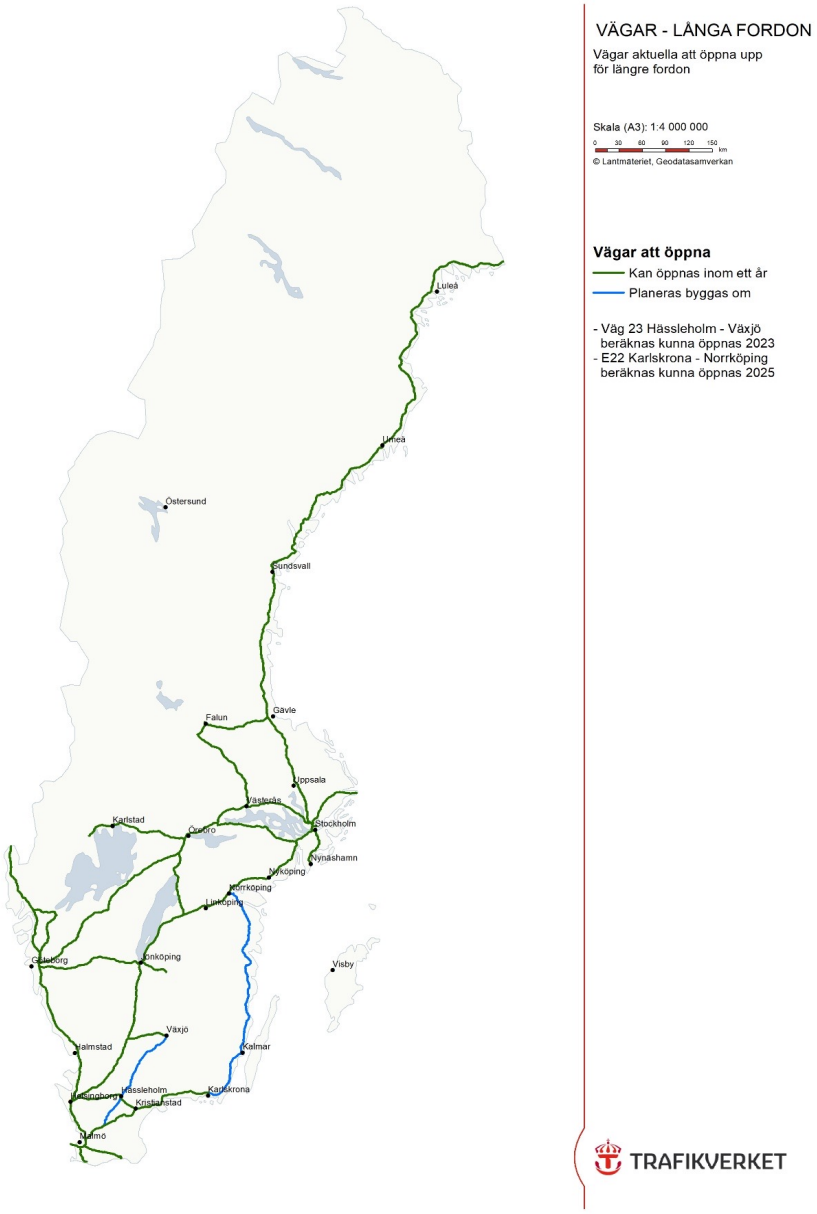
TRAFIKVERKET

Process to open the roads for longer vehicles

New regulation 31/8 - 2023

Transport agency – requirements on vehicles

Transport administration prescribes on roads



TRAFIKVERKET

Activities at Trafikverket

- Start to analyse the first 4000 km
  - The green roads on the map
  - Have to look into changes made in the national investments plan
  - There might be some minor works
- Strategy and mark up the network with road signs
- Last mile access - assignment from the government
- Detour network that are available at incidents and maintenance,….
- Plan and strategy to open more roads

Thank you for listening!

Nordic HCT Conference 2022

The Conference starts again 12.50

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2022-10-11

Learnings from Netherlands
Marcel Otto, Ministry of Infrastructure and Water Management

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2022-10-11

Rijkswaterstaat
Ministry of Infrastructure and Water Management

Load and overloading by heavy duty vehicles on main roads in the NL

Developments in time and some considerations on consequences

Marcel Otto (MSc),
Strategic advisor and coordinator freight transport

6 Oktober 2022

Research setup

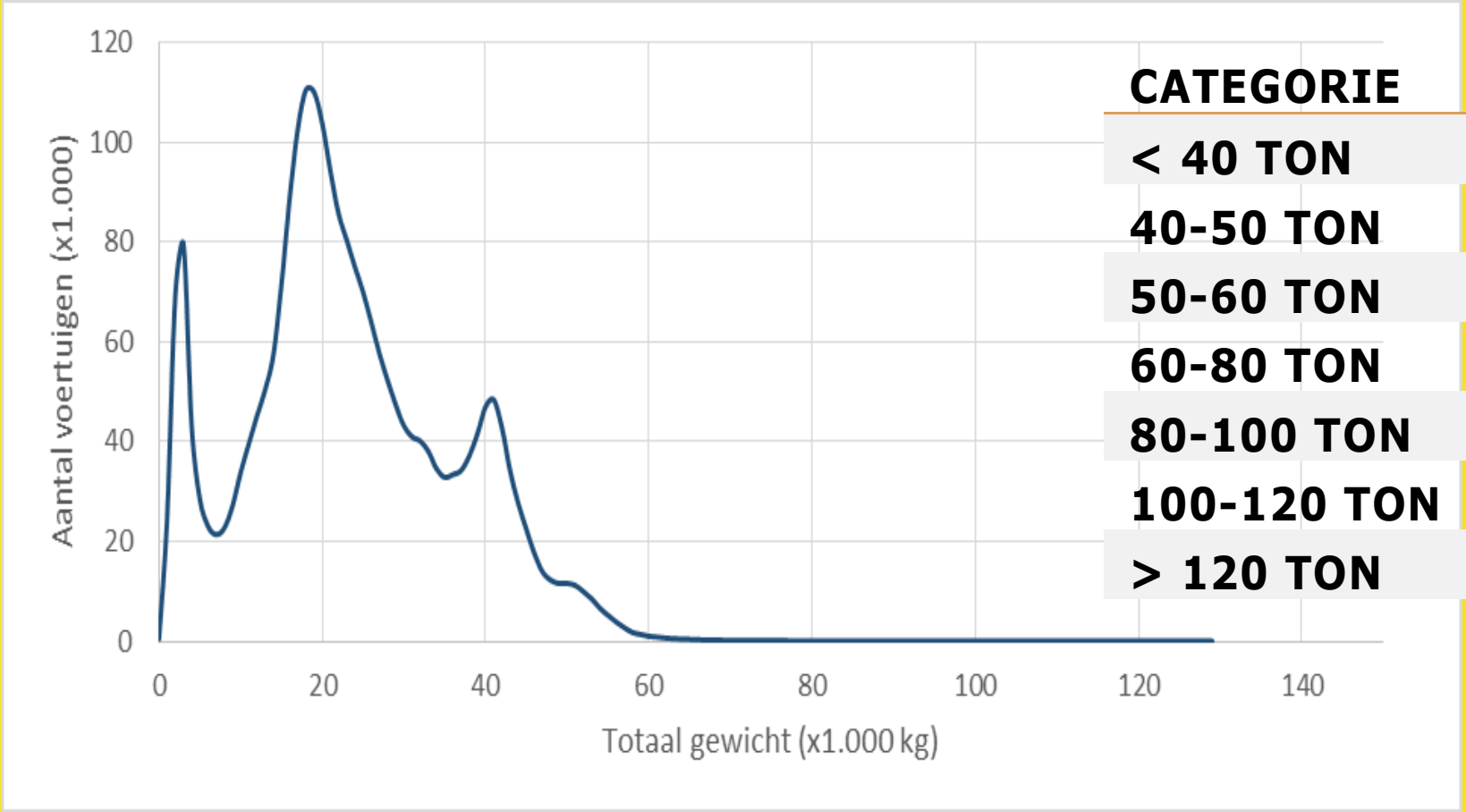
Current situation:
Data of 9 working WiM-stations Nov-Dec 2020/2021

Historical trends:
Data of 1 WiM-station 2015-2021. Compared with 2014 research results.

Future trends:
Prognoses for 5 objects and 3 routes

WiM-data includes:
Vehicle type, location/time, total/axle weights, overload per vehicle type differentiated by axles/total weights

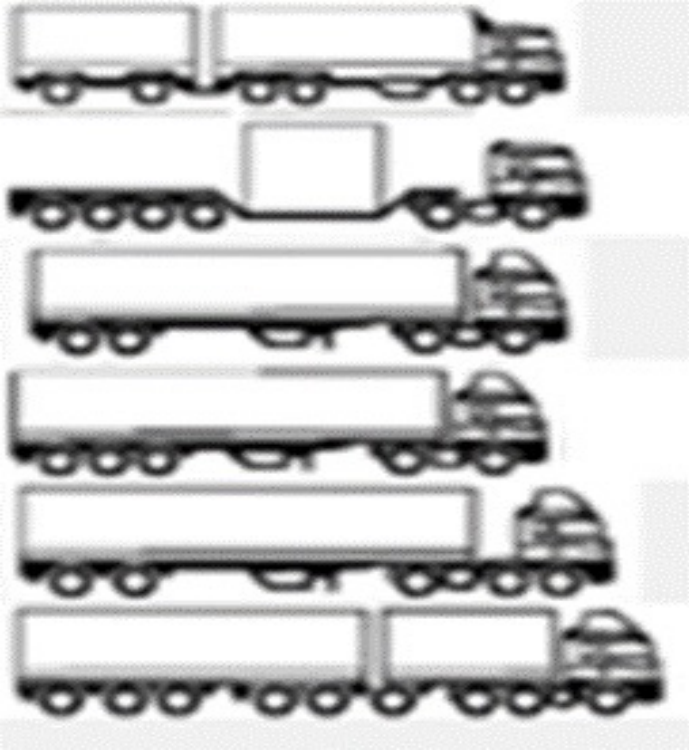
Loads of trucks on main roads in NL



CATEGORIE	AANTAL	AANDEEL
< 40 TON	2.155.600	86,1%
40-50 TON	277.400	11,1%
50-60 TON	62.700	2,5%
60-80 TON	5.900	0,2%
80-100 TON	1.000	0,0%
100-120 TON	100	0,0%
> 120 TON	0	0,0%

Overloading of trucks on main roads in NL

- 10.1% trucks overloaded
- 7.6% on axles, rest axles and total
- 54% minor exceedances (< 110%)
- 10% major exceedances (>125%)
- Big differences for configurations smaller in time (not in time of day)
- EMS1(R) less excess on axles, more on total weight (2014 vs 2021)



Max. weight from 40 ➡ 50KT?

- More than 97% of road freight traffic is lighter than 50T. That is, per 100,000 vehicles there are 2,788 heavier than 50 tons. 0.283% is heavier than 60 tons.
- Looking at the exceedance probabilities for the total weight, it is striking that the EMS-1 vehicles are relatively often heavier than 60 tons and also relatively often heavier than 80 tons.
- Reducing the maximum permissible vehicle weight for regular road freight transport from 50 to 40T would lead to huge increase in number of trucks.
- The construction norms for bridges in the Netherlands are based on the use by freight vehicles with a maximum vehicle weight of 50T.

Other considerations

1. Need for structural monitoring with higher share of roads and traffic, based on more and more robust WiM-systems
2. Except for EMS1 no insights in other configurations with excemptions, so an exceeding do not always need to be a violation. Need approval to process personal data (i.c. images) in new research with extra WiM-stations.
3. Differences in (over-)load per location might lead to differentiation in norms for constructions or access regulations for configurations
4. Impact analyses for EMS 2 on lifetime of steel and concrete bridges, shows small effects in compare with accumulations of regular configurations in time, but also depending on substitution and compliance in maximum load.
5. What are the cost and benefits of regular configurations (smaller and lighter) in compare with specials (i.e. EMS)? And how these cost and benefits are or might be allocated to public and private stakeholders?

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HCT city project in Sweden – an overview

Fredrik Cederstav, RISE

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2022-10-11

Nordic HCT Conference 2022

Fredrik Cederstav, Sr Project Manager, RISE AB
Project: HCT-City (High Capacity Transports)

HCT-City:
Benefits with HCT in urban construction areas. Pilots in 2 cities and system analysis

Time: April 2021-March 2024
Budget: 24 MSEK

Varberg rail tunnel:

3 km tunnel. Opens in 2024.
Logging existing vehicles.

Stockholm NDS:

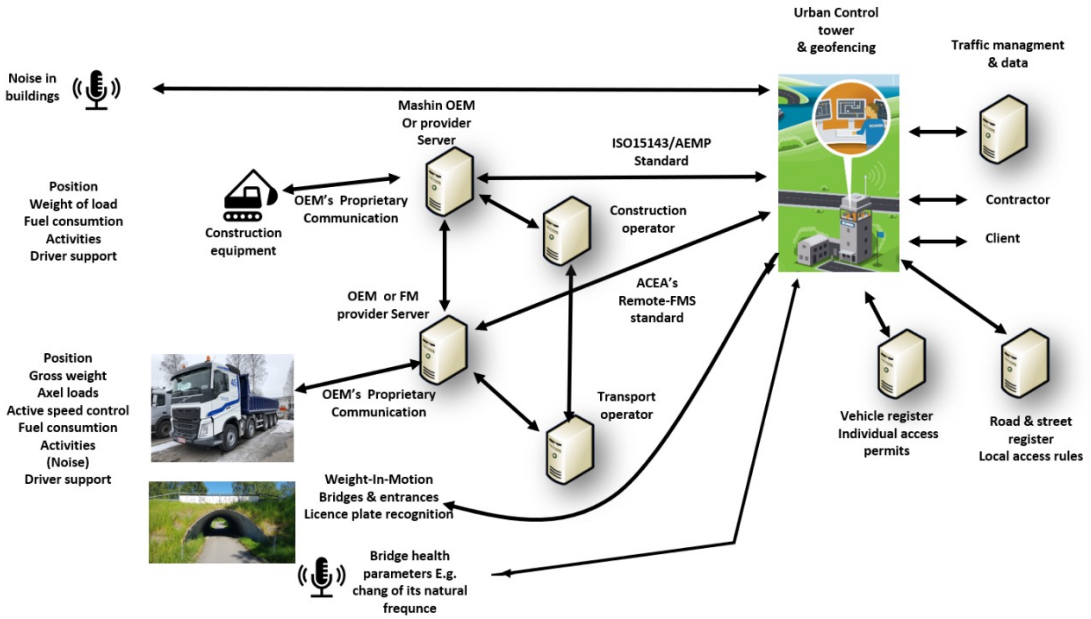
Several huge housing projects. Benefits with 5-axle truck.

Problem:

- 50% of weight-related goods transports in cities are construction- and mass transports
- Increased urbanization-increasing heavy mass transports
- Challenging road wear, traffic safety, noise and CO2

Solution:

- Intelligent access+allow vehicles with higher gross weight on specified routes if the load is distributed on more axles
- Digital support and control of loads, routes and speed with connected vehicles, loaders and infrastructure
- Can BK2 be upgraded and open for 5-axles ?



Hypothesis (5 axles, GVW 42 ton):

- 50% less trucks
- 40% less CO2
- Improved productivity (ton/h)
- Less congestion
- Less road wear (per tonkm)

Fordon	Medelbrutto-vikt (ton)	Antal resor för att flytta 2 196 ton	Medellast (ton)	Medel Axellast (ton)	l/100km	ABba (ml/tonkm)
Treaxligt BK2 referens fordon	23,5	**172 (100%)**	12,8	7,8	31,79	**50 (100%)**
Förstudie femaxlad (enl finska bruttovikter)	37,8	**111 (-35%)**	19,3	7,6	43,29	**45 (-10%)**
Utvecklad fem-axlad (enl finska bruttovikter)	42	**93 (-46%)**	23,5	8,4		**30 (-40%)**

Resultat från förstudien

Beräknade resultat för optimerade fordon

Testing **digital** functions such as driver support, weight control and geofencing

Research topics (1):

- From Prestudy in Sthlm: 35% less routes and potential for **~46% less**!
- Is this within reach ?

- Designing two new trucks with double load capacity, improved maneuverability and improved traffic safety
- Logging of trucks and wheel loaders
- Measurement of over- and underloads
- How to connect trucks on a system level

Research topics (2):

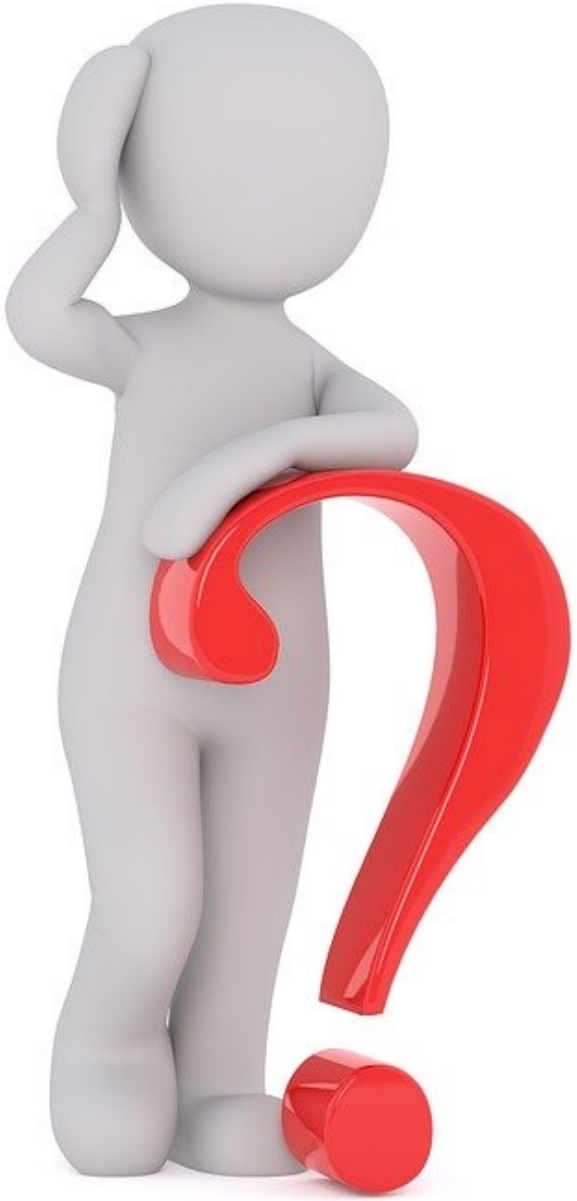
Can HCT:

- mitigate emissions by 40%
- Improve transport efficiency
- Improve productivity and capacity for construction sites
- Mitigate urban congestion

To be further examined:

- Impact on asfalt layers, bridges, road wear etc.
- Improved traffic safety (sensors, cameras, geofencing)
- Cycle times, Load balancing, costs

HCT-City. Nordic HCT Conference 2022.



Questions !

https://hct-city.se/

fredrik.cederstav@ri.se
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HCT and the benefits for Stockholm
Amanda Baumgartner, City of Stockholm

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HCT and the benefits for the City of Stockholm

Amanda Baumgartner
Transport department City of Stockholm

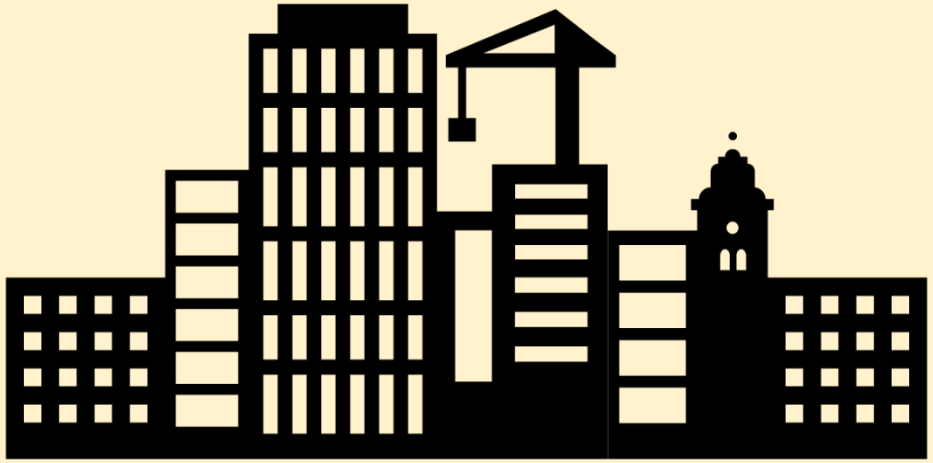
Stockholms stad

Stockholm is growing

Stockholms stad

Mass management plan

Efficient mass transport is vital



- 70 000 housing projects
- Bypass project
- Extension of underground

Urban waterways as a resource to reduce traffic on roads.

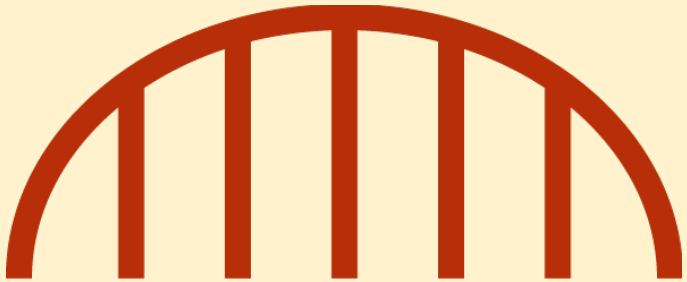
Stockholms stad

300 trucks or
2 barges per week
60 % CO_2 reduced

We need better knowledge about the quays

Bridges of the city

Updating knowledge of capacity



- 933 bridges
- Better calculations
- Reclassify

Re-classify BK2 roads to BK1?

Stockholms stad

Geofencing conditional permit

Pilot within Smart urban traffic zones project

- 15 km/h in city using geofencing
- Less transports required
- Regulations an obstacle!

Stockholms stad

Longer vehicles in the city of Stockholm?

Stockholms stad

Thank you!

amanda.baumgartner@stockholm.se

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2022-10-11

Results from demo of HCT Construction transport in Stockholm

Martin Svedin, M logistics

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2022-10-11

Smarta urbana trafikzoner

HCT conference

2022-10-06

Martin Svedin

Construction transports

Project: Trial with BK1 weights on a BK2 road

- Project starated with a conclusion that there is a shortig of transportcapacity
- The large projects in Stockholm with building the new subways and also new roads around Stockholm will demand concrete on a large scale. The transports of these volumes will be done with a weightrestriction under BK2
- The purpose of this demonstration project is to do a trial with BK1 weights and to analyze if these transports can be done without negative effects on roads and environment around.
- Gains for the project would be:
  - Fewer transports is need to deliver the volumes that the large projects need.
  - Cost of more wear on the roadnetwork would be less then cost gained from fewer transports when full capacity is used for every single transport.
  - Enviromental gains when practically 14% of transports could be reduced when conditions is right
- Measures that is needed to make project possible:
  - Lowered speed with Geofence control
  - When using newer vehicles there is a better control in the vehicles airsuspesion then in older trucks with springsuspesion. So with using modern suspension we can devide the loads better over axels with reuced roadwear as a results
  - The weight of the load is measured in real time in the vehicle with help of the airsuspesionsensors and can therefore be used for activating and deactivating the geofencezone.
  - An exemption for divisible loads with controlled travel routes that are controlled by geofence

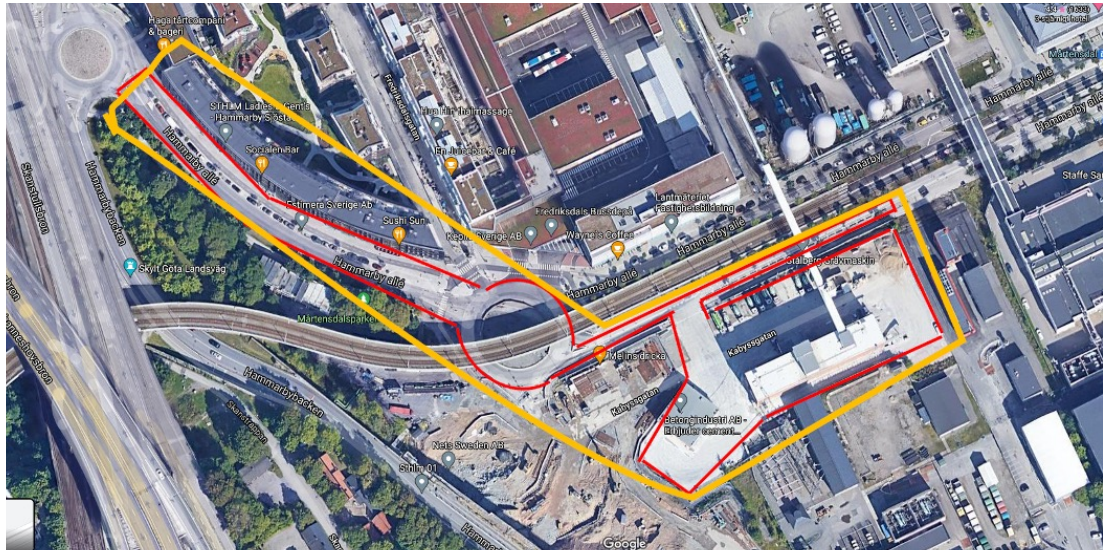
Construction transports

Choosen routes

- Södermalm was choosen as exemptionarea with exception for certain places that is restricted due to roadconditions
- A specific in testarea at Tengdahlsgatan was picked for specific test such as vibrationtesting

Measurement of vibrations

- A Measurement of vibrations with focus on comfort for residents was done. The measurement was done at Tengdahlsgatan and that site was choosen for being suitable with the right groundconditions etc
- The measurement was done by Efterklang that placed measurementequipment on different levels inside and outside the real estate that was choosen. The aim was to measure vibrations in different speeds with different loads.



Construction transports

Challenges

- The pandemic gave us lots of challenges
- The vibration mesurement showed to be more complex then first planned for due to lots off more parameters that needed to be considered.
- A number of techical challenges came up during mounting equipment on the truck
- The conditions for controlling the geofencezone needed to be adapted so that it could activate and deactivate the system from both cloud and the vehiclesystems for measuring weight of load.
- In this case we used the vehicles airsuspension system
- Same airsuspension is working to keep the truck as leveled as possible during travel. This is a challenge when passing roadbumps for example as it can cause a spike in axelload that could trigger the system for the wrong reasons.

Results

Vibration measurement

- The result is showing that the most significant faktor is speed
- The lowering of speed that we did during this project shows that there is less vibrations with BK1 loads in 15km/h then with BK2 loads and 30km/h
- The vibrationstudie also showed that the streets surface in combination with speed of vehicle has a significant effekt in felt vibrations
- We also could demonstrate that the newer airsuspesion systems are better in handeling transitions between diffrent roadsurfaces so that less vibrations is transferred to road.
- A possible solution could be to control speed depending och roadsurfaceing quality.

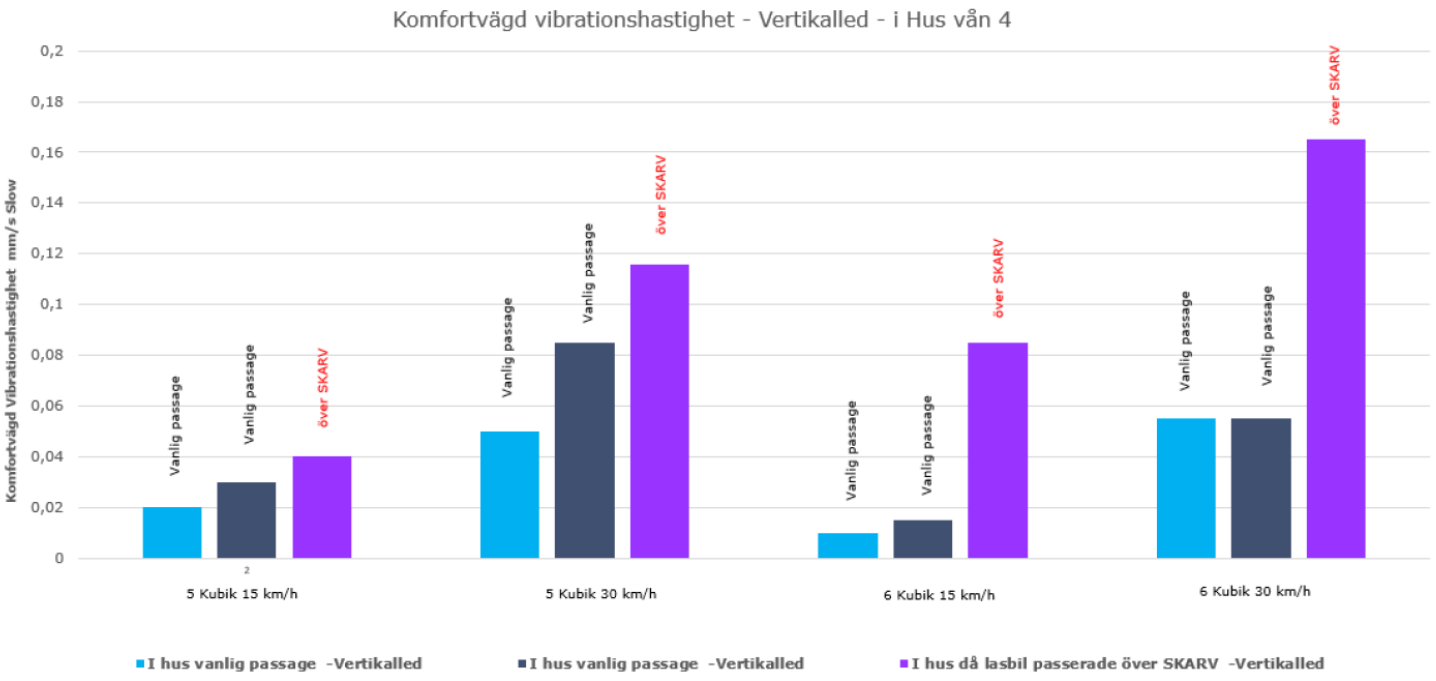


Diagram 3, visar komfortvägd vibrationshastighet i bjälklaget på fjärde våningen i huset - vertikalled vid 12 lastbilspassager, uppdelade i 4 scenario : 5 kubik 15 km/h, 5 kubik 30 km/h, 6 kubik 15 km/h, 6 kubik 30 km/h.

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Learnings from Finland
Otto Lahti, Finnish Transport and Communications Agency

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2022-10-11

TRAFICOM
Finnish Transport and Communications Agency

City HCT experiences in Helsinki

Otto Lahti
Chief adviser

What HCT means this time

HCT in Finland ~32 m

City HCT ~ heavy truck in city

When you build something big in the city
Transport volumes are high and distances are long

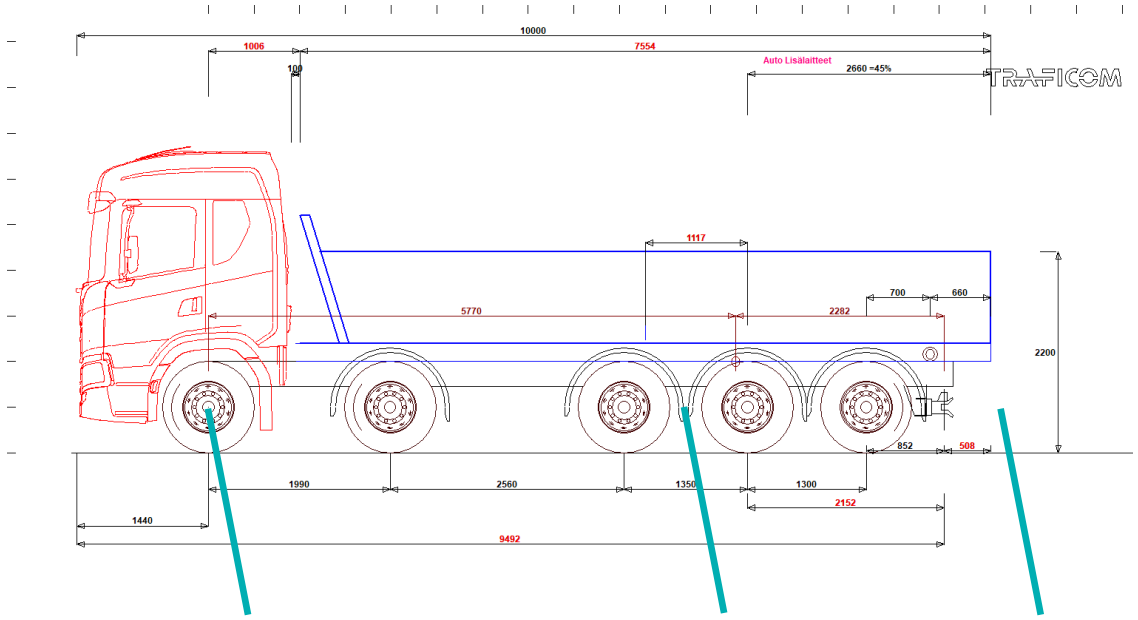
- 76 t HCT has double load compared to 40 t truck
  - More payload
  - Less trucks
  - Less emissions
  - Better safety

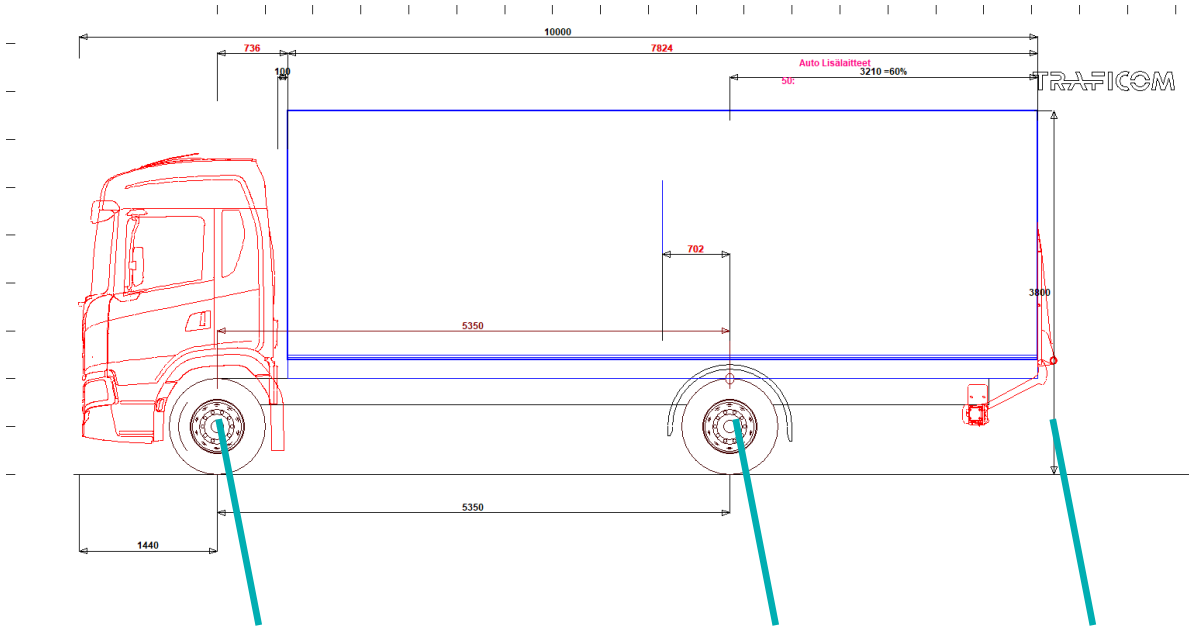
Picture: YIT

How long and heavy is 5-axle tipper truck?

- Max weight for combination 76 t
- Max weight for truck 42 t
  - More important is the bridge rule
  - → typical weight 38-40 t

Same lenght and turning circle





Heavy semitrailers are also possible

- 3+2-axle 44 t
  - Common in Finland
  - Cheap standard vehicles
- With sliding bogie
  - 3+3-axle 52 t
  - 4+3-axle 59 t
  - 4+4-axle 65 t
    - 64 t single tires

TRAFICOM
Finnish Transport and Communications Agency

Thank you

Otto.lahti@traficom.fi

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2022-10-11

Learnings from Denmark
Martin Frimann Mortensen, Danish Road Directorate

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2022-10-11

HCT in cities; Allowing higher weight and dimensions to make transport more efficiently and greener in Denmark

Færdselsstyrelsen

Vejdirektoratet

HCT konferens
October 6., 2022

Færdselsstyrelsen
Vejdirektoratet

Political agreement on 24th of June 2022:

- 11 initiatives will allow vehicles and road-trains to become longer and heavier:
  - 7 initiatives will allow heavier weight
  - 4 initiatives will allow longer road trains
- Positive socio-economic gain
- Reduction of 0,1 million tons of Carbon gasses
- Part of an agreement changing the truck fees for using public roads
- Permitted from 1st. of January 2025

PROPOSAL: Preparations of the concrete changes in regulations are not finished yet!

Weight initiatives for rigid trucks

Færdselsstyrelsen
Vejdirektoratet

- Increased weight for 4-axl rigid trucks, from 32.000 to 36.000 kg
  - All types of propellants
  - Must comply minimum wheel-base (TBD)

- Increased weight for 5-axl rigid trucks, from 32.000 to 42.000 kg
  - All types of propellants
  - Must comply minimum wheel-base (TBD)

Weight initiatives for road trains

Færdselsstyrelsen
Vejdirektoratet

- Increased weight for 3-axl road trains, from 28.000 to 30.000 kg
  - All types of propellants

- Increased weight for 4-axl road trains, from 38.000 to 40.000 kg
  - All types of propellants

- Increased weight for 5-axl road trains, from 42.000 to 47.000 kg
  - Where the rigid trucks has 2 axels
  - All types of propellants

- Increased weight for 5-axl road trains, from 44.000 to 47.000 kg
  - Where the rigid trucks has 3 axels
  - All types of propellants

- Increased weight for 6-axl road trains, from 50.000 to 52.000 kg
  - Where the rigid trucks has 4 axels
  - All types of propellants

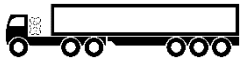
- Increased weight for 6-axl road trains, from 50.000 to 53.000 kg
  - Where the rigid trucks has 3 axels
  - All types of propellants

Length initiatives for road trains

Færdselsstyrelsen
Vejdirektoratet

- Increased length for semitrailers (+1,3 m)
  - Roadtrain 16,50 m -> 17,80 m
  - Semitrailer: 13,60 m -> 14,90 m
  - Must comply the EU regulations for turning radius

- Increased length for semitrailer-roadtrains, using alt. fuels (+1 m)
  - Roadtrain 16,50 m -> 17,50 m
  - Semitruck coupling-length: 4,5 m -> 5,5 m
  - Must comply the EU regulations for turning radius



- Increased length for semitractor and semitrailer, with crane (+2 m)
  - Roadtrain 16,50 m -> 18,50 m
  - Max length of trailer: 13,60 m
  - Must comply the EU regulations for turning radius

- Increased length for rigid truck and trailer, with crane (+2 m)
  - Roadtrain 18,75 m -> 20,75 m
  - Total length of loadingspace must not exceed 15,65 m
  - Must comply the EU regulations for turning radius

Thank you for listening.

Martin Frimann Mortensen
Vejdirektoratet
(Danish Road Directorate)

Mail: mfm@vd.dk

Tel.: + 45 7244 2711

Færdselsstyrelsen

Vejdirektoratet

Questions and summary of Session 1
Ulf Ceder, Scania

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2022-10-11

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The Conference starts again 14.30

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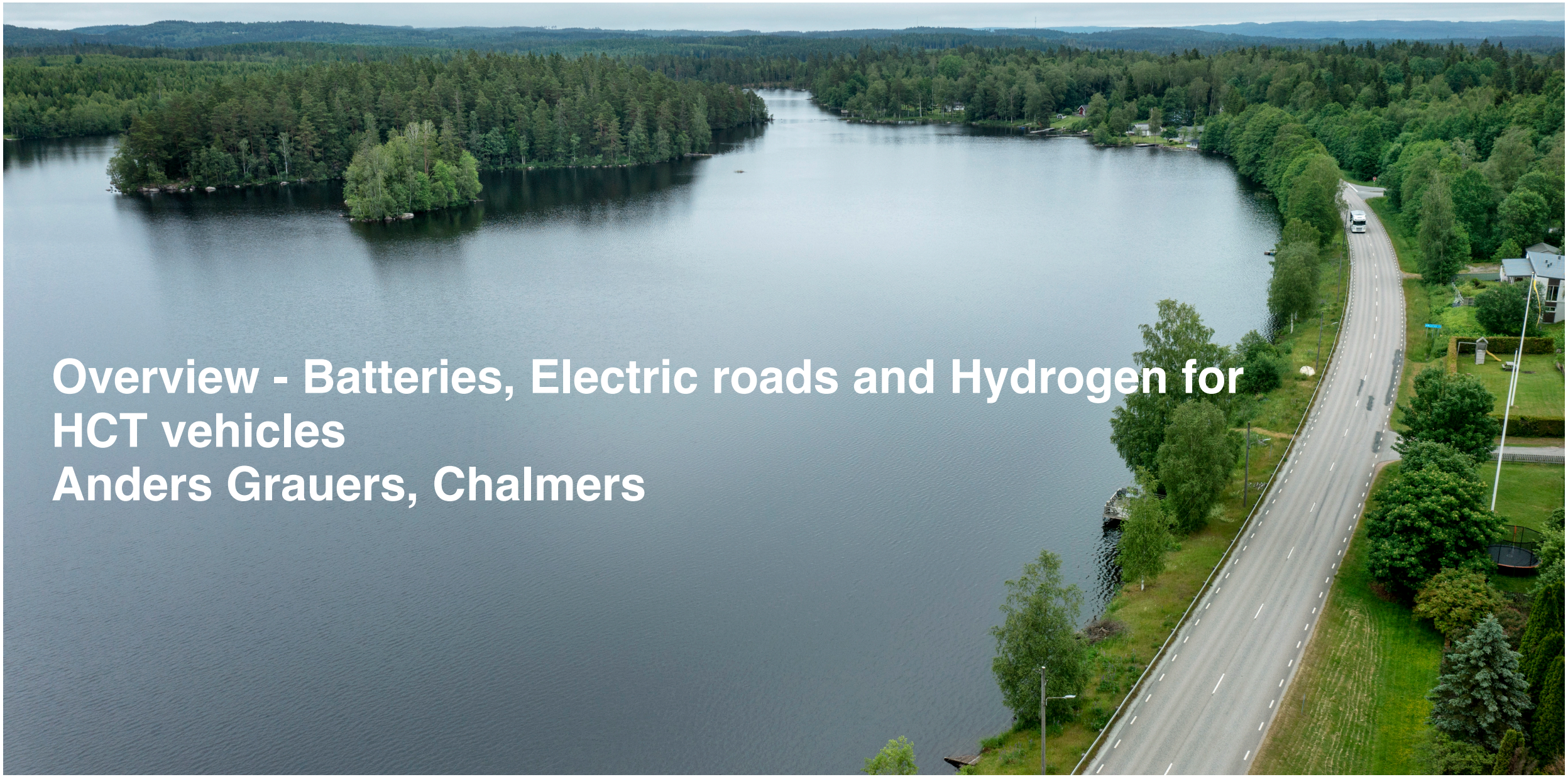


Overview - Batteries, Electric roads and Hydrogen for HCT vehicles

Anders Grauers, Chalmers

CLOSER

2022-10-11

Batteries, Electric roads and Hydrogen for HCT-vehicles

Anders Grauers

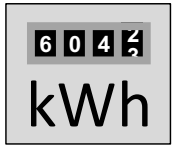
Chalmers tekniska högskola

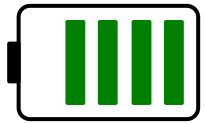
Disclaimer:

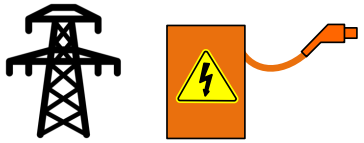
Very rough Cost parameters - To illustrate main factors

Complex question - No final conclusions possible

Size does not matter!







~ 2.5 × Energy Consumption

~ 2.5 × Battery Capacity

~ 2.5 × Chargers & Grid Power

~ 2.5 × Fuel Saving

Cost & Benefit - determines choice of propulsion

Direct Costs

- Vehicle
- Infrastructure
- Fuel/Energy
- Driver salary

Indirect Costs

- Lower payload
- Extra driver time
- Extra vehicle time
- Extra driving distance

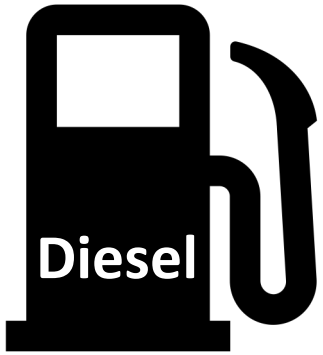
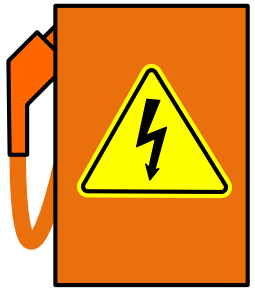
Often zero, for many trucks.
When non-zero – often important

Pro's and Cons

- Robustness
- Flexibility
- Business complexity
- …

Not discussed in this presentation

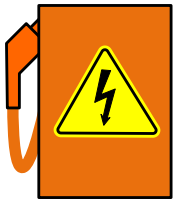
Main differences

	Reference	Good!	Good!	Good!
				
Vehicle Cost	100%	~100%	~200%	~130%
"Fuel" €/kWh$_{wheel}$	0.4*	~ 0.4*	~ 0,1*	~ 0,1*
Infra. €/kWh$_{wheel}$	(in fuel cost)	(in fuel cost)	0.1-0.4**	0.2-0.8**
Introduction:		Medium	Easy	Difficult

* Pre and post 2022-202X energy crisis

** Depends on utilization

Main differences



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Suitable for:

Vehicles used few days <u>OR</u> very varying distance.

Long dist. & Heavy Goods

Suitable for:

Vehicle used most days

<u>&</u> Similar distances per day

Can charge at night/breaks

Light goods <u>OR</u> Short dist.

Suitable for:

Very high traffic volumes

Especially for

Long dist. & Heavy goods

Similar TCO as diesel 2020

Can have lower TCO than diesel in good segments

Speculation: Solution with lowest Cost?

Local Distribution — Battery & stationary Charging

Regional Distribution up to 300 km — Battery & stationary Charging

Not used daily, or very varying distances — H2 or ERS

Long Haul, varying route — ERS, H2, Battery with fast chg

Long Haul, Fixed route — ERS, Battery with fast chg

Same conclusions for HCT!

Difference often rather small – non cost factors may influence results

Truck size does not influenced choice of propulsion …but by **driving patterns** and **type of load** does.

- Battery and stationary charging often cost effective and rather easy to introduce

- H2 and ERS stronger if
  - Heavy goods AND long distance
  - Low utilization of charging
  - Vehicle used few days OR Very varying distance
  - Very high traffic density (only ERS)

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ERS development in Sweden
Kenneth Natanaelsson, Swedish Road Authority

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Det går inte att visa bilden.

TRAFIKVERKET

ERS in Sweden

Kenneth Natanaelsson
Trafikverket
221006

Roadtransports will continue to dominate!

Probably need of different solutions:

- Increased efficiency in the transportsystem
- Biofuels
- Static charging – Battery Electric Vehicles
- Dynamic charging - Electric roads
- Hydrogen/Fuelcells
- Battery swapping etc

Demonstrators for electric roads

Create knowledge about the construction and maintenance of ERS!

Sandviken
2016–2020

Lund
2020–2023

Arlanda
2018–2021

Visby
2020–2023

TRAFIKVERKET

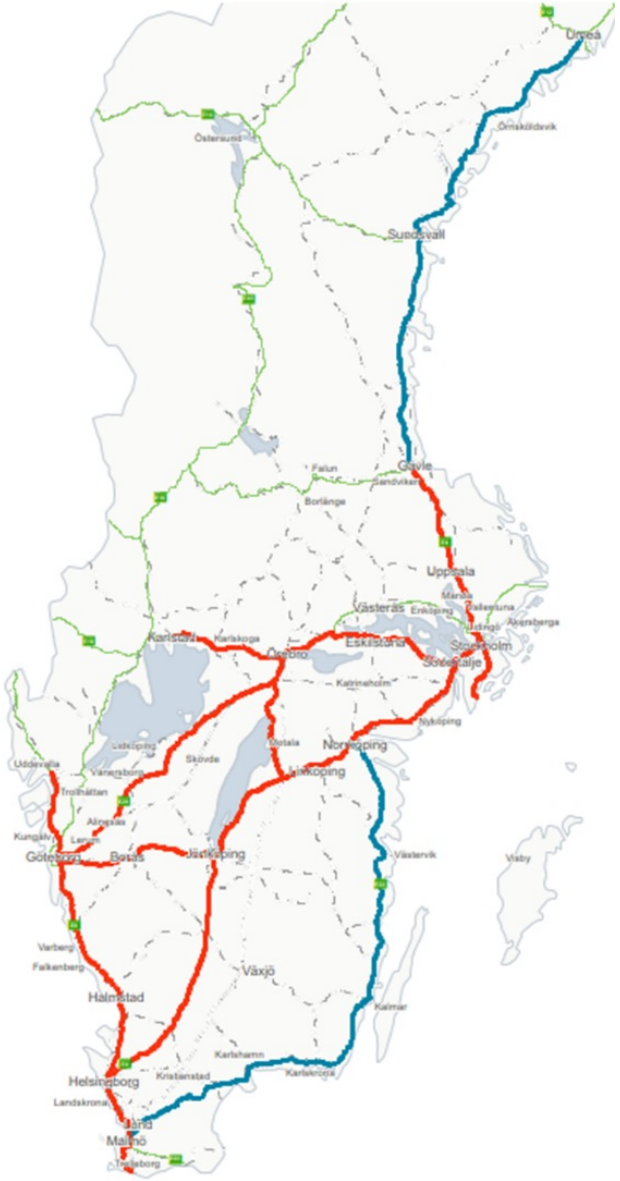
The Swedish government increases the tempo!

- Electrification commission
- Directive for ERS
- Strategi for next generations electrification
- Task to plan for deployment of ERS
- Task to analyze the need for static fast chargers for heavy transports along the major road network
- Task to analyze hydrogen/fuel cells

TRAFIKVERKET

Task to analyze the supply and demand for static fast chargers for heavy transports

- Heavy electrical vehicles with stationary charging are a reality at the market today
- To introduce vehicles with stationary charging is almost a necessity for the vehicle industry to reach the EU CO_2-demands
- The prediction for Sweden is that there is approximately 70 000 electrical vehicles using stationary charging in the fleet 2040
  - 70 000 private
  - 5 000 – 14 000 semi-public charging points*
  - 3 000 – 6 000 public charging points*



Road network considered for the deploymentplan for ERS

Included in the analysis of the road network:

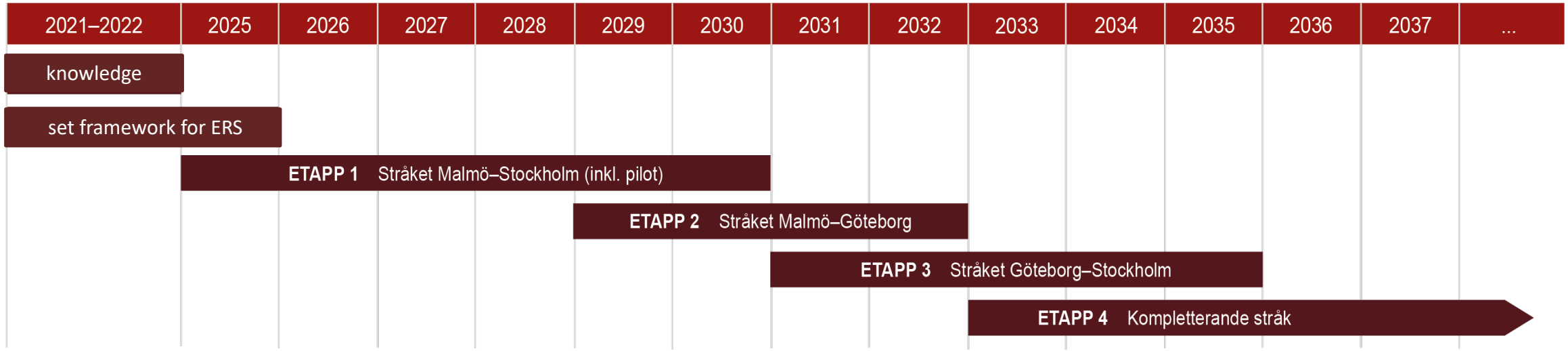
- The roads with the highest traffic volumes (freight)
- Connections to harbours – terminals and large industries
- The ERS - pilot

2000 km ADT freight 3800

1000 km ADT freight 3100

TRAFIKVERKET

Possible deploymentplan for ERS



- The first phase includes:
  - follow the development and built knowledge for different alternatives to electrify the transportsystem
  - set the framework for building ERS at the swedish road network (regulations, power supply, and more)
- The proposed deploymentplan consists of four major transport routes and starts with the pilot 2025/2026. The plan includes 2 400 km in total until 2037, that might be extended if there are demand for it.

Recommendations/Summary (assigments)

- Lack of infrastructure for stationary charging is an obstacle for electrification of heavy transports and that infrastucture should be deployed now
- ERS can be a solution for electrification of long distance transports. There are still analyzes that need to be done and evaluated.
- During the upcoming years get more knowledge to remove uncertainties how heavy transports can be electrified.
- Hydrogen for transport cluster around Industries that produce H2 or more?
- Battery swapping?

Foto: Dan Boman 2020 Scania

Permanent ERS pilot

Örebro - Hallberg


Thank You!

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2022-10-11

ERS development in Denmark
Bo Ekman, Danish Road Directorate

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2022-10-11

Catenary lines Femern - Øresund

Bo Ekman

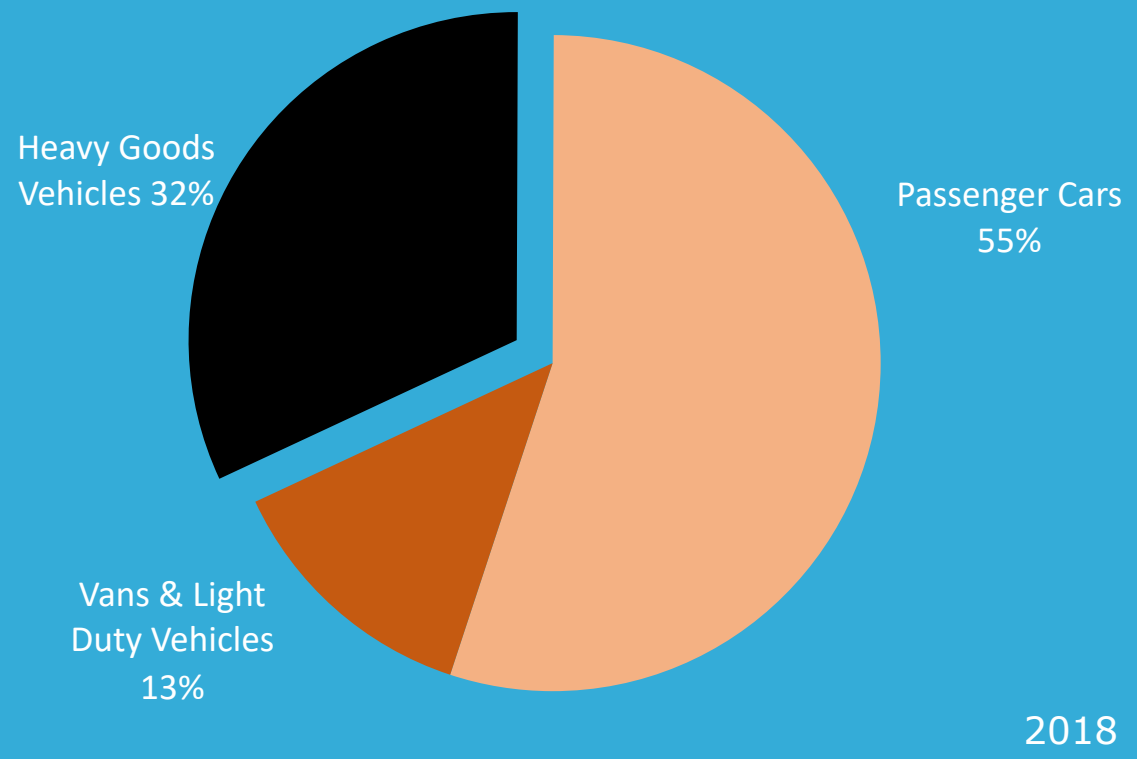
HCT-conference
6. October 2022

Vejdirektoratet

Charging while driving

Vejdirektoratet

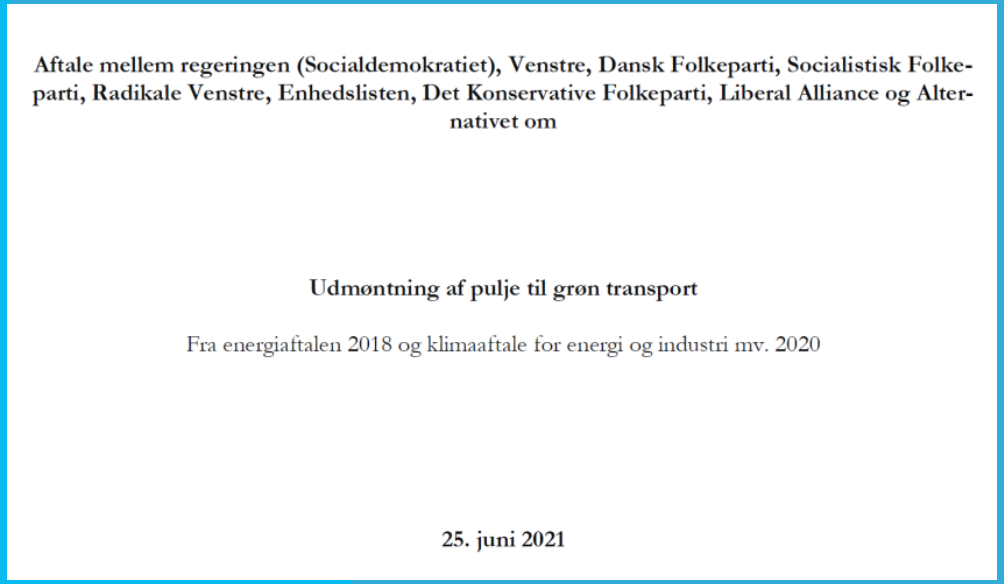
The challenge..... Heavy goods transport



Vejdirektoratet

The Danish Climate Act

Greenhouse gas emission reduced by 70% by 2030 / Zero emission by 2050



Aftale mellem regeringen (Socialdemokratiet), Venstre, Dansk Folkeparti, Socialistisk Folkeparti, Radikale Venstre, Enhedslisten, Det Konservative Folkeparti, Liberal Alliance og Alternativet om

Udmøntning af pulje til grøn transport

Fra energiaftalen 2018 og klimaaftale for energi og industri mv. 2020

25. juni 2021

Conversion of heavy goods vehicles

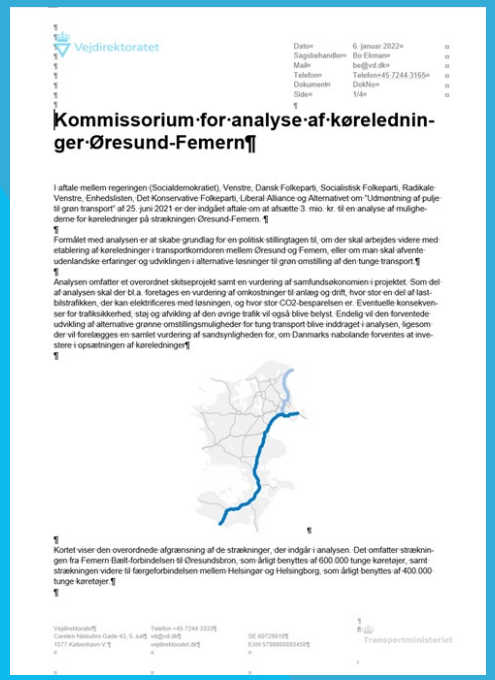
Analysis on catenary lines Øresund-Femern

Analysis of the possibility for catenary lines on the Øresund-Femern link.

3 million DKK (=40.000 €)

Vejdirektoratet

Terms of Reference



Vejdirektoratet

Dato:	6. januar 2022
Sagsbehandler:	Bo Ekman
Mail:	be@vd.dk
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Dokument:	DokNo:
Side:	1/4

Kommissorium for analyse af køreledninger Øresund-Femern

I aftale mellem regeringen (Socialdemokratiet), Venstre, Dansk Folkeparti, Socialistisk Folkeparti, Radikale Venstre, Enhedslisten, Det Konservative Folkeparti, Liberal Alliance og Alternativet om "Udmøntning af pulje til grøn transport" af 25. juni 2021 er der indgået aftale om at afsætte 3. mio. kr. til en analyse af mulighederne for køreledninger på strækningen Øresund-Femern.

Formålet med analysen er at skabe grundlag for en politisk stillingtagen til, om der skal arbejdes videre med etablering af køreledninger i transportkorridoren mellem Øresund og Femern, eller om man skal afvente udenlandske erfaringer og udviklingen i alternative løsninger til grøn omstilling af den tunge transport.

Analysen omfatter et overordnet skitseprojekt samt en vurdering af samfundsøkonomien i projektet. Som del af analysen skal der bl.a. foretages en vurdering af omkostninger til anlæg og drift, hvor stor en del af lastbilstrafikken, der kan elektrificeres med løsningen, og hvor stor CO2-besparelsen er. Eventuelle konsekvenser for trafiksikkerhed, støj og afvikling af den øvrige trafik vil også blive belyst. Endelig vil den forventede udvikling af alternative grønne omstillingsmuligheder for tung transport blive inddraget i analysen, ligesom der vil foreligge en samlet vurdering af sandsynligheden for, om Danmarks nabolande forventes at investere i opsætningen af køreledninger.

Kortet viser den overordnede afgrænsning af de strækninger, der indgår i analysen. Det omfatter strækningen fra Femern Bælt-forbindelsen til Øresundsbron, som årligt benyttes af 600.000 tunge køretøjer, samt strækningen videre til færgeforbindelsen mellem Helsingør og Helsingborg, som årligt benyttes af 400.000 tunge køretøjer.

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Transportministeriet

Approved by:

The Transportminister
The Green Transport agreement partners

Vejdirektoratet

Catenary lines Øresund-Femern
- Contents

1. Analysis of catenary line solutions
2. Designation of road sections, sketch project & construction estimate
3. Mapping of the traffic on the link
4. Potential for transfer of heavy transport
5. Estimation of the CO2-effect effect
6. Development of alternative fossil-free technologies
7. Development of ERS in the neighboring countries (SWE/GER)
8. Cost analysis for road users
9. Socioeconomic analysis

Vejdirektoratet

Catenary Lines Øresund-Femern
- Contents continued

9. Abnormal transports (height, width, dangerous goods, etc)

10. Downed catenary lines

11. Significance for road workers and emergency personnel

12. Noise from catenary lines

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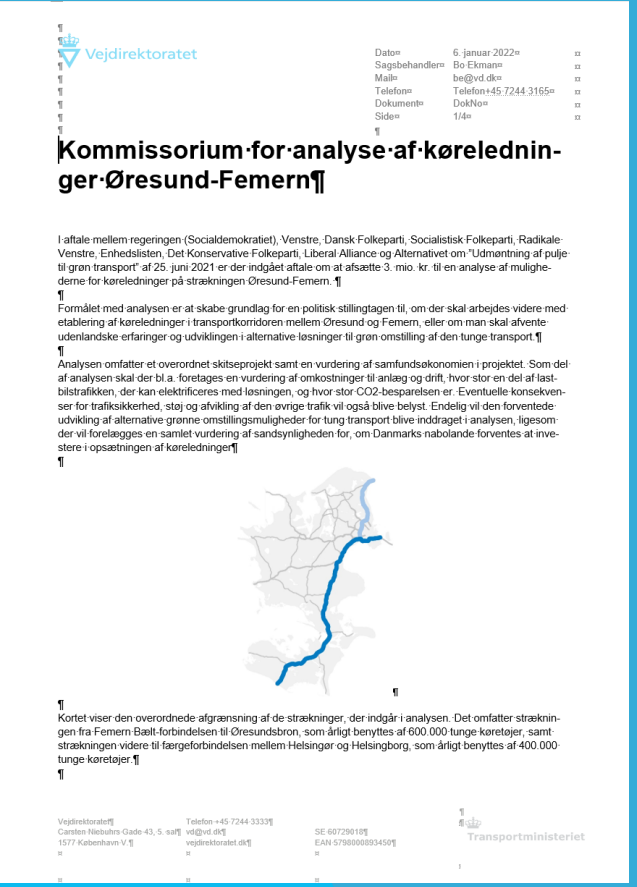

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Transportministeriet

The overall schedule for the analysis is:

Winter 2021/2022	Terms of reference for the project
mid 2022	Initiation of tendering for consultants and initiation of partial analyses
Mid 2023	Completion of data processing and partial analyses
Autumn 2023	Overall analysis and preparation of final report
End of 2023	Reporting to the Ministry of Transport

Vejdirektoratet

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Scanias electrified HCT vehicles
Anna Pernestål, Scania

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Anna Pernestål, Scania pilot partner

HCT – part of a sustainable transport system

SCANIA

Driving the shift

towards a sustainable transport system

Scania’s aim is to drive the shift towards a sustainable transport system, creating a world of mobility that is better for business, society and the environment.

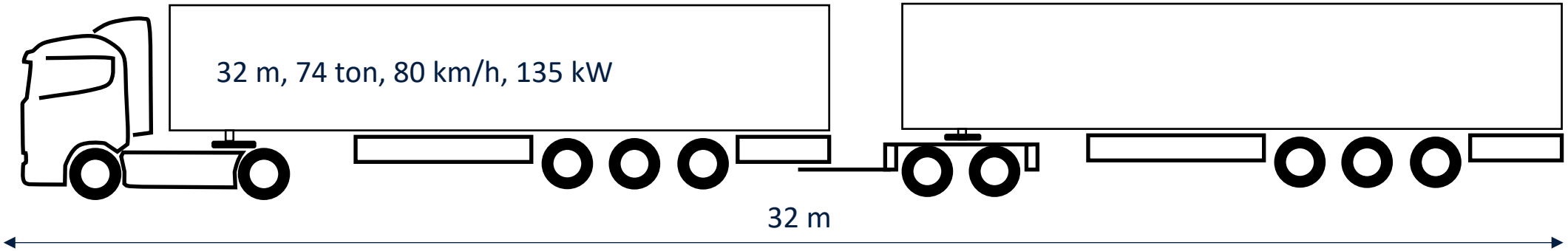
Leader in sustainable transport

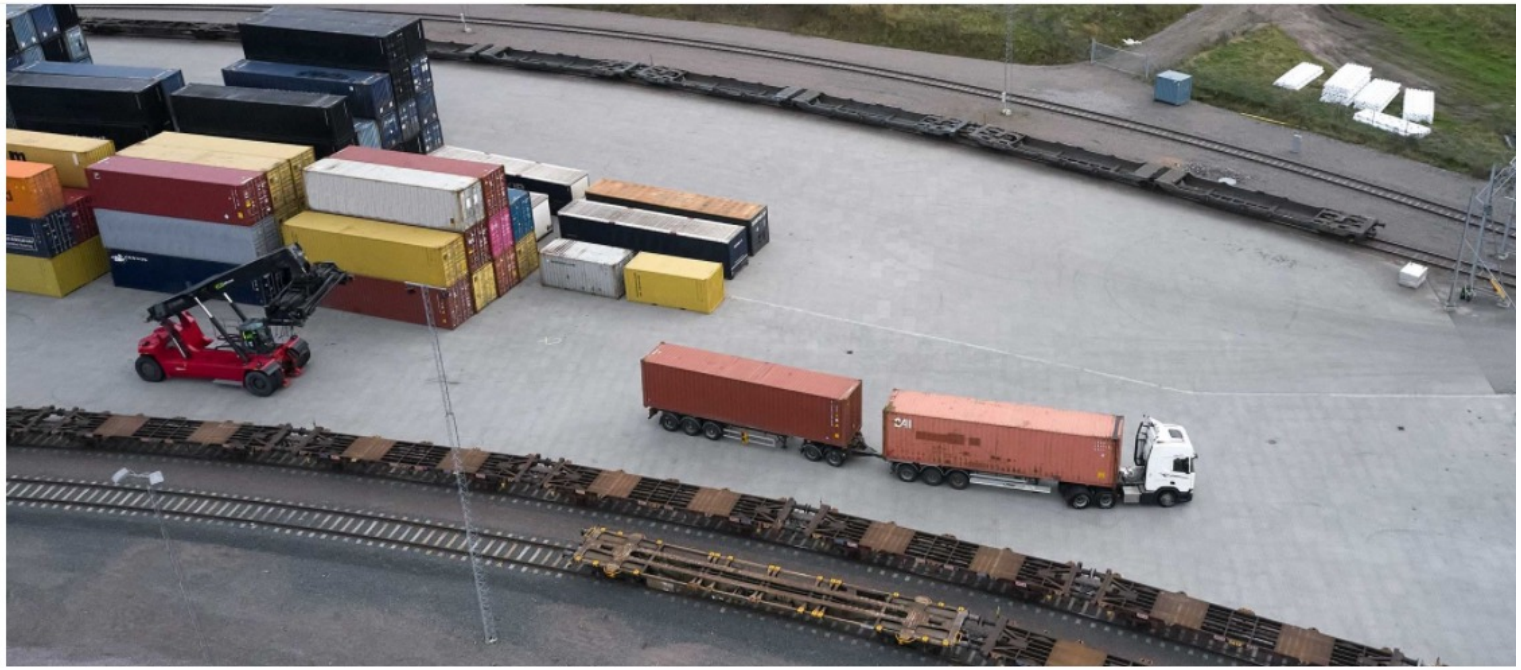
HCT is part of the Sustainable Transport System

35% less energy

35% less CO2

Increased road utilization





SCANIA BYGGER EXTREM-TUNG OCH EXTRALÅNG EL-LASTBIL ÅT JULA LOGISTICS

MER INFORMATION

Pressansvarig för Scania Sverige

Kontakta pressansvarig för mer information:
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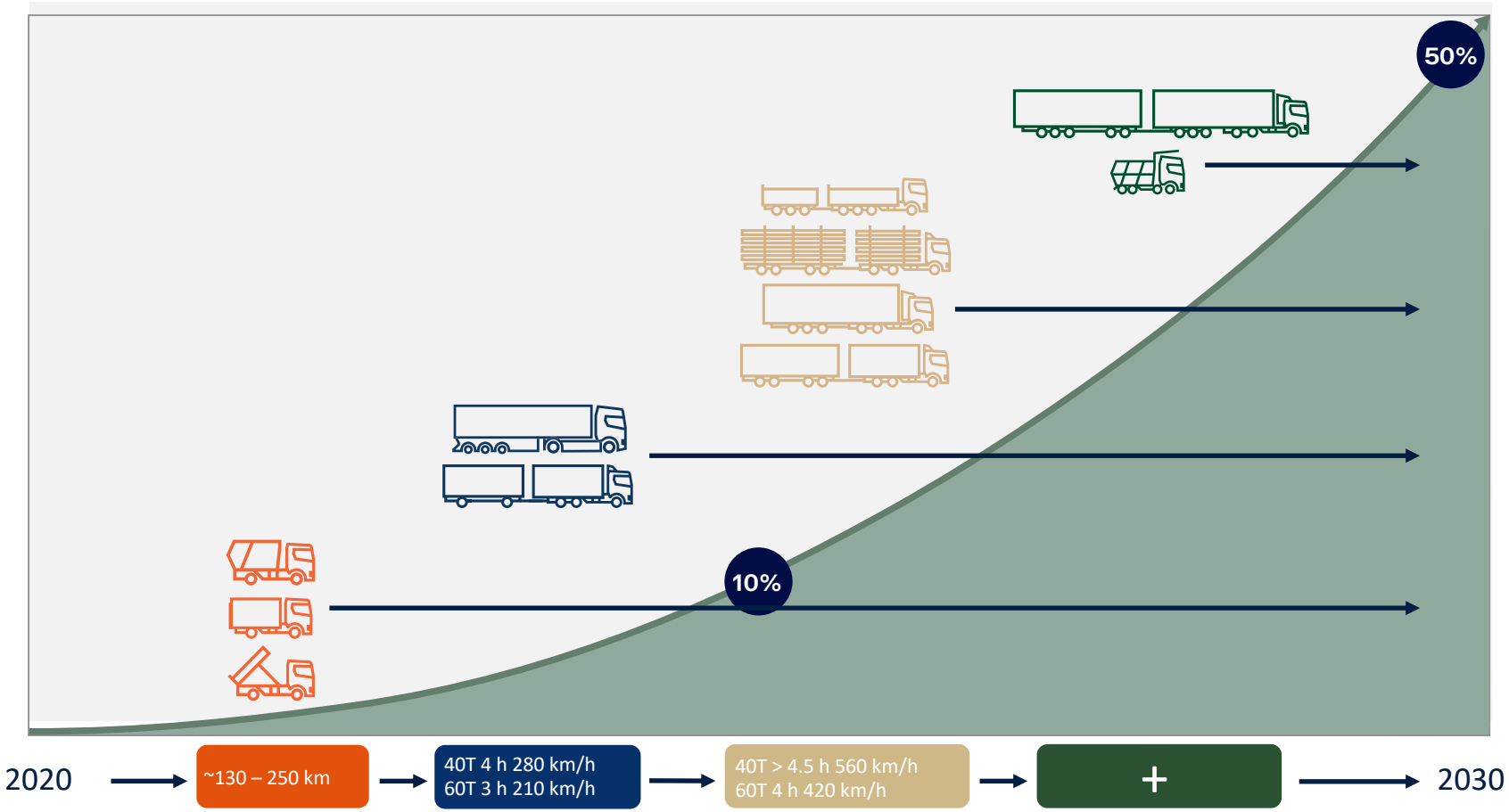
hans.stromberg@scania.com

Figur 1. Rutt mellan Falköping kombiterminal och Jula centrallager i Skara

Electrification

Sooner than you think



Questions and summary of Session 2
Lena Larsson, Volvo Trucks

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2022-10-11

Useful information

All presentations will be posted at closer.lindholmen.se/HCT.

(you will get more information in a mail after the conference)

Next years conference will be in October 2023

Thanks for being here

and

Very welcome next year

thomas.asp@trafikverket.se