

HAMMER

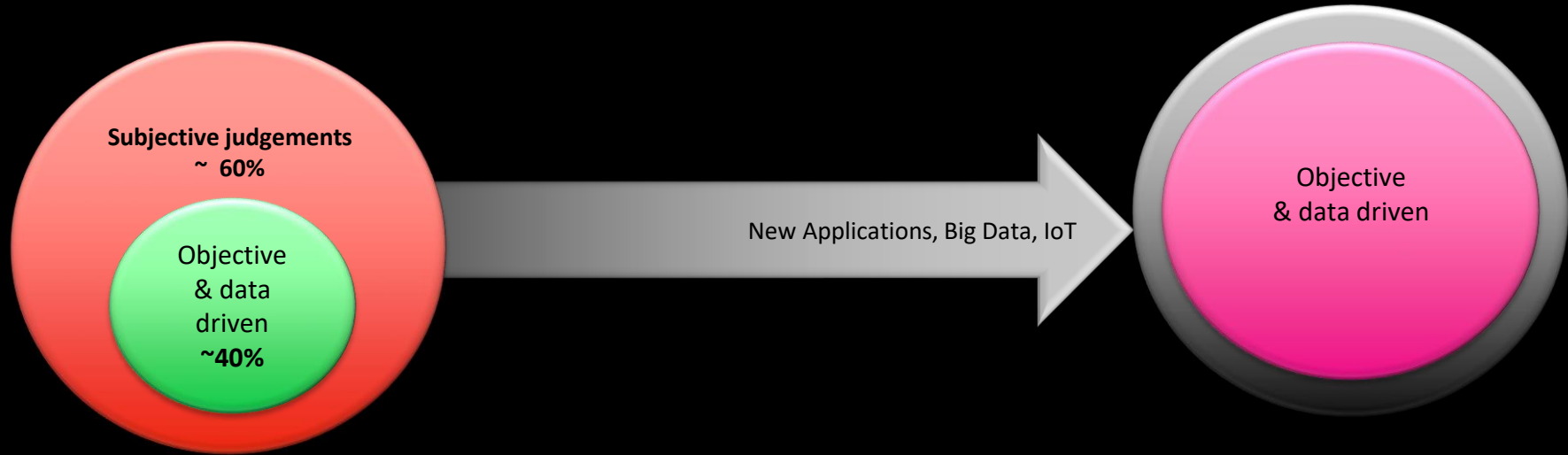
Disruptive applications of road data

Powered by

RAMBOLL

DECISIONS IN INFRASTRUCTURE

PERSONAL OPINIONS TRUMPS DATA



DECISIONS IN INFRASTRUCTURE



- Transverse unevenness
- Longitudinal unevenness
- Ravelling
- Texture
- Cross fall
- Water Layer depth
- Edge damage
- Pointing
- Geometry (gradient, curvature)
- Coordinates (DGPS)
- Road images
- Etc etc

Big data

Cheap sensors

HAMMER

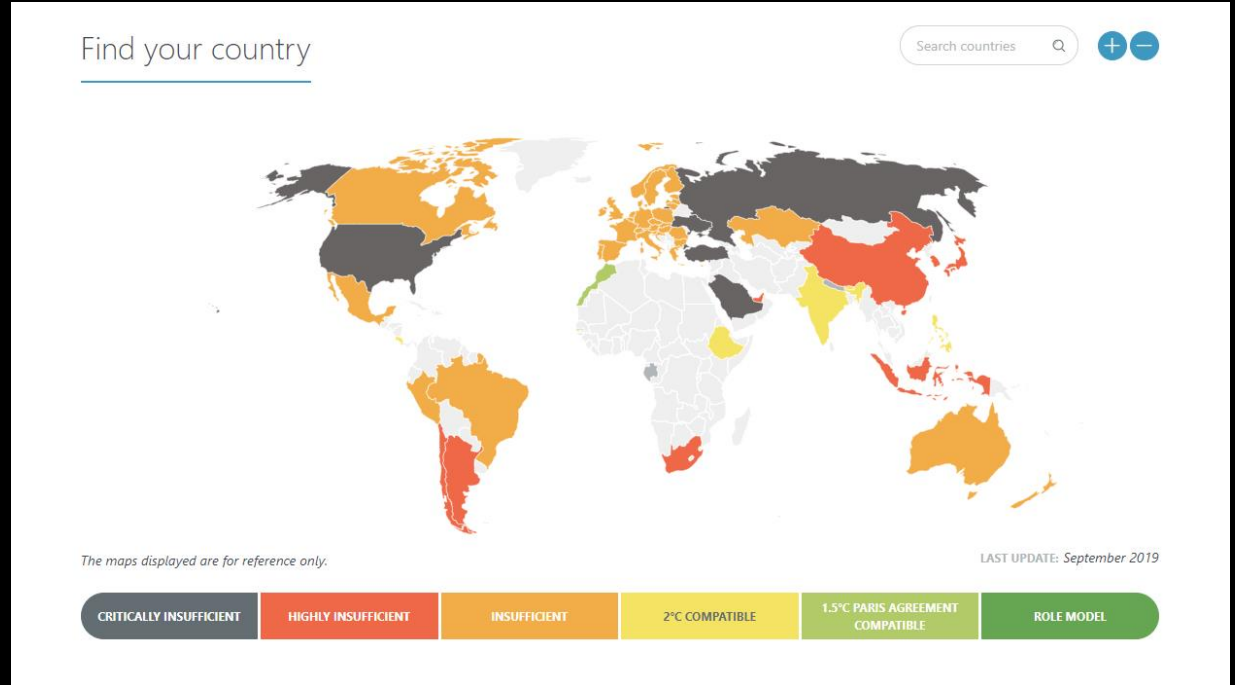
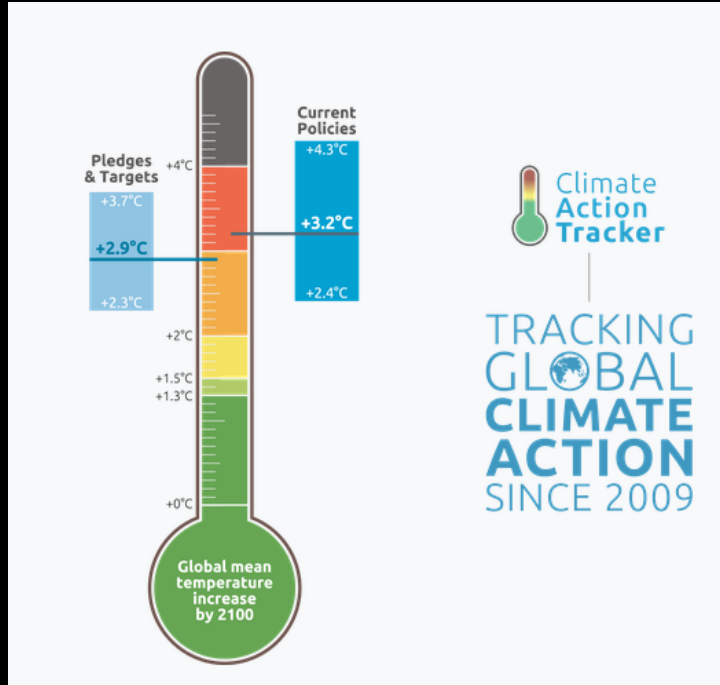
Purpose-oriented products

HAMMER

WHAT ARE WE LOOKING AT?

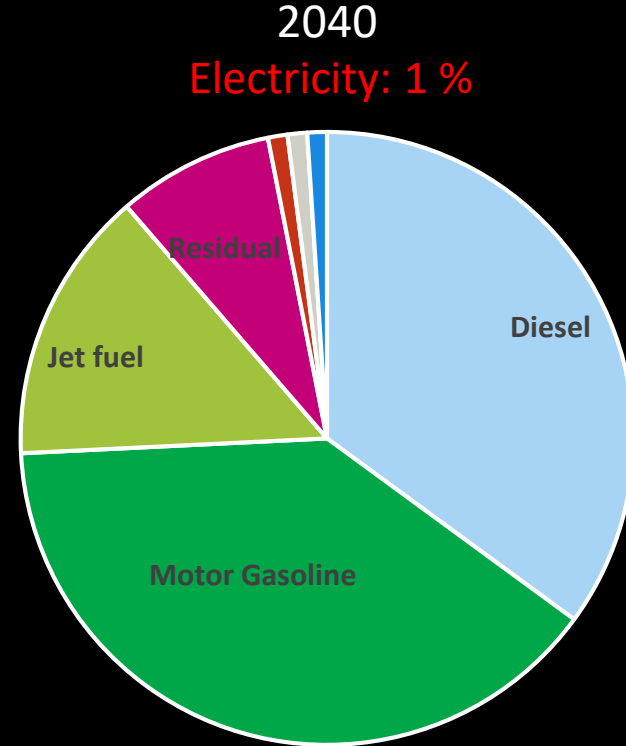
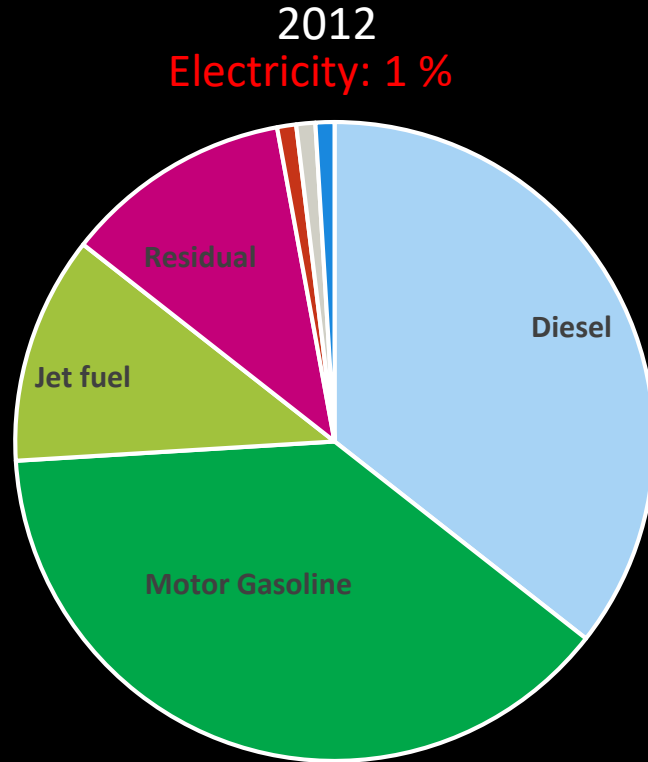


CLIMATE CHANGE: WE ARE NOT MOVING AT SPEED



ACCELERATE INNOVATION

ELECTRIFICATION IS A FRACTION OF THE ANSWER



LOWER CARBON EMISSIONS? CAN WE DO SOMETHING WITH EXISTING RESEARCH?

FUEL CONSUMPTION IS
SIGNIFICANTLY AFFECTED BY

- ROAD GEOMETRY
- ROAD ROUGHNESS
- VEHICLE CONFIGURATION



Pavement Roughness and Fuel Consumption

Suzanne Greene
Mehdi Akbarian
Frank-Josef Ulm
Jeremy Gregory

August 2012

The effect of highway geometry on fuel consumption of heavy-duty vehicles operating in eco-driving mode

G.K. Boto, R.A. Bohne, H. Vignisd
NTNU, Department of Civil and Transport
H. Brattebo
NTNU, Industrial Ecology Program, 7491,
H. Wallbaum & B. Ebrahimi
Chalmers University of Technology, Dep.
Sweden

ABSTRACT: This paper presents an analysis of the effects of the geometry of a highway on fuel consumption of heavy-duty vehicles operating in eco-driving mode. Field data from a high traffic volume highway in Norway are used in this study. Vertical and horizontal profile layers of the same road sections are considered individually and merged with vehicle field data. The study includes a correlation and regression analysis to investigate the relationship between the road gradient and the rate of fuel consumption of a representative truck. The effect of road gradient is examined in both acceleration and deceleration (retardation) mode. Different models are developed, which can serve as a tool for decision making at early design and planning phases of a highway project, where information on fuel consumption and its environmental impacts may influence design choices.



The impact of road geometry, surface roughness and truck weight on operating speed of logging trucks

Gunnar Svensson & Dag Fjeld

To cite this article: Svensson & Fjeld (2017) The impact of road geometry, surface roughness and truck weight on operating speed of logging trucks, Scandinavian Journal of Forest Research, 32(4), 319-327. DOI: 10.1080/03601376.2016.1228408
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Partner 4: CDV

Partner 5: FEHRL

This project was initiated by ERA-NET ROAD.

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Date: 09 July 2016, At: 00:00

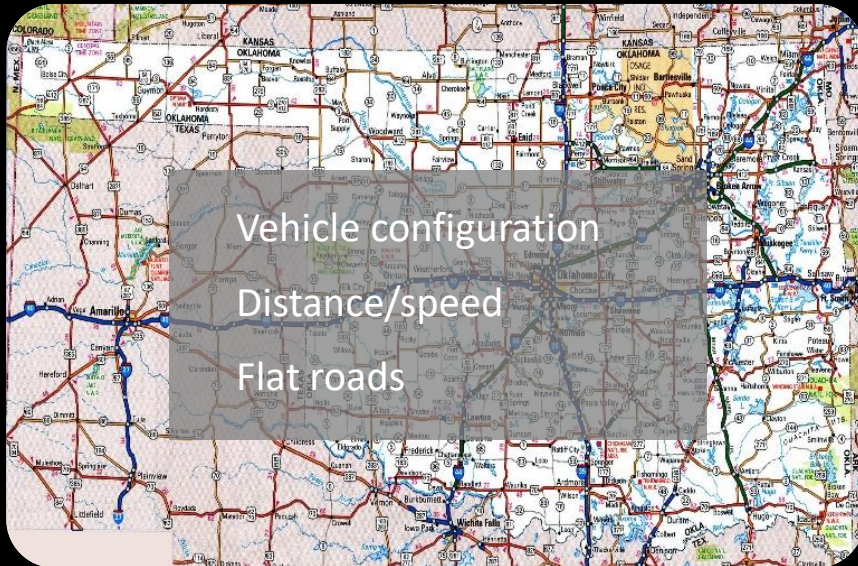


HAMMER

CAN WE DO SOMETHING TODAY?

EXAMPLE ROUTE PLANNING

Traditional 2D



FUELSAVE 3D



Vehicle configuration

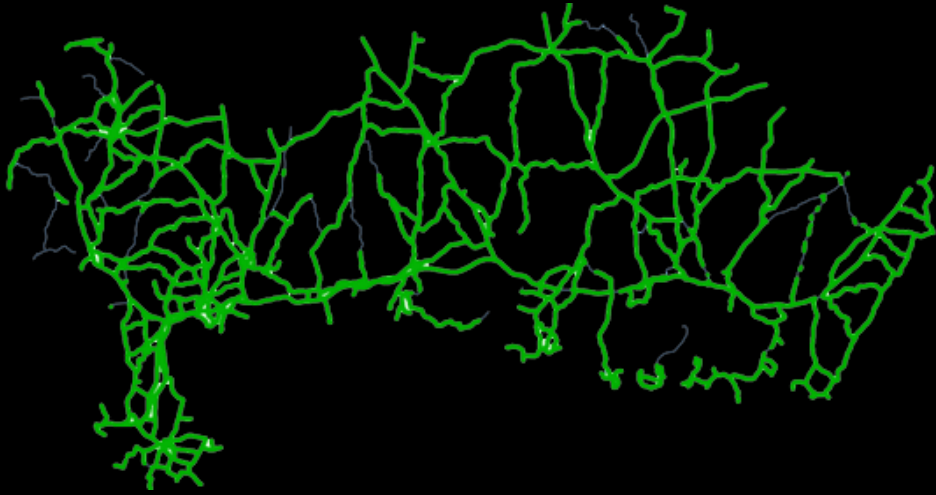
Distance/speed

Road geometry*

Road condition*

*Hilliness, curvature, IRI, MPD

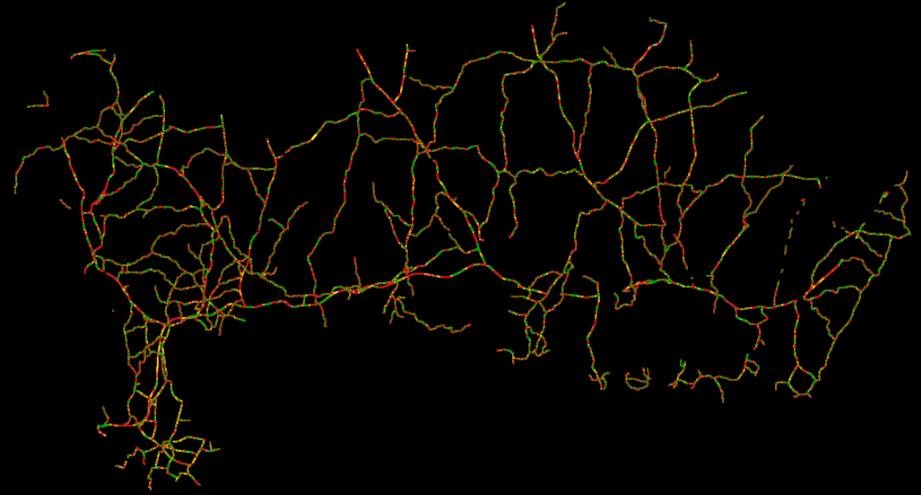
FUELSAVE



2D

vs

3D



10-20 % fuel and CO2 reduction potential

FUELSAVE SO WHAT?

Transport work in Sweden on secondary and tertiary roads (74 % of the network)

- 1,7 Billion SEK

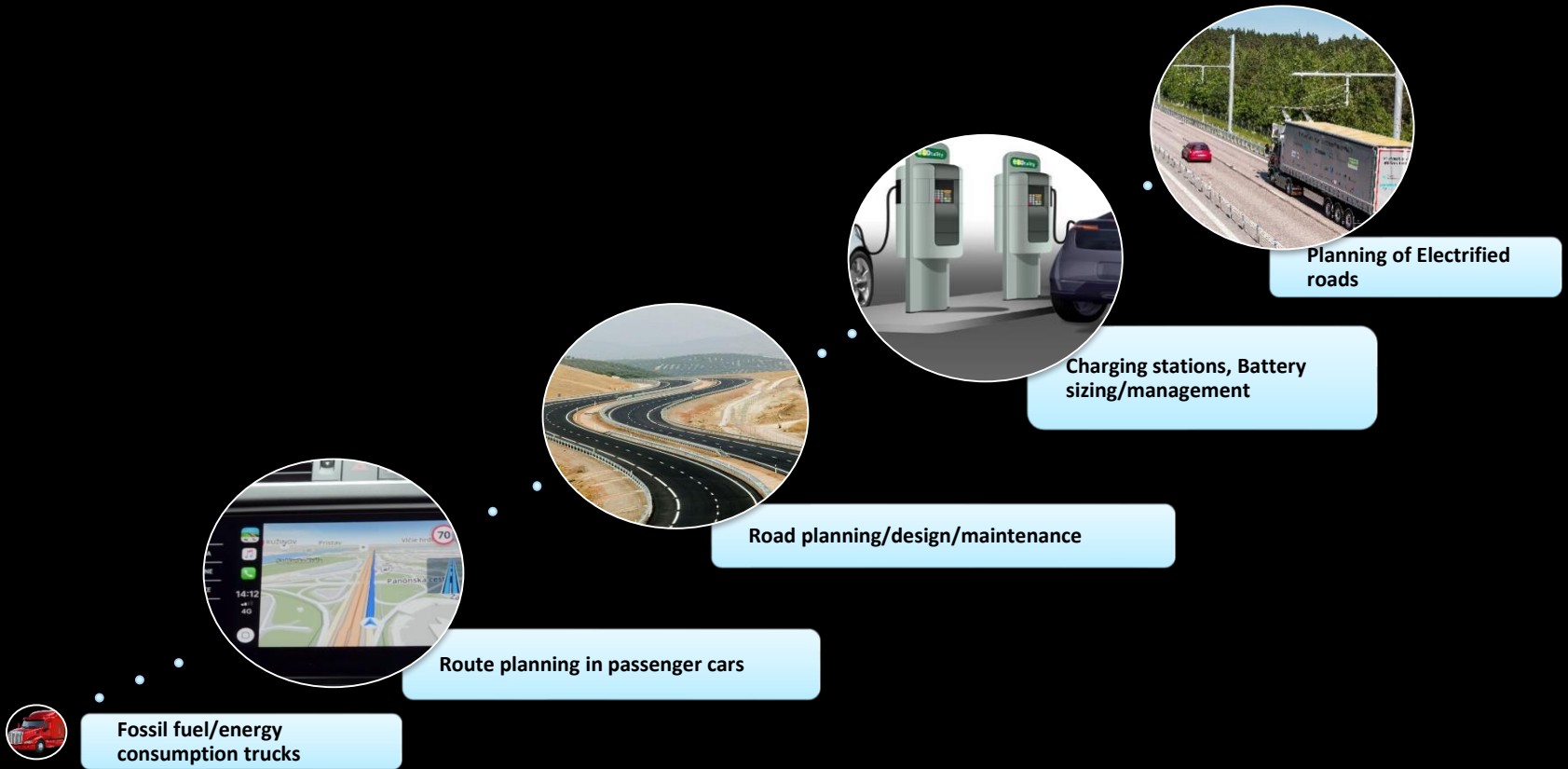
- 300 000 tons CO₂

(for reference, 600 million bathtubs)

Yearly



WHERE DO DECISIONS FIT IN?



FUELSAVE

STANDALONE AND API





IN VEHICLE VIBRATIONS ARE A SIGNIFICANT FACTOR IN THE MOST COMMON
WORK INJURY IN THE WORLD

National Cooperative Highway Research Program

NCHRP Report 353

Effect
on Pa

ICS: 13.109.13.100

ISO/WD 2631-1

Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements

GENERAL INFORMATION

Status: 0 Under development

Edition: 1.0

Technical Committee: ISO/TC 108/SC 4 Human exposure to mechanical vibration and shock

ICS: 13.109 Vibration and shock with respect to human beings

LIFE CYCLE

A standard is reviewed every 5 years



REVISIONS / CORRIGENDA

Previously
@ ISO 2631-1:1987
@ ISO 2631-1:1987/AMD 1:2008

Now under development
@ ISO/WD 2631-1


WHOLE BODY VIBRATIONS
TARGETING THE MOST COMMON
INJURY IN THE WORLD

WHY?



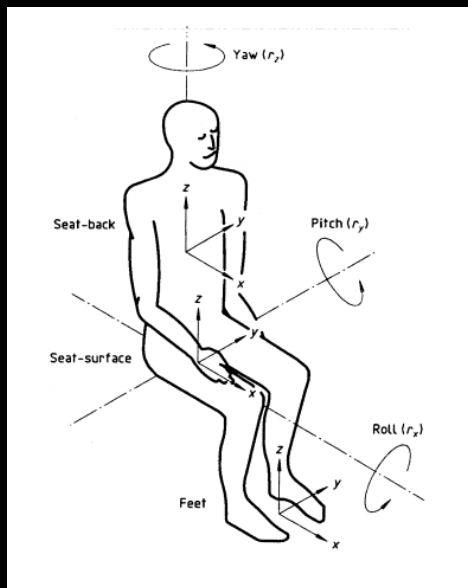
**BUS AND TRAM-OPERATORS ARE ON SICK-LEAVE 60%
MORE DAYS THAN THE POPULATION IN AVERAGE**

WHY?

A photograph of a male driver with glasses, wearing a light blue polo shirt and a seatbelt, sitting in the driver's seat of a truck. He is looking out the windshield at a road lined with green trees. The interior of the truck, including the steering wheel and dashboard, is visible. A semi-transparent grey box is overlaid on the image, containing text.

34 % of all bus and truck-drivers states that they have problems arising from vibrations in the driver environment

VIBRATIONS; THE BASICS



Acceleration [m/s^2]	5	104	313	625	1250	2500	3750	5000	6250	7500	10000	12500	15000
4,5	84	253	506	1013	2025	3038	4050	5063	6075	8100	10125	12150	
4	67	200	400	800	1600	2400	3200	4000	4800	6400	8000	9600	
3,5	51	153	306	613	1225	1838	2450	3063	3675	4900	6125	7350	
3	38	113	225	450	900	1350	1800	2250	2700	3600	4500	5400	
2,5	26	78	156	313	625	938	1250	1563	1875	2500	3125	3750	
2	17	50	100	200	400	600	800	1000	1200	1600	2000	2400	
1,5	9	28	56	113	225	338	450	563	675	900	1125	1350	
1,4	8	25	49	98	196	294	392	490	588	784	980	1176	
1,3	7	21	42	85	169	254	338	423	507	676	845	1014	
1,2	6	18	36	72	144	216	288	360	432	576	720	864	
1,1	5	15	30	61	121	182	242	303	363	484	605	726	
1	4	13	25	50	100	150	200	250	300	400	500	600	
0,9	3	10	20	41	81	122	162	203	243	324	405	486	
0,8	3	8	16	32	64	96	128	160	192	256	320	384	
0,7	2	6	12	25	49	74	98	123	147	196	245	294	
0,6	2	5	9	18	36	54	72	90	108	144	180	216	
0,5	1	3	6	13	25	38	50	63	75	100	125	150	
0,45	1	3	5	10	20	30	41	51	61	81	101	122	
0,4	1	2	4	8	16	24	32	40	48	64	80	96	
0,35	1	2	3	6	12	18	25	31	37	49	61	74	
0,3	0	1	2	5	9	14	18	23	27	36	45	54	
0,25	0	1	2	3	6	9	13	16	19	25	31	38	
0,2	0	1	1	2	4	6	8	10	12	16	20	24	
0,15	0	0	1	1	2	3	5	6	7	9	11	14	
0,1	0	0	0	1	1	2	2	3	3	4	5	6	
Daglig exponeringstid													
	5 min	15 min	30 min	1h	2h	3h	4h	5h	6h	8h	10h	12h	

TODAY?



CAN WE MEASURE IT?

State network level



Sub-/Urban road level?

LOOK IN YOUR POCKET



ICS 13.100.10

ISO/AWI 2631-1

Mechanical vibration and shock — Evaluation of human exposure to whole-body vibration — Part 1: General requirements

GENERAL INFORMATION

Status : @ under development

Edition : 3

Technical Committee : ISO/TC 108/SC 4 Human exposure to mechanical vibration and shock

ICS : 13.100 Vibration and shock with respect to human beings

LIFE CYCLE

A standard is reviewed every 5 years

00 10 20.00 Preparatory 30 40 50 60 90 95

REVISIONS / CORRIGENDA

Previously

@ ISO 2631-1:1997

@ ISO 2631-1:1997/AMD 1:2010

Now under development

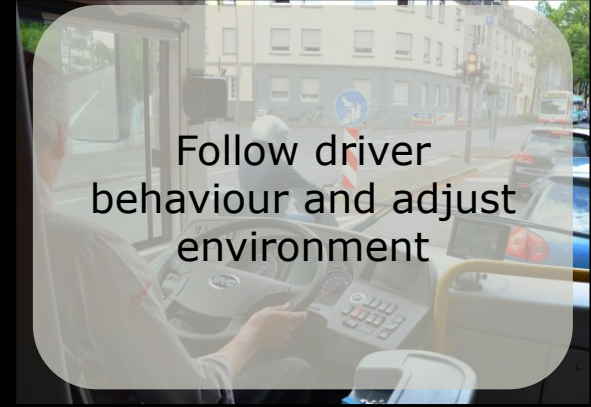
@ ISO/AWI 2631-1



VIBE: targeting whole body vibrations on network level with big data



MAINTENANCE THE OTHER WAY



SUMMARY



Objective
& data driven

HAMMER

Is all about Data Pipeline Driving