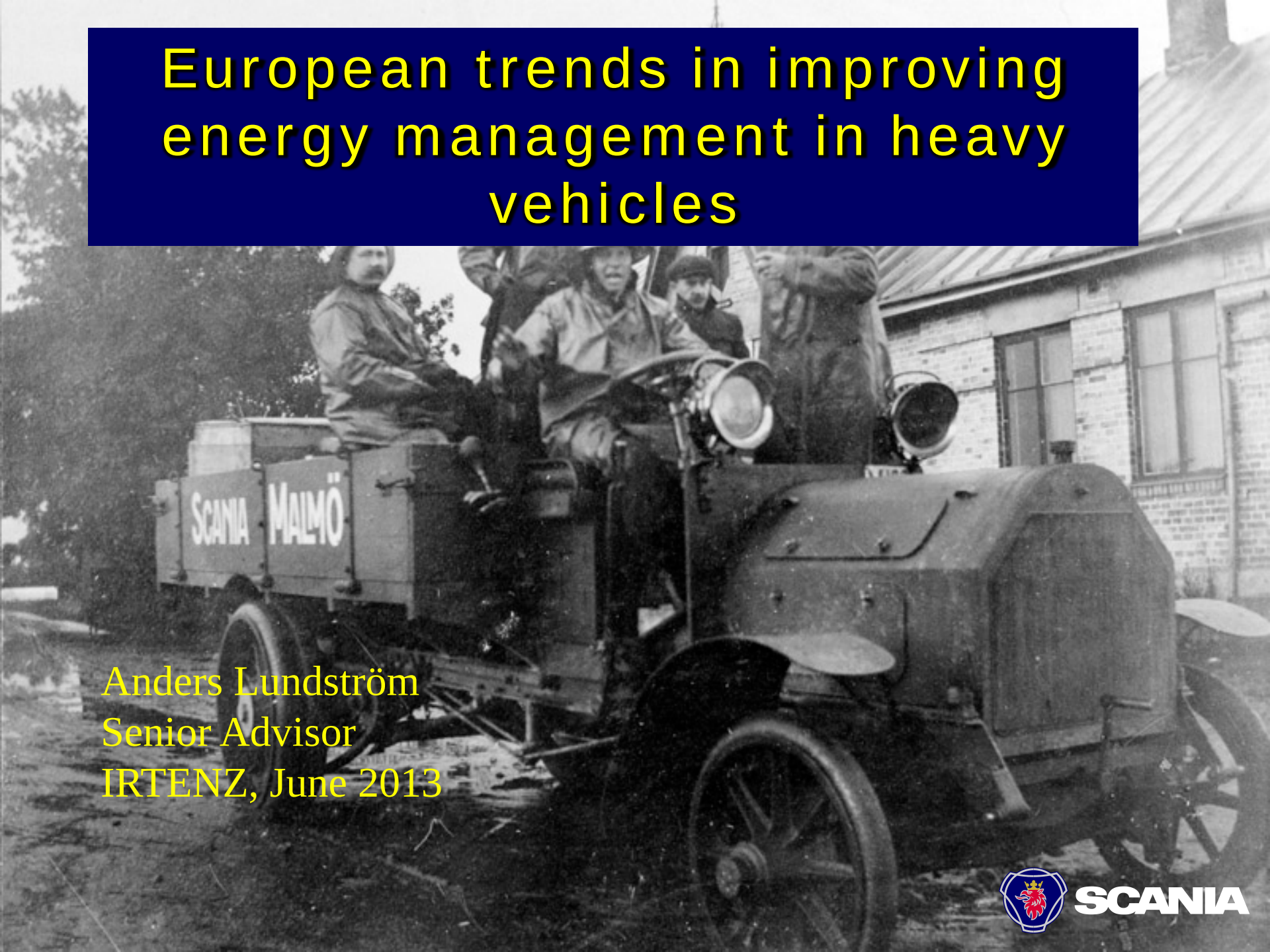
European trends in improving energy management in heavy vehicles



Anders Lundström
Senior Advisor
IRTENZ, June 2013

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1. Worldwide regulation proposals

- **Background**
- **Japan**
- **USA**
- **China**
- **EU**
- **Global “headache”**

Background (1)

<u>Passenger cars</u> have a well established test procedure to measure fuel consumption and carbon dioxide generation.

The car is put on a dyno and run through a series of speeds and torques, same method as for emissions of NOx, particulates et cetera. Test cycle is not adequate for real life fuel consumption.

Limit values have been legislated.

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Background (2)

Heavy trucks and buses have no similar existing procedure since measurements and limit settings of NOx and particulates are performed for the engine only.

Added complexities:

- **Comparatively short production series**
- **More complex structure, e.g. axles config.**
- **Bodies and trailers are not supplied by motor vehicle manufacturer**
- **High pay-load variation**
- **Same engine can be used in many chassis**

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Japan

So called “Toprunner” procedure since 2006.

Vehicle mission simulation based on engine map. Standardized values for rolling resistance and air resistance.

About 15 truck and 15 bus/coach classes.

Simulated driving missions highly focussed on congested traffic.

Target values.

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USA

Effective per 2014.

Engine and vehicle are treated separately.

Vehicle simulation programme from EPA.

“Load Specific Fuel Consumption” (NAS to US Congress)

China

Effective per 2014.

Dyno test for basic variants (not clearly defined), simulation for variants.

Test cycle is Chinese version of emission cycle WHVC, not realistic for real life fuel consumption.

EU

Full simulation approach.

Vehicles by segments. Mission specific cycles.

“Work done” – principle: fuel consumption and carbon dioxide generation in grammes per tonkilometer of goods

Accurate enough to be used as a sales support tool.

Development in cooperation between EU COM and EU commercial vehicle manufacturers.

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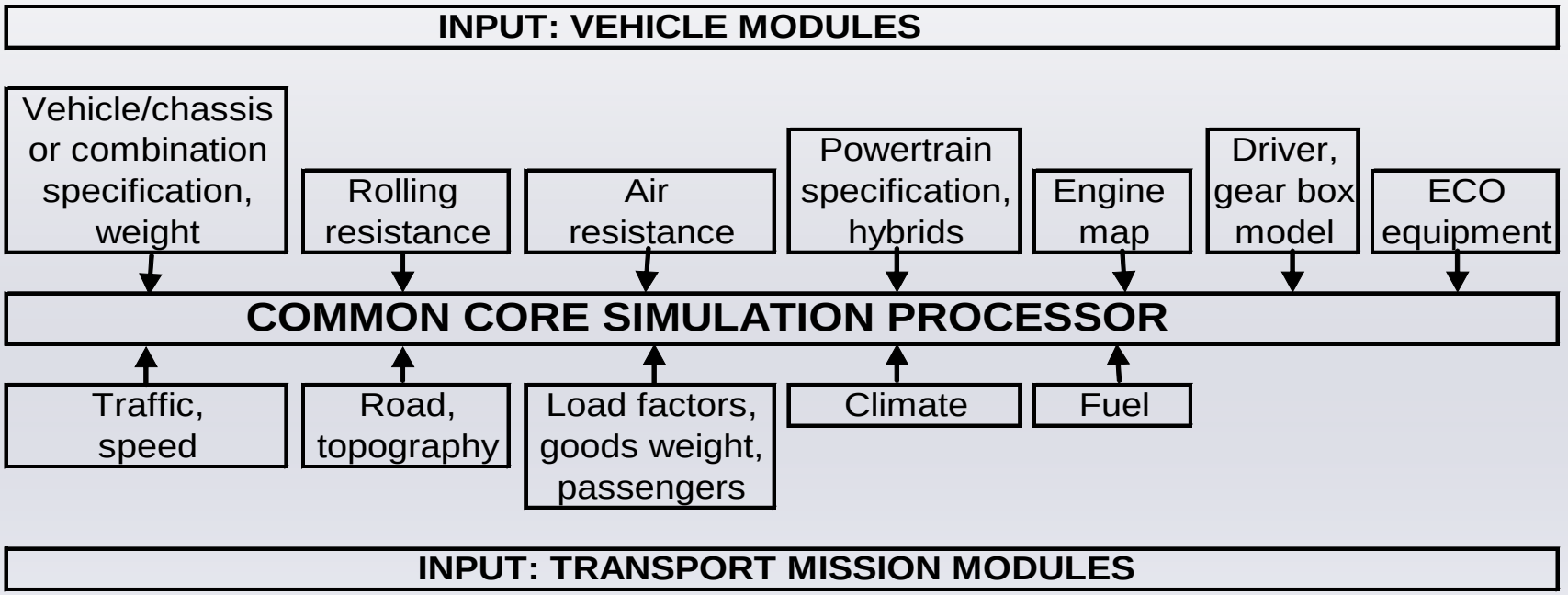
ORIGINAL EU PROPOSAL IN 2008

A MODULAR APPROACH TO FUEL EFFICIENCY DECLARATION OF HDV (1)



Input modules could be standardised, generic, or specific according to application purpose.

With standardised interfaces to the core processor, input modules could be developed and improved over time.

ORIGINAL EU PROPOSAL IN 2008

Global ”headache”

DAIMLER

HD vehicle industry is faced with more and more different GHG/FE regulations in major world markets

Can we generate similar processes with similar basic input data around the world til 2020 ?
What do we have to do to influence limits and how can we organize cost efficient fulfillment ?

Daimler Trucks

Courtesy Dr. Manfred Schuckert, Daimler AG

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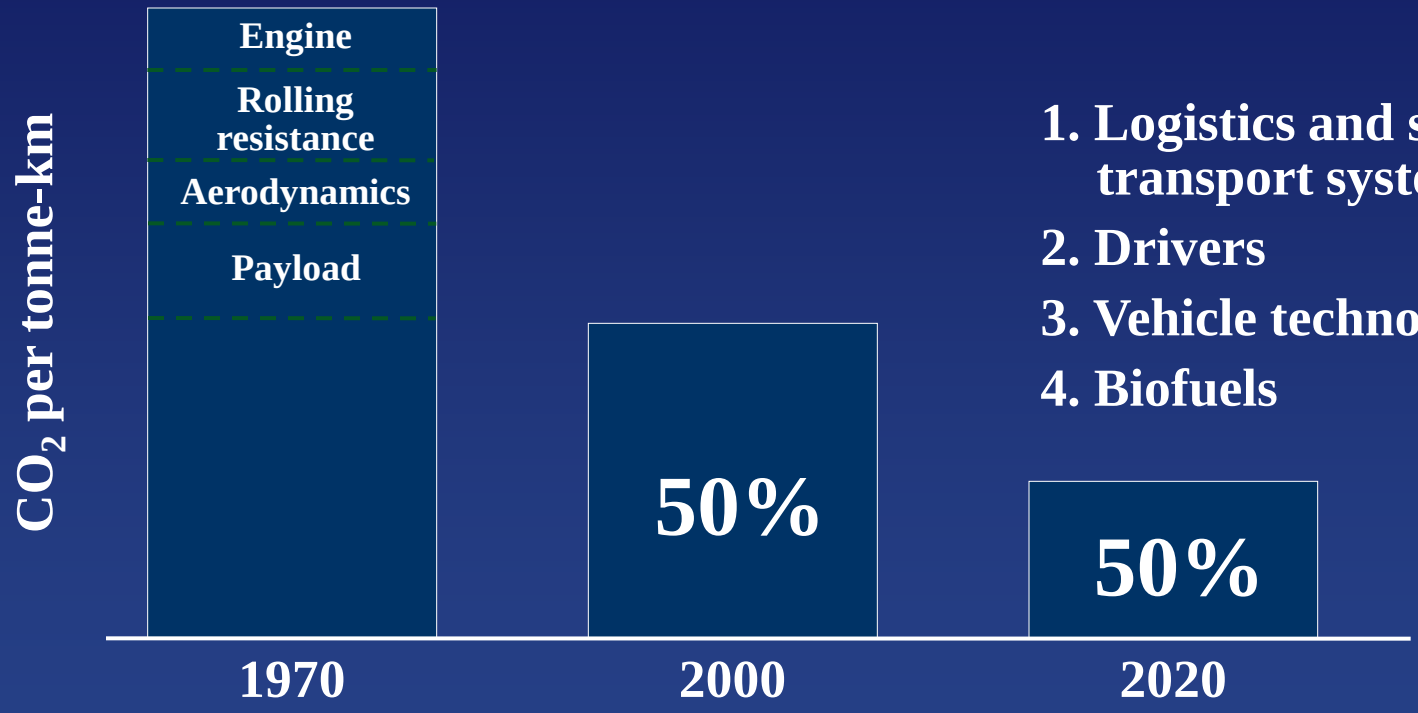
2. Fuel economy vision

Sustainable transport – vision

Many parallel roads – no silver bullets



1. **Logistics and smarter transport systems**
2. **Drivers**
3. **Vehicle technology**
4. **Biofuels**

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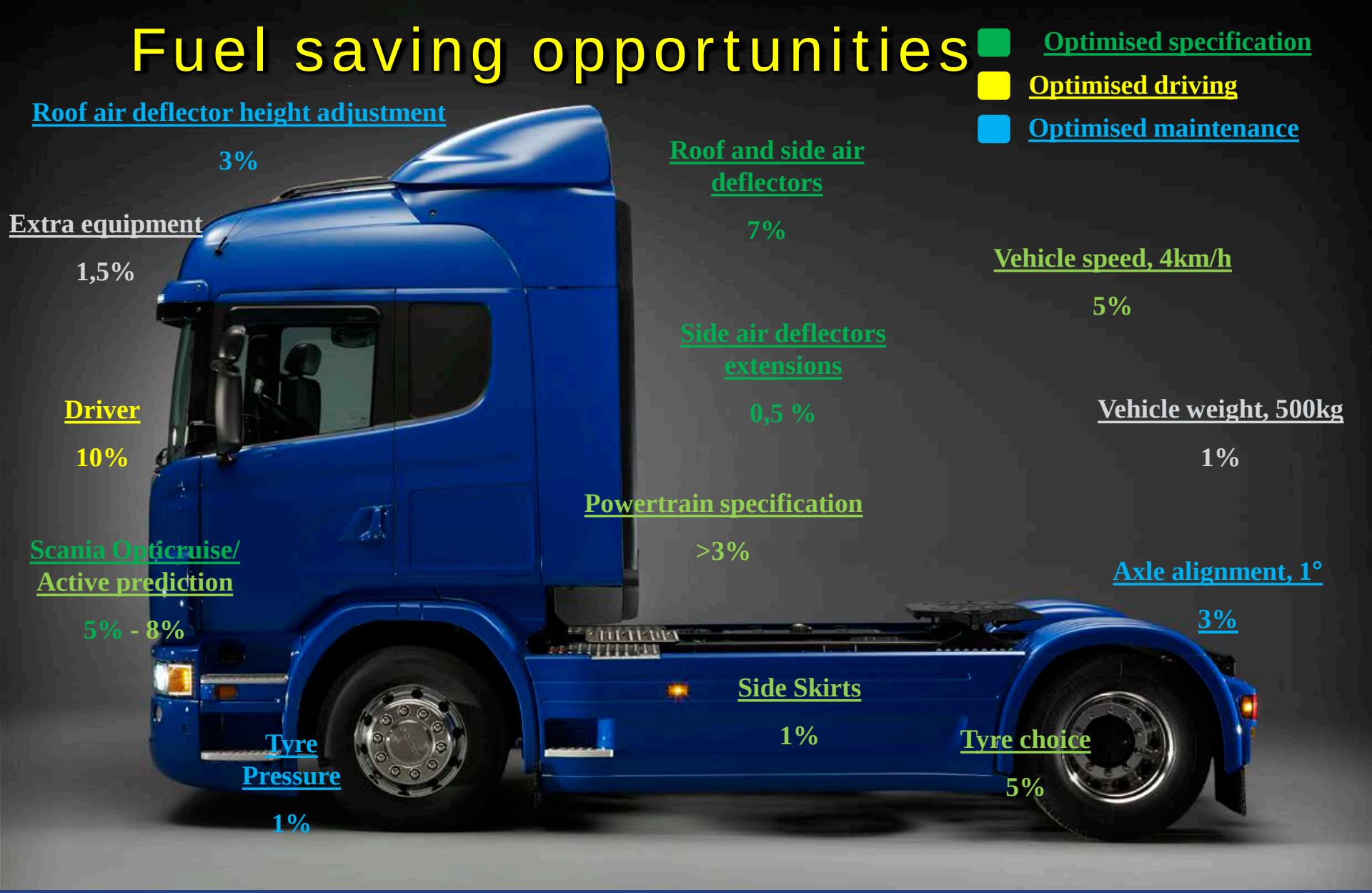
Fuel saving opportunities

Optimised specification

Optimised driving

Optimised maintenance



Roof air deflector height adjustment

3%

Extra equipment

1,5%

Driver

10%

Scania Opticruise/ Active prediction

5% - 8%

Tyre Pressure

1%

Roof and side air deflectors

7%

Side air deflectors extensions

0,5 %

Powertrain specification

>3%

Side Skirts

1%

Vehicle speed, 4km/h

5%

Vehicle weight, 500kg

1%

Axle alignment, 1°

3%

Tyre choice

5%

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Three commercially available sustainable biofuels

Bioethanol

World's No. 1 biofuel
Diesel engine & efficiency

Average 71 %
CO_2 reduction (EU)

Buses, coaches waste collectors, distribution trucks.

Biodiesel

Low blends to B100
Diesel engine

Average 38 %
CO_2 reduction (EU)

All types of applications, including long-haulage and coaches.

Biogas

Mixes with CNG
Otto engine

Average 73 %
CO_2 reduction (EU)

City/Intercity buses, waste collectors, distribution trucks.

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So why are biofuels important?

Sustainable biofuels are essential for reducing carbon emissions from road transport.

Large and increasing volumes of sustainable biofuels

- **secure long-term production of biofuels**
- **promote investment in biofuel engine development**
- **make transport operators confident to try biofuels**

But policy u-turns hurt climate policy and investment security!

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3. Fuel economy practice

Scania Transport Laboratory Inc,
operating as a typical European haulier

International Long Haulage, 24 trucks
- On the road 24 h – 7 days a week
- 400.000 km/year
- 3,5 driver/truck
- Max 80 km/h, average 76 km/h

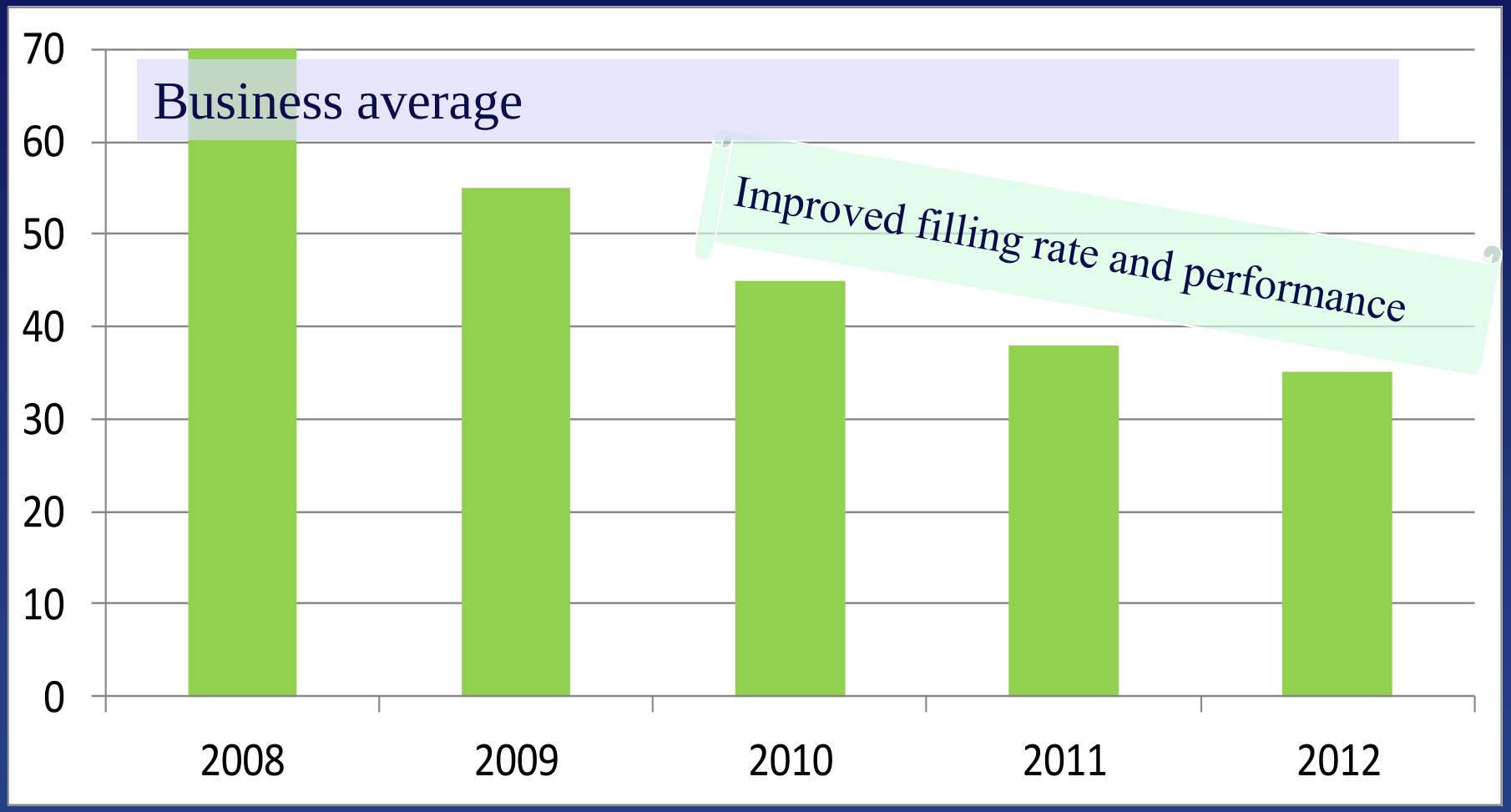
Local Distribution, 20 trucks
- Pick-up and delivery, stop and go
- 30.000 km/year
- 1,5 driver/truck
- Max 80 km/h, average 28 km/h

Bus, 4 buses
- Timetable, weekdays
- 80.000 km/year
- 1,2 driver/bus
- Max 90 km/h, average 46 km/h

International Long Haulage

24 trucks, 400.000 km/year
110 trailers, 90% loaded
80 drivers

Transport efficiency,CO2 g/tonkm



Keys to transport efficiency

1. Truck specification – optimized and dedicated.
2. Maintenance – right truck and trailer tuning.
3. Fleet age – use new technology when high mileage.
4. Driver training – no speeding, no idling, no braking.
5. Telematics – monitor truck and driver performance.
6. Fill up – maximize volume and/or weight of goods.
7. Weight and dimension – harmonized regulation.

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4. Recommendations

1. Monitor fuel economy and carbon footprint legislation in the EU, Japan and USA

2. Do not waste money on developing your own procedure, but start looking at typical NZ mission profiles

3. Sort out the “Kalasih dilemma” : on both micro and macro levels: energy (fuel, carbon dioxide) per tonnekilometer of goods should be decreasing, if not, why?

4. Stable alternative fuels policy.

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