



REDUCING ROAD TRANSPORT NOISE IN URBAN AREAS

Parameters Influencing Road Transport Noise

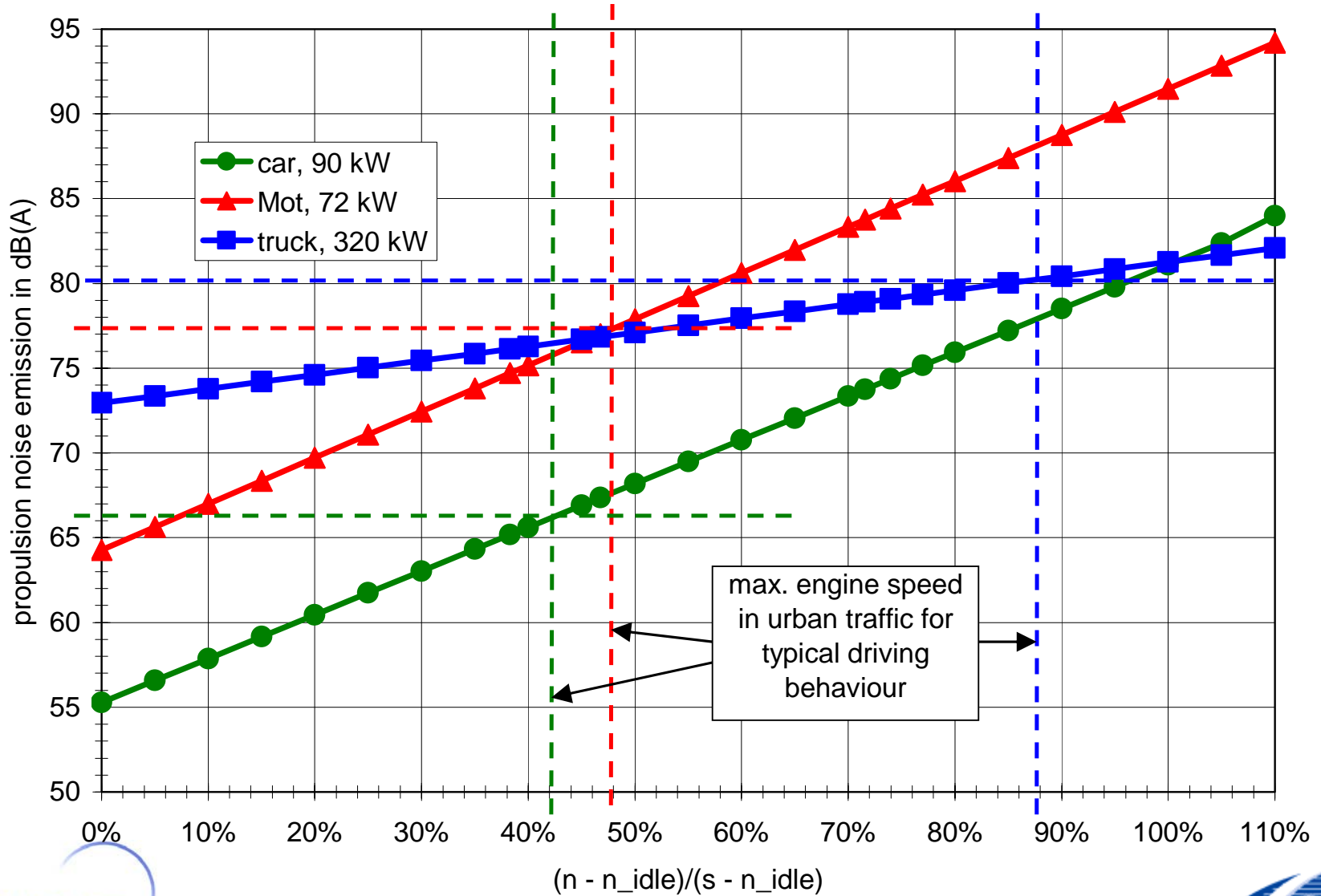
Heinz Steven
TUEV Nord Mobilitaet
HSteven@tuev-nord.de

Brussels, 11. June 2007

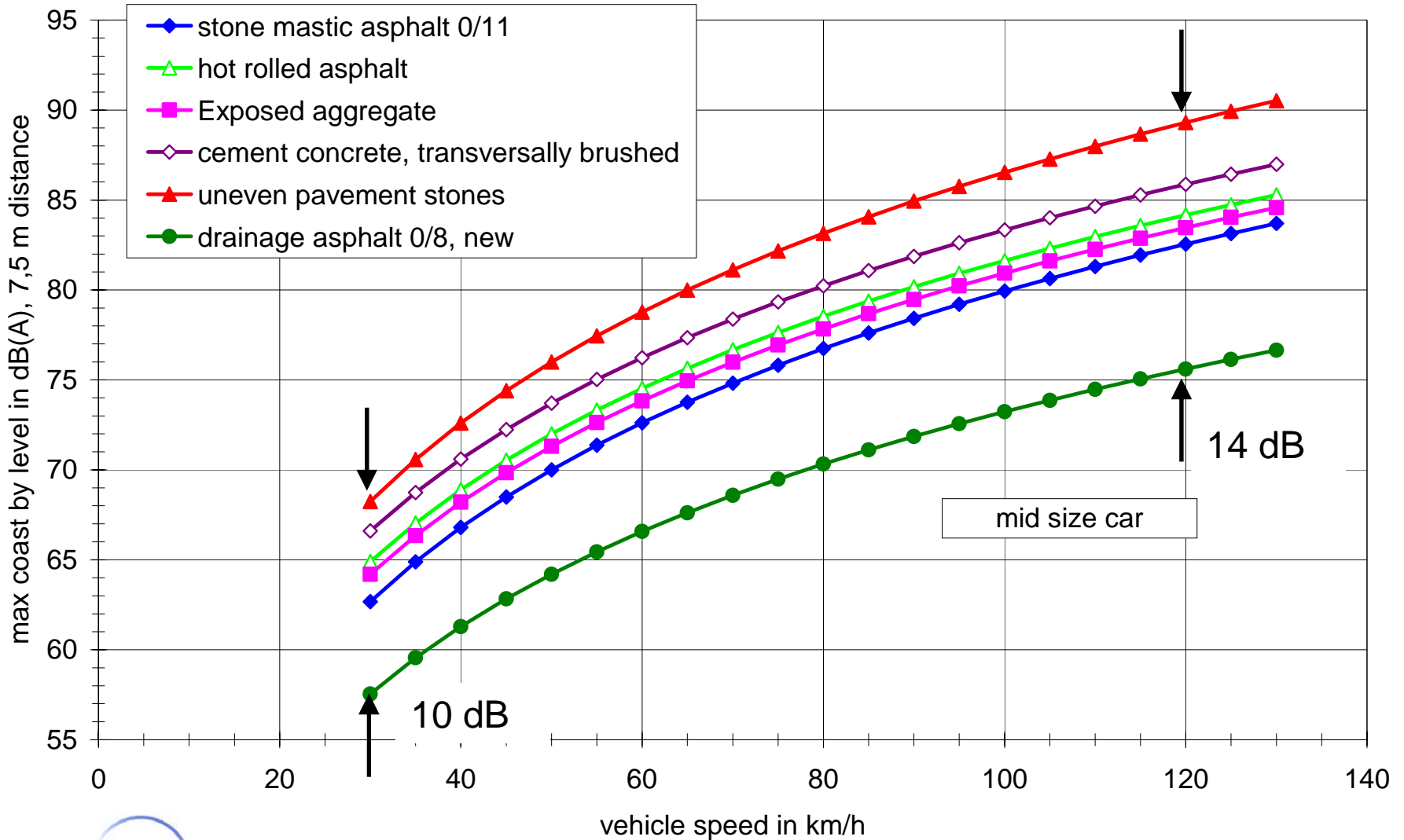


- 1. Specific emissions of vehicles of different categories**
 - Propulsion noise,
 - Tyre/road noise
- 2. Noise emissions in real traffic**
 - single vehicles, statistical pass by noise,
 - contribution of vehicle categories to Lden and Lnight, Analysis of current situation
- 3. Effects of noise reduction measures and rank order of measures**

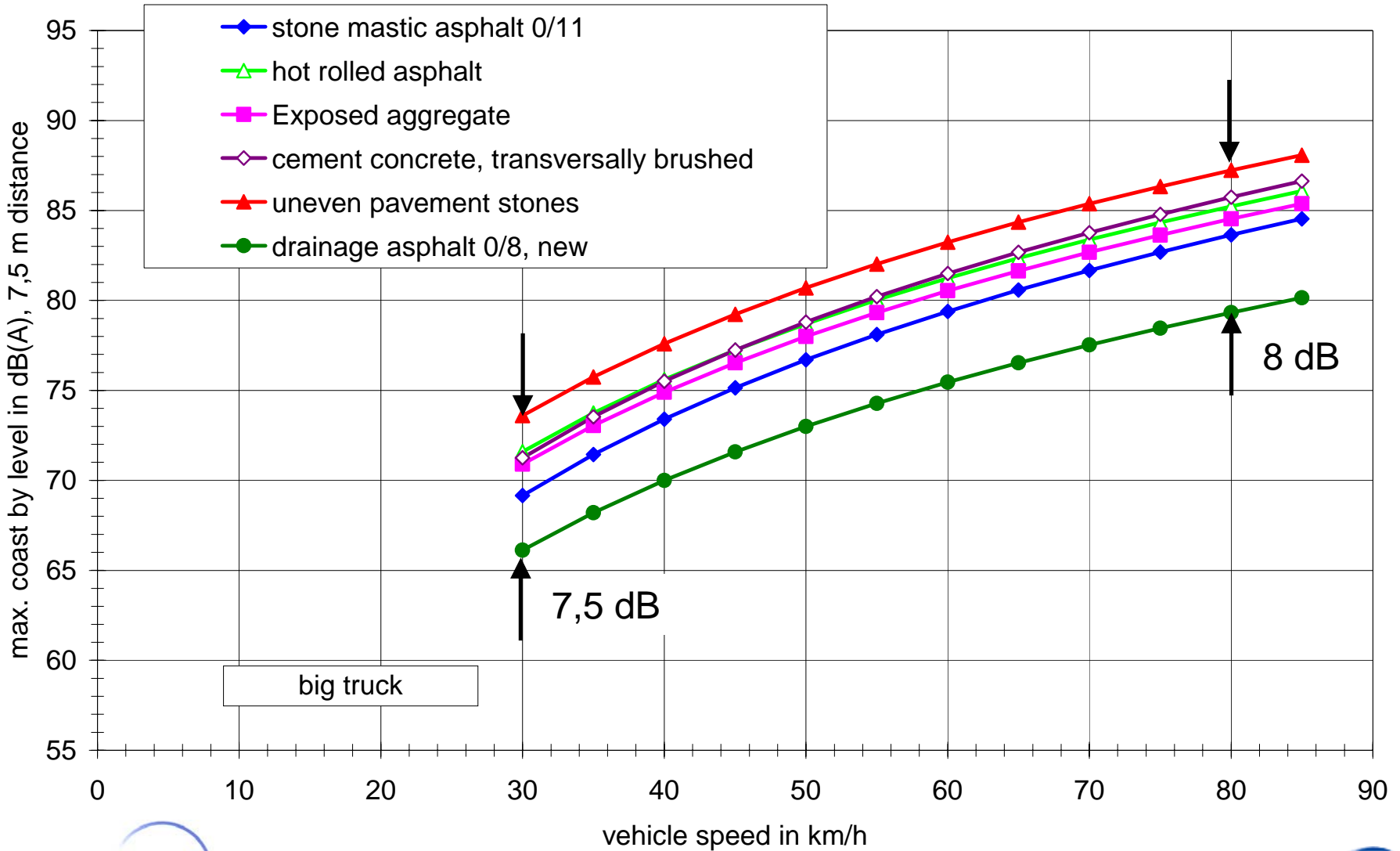
Propulsion noise



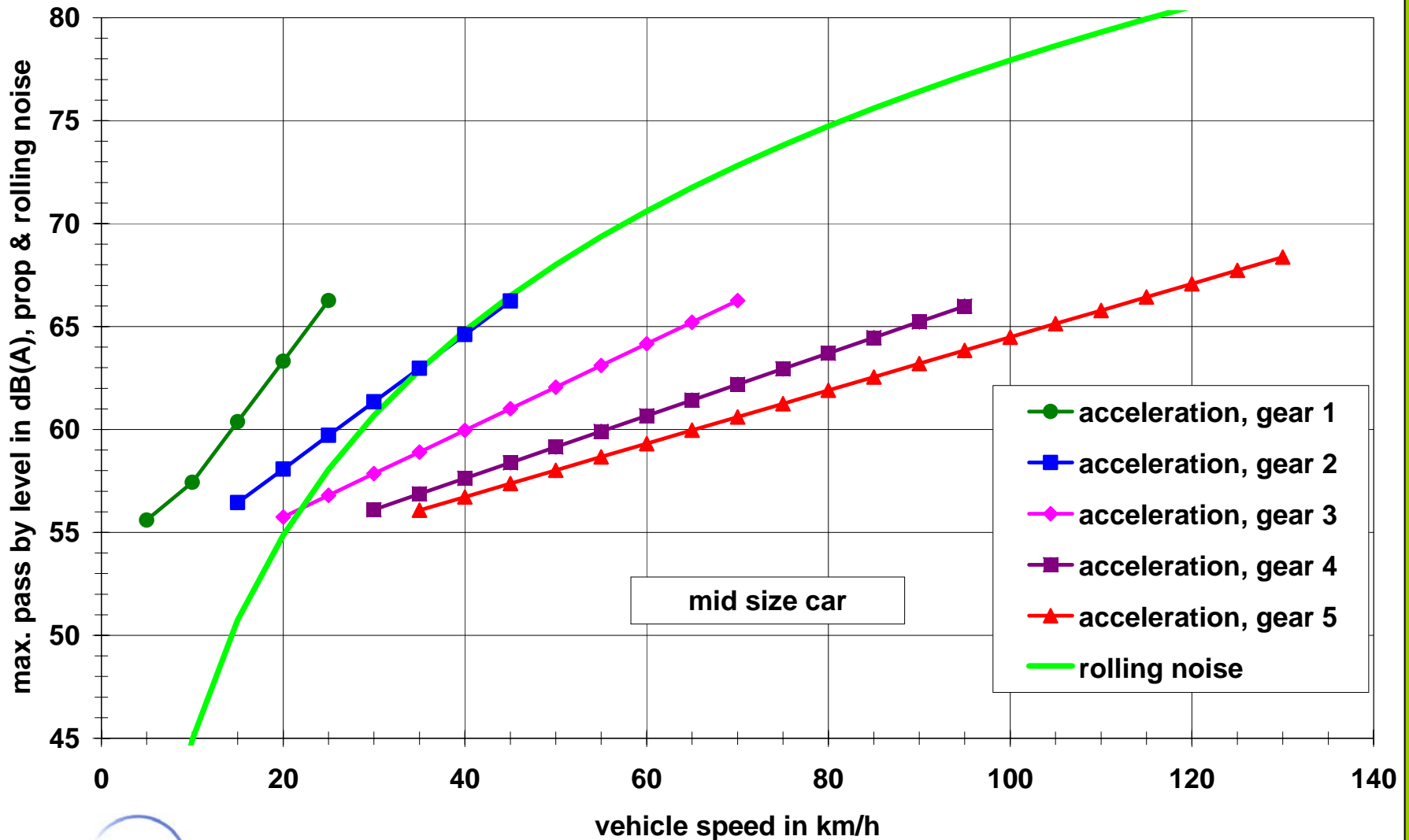
max. engine speed
in urban traffic for
typical driving
behaviour



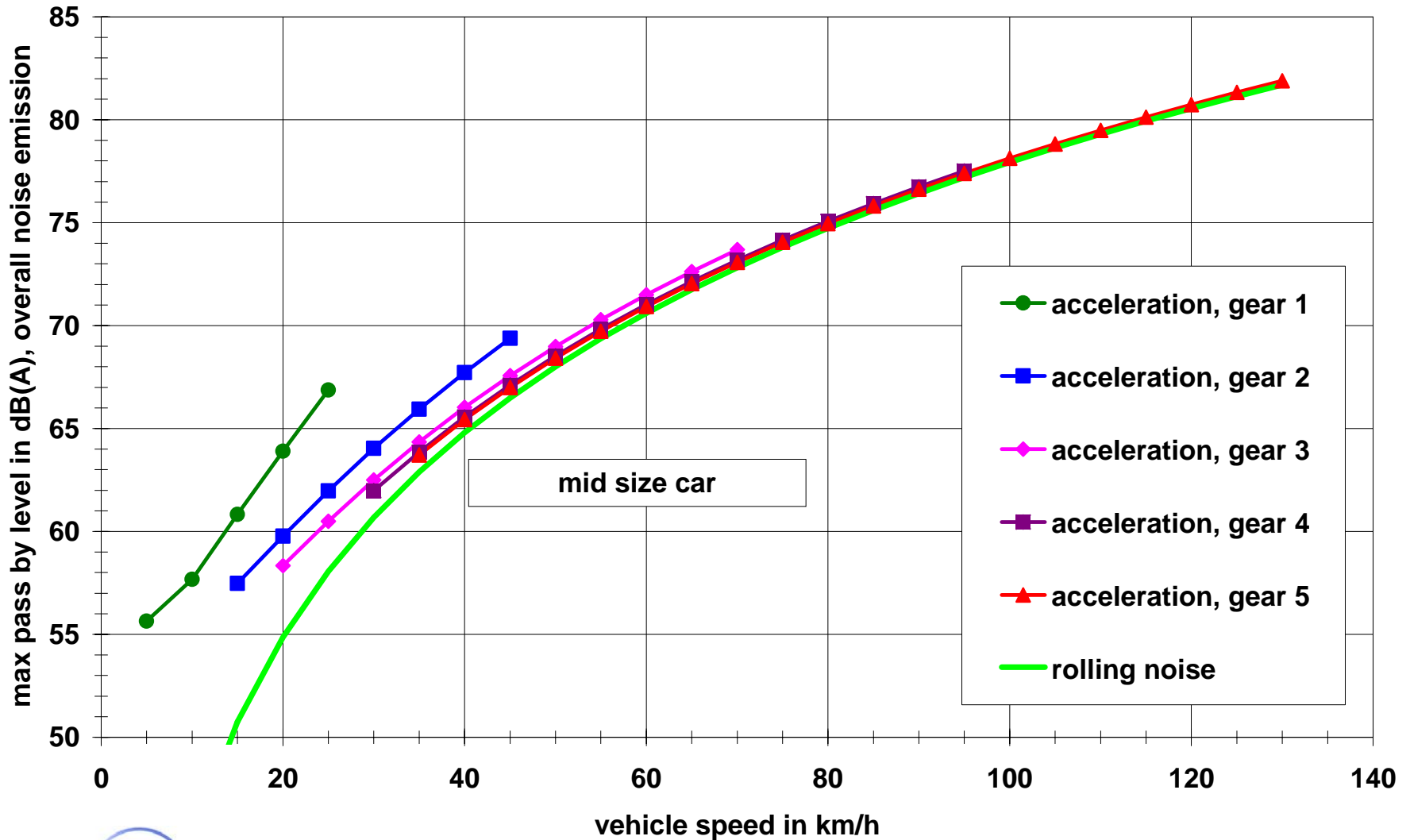
Tyre/road noise, road influence



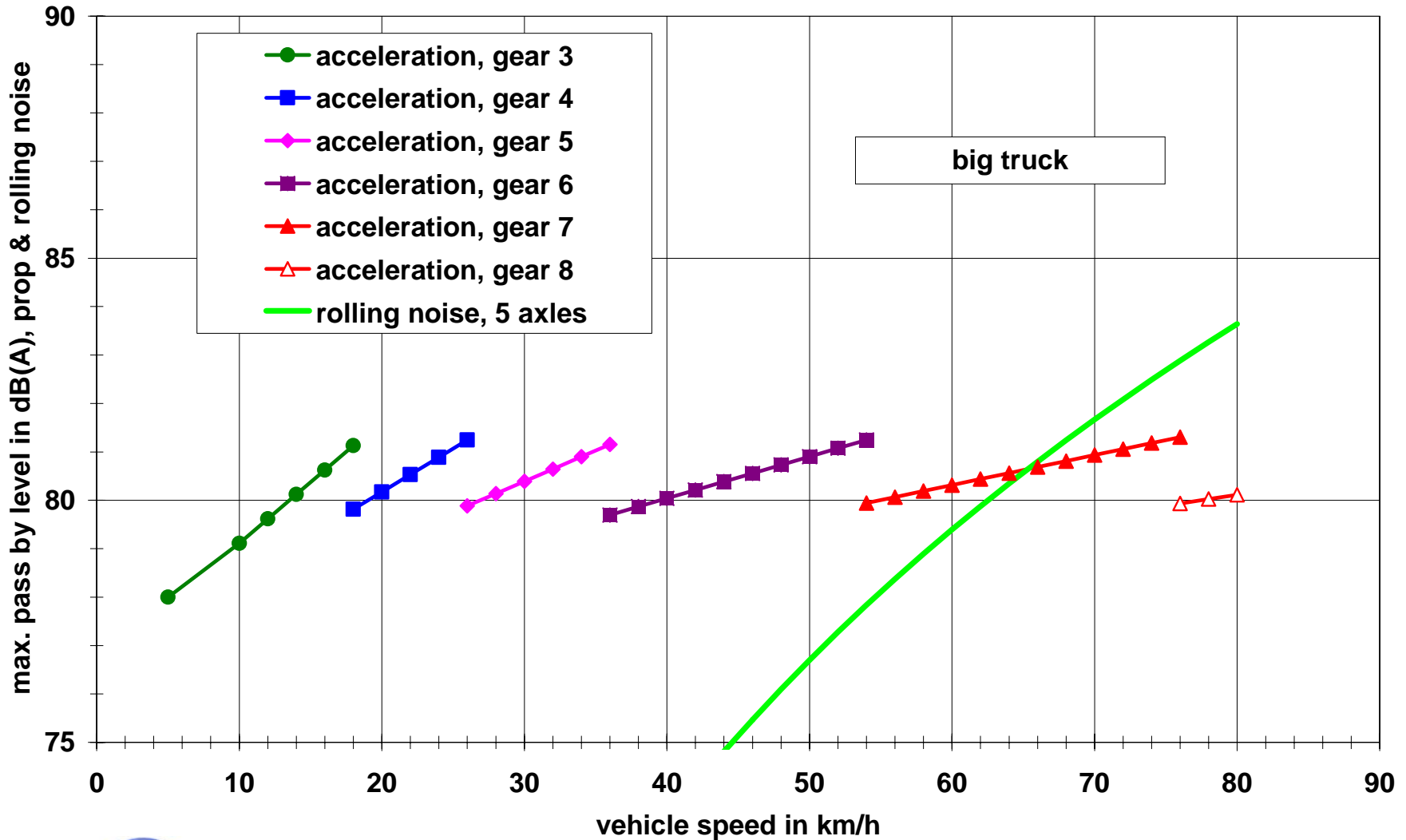
Comparison of propulsion noise and rolling noise



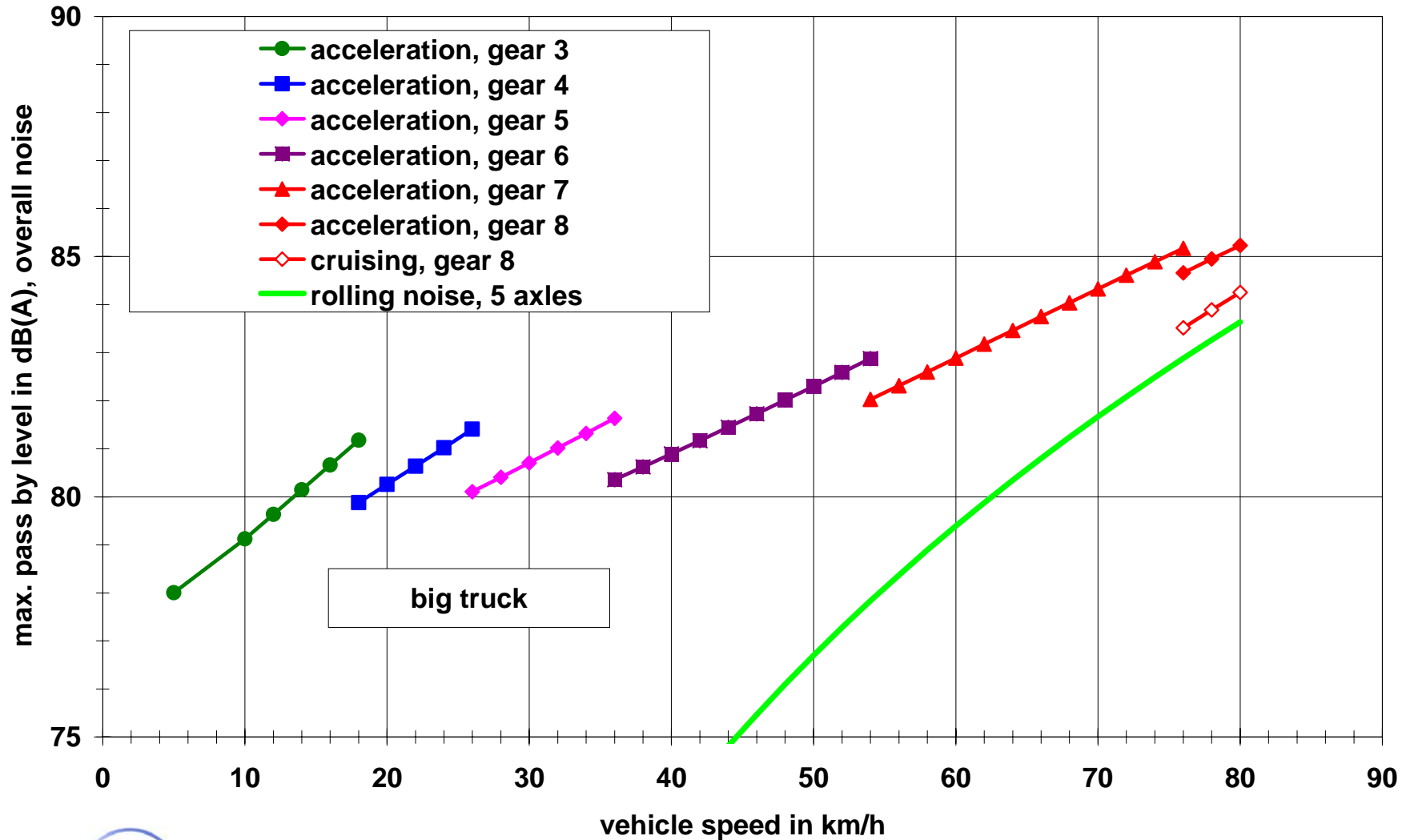
Comparison of propulsion noise and rolling noise



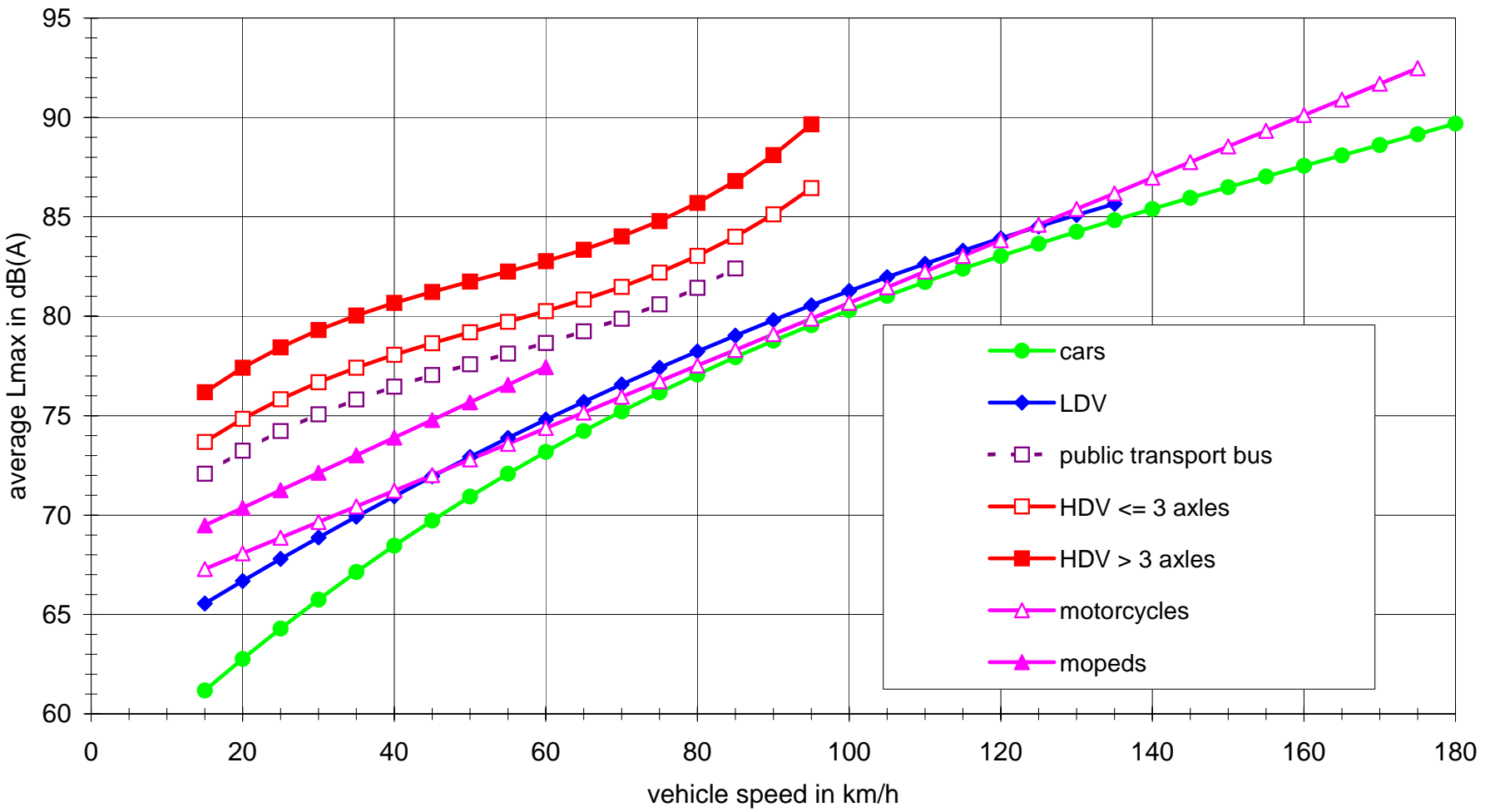
Comparison of propulsion noise and rolling noise



Comparison of propulsion noise and rolling noise



Noise emission in real traffic



Scenario calculations with TraNECaM

- The following part deals with the contributions of vehicle categories to Lden and Lnight for different road categories and the effects of different reduction scenarios.

The results shown are based on calculations

performed with the **TraNECaM** model.

Traffic
Noise
Emission
Calculation
Model

This model was originally developed for the German Federal Environment agency and was updated with funding of the EU-commission and the Norwegian Pollution Control Authority.

- The model calculates the Leq for each hour of the day separately for a workday, a Saturday and a Sunday. Within a road category the traffic situation varies in relation to the actual hourly traffic volume.
- The contributions of each emission stage (related to different type approval limit values) and vehicle category are summarised for each hour of the day and afterwards summarised to Lday, Levening, Lnight and Lden.
- The calculation is carried out separately for propulsion noise, rolling noise and total noise.
- The user has the possibility to modify the databases and define/modify vehicle layers and modify the weighting factors.

No	Road category	no of lanes	ADT	percent LDV	percent HDV	Lnight	Lden
						dB(A)	dB(A)
1	residential streets, speed limit 30 km/h	2	500	3.3%	1.0%	44.7	53.5
2	residential streets, speed limit 50 km/h	2	500	3.3%	1.0%	46.1	54.9
3	urban, main streets, speed limit 50 km/h, right of way	2	2000	4.6%	3.0%	54.7	63.6
4	urban, city centre	2	10000	4.4%	4.0%	60.6	69.4
5	urban, main streets, speed limit 50 km/h, traffic lights	4	30000	4.5%	5.0%	65.7	74.6
6	urban, main streets, speed limit 60/70 km/h	4	40000	4.4%	5.0%	70.2	78.0
7	rural, speed limit 70 km/h	2	10000	4.3%	8.0%	63.1	72.1
8	rural, speed limit 80/90 km/h	2	10000	4.2%	8.0%	64.6	73.5
9	rural, speed limit 100 km/h	2	10000	4.0%	10.0%	65.6	74.5
10	motorway, speed limit 80 km/h	4	40000	4.2%	20.0%	74.0	82.7
11	motorway, speed limit 100 km/h	4	40000	4.2%	20.0%	74.9	83.6
12	motorway, speed limit 120 km/h	4	40000	4.2%	20.0%	75.3	84.1
13	motorway, without speed limit	4	40000	4.2%	20.0%	75.7	84.5

Reference year: 2007

Reference for Lden: 10 m distance, 2 m height,

ADT: average daily traffic volume,

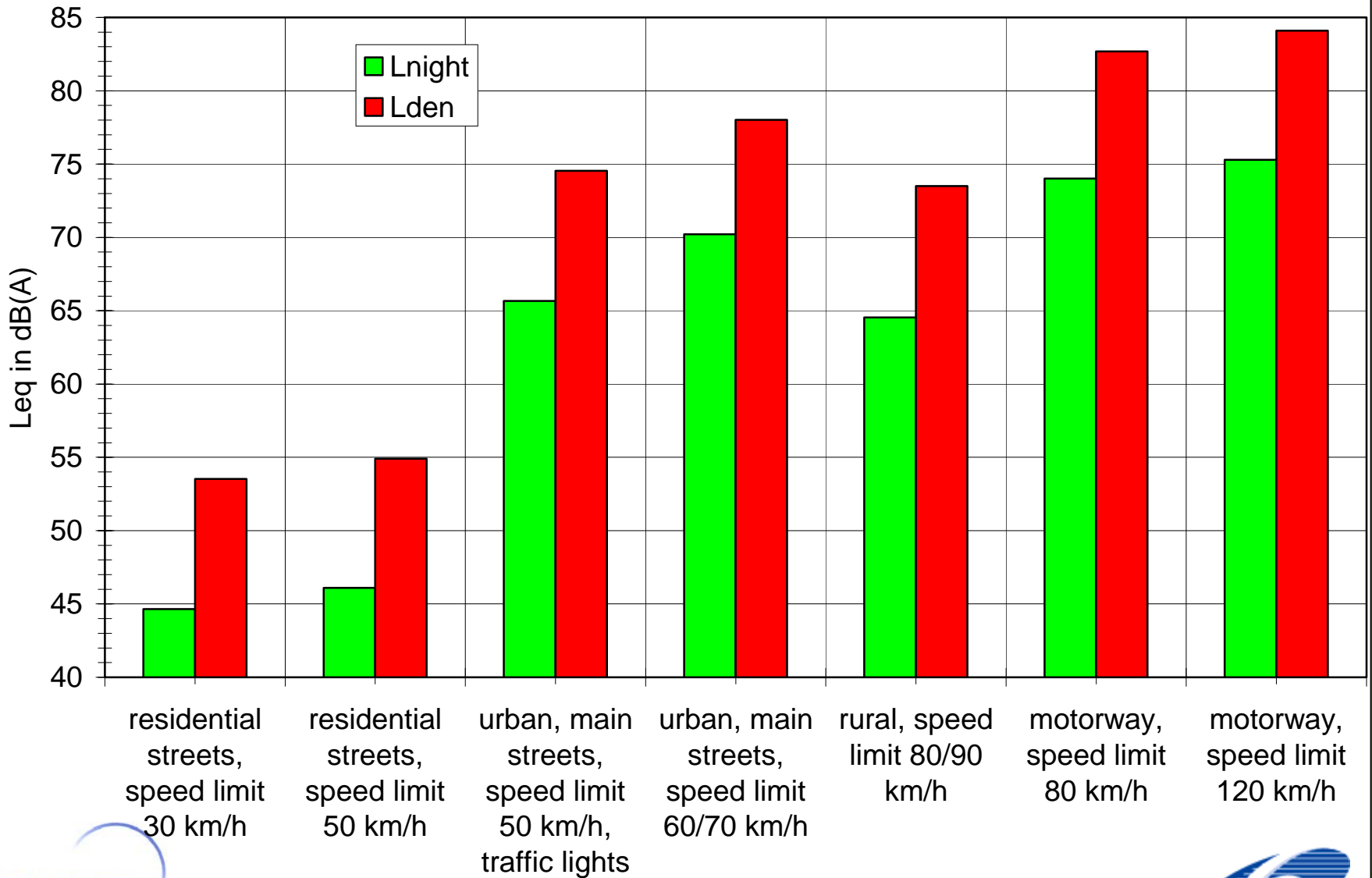
LDV: light duty vehicles (up to 3500 kg gross vehicle mass),

HDV: heavy duty vehicles (more than 3500 kg gross vehicle mass),

Lnight between 23:00 and 7:00,

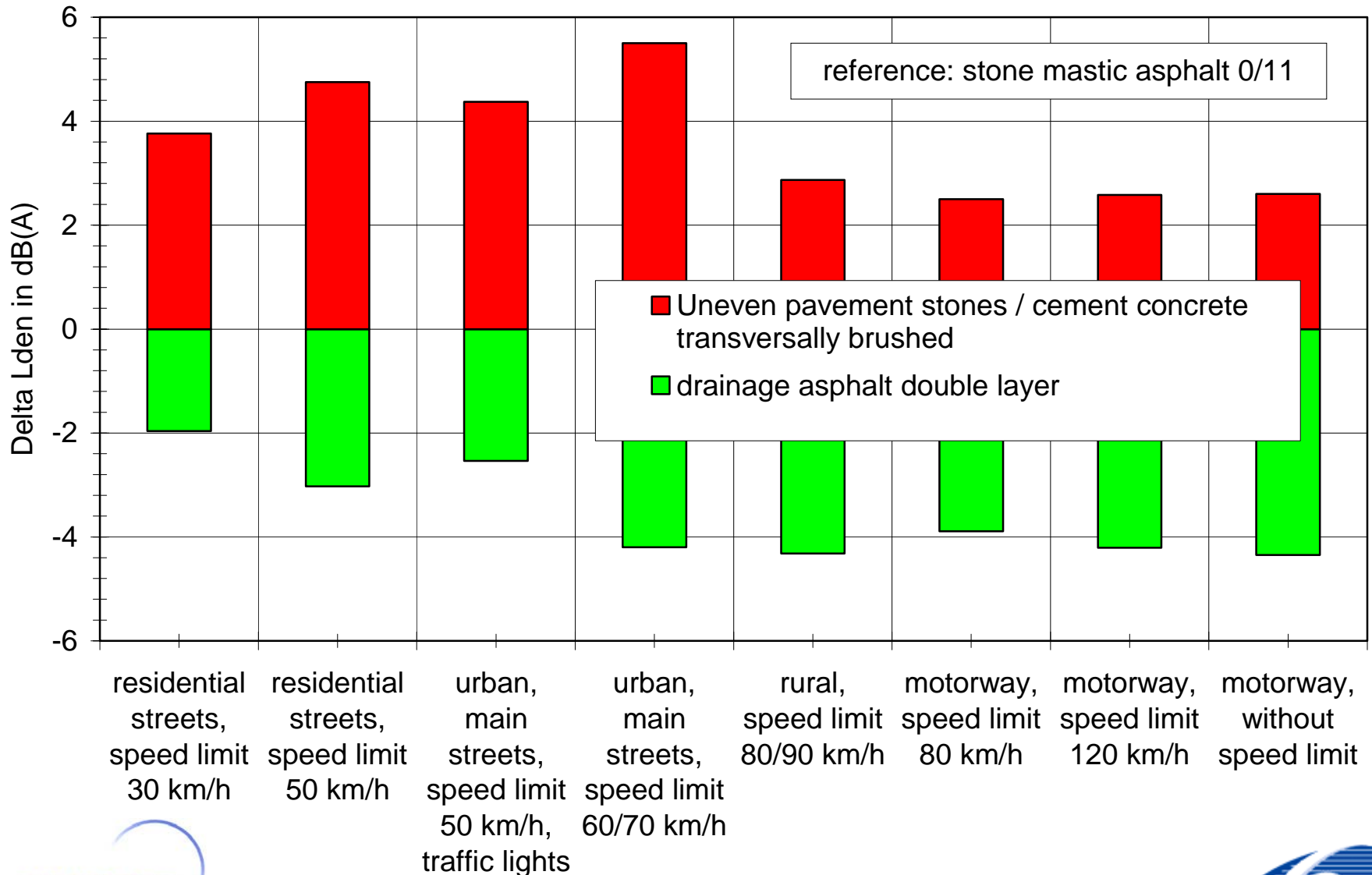
road surface stone mastic asphalt 0/11

Noise emission on different roads



No	Road category	Lden in dB(A)				
		stone mastic asphalt 0/11	Uneven pavement stones	diff	drainage asphalt double layer	diff
1	residential streets, speed limit 30 km/h	53.5	57.3	3.8	51.6	-2.0
2	residential streets, speed limit 50 km/h	54.9	59.7	4.8	51.9	-3.0
3	urban, main streets, speed limit 50 km/h, right of way	63.6	69.0	5.4	59.5	-4.1
4	urban, city centre	69.4	73.6	4.1	67.2	-2.2
5	urban, main streets, speed limit 50 km/h, traffic lights	74.6	78.9	4.4	72.0	-2.5
6	urban, main streets, speed limit 60/70 km/h	78.0	83.5	5.5	73.8	-4.2
	Road category	stone mastic asphalt 0/11	cement concrete transversally brushed	diff	drainage asphalt double layer	diff
7	rural, speed limit 70 km/h	72.1	74.8	2.7	68.6	-3.5
8	rural, speed limit 80/90 km/h	73.5	76.4	2.9	69.2	-4.3
9	rural, speed limit 100 km/h	74.5	77.3	2.8	70.3	-4.2
10	motorway, speed limit 80 km/h	82.7	85.2	2.5	78.8	-3.9
11	motorway, speed limit 100 km/h	83.6	86.2	2.6	79.5	-4.1
12	motorway, speed limit 120 km/h	84.1	86.7	2.6	79.9	-4.2
13	motorway, without speed limit	84.5	87.1	2.6	80.2	-4.3

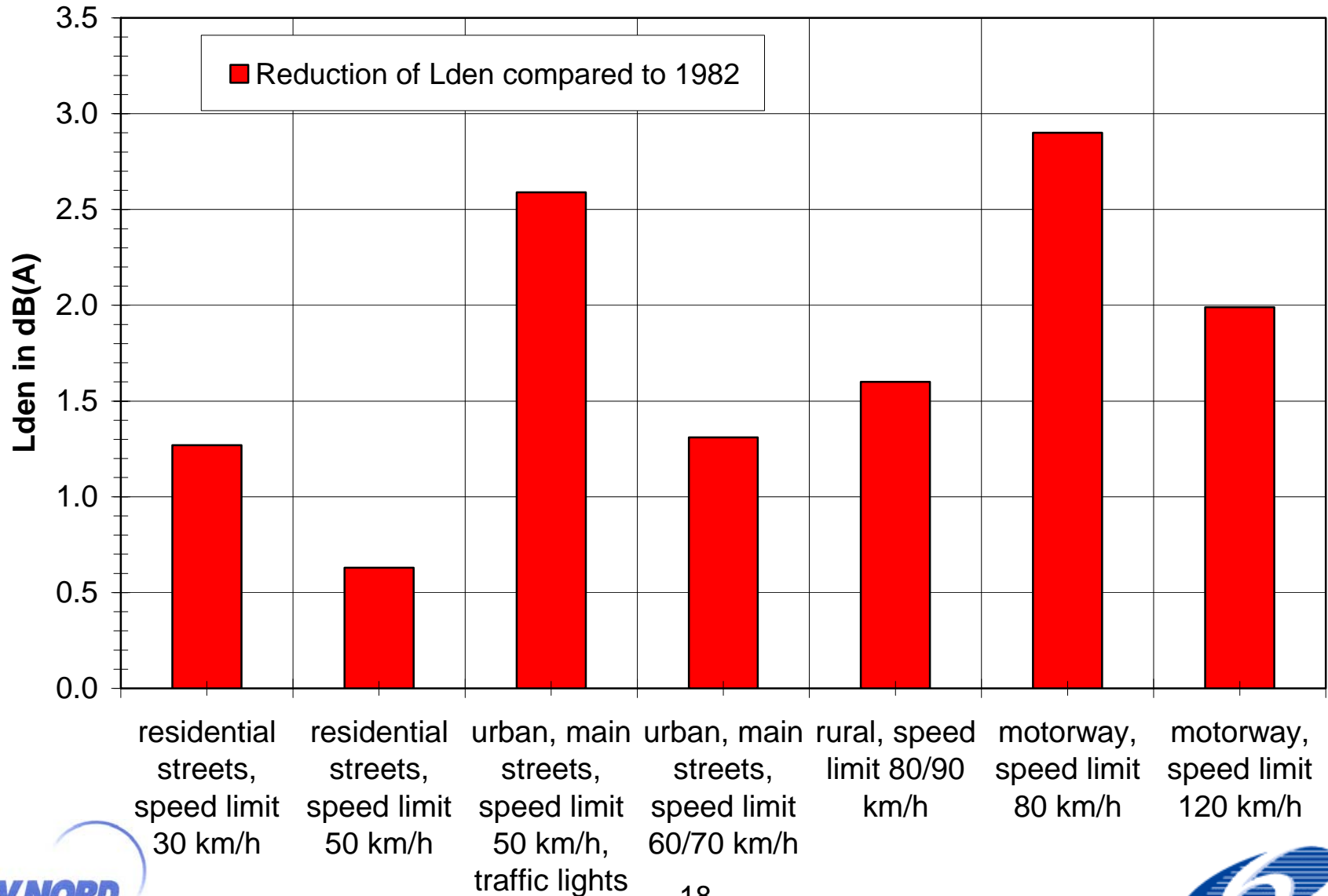
Road surface influence



Comparison of 1982 and today

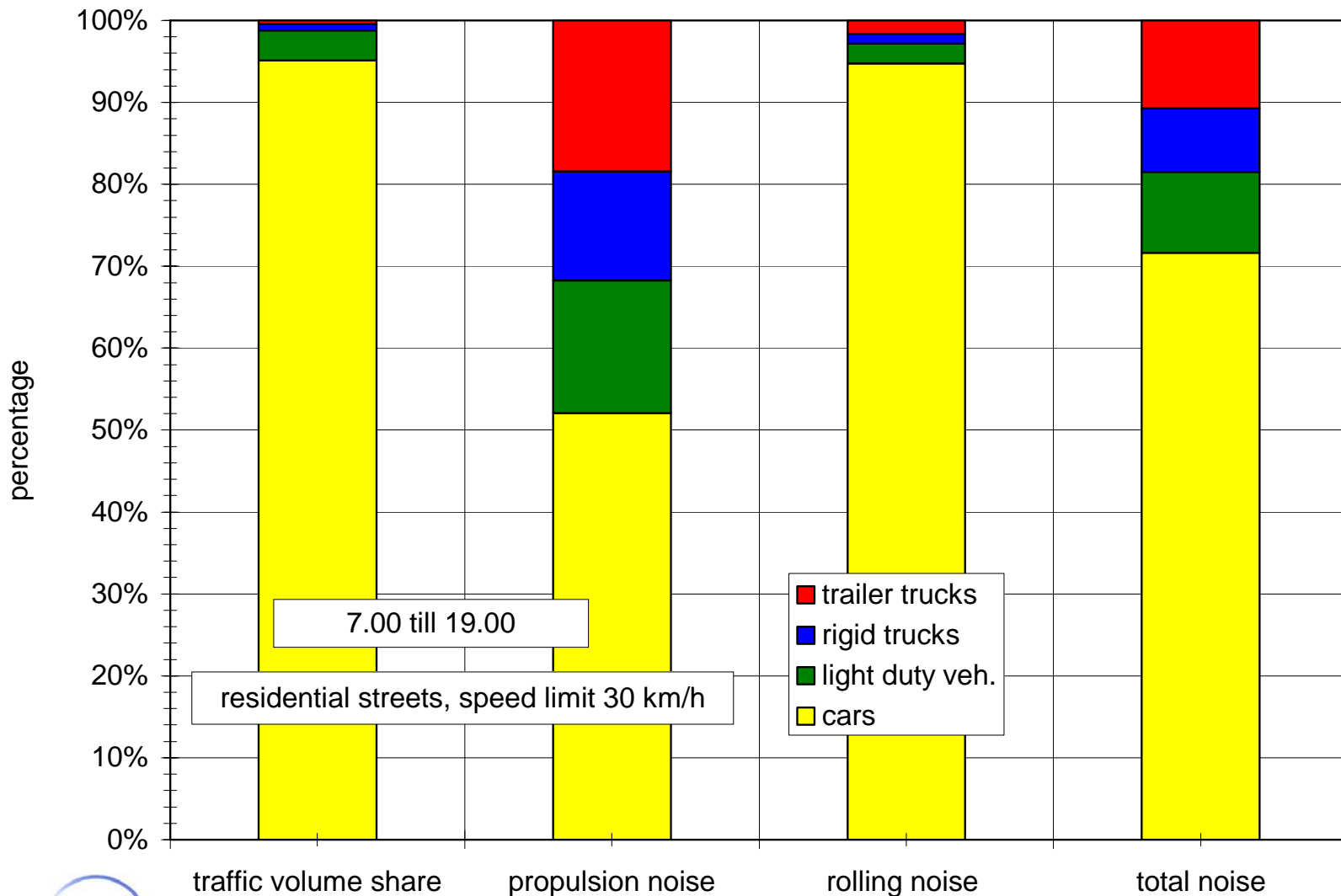
No	Road category	Lden in dB(A)		
		1982	2007	Diff
1	residential streets, speed limit 30 km/h	54.8	53.5	-1.3
2	residential streets, speed limit 50 km/h	55.5	54.9	-0.6
3	urban, main streets, speed limit 50 km/h, right of way	64.6	63.6	-1.1
4	urban, city centre	71.8	69.4	-2.3
5	urban, main streets, speed limit 50 km/h, traffic lights	77.1	74.6	-2.6
6	urban, main streets, speed limit 60/70 km/h	79.3	78.0	-1.3
7	rural, speed limit 70 km/h	74.7	72.1	-2.5
8	rural, speed limit 80/90 km/h	75.1	73.5	-1.6
9	rural, speed limit 100 km/h	76.2	74.5	-1.7
10	motorway, speed limit 80 km/h	85.6	82.7	-2.9
11	motorway, speed limit 100 km/h	85.8	83.6	-2.2
12	motorway, speed limit 120 km/h	86.1	84.1	-2.0
13	motorway, without speed limit	86.3	84.5	-1.8

Comparison of 1982 and today

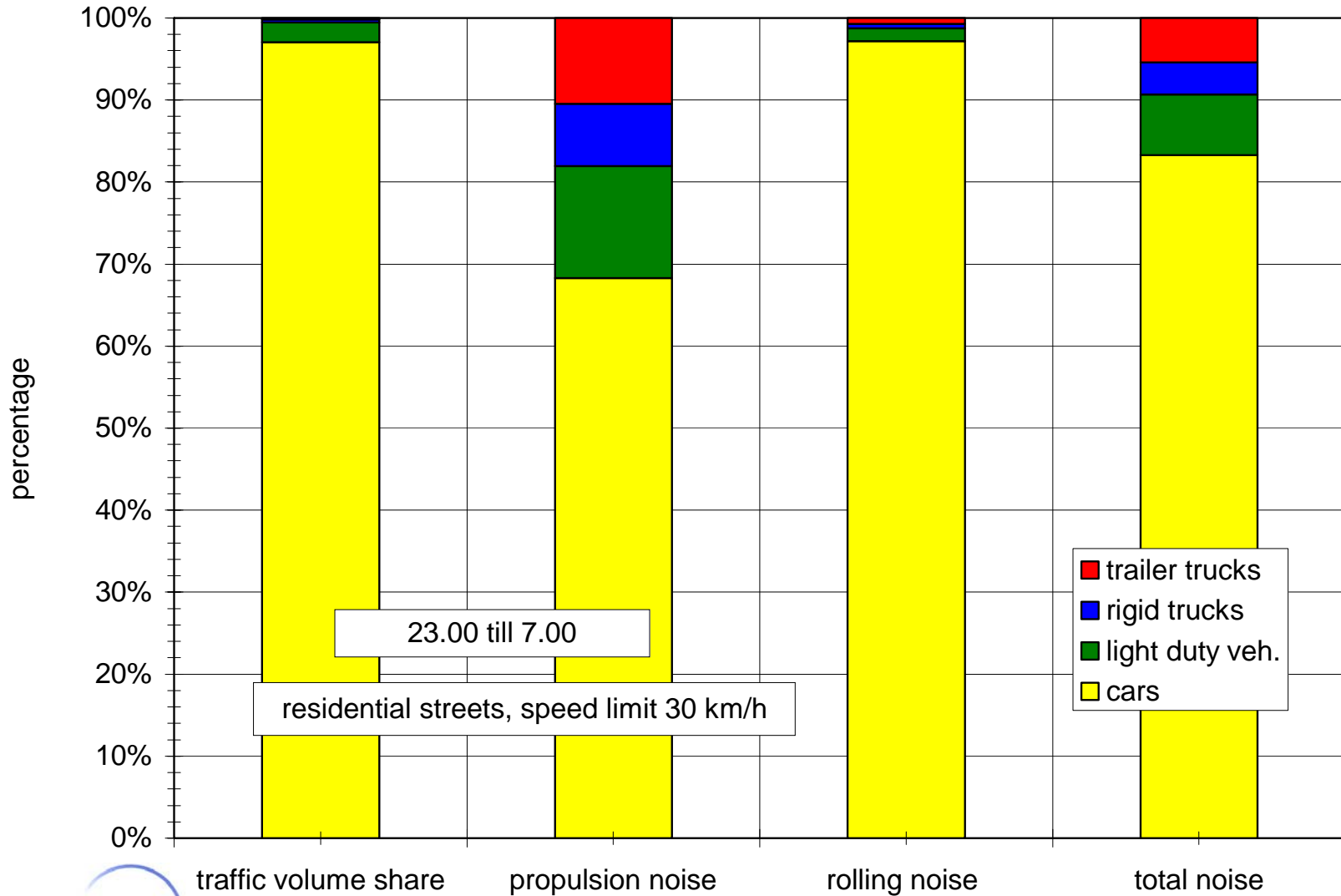


- The following slides show the percentages of different vehicle categories on traffic volume, Lden and Lnight for different road categories.
- The contributions to the noise levels are based on noise energy and are separated for propulsion noise and tyre/road noise.
- The traffic volume, traffic composition and side conditions are the same as for the table in page 13. The numbers in the headers identify the road category.

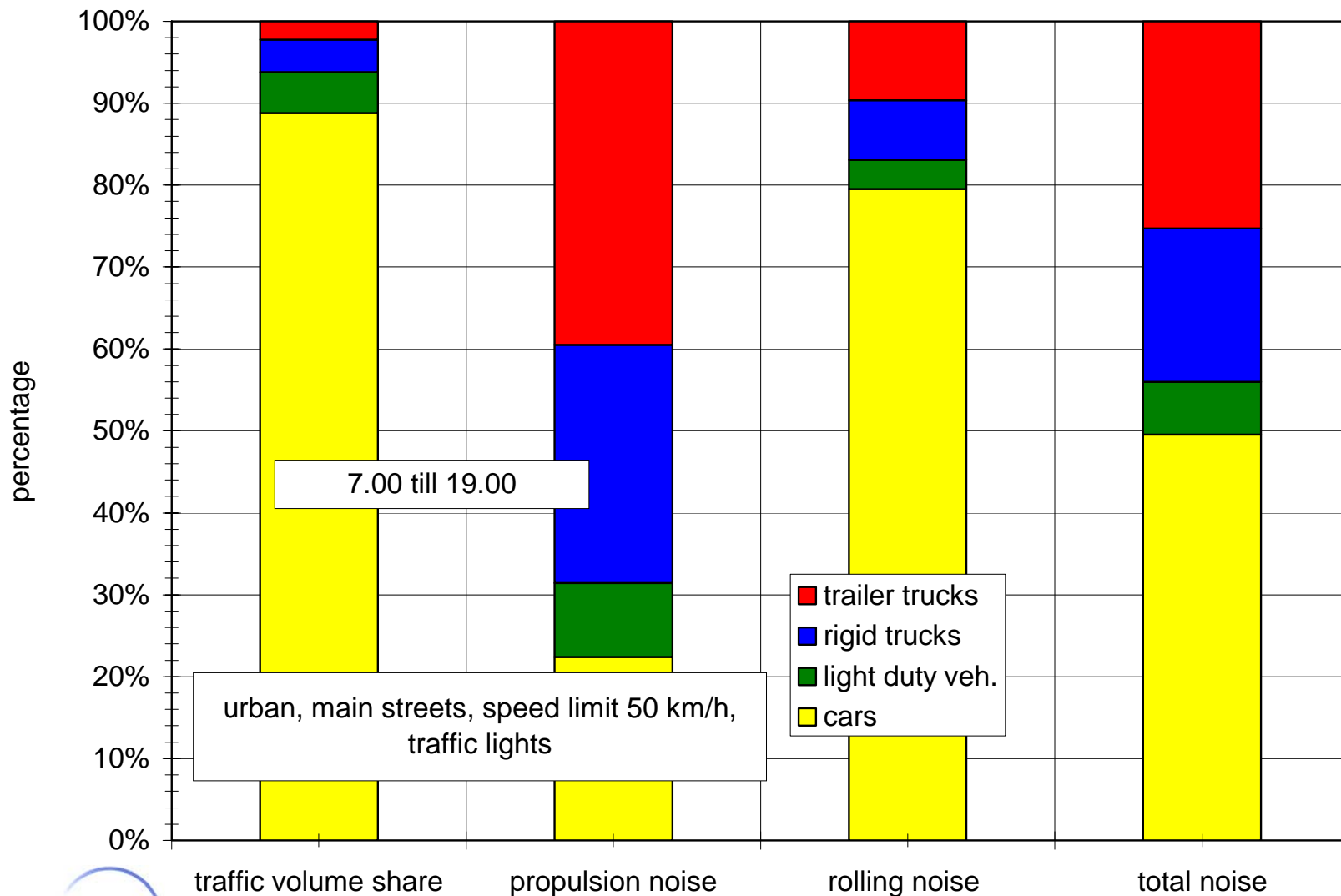
1 - Residential streets, SPL 30 km/h



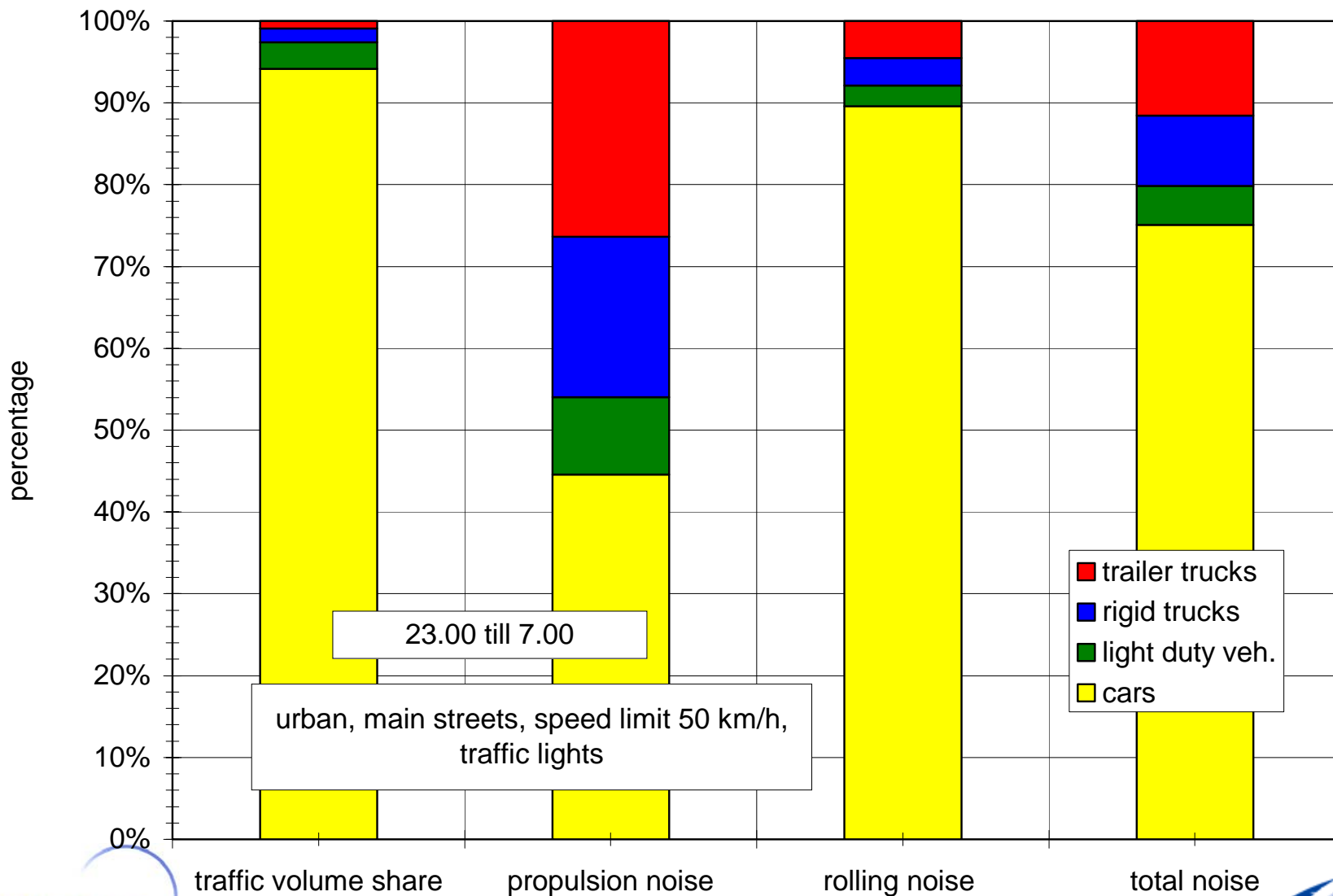
1 - Residential streets, SPL 30 km/h



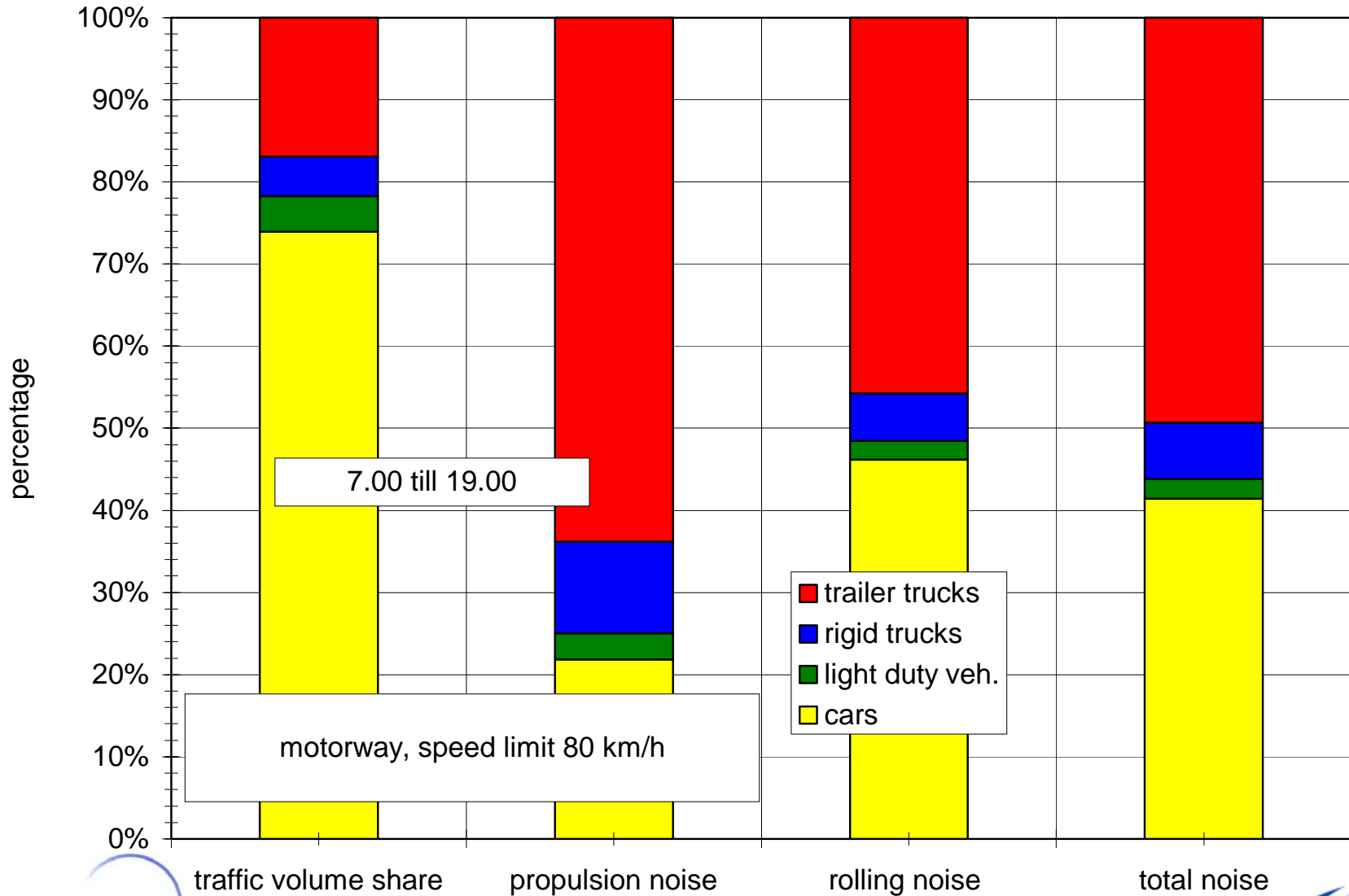
5 - Main streets, SPL 50 km/h



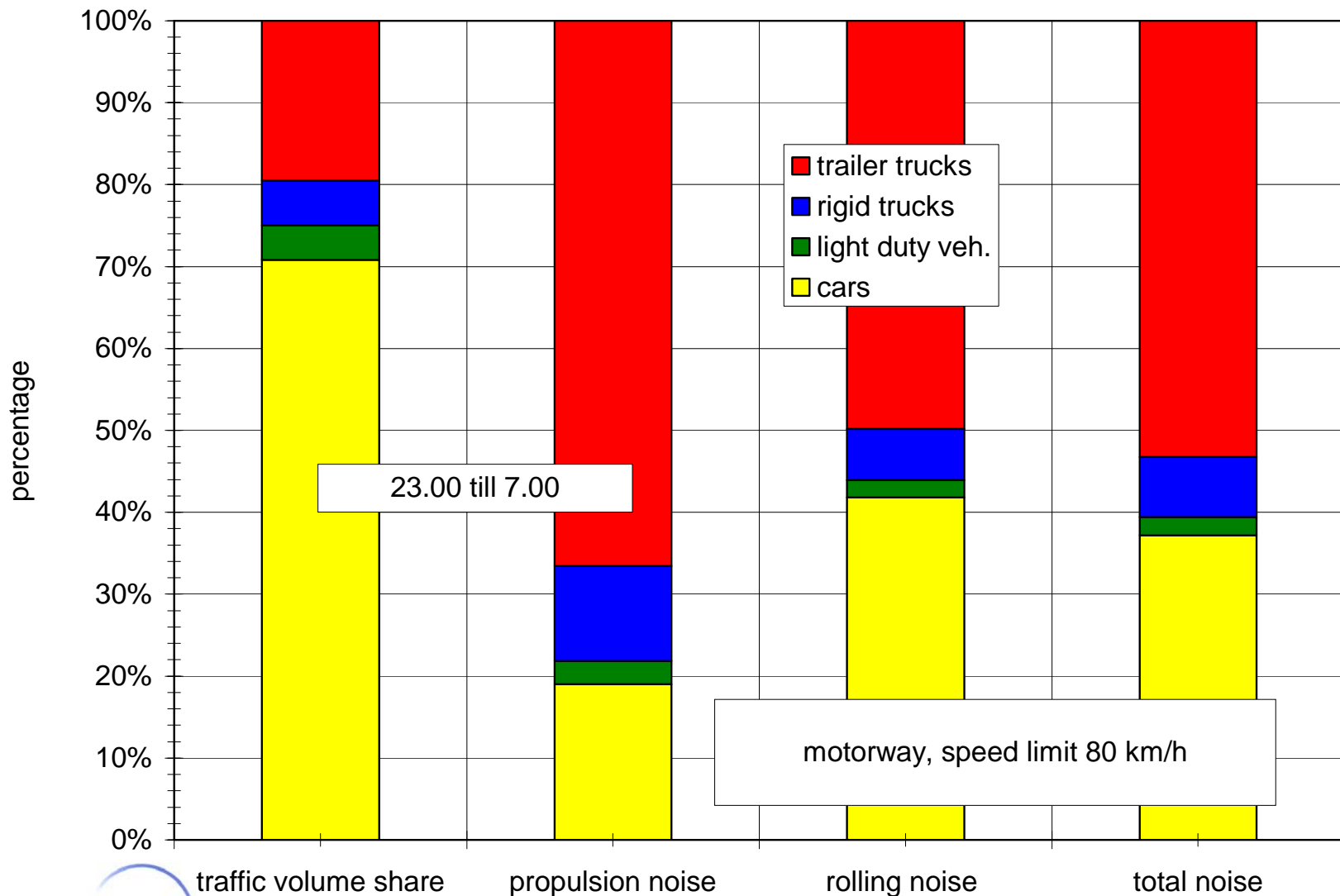
5 - Main streets, SPL 50 km/h

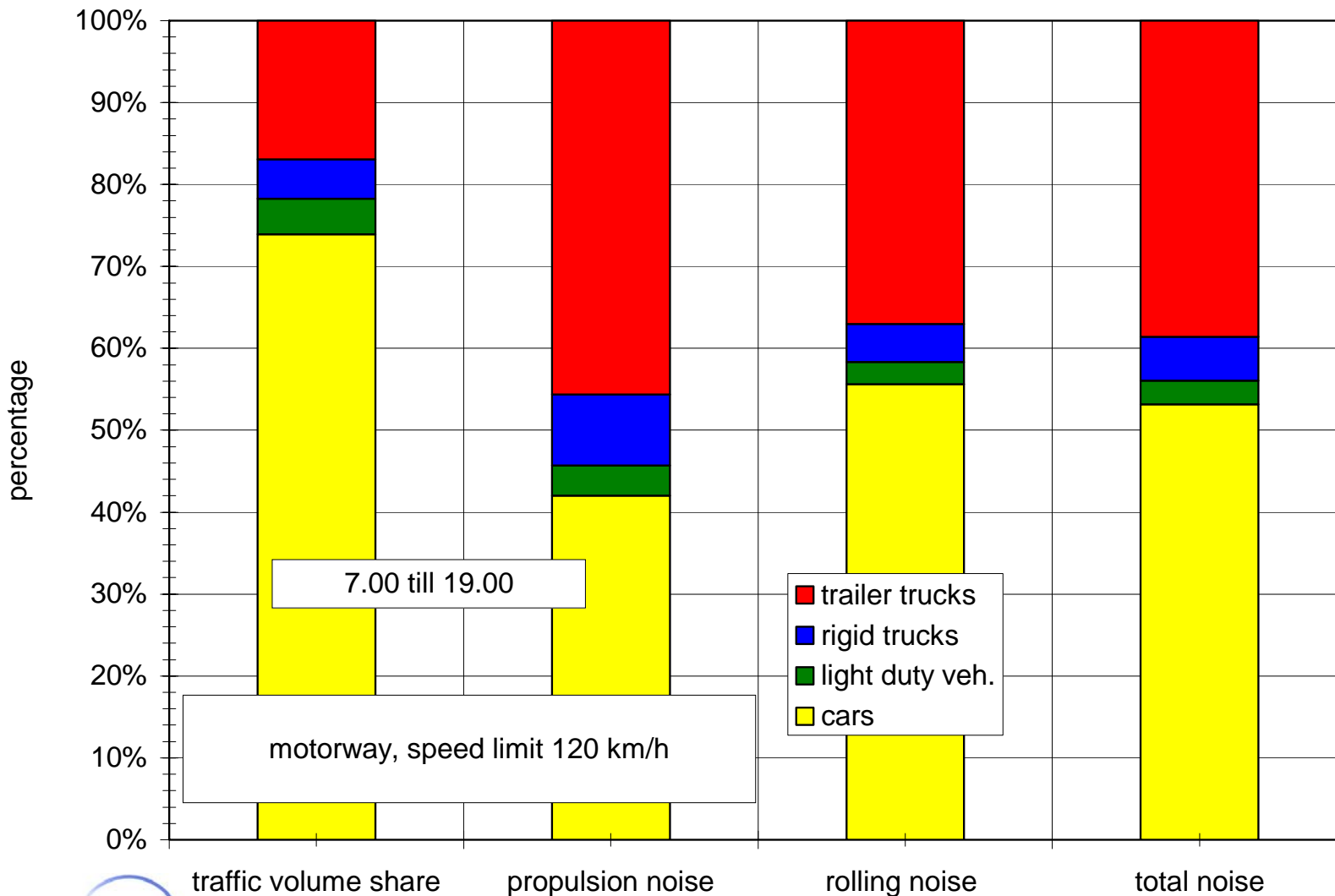


10 – motorway, SPL 80 km/h

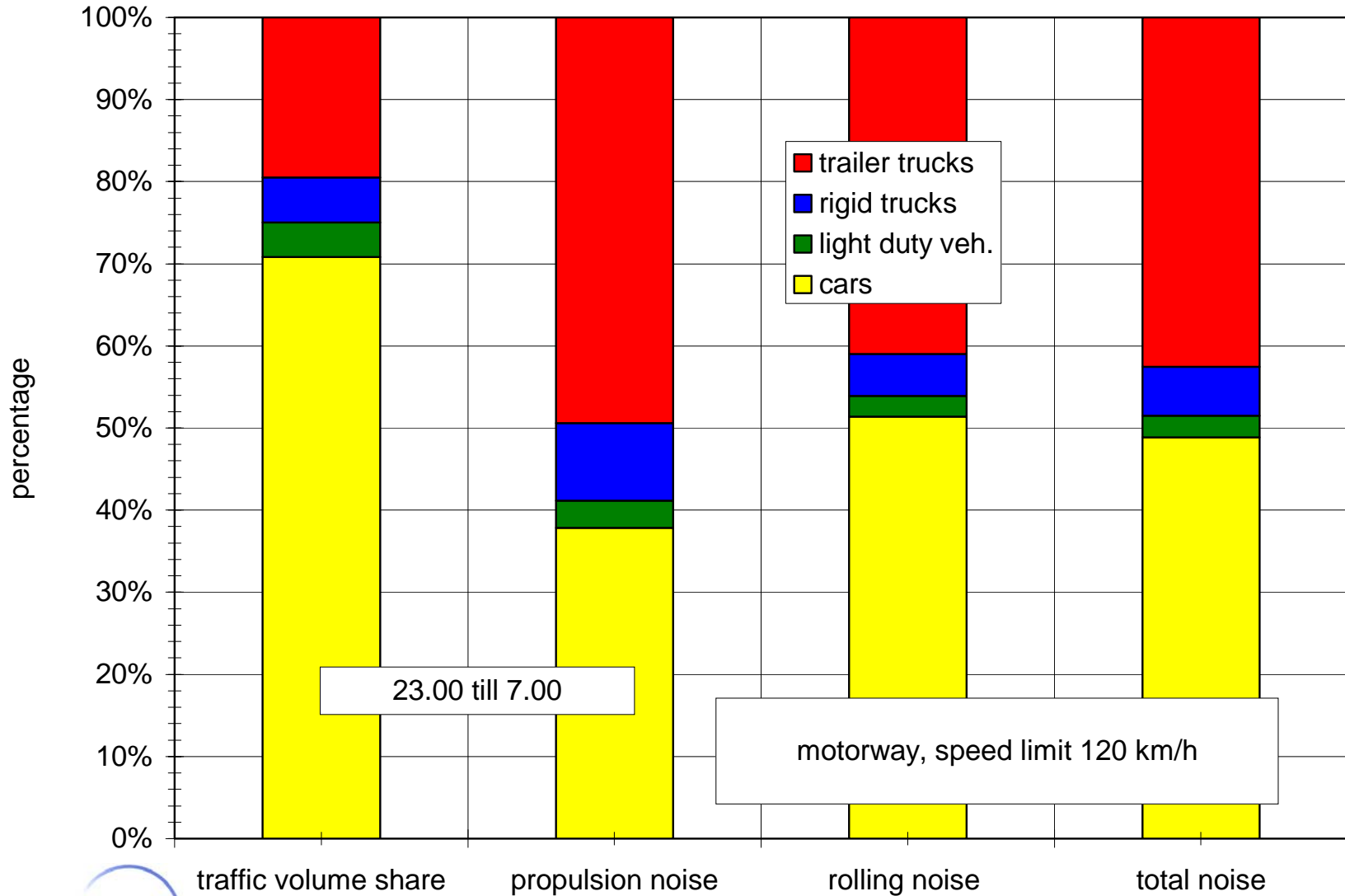


10 – motorway, SPL 80 km/h





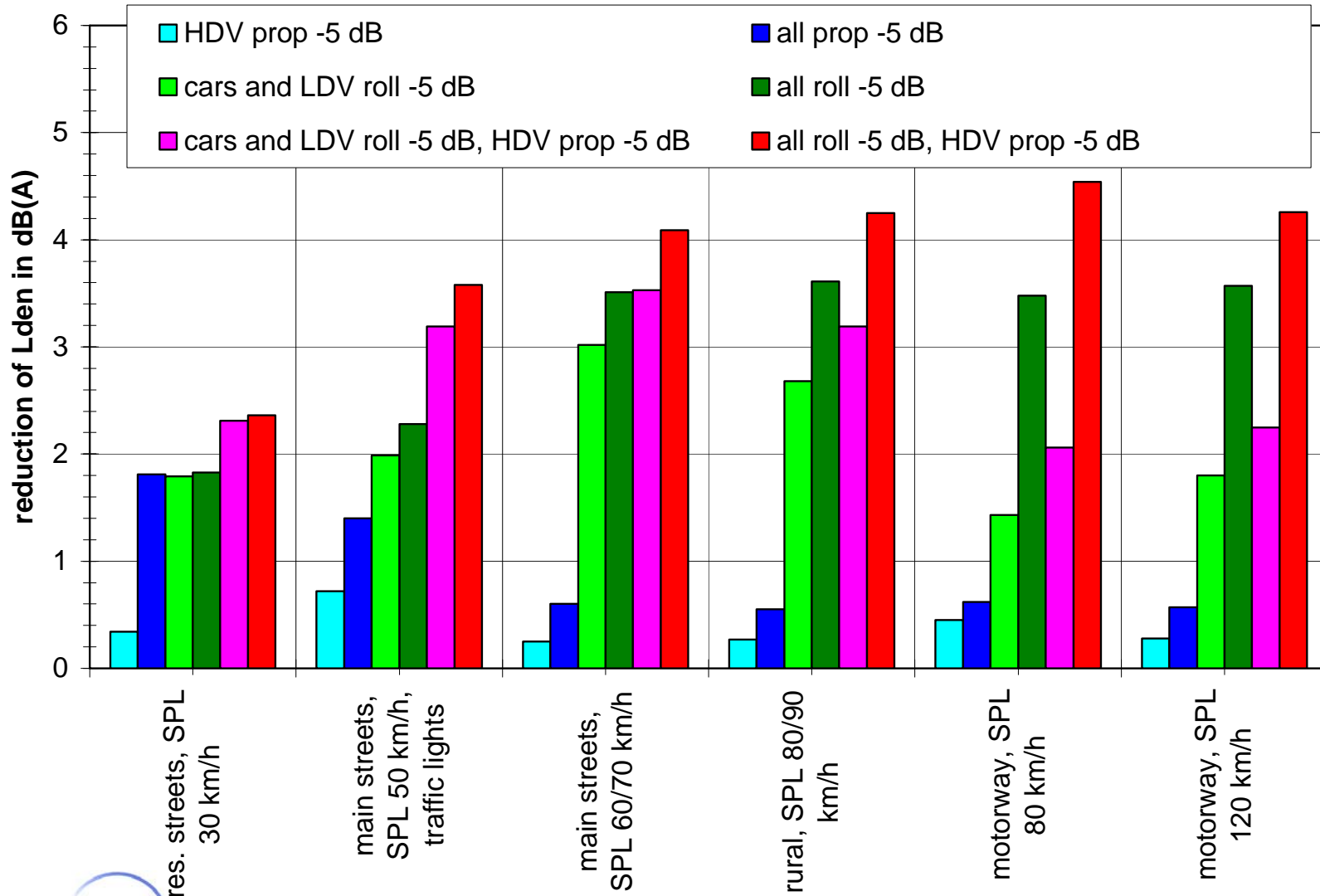
12 – motorway, SPL 120 km/h



Effects of reduction measures were calculated for the following scenarios:

- Propulsion noise reduction of 5 dB for all heavy duty vehicles (HDV),
- Rolling noise reduction of 5 dB for all cars and light duty vehicles (LDV),
- Propulsion noise reduction of 5 dB for all vehicles,
- Rolling noise reduction of 5 dB for all vehicles,
- Rolling noise reduction of 5 dB for cars and LDV, propulsion noise reduction of 5 dB for HDV,
- Rolling noise reduction of 5 dB for all vehicles, propulsion noise reduction of 5 dB for HDV.

No	Road category	Lden in dB(A)												
		base case	HDV prop 5 dB	Diff	cars and LDV roll -5 dB	Diff	all prop -5 dB	Diff	all roll -5 dB	Diff	cars and LDV roll -5 dB, HDV prop -5 dB	Diff	all roll -5 dB, HDV prop -5 dB	Diff
1	residential streets, speed limit 30 km/h	53.5	53.2	-0.3	51.7	-1.8	51.7	-1.8	51.7	-1.8	51.2	-2.3	51.2	-2.4
2	residential streets, speed limit 50 km/h	54.9	54.7	-0.2	52.3	-2.6	53.8	-1.1	52.2	-2.7	51.9	-3.0	51.8	-3.1
3	urban, main streets, speed limit 50 km/h, right of way	63.6	63.4	-0.2	60.5	-3.1	62.9	-0.6	60.1	-3.4	60.0	-3.6	59.6	-3.9
4	urban, city centre	69.4	68.7	-0.8	67.6	-1.8	67.8	-1.6	67.4	-2.0	66.4	-3.0	66.1	-3.3
5	urban, main streets, speed limit 50 km/h, traffic lights	74.6	73.8	-0.7	72.6	-2.0	73.2	-1.4	72.3	-2.3	71.4	-3.2	71.0	-3.6
6	urban, main streets, speed limit 60/70 km/h	78.0	77.8	-0.3	75.0	-3.0	77.4	-0.6	74.5	-3.5	74.5	-3.5	73.9	-4.1
7	rural, speed limit 70 km/h	72.1	71.6	-0.5	69.8	-2.3	71.3	-0.9	69.1	-3.1	68.9	-3.3	68.0	-4.2
8	rural, speed limit 80/90 km/h	73.5	73.2	-0.3	70.8	-2.7	73.0	-0.5	69.9	-3.6	70.3	-3.2	69.3	-4.3
9	rural, speed limit 100 km/h	74.5	74.2	-0.3	71.9	-2.6	73.9	-0.6	71.0	-3.5	71.3	-3.2	70.3	-4.2
10	motorway, speed limit 80 km/h	82.7	82.2	-0.5	81.3	-1.4	82.1	-0.6	79.2	-3.5	80.6	-2.1	78.1	-4.5
11	motorway, speed limit 100 km/h	83.6	83.3	-0.3	82.0	-1.6	83.0	-0.6	80.0	-3.6	81.5	-2.1	79.3	-4.3
12	motorway, speed limit 120 km/h	84.1	83.8	-0.3	82.3	-1.8	83.5	-0.6	80.5	-3.6	81.9	-2.3	79.8	-4.3
13	motorway, without speed limit	84.5	84.3	-0.3	82.6	-2.0	84.0	-0.5	80.9	-3.6	82.1	-2.4	80.3	-4.3



This leads to the following rank order of necessary reduction measures:

- 1. Rolling noise reduction for all vehicles (by measures related to tyres as well as to road surfaces),**
- 2. propulsion noise reduction for HDV,**
- 3. Propulsion noise reduction for motorised two wheelers, if they have an important fleet share,**
- 4. Propulsion noise reduction of LDV,**
- 5. Propulsion noise reduction of cars.**

Thank you for your attention!