Green scoring workshop

Calculation methodology

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- Similar vehicle score using the different green scores available
- Methodology proposal
  - Moving targets
  - Moving GHG/pollutant/efficiency weighting
  - Pollutants scale
  - GHG scale
  - Efficiency scale
- Potential data sources
  - Support from people in this room

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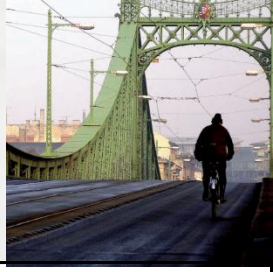
Vehicle ranking



	Ecoscore	Next green car	ACEEE green book	ADAC EcoTest	Green vehicle Guide	EcoMobiliste
	Belgium	UK	US	Germany	Australia	Switzerland
Toyota Prius 1.8	77/100	30/0	55/100	90/100	85/100	75.3/100
Bugatti Veyron	23/100		19/100			
BMW X5 3.0L	54/100		31/100		57/100	
BMW X5 4.4L	47/100	79/0	24/100	51/100	45/100	
Porsche Panamera 4.8		46/0	33/100	74/100	62/100	
Porsche Panamera 3.0 Hybrid			39/100	82/100	72/100	
Porsche Panamera 3.0 Diesel		48/0			65/100	
Smart ForTwo 52kW	76/100	27/0	53/100	65/100	87/100	65/100
Ford Focus 1.0	72/100	32/0		77/100		66/100
Ford Focus 1.6	68/100	41/0		78/100	70/100	
Nissan Note 1.6	67/100	43/0				39/100
Nissan Note 1.5 Dci		32/0		56/100		56/100
Min	23	21	19	51	45	39
Max	77	73	55	90	87	75
Diff	54	52	36	39	42	36
No of records	32554		15000	1563	2275	1490
Year	from 1990		from 2000	From 2003	From 2008	just 2013

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Questions to be answered

- How to compare vehicles and make sure test is representative of the reality?
  - Which test cycle?
  - What test conditions?
- How to define the green NCAP score?
  - Calculation methodology
  - Weighting of GHG / Pollutants / Efficiency
  - Time dependant or once and for all?
- How to disseminate the green NCAP score results?
  - Label design and information content
  - Communication strategy : website location / design (not covered today)

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Questions to be answered

- How to start the NCAP green score?
  - What data is available?
  - Who is willing to collaborate further?

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Just the moderator !

- Get consensus around the table
- Ideas to trigger reaction (some provocative)
- Will be followed-up by methodological paper, which will be reviewed by the group
- Forming a NCAP green score methodological sterring commitee ?

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Test cycle choice

- WLTP seems the way to go, as:
  - Internationally backed/designed
  - More demanding than most popular cycle, NEDC
  - Most test labs, OEMs already testing under WLTP

- This is the test cycle of the future!

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Test cycle conditions

- Making the testing more representative of reality

- Extra weight to be more representative of real vehicle weight ?
- Tougher coast down curves ?
- A/C, Lights on as in ADAC Eco Test ?

- Some penalty coefficient for testing under TA conditions?

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Score calculation methodology

- Score to 100, 100 being the cleanest vehicle ?

- Distribute the 100 points for each of:
- Pollutants
- CO2
- Efficiency
- Other?

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Methodology proposal

- Relative weight of pollutant vs GHG

Score composition	Ecoscore	Next green car	ACEEE green book	ADAC EcoTest	Green vehicle Guide	EcoMobiliste
	Belgium	UK	US	Germany	Australia	Switzerland
GHG	50	60	65	50	50	6
pollutant	40	40	35	50	50	2
noise	10					2
Total	100	100	100	100	100	100

60
40

- Should noise be included?

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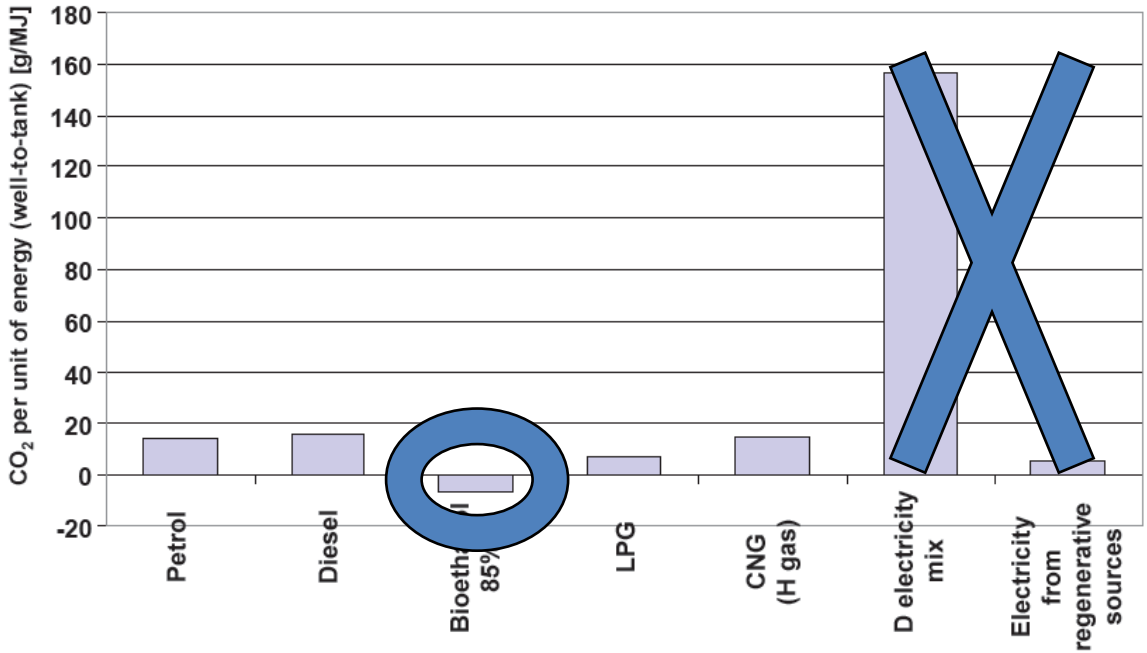
Methodology proposal

- Upstream issues replaced by vehicle energy efficiency
  - So ranking is only vehicle-dependant
  - Bonus for environmentally friendly fuelled vehicles ? (biofuels)

ADAC

CO_2 emissions in energy generation per unit of energy



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Pollutant scaling

- NOx, PM more harmful than other pollutants

CO	HC / VOC	NOx	PM
1	10	100	1000

Pollutant	Marginal Cost by Location of Emissions (2004$/kg)		
	Motor Vehicles [a]	Refineries and Factories [b]	Electric Power Plants [c]
CO	0.04	0.008	0.004
HC or VOC	0.47	0.094	0.047
NOx	6.24	1.25	0.62
SO_2	29.42	5.88	2.94
PM_{10}	50.09	10.02	5.01

Notes:
a. Geometric mean of low and high health cost estimates from Delucchi (2004), Table 1-A1.
b. Values for motor vehicles (a) reduced by a factor of 5.
c. Values for motor vehicles (a) reduced by a factor of 10.

- Non-exhaust regulated pollutant to be included VOCs ?

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Pollutant scaling

- Max points for zero emission vehicles?
- Zero points for Euro 3/4 limits (looking at developing countries)

	NEDC		ADAC Motorway	
	★★★★★ 50 points for [g/km]	★☆☆☆☆ 10 points for [g/km]	★★★★★ 50 points for [g/km]	★☆☆☆☆ 10 points for [g/km]
HC	0.10 a)	0.20 d)	0.10 a)	0.20 d)
CO	0.50 b)	1.00 e)	0.50 b)	7.00 c)
NOx	0.06 a)	0.25 f)	0.06 a)	0.70 c)
PM	0.003 c)	0.015 c)	0.003 c)	0.015 c)
PN	6E+10 c)	6E+12 g)		

a) Euro 6 petrol

b) Euro 6b diesel

c) ADAC EcoTest

d) Euro 3 petrol

e) Euro 4 petrol

f) Euro 4 diesel

g) possibly OBD GW

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Pollutant scaling - proposal

- 40 points too much?
- Constant over time?

Max points		Max point values	Min point values
5	HC	0	0.2
5	CO	0	1
10	NOx	0	0.25
20	PM	0	0.015
40	**Total**		

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Methodology proposal – CO2 / efficiency

- Gradually substitute CO2 with Energy efficiency ?
  - Won't affect ICEs if appropriate scaling
  - Allow to gradually introduce PHEV/ Evs (score to decrease over time)

- Straight only efficiency
  - Converting CO2 to energy/FE
  - Taking battery SoC into account for PHEV, EV (all ?)

CO2	Energy (l/100km)		MJ per Km	
g/km	Gasoline	Diesel	Gasoline	Diesel
200	8.44	7.52	2.83	2.71

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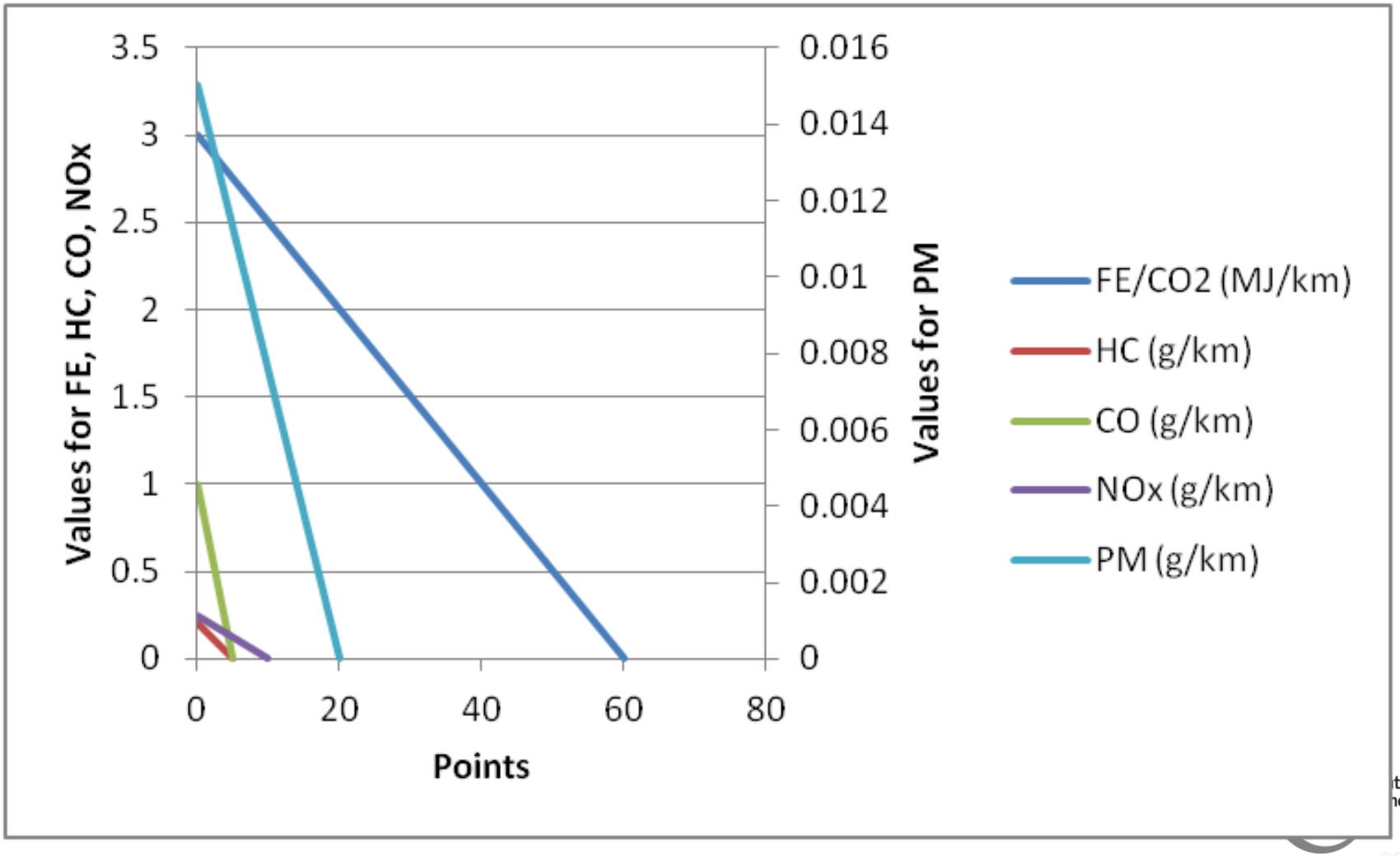
Summing up !



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Random Scores on NEDC cycle

- Using VCAcarfueldata real tested pollutant emissions

Make	Model	Fuel Type	CO2	CO	HC	Nox	PM	EF	CO2 Sco	CO Sc	HC S	Nox Sc	PM Sc	Score
VOLKSWAGEN C.	New Caddy (Passe	CNG	156	481	37	6	0	2.2	15.9	2.6	4.1	9.76	20	52.3
VOLKSWAGEN C.	New Caddy (Passe	Diesel	161	191	45	129	2	2.2	16.3	4.05	3.9	4.84	17.3	46.4
ALFA ROMEO	MiTo, 2012 onward	Petrol	98	528	49	37	0	1.4	32.3	2.36	3.8	8.52	20	67.0
ALFA ROMEO	MiTo, 2012 onward	Diesel	90	393	27	167	0.5	1.2	35.6	3.04	4.3	3.32	19.3	65.6
ASTON MARTIN L	DB9, MY2013	Petrol	333	187	41	29	0	4.7	0	4.07	4	8.84	20	36.9
BMW	5 Series F10/F11, F	Petrol	188	194	40	21	0	2.7	6.87	4.03	4	9.16	20	44.1
BMW	5 Series F10/F11, F	Diesel	143	37	13	148	0.3	1.9	21.2	4.82	4.7	4.08	19.6	54.4
CHEVROLET	Cruze, MY2011	Petrol	174	630	52	8	0	2.5	10.8	1.85	3.7	9.68	20	46.1
FORD	B-MAX, Model Yea	Petrol	119	604	71	47	0	1.7	26.4	1.98	3.2	8.12	20	59.7
FORD	B-MAX, Model Yea	Diesel	109	215	21	134	0.4	1.5	30.4	3.93	4.5	4.64	19.5	62.9
LAND ROVER	Defender	Diesel	266	179	28	196	2.1	3.6	0	4.11	4.3	2.16	17.2	27.8
MAZDA	CX-7, Model Year 2	Diesel	199	210	15	143	3	2.7	6.03	3.95	4.6	4.28	16	34.9
MERCEDES-BENZ	E-Class Saloon, Mo	Diesel Elec	109	248	23	158	0.2	1.5	29.2	3.76	4.4	3.68	19.7	60.8
MERCEDES-BENZ	E-Class Saloon, Mo	Diesel	129	54	1[illegible]	146	0.2	1.7	25	4.73	4.8	4.16	19.7	58.4
TOYOTA	Prius, MY2012	Petrol Hyb	8[illegible]	258	58	6	0	1.3	34.8	3.71	3.6	9.76	20	71.9
TOYOTA	iQ, MY2012	Petrol	9[illegible]	143	27	16	0	1.4	32	4.29	4.3	9.36	20	70.0
TOYOTA	Auris , MY2013	Petrol Elec	8[illegible]	124	18	6	0	1.2	35.4	4.38	4.6	9.76	20	74.1
SMART	fortwo coupé, Moc	Petrol	97	2[illegible]	[illegible]	11	0	1.4	32.6	3.99	4.4	9.56	20	70.5
SMART	fortwo coupé, Moc	Diesel	86	103	18	160	1	1.2	36.7	4.49	4.6	3.6	18.7	68.0
Renault	Zoe	EV	0	0	0	0	0	0.5	49.2	5	5	10	20	89.2

Recap on methodology

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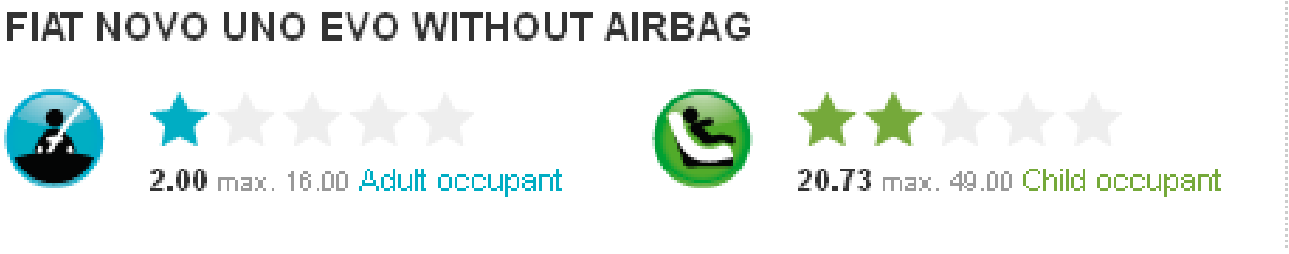
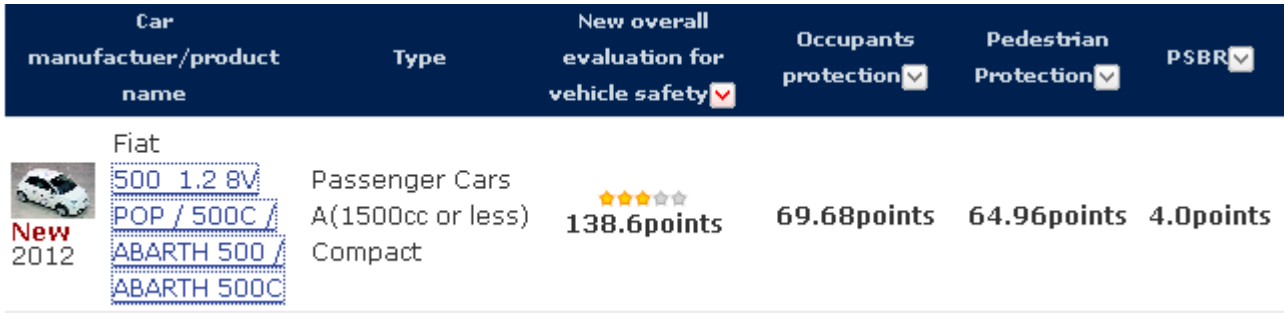
Label design

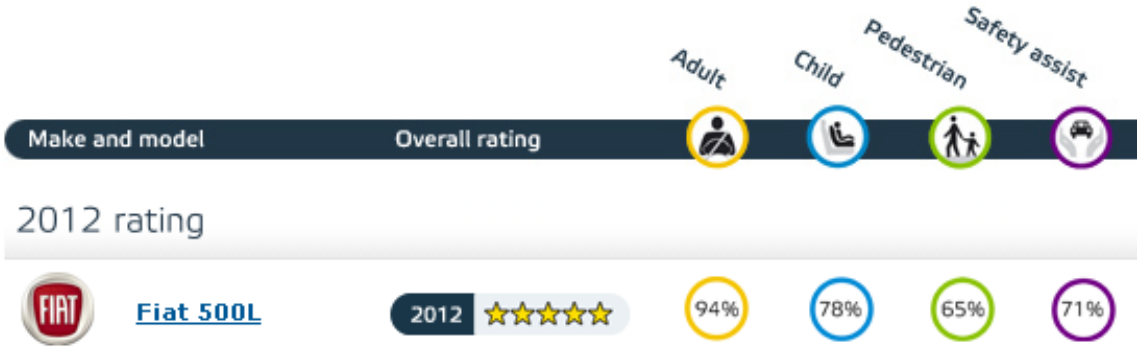
- Capitalizing on Safety NCAP?
- Latin America



- Japan



- Europe



Label design

- Information displayed:
- Overall rating (the NCAP green score)
- Overall rating within vehicle class?
- Annual Fuel/Energy spendings (currency, mileage)?
- CO2 emissions (%)?
- Local pollution (%)?
- Efficiency (%)?

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Data sources

- A Lot of model variants!
  - Compiling an up-to-date car catalogue very difficult task
  - Focusing on sales hit ?
- Measured pollutant emissions
  - Few green scores based on that, most based on emissions standard level
  - Few data on real tested pollutant emissions
- GHG emissions
  - Good coverage and data easily available on official test cycles
- Efficiency measurement
  - Derived from FE/CO2 for non plug-in vehicles
  - Battery monitoring for plug-in vehicles

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Further steps

- Green Global NCAP steering commitee ?
  - Test cycles profile and running conditions
  - Score calculation methodology
  - Label design
  - Communication strategy

- Other suggestions?

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