EcoTest
Testing and Assessment Protocol
Version 3.2
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1 The new EcoTest

The ADAC EcoTest was published for the first time in 2003 to provide consumers with comprehensive information on the eco-friendliness of cars. It relies on real-life testing of cars that goes beyond applicable legal requirements. EcoTest evaluates not only CO_2 emissions, but also pollutant emissions (HC, CO, NO_x, particulate matter and particle number). To make it clear that EcoTest is not based on the evaluation of CO_2 alone, the toxic components of exhaust emissions are also included under the heading “pollutants”. The EcoTest procedure has been well-received by consumers and manufacturers throughout Europe as a comparative test and will continue to be available with its familiar star rating system.

Nine years have passed and new legal standards (Euro 5 and Euro 6) and advances in automotive technology have made it necessary to adapt or tighten the EcoTest testing and assessment protocol so as to reflect the state-of-the-art.

2 Test cycles

To ensure reproducible, standardised test conditions, it is necessary to carry out measurements on a chassis dynamometer in the emissions laboratory, using the prescribed test cycles. There is no mandatory sequence for the individual test cycles.

The ADAC emissions laboratory has the advantage of being located 600m above sea level, allowing to check how well vehicles adapt to altitude.

The test cycles include the measurement of pollutants such as carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NO_x) and particulate matter (PM) as well as carbon dioxide (CO_2), a greenhouse gas. A new feature of the EcoTest is the measurement and inclusion of the particle number (PN) of diesel and direct-injection petrol engines in the NEDC cold test.

Fuel consumption is then calculated on the basis of emissions containing carbon.

The EcoTest simulates real-life conditions. Therefore, the following requirements apply to all EcoTest cycles in addition or in contrast to Directives (EC) 715/2007 and (EC) 692/2008:

- All vehicles are tested at their actually measured weight.
- All vehicles are driven under harsh acceleration in kick-down.
- Vehicles with a gear-shift indicator are tested shifting the gears as recommended (NEDC only).
- Commercially available fuel brands are filled into the vehicle tanks.
- Room temperature in the emissions laboratory is 22°C ± 2°C for all tests.
- Daytime running lights or low beam are on in all cycles.

The road load (homologation values) is either provided by the vehicle manufacturers or measured in the lab.

2.1 New European Driving Cycle (NEDC)

The “New European Driving Cycle” (NEDC, pursuant to Regulation ECE-R 83) (**Figure1)** has been the homologation cycle for new vehicle type approval since

1996. In order to rule out any defect in the vehicle to be tested, the EcoTest measurement readings obtained in the NEDC cold test are compared with the homologation values. If there are considerable discrepancies, the testers will try to determine their causes and then decide whether to continue the EcoTest procedure with this vehicle or whether there is a defect.

The first part of the driving cycle (Phase 1) represents urban driving, in which a vehicle is started in the morning (after being parked all night) and then driven in stop-and-go mode. The second part (Phase 2) represents extra-urban driving at a maximum speed of 120kph. The NEDC takes some 20 minutes and respectively covers distances of approx. 4km in Phase 1 (urban) and approx. 7km in Phase 2 (extra-urban).

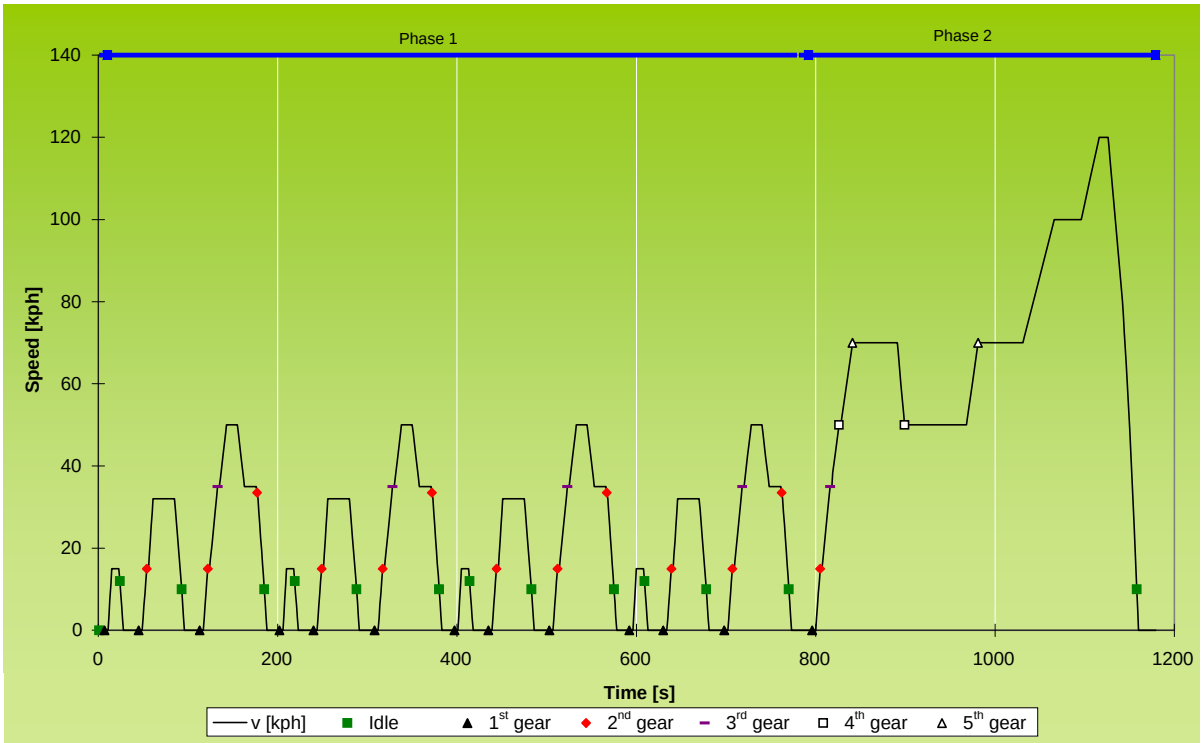

Figure1: New European Driving Cycle (NEDC)

This test evaluates:

- Pollutant emissions of HC, CO, NO_x, and PM, PN (diesel and direct-injection petrol engines only)
- CO_2
- Fuel efficiency

The engine temperature before starting the NEDC cold test is 22°C ± 2 °C. The soak time is at least 6 hours and no more than 30 hours. The NEDCin the ADAC EcoTest is carried out with the daytime running lights on or with the low beams on, as applicable.

2.2 WLTC

The **W**orldwide harmonised **L**ight vehicles **T**est **C**ycle (WLTC) is going to replace the NEDC (see **Figure 2**). The WLTC consists of four phases (low, middle, high and extra high) and is supposed to cover as many aspects of real-life driving as possible.

Distances covered are: approx. 3km in the first or low phase, approx. 5km in the middle phase, approx. 7km in the high phase and approx. 7.7km in the extra high phase. In order to gain experience with the new cycle ahead of its passing into law, the new EcoTest will include the WLTC (engine temperature approx. 90°C) instead of the previously used NEDC hot test.

One drawback of the NEDC is that power-consuming devices are not switched on. The ADAC EcoTest has long since taken this aspect into account by turning on the air condition in both the NEDC hot test and the ADAC motorway test. The WLTC additionally includes switching on the low beams or, if applicable, the daytime running lights. Activating the air conditioning system and switching on the low beams or the daytime running lights allows determining the efficiency of these power-consuming devices.

Please note: Initially, this cycle will be used only to evaluate CO_2 emissions, just like the NEDC hot test in the previous EcoTest. This does not rule out the future possibility of evaluating pollutant emissions in the WLTC.

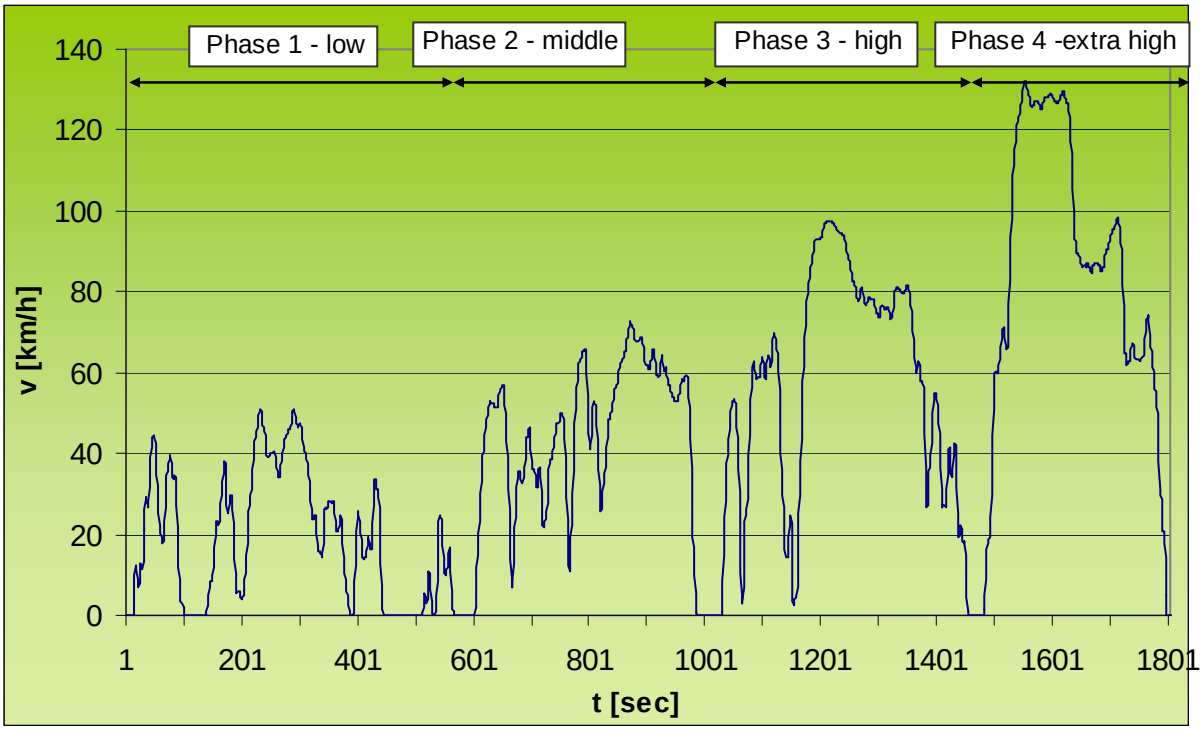

Figure 2**:** WLTC

This test evaluates:

- CO_2
- Fuel consumption

The recommended engine temperature before starting the WLTC is approx. 90°C.

Settings for manually controlled air conditioning systems:

- A/C switch: on
- Temperature selector: approx. 20°C; temperature is measured between the positions of the driver's head and the front passenger's head

- Fan speed selector: 1/3 ... 1/4
- Air flow selector: Floor/windscreen

Settings for automatic air conditioning systems:

- A/C switch: on
- Temperature selector: 20°C
- Fan speed selector: AUTO
- Air flow selector: AUTO

2.3 ADAC motorway cycle

Figure 3 shows the ADAC motorway cycle. Ratings are based on the average of phase 1 and phase 2. This additional test developed by ADAC is designed to show whether the exhaust emission control system also performs well outside the NEDC test required for type approval. The ADAC motorway cycle reflects the fact that in most European countries the motorway speed limit is 130kph. In addition, it also includes full-load acceleration.

The cycle consists of a short preconditioning phase, which will not be included in the measurement, and of two identical test phases. The two phases make it possible to rule out that a vehicle is presently in a regeneration phase (particulate filter burn-off, SCR system regeneration). If the emissions in both phases differ greatly, regeneration has occurred and the test is repeated. The distance covered per phase of the ADAC motorway cycle is approx. 10km.

Measurements are conducted with the air conditioning on. The settings correspond to those used in the WLTC. In addition, the low beams or, if applicable, the daytime running lights are switched on.

This test evaluates:

- Emissions: HC, CO, NO_x, and PM
- CO_2
- Fuel efficiency

The recommended engine temperature before starting the ADAC motorway cycle is approx. 90°C.

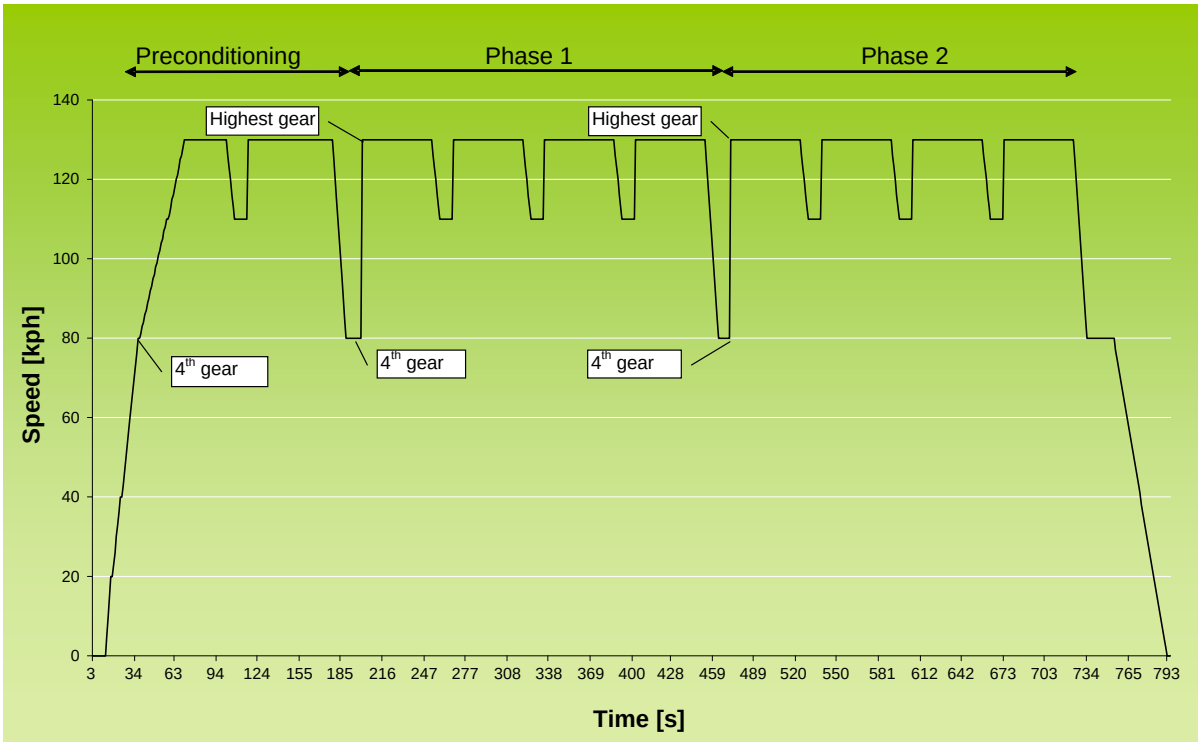

Figure 3**:** ADAC motorway cycle

3 Test procedure

3.1 Petrol and diesel vehicles

There is no specific chronological order in which the individual test cycles should be run for measuring petrol and diesel vehicles.

3.2 Natural gas vehicles

The test procedure is similar to the requirements for petrol and diesel vehicles. Regardless of the type of gas used (CNG, LPG), the vehicles are measured and evaluated only in the gas-powered mode of operation, if technologically feasible.

3.3 Hybrid vehicles

As for the above-mentioned drive types, there is no mandatory measurement sequence for hybrid vehicles. Before measurement begins, the on-board display must show an SOC value of 60-70% (SOC = State of Charge).

3.4 Plug-in hybrids / range extender electric vehicles

For EcoTest measurements of plug-in hybrids or range extender electric vehicles, the following cycles with an empty battery and with a full battery are necessary: There is no mandatory sequence for the procedures/cycles. If the engine starts during the test, the distance covered with the engine on will be subtracted. The periods during which the engine is active will be determined either by OBD evaluation or by modal analysis:

- Warm-up, soak temperature at 22°C and charging (SOC 100%)
- Repeated NEDC measurements with a full battery until SOC is at least <50%; complete cycle
- KWh measurement of the electrical energy (E) supplied by recharging via wall-box or power socket
- Repeated WLTC measurements with full battery until SOC at least <50%; complete cycle
- KWh measurement of the electrical energy (E) supplied by recharging via wall-box or power socket
- Repeated ADAC motorway cycle measurements with full battery until SOC at least <50%; complete cycle
- KWh measurement of the electrical energy (E) supplied by recharging via wall-box or power socket
- Drive until battery is empty; soak temperature at 22°C
- One-time NEDC measurement with empty battery (SOC_end – SOC_start <3%)
- One-time WLTC measurement with empty battery (SOC_end – SOC_start <3%)
- One-time ADAC motorway cycle measurement with empty battery (SOC_end – SOC_start <3%)

The energy E is determined by recharging. The measurement allows for charging losses (regular charging). The basis for evaluation is the energy consumption in kWh (see 3.4 Formula 3). Pollutants and CO_2 emissions are calculated applying the formula pursuant to Regulations ECE-R 83 and ECE-R 101. The mean mass emissions of the pollutant when the battery is fully charged ($M1_i$) and of the fuel consumption when the battery is fully charged (FC_1) are only taken into account from the first measurement (SOC 100%). Emissions are calculated according to the following formula (1) pursuant to ECE-R 83:

$$M_i = \frac{(D_e \cdot M1_i + D_{av} \cdot M2_i)}{(D_e + D_{av})} \quad (1)$$

M_i Mass emissions of pollutant i (g/km)

$M1_i$ Mean mass emissions of pollutant i (g/km) when battery is fully charged

$M2_i$ Mean mass emissions of pollutant i (g/km) when battery is empty

D_e Distance covered in fully electric mode (km)

D_{av} 25km (average mileage between battery charging cycles)

Fuel consumption is calculated according to the following formula (2):

$$FC = \frac{(D_e \cdot FC_1 + D_{av} \cdot FC_2)}{(D_e + D_{av})} \quad (2)$$

FC fuel consumption (l/100km)

FC_1 fuel consumption (l/100km) when battery is fully charged

FC_2 fuel consumption (l/100km) when battery is empty

CO_2 emissions corresponding to the electrical energy used are calculated according to the following formula (3):

$$CO_{2elektr} = \frac{CO_{2strommix} \cdot E}{D_e} \quad (3)$$

$CO_{2electricity\ mix}$ CO_2 emissions per 1kWh are 563g/kWh (source: Federal Environment Agency data for German electricity mix, as adapted from time to time)

E Supplied electrical energy (kWh)

D_e Distance covered in fully electric mode (km)

The CO_2 emissions determined according to the above formula (1) are converted into a CO_{2WTW} value (see **4.2**) and then added to the $CO_{2electr}$ emissions.

$$CO_{2PlugIn} = CO_{2WTW} + CO_{2elektr} \quad (4)$$

$CO_{2PlugIn}$ CO_2 emissions calculated for plug-in or hybrid vehicle with range extender

CO_{2WTW} calculated well-to-wheel CO_2 emissions (see **4.2**)

$CO_{2electr}$ calculated CO_2 emissions for electrical energy consumed (formula 4)

3.5 Electric vehicles

The cycle for electric vehicles is a combination of the NEDC, the WLTC and an adapted part of the ADAC motorway cycle (see **Figure 4**). The distances covered have been adapted so that the mathematical weightings match again. Individual measurements may be required. Therefore, the measurement procedure is selected as needed. Prior to the cycle, the electric vehicle is fully charged. The EcoTest electric cycle is run to completion with the daytime running lights or the low beams switched on throughout the entire electric cycle. The air conditioning is off during the NEDC part and on during the WLTC and ADAC motorway cycles. The electric cycle is repeated until SOC is at least <50%. Subsequently, the required electric energy E is determined by using the standard recharging facility (standard equipment). Depending on the vehicle equipment or delivery condition, the electric vehicle is charged via the household socket (Schuko plug, 10A) or - if the above variant is not possible - by a type II charging plug (wall-box, max 16A - single phase). The energy measurement also takes into account the load losses. The basis for evaluation is the energy consumption in kWh (see **3.4** formula 3).

The main factor allowing a comparison between electric vehicles and conventional vehicles regarding the CO_2 footprint is the generation of the electric power used. The reference presently used is the German electricity mix **with a CO_2 value of 563 g/kWh (source: Federal Environment Agency)**. This value is adapted from time to time (no more than once a year). For publication of the EcoTest in other European countries, the applicable national electricity mix may be used for evaluation. The CO_2 emissions of electric vehicles are calculated as a function of their **current consumption (kWh/100km)**, applying formula 3 (see 3.4 above). The pollutant emissions of

electric vehicles are not assessed because they are not generated locally by the vehicles themselves (decided on 4 November 2010).

There is presently no way of determining and indicating the energy values for the individual distances covered, except for the data provided by the vehicle manufacturers.

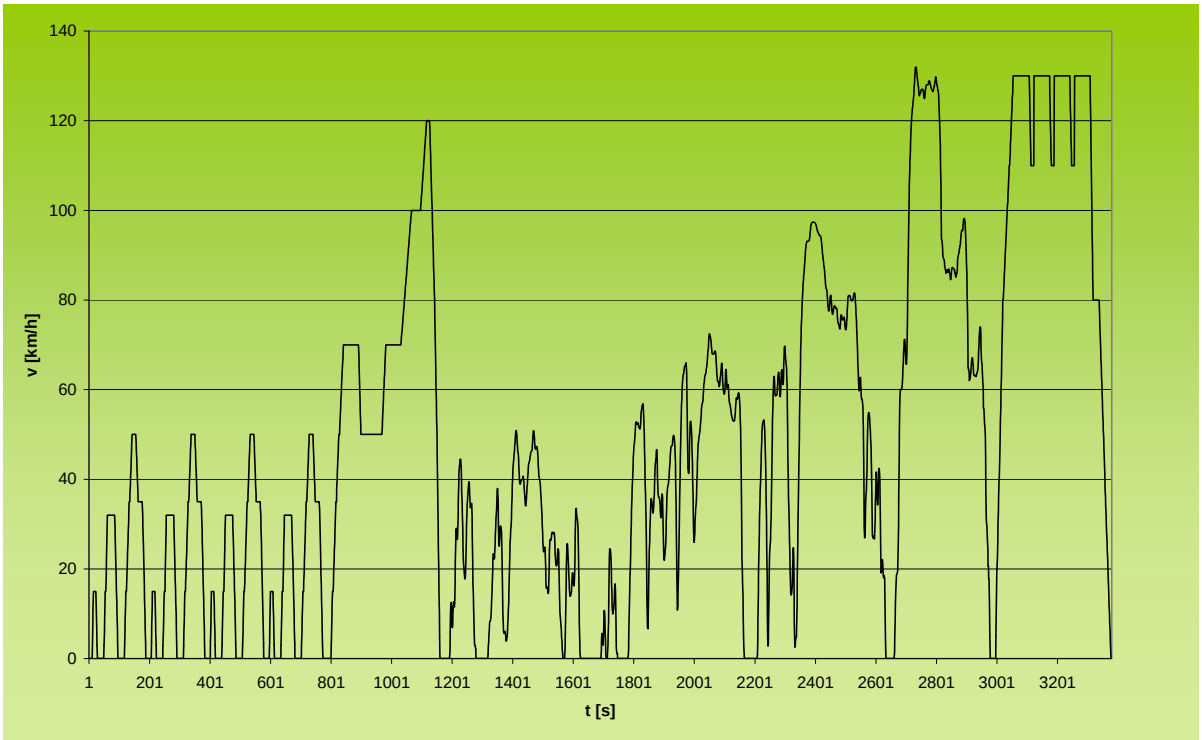

Figure 4**:** Illustration of EcoTest electric vehicle cycle

4 Assessment protocol

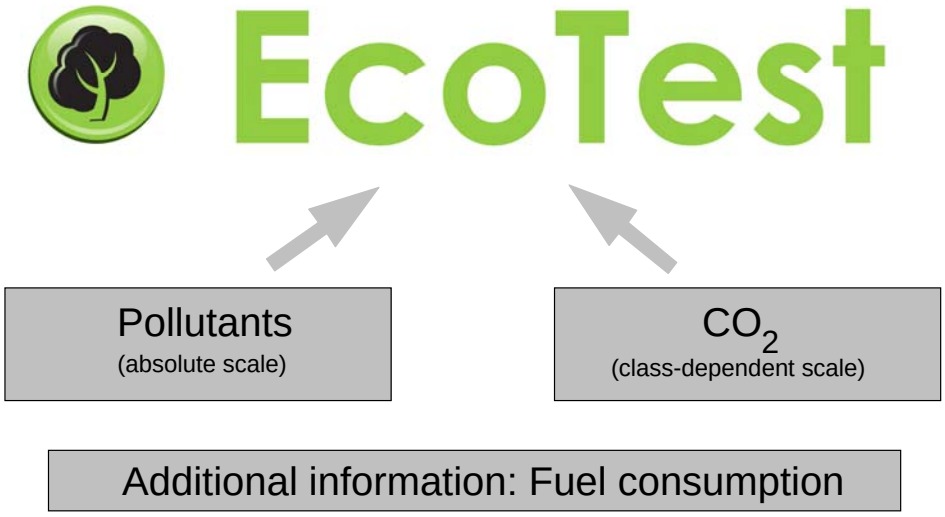

Figure 5**:** EcoTest formula

The EcoTest rating is based on the combined scores for the two main criteria, i.e. pollutants and CO_2 (see **Figure 5**). The pollutant score is indicated as an absolute value, regardless of vehicle size and fuel type. This is in contrast to applicable laws that provide different limits for petrol vehicles and for diesel vehicles. The limits for both engine types will be in a closer range after the introduction of Euro 6 (2014). In that respect, the EcoTest is ahead of its time since it applies the same limits to all vehicles. However, the consumption-dependent carbon dioxide emissions are assessed individually for each vehicle class, since car buyers also look at the consumption of the competition. All limits have been tightened so that they will still be valid in the future and the protocol will be applicable without any changes for a long time. The exact method by which the pollutant and CO_2 scores are determined will be explained below. Fuel consumption is provided as an additional detail.

There is no way to take the entire eco balance of a vehicle into account because the data is too complex for an independent verification of the manufacturer's information on the manufacturing process.

The EcoTest rating is calculated according to the following formula (5):

$$Rating_{EcoTest} = Score_{\text{pollutants}} + Score_{CO_2} \quad (5)$$

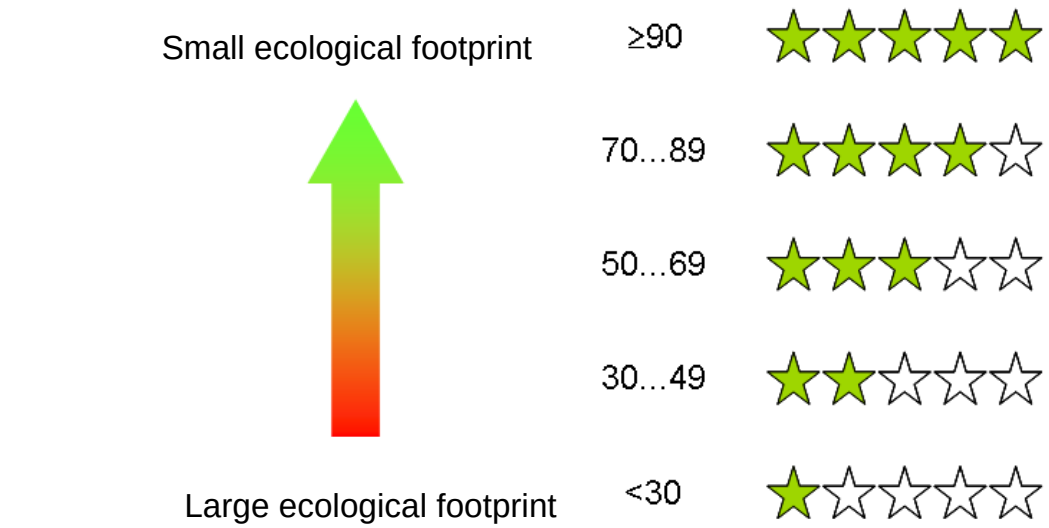

Figure 6**:** Star rating

Figure 6 shows the scores needed to obtain the individual EcoTest star ratings.

4.1 Emissions

The evaluation (see **Figure 7**) of the pollutants (CO, HC, NOx, PM and PN) is based on a linear scale system which disregards the vehicle class and the vehicle's type of powertrain. While larger vehicles may be better than small cars, the decisive aspect is the quality of the exhaust gas control system. In contrast to applicable laws, the same limits apply to diesel, petrol, hybrid, natural gas and electric vehicles. Scores range from 0 points for high emissions to 50 points for low emissions, depending on the measured values.

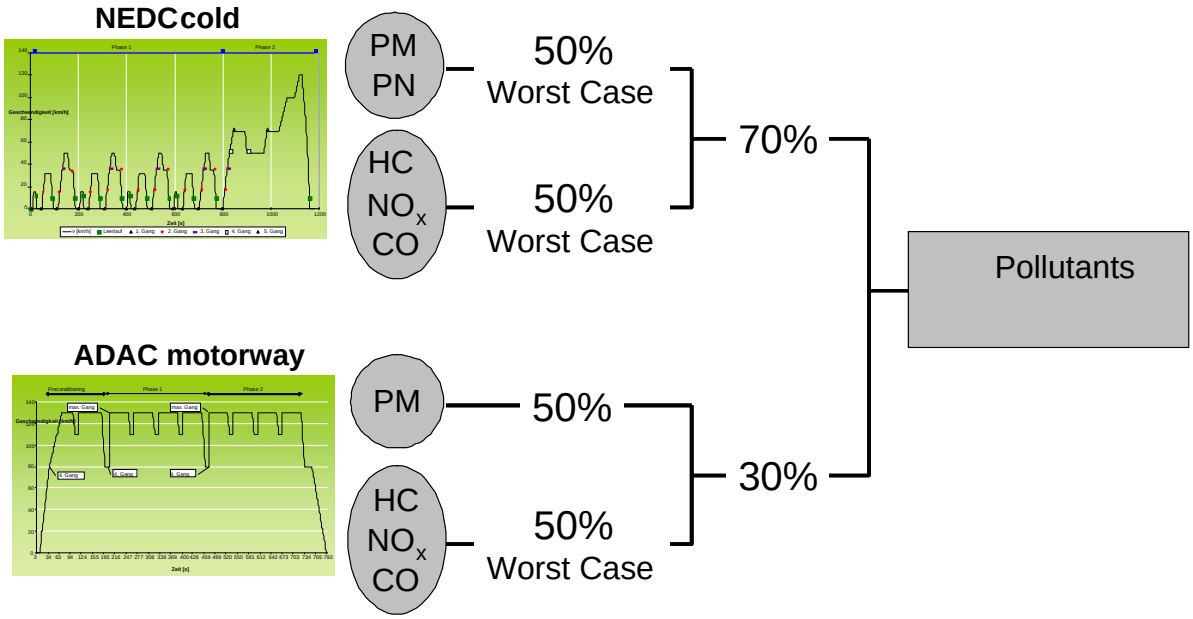

Figure 7**:** How to obtain the pollutants score

The pollutant rating is based on the NEDC cold test and the ADAC motorway cycle. This combination allows a comprehensive analysis of emission characteristics in a very large number of different situations. In the NEDC cold test, the lowest score (= highest emission level) is determined as the average of the particulate matter rating and the lowest-scoring particle number (= highest emission level) from the HC, NO_x and CO emissions ratings. In the ADAC motorway cycle, the average is determined from the particulate matter score and from the worst-case scores for HC, NO_x and CO. The worst case approach provides a good indication of the problems related with each type of emission and does not yield an unduly more positive result by weighting with better values. The thresholds for each rating are indicated in **Table 1**.

Table 1**:** Pollutant thresholds

	NEDC		ADAC motorway	
	★★★★★	★☆☆☆☆	★★★★★	★☆☆☆☆
	50 points at [g/km]	10 points at [g/km]	50 points at [g/km]	10 points at [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
NO_x	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

The pollutant rating is the weighted average of the NEDC cold test result, which counts 70%, and the ADAC motorway cycle result, which counts 30%. These percentages reflect the differences in frequentation of the various types of roads. Thus, the average car is assumed to travel 70 percent of its mileage in urban traffic and on extra-urban roads, but only 30 percent on motorways.

The pollutant score is calculated according to the following formula (6):

$$Score_{\text{pollutants}} = 0.7 \cdot (0.5 \cdot Score_{NEDC\ cold\ PM,PNworstcase} + 0.5 \cdot Score_{NEDC\ cold\ HC,CO,NOxworst\ case}) + \\ + 0.3 \cdot (0.5 \cdot Score_{motorway\ PM} + 0.5 \cdot Score_{motorwayHC,CO,NOx\ worst\ case}) \quad (6)$$

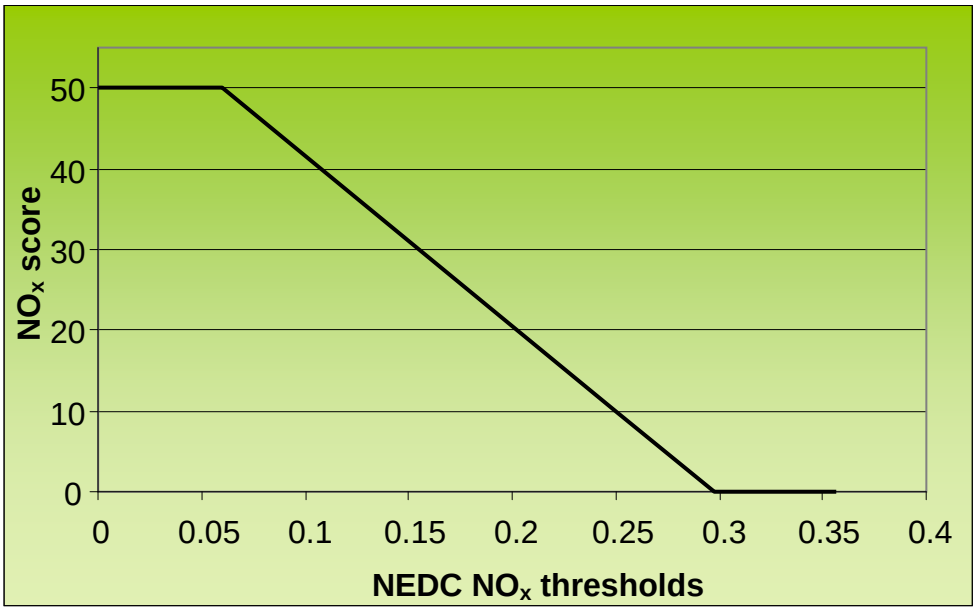

Figure 8**:** Sample diagram of NO_x thresholds in the NEDC

Figure 88 shows an example of an NO_x rating in the NEDC.

4.2 Carbon dioxide (CO_2)

The CO_2 rating is class-dependent. An absolute rating would show no differences within a class and only confirm the common knowledge that large vehicles use more fuel than small vehicles. Hence the decision to base the evaluation of the vehicles on their classes. The EcoTest has been so well-received not least because it allows consumers to choose an eco-friendly vehicle in any vehicle class – according to their individual needs. The idea is that all vehicles contribute something – whether they are in the small-car class or in the luxury class. **Table 2** lists examples of the individual classes. It should be noted that there is no separate SUV class. Instead, these vehicles are classified according to their body. For instance, a BMW X3 will be found in the same class as a 3 series BMW.

Table 2**:** Classification examples

No.	Vehicle class	Examples
1	Microcar	Smart
2	City	Fiat 500, Peugeot 107, VW up!
3	Supermini	Ford Fiesta, Peugeot 208, VW Polo, Audi A1
4	Small family	Mercedes A-class, Toyota Auris, VW Golf
5	Family	BMW 3-series, Mazda 6, Opel Insignia, Toyota Avensis
6	Executive	Audi A6, BMW 5-series, Mercedes E-class, Volvo V70
7	Luxury	Audi A8, BMW 7-series, Mercedes S-class

In order to apply the same standards to electric vehicles and plug-in hybrids (power-plant emissions are taken into account) as to vehicles with a combustion engine, future assessments will include all CO_2 emissions from well to wheel (WTW). According to this approach, the measured CO_2 emissions (tank-to-wheel [TTW] values) will be added to the CO_2 emissions generated in providing the fuel (well to tank [WTT]) (source: g/MJ: WTW analysis of future automotive fuels and powertrains in the European context, WTT Report Version 3c July 2011; g/kWh: 1kWh = 3.6MJ). These values will be updated from time to time. **Table 3** shows the caloric value and the CO_2 emissions per caloric value for each type of fuel used. This CO_2 correction will be carried out for all measured CO_2 emissions in the complete NEDC, the complete WLTC and the ADAC Motorway Cycle.

Table 3**:** Energy content and CO_2 emissions per caloric value (source: extract from WTW analysis of future automotive fuels and powertrains in the European context, WTT Report Version 3c July 2011 / source for CNG Germany mix: BDEW, Version 12/2012 and DBFZ-Betreiberumfrage 2011/2012)

Fuel	CO_2 emissions WTT per caloric value [g/MJ]	Minimum calorific value Hu [MJ/l]	Minimum calorific value Hu [MJ/kg]
Petrol *	14.1	32.0	43.0
Diesel *	15.8	36.0	43.0
Bioethanol (eco share 85%)	-6.5	21.0	27.0
LPG	7.5	24.0	45.0
CNG (Germany mix, eco share 15%)	-0.7	-	46.6
Hydrogen	91.0	5.0	122.0
Electricity (Germany mix)	156.4	–	–

* Not taking the bio fuel quota into account

Abbreviations used:

WTW	well to wheel
TTW	tank to wheel (= measured value)
WTW	well to tank

FC	measured fuel consumption
Hu	minimum calorific value = caloric value [mJ/l] or [MJ/kg]
$CO_{2_{WTTproE}}$	CO_2 emissions (WTT) per caloric value [g/MJ]

Well-to-wheel CO_2 emissions ($CO_{2_{WTW}}$) are calculated according to the following formula (7):

$$CO_{2_{WTW}} = CO_{2_{TTW}} + CO_{2_{WTT(fuel)}} \quad (7)$$

The CO_2 emissions (WTT) depend on the fuel consumption, the calorific value and the CO_2 emissions per caloric value for each particular type of fuel. The following formula (8) applies to fuels whose consumption is indicated in l/100km (diesel, petrol, LPG):

$$CO_{2_{WTT(Diesel)}} = \frac{FC_{(Diesel)}[l/100km] \cdot Hu_{(Diesel)}[MJ/l] \cdot CO_{2_{WTTproE(Diesel)}}[g/MJ]}{100} \quad (8)$$

The following formula (9) applies to fuels whose consumption is indicated in kg/100km (CNG, hydrogen):

$$CO_{2_{WTT(CNG)}} = \frac{FC_{(CNG)}[kg/100km] \cdot Hu_{(CNG)}[MJ/kg] \cdot CO_{2_{WTTproE(CNG)}}[g/MJ]}{100} \quad (9)$$

After correction of the CO_2 emissions as well to wheel values, the points are awarded. Scores range from 0 to 60 points for each individual result. **Table 4** shows the thresholds for each vehicle class.

Please note: Due to the well-to-wheel approach, the new CO_2 rating system is not comparable to the previous rating system.

Table 4: Class-specific CO_2 thresholds

Vehicle class	★★★★★ 50 points at [g/km]	★☆☆☆☆ 10 points at [g/km]
1	80	180
2	80	180
3	90	195
4	100	215
5	115	240
6	130	270
7	145	300

The CO2 rating takes the measurement results from the NEDC cold test, the WLTC and the ADAC motorway cycle into account. The average of the NEDC cold test and WLTC values is determined. This average is then weighted as 70% and the value from the ADAC motorway cycle is weighted as 30% (see

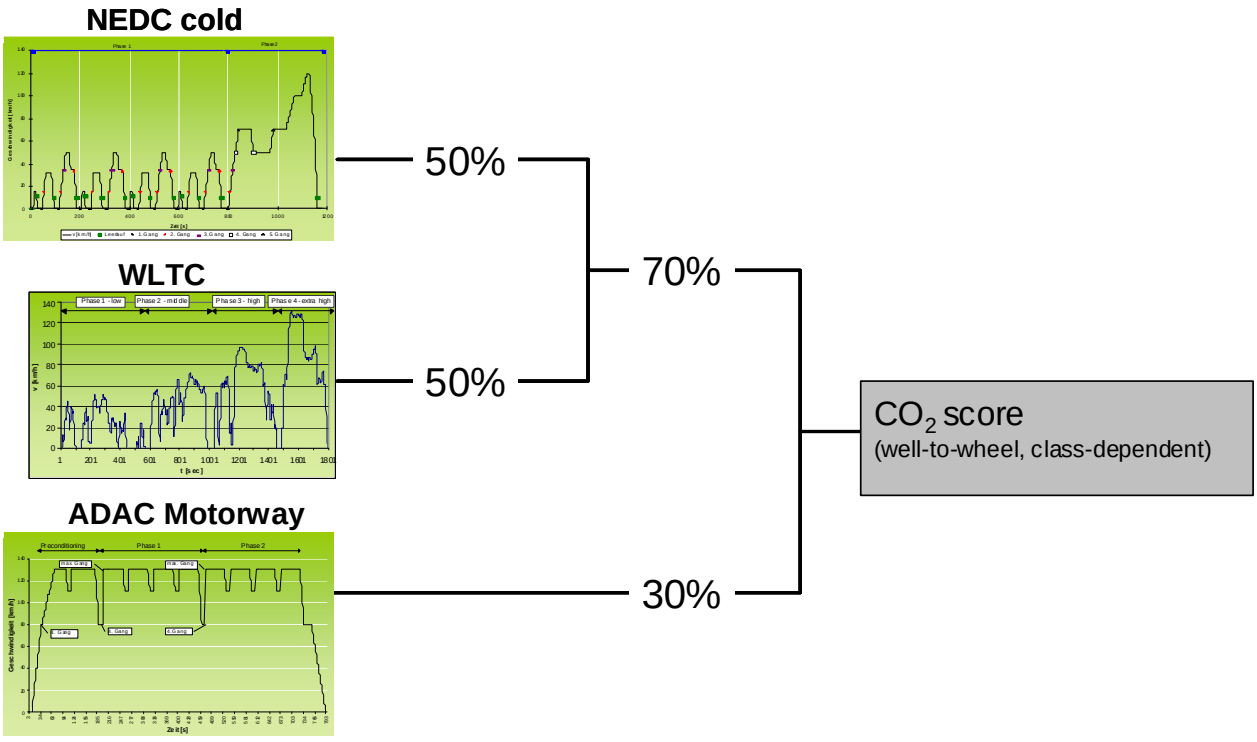

Figure 9).

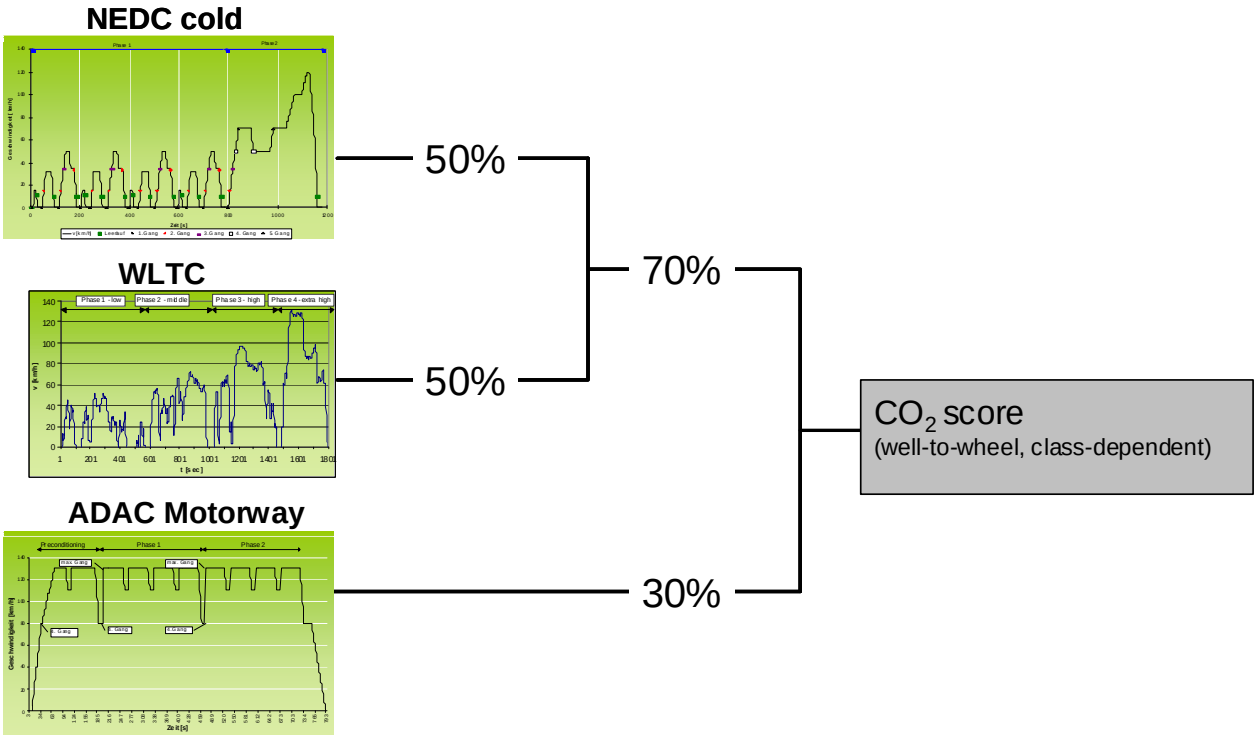

Figure 9: CO_2 rating formula

The CO_2 points are calculated according to the following formula (10):

$$Score_{CO_2} = 0.7 \cdot (0.5 \cdot score_{NEDCcold} + 0.5 \cdot score_{WLTP}) + 0.3 \cdot score_{motorwaycycle} \quad (10)$$

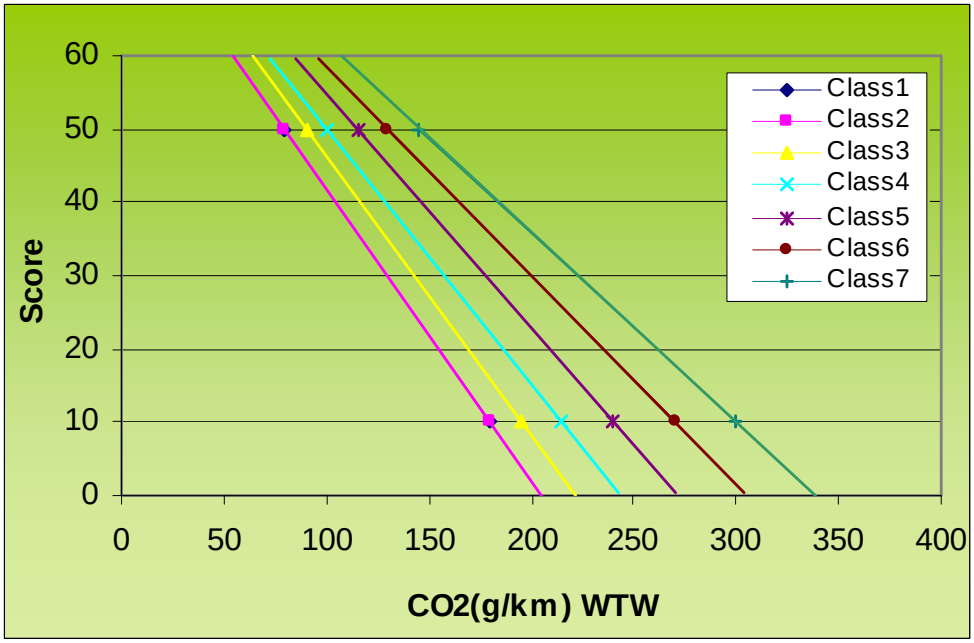

Figure10**:** CO_2 thresholds

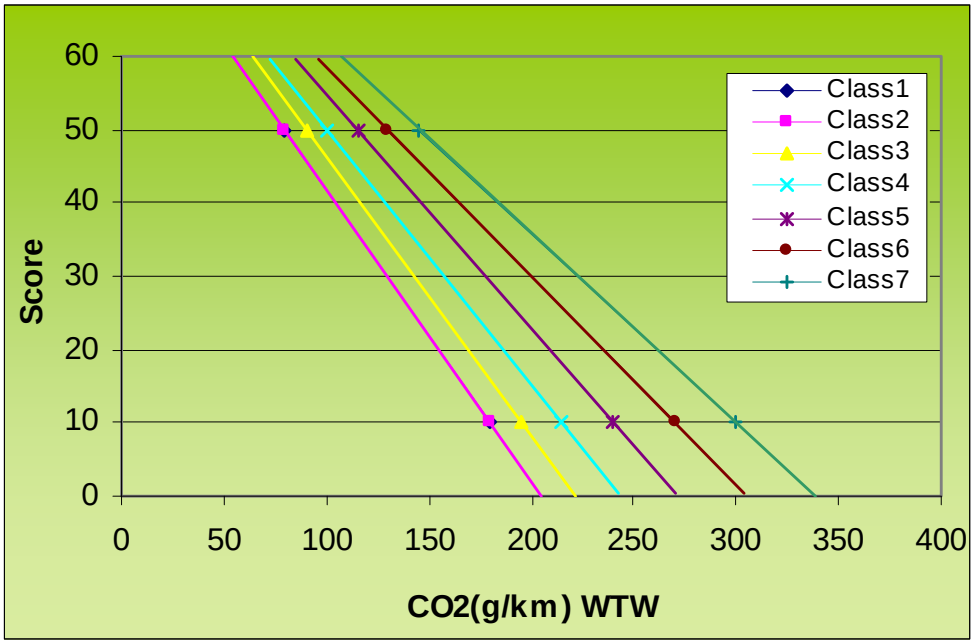

Figure10 is a graphical illustration of the CO_2 thresholds for each vehicle class.

In the new EcoTest, the total CO_2 emissions will be indicated as well-to-wheel values.

4.3 Fuel consumption / energy consumption

EcoTest fuel consumption data (or energy E) will be published in addition to the scores and star ratings to provide complementary information for consumers. The fuel consumption will not affect the star rating. It is determined on the basis of the carbonaceous components in the exhaust gas. The ADAC Autotest car reviews provide detailed information on urban, extra-urban and motorway fuel consumption. The EcoTest only indicates the overall consumption, determined in a similar manner as the CO_2 emissions – ADAC motorway consumption counting 30% and the weighted average consumption from the NEDC and the WLTC counting 70% (see formula (11)). The overall EcoTest consumption is further converted on the basis of the test consumption and not into a well-to-wheel value.

$$FC = 0.7 \cdot (0.5 \cdot FC_{NEDC\ cold} + 0.5 \cdot FC_{WLTP}) + 0.3 \cdot FC_{ADACmotorway} \quad (11)$$

Urban fuel consumption is calculated according to the following formula (12) in the ADAC Autotest:

$$FC_{io} = \frac{(s_{NEFZio} \cdot FC_{NEFZio} + s_{WLTPlow} \cdot FC_{WLTPlow})}{(s_{NEFZio} + s_{WLTPlow})} \quad (12)$$

Formula (13) yields the extra-urban fuel consumption:

$$FC_{ao} = \frac{(s_{NEFZao} \cdot FC_{NEFZao} + s_{WLTPmiddle} \cdot FC_{WLTPmiddle} + s_{WLTPhigh} \cdot FC_{WLTPhigh} + s_{WLTPestrahigh} \cdot FC_{WLTPextrahigh})}{(s_{NEFZao} + s_{WLTPmiddle} + s_{WLTPhigh} + s_{WLTPextrahigh})} \quad (13)$$

Finally, the ADAC motorway consumption is determined as follows (formula 14):

$$FC_{BAB} = \frac{(s_{BABPhase1} \cdot FC_{BABPhase1} + s_{BABPhase2} \cdot FC_{BABPhase2})}{(s_{BABPhase1} + s_{BABPhase2})} \quad (14)$$

5 Results

An evaluation (see

Figure11) from 2003-2014 showed that vehicles kept getting better and better. Many manufacturers have turned to the EcoTest and applied its findings to the development of new vehicles.

The EcoTest results are available at **www.adac.de/ecotest**. The site features both old and new vehicle models. Findings obtained according to the old EcoTest protocol are marked accordingly.

The findings are also available at the international site **www.ecotest.eu**. Both sites offer filters for individual comparisons between vehicles. The ADAC EcoTest findings are also an integral part of the ADAC Autotest car review series available in print or on-line.

The procedure is described in detail on the Internet, supplemented with descriptions of findings (some with diagrams) from the latest EcoTest publication and with ADAC demands.

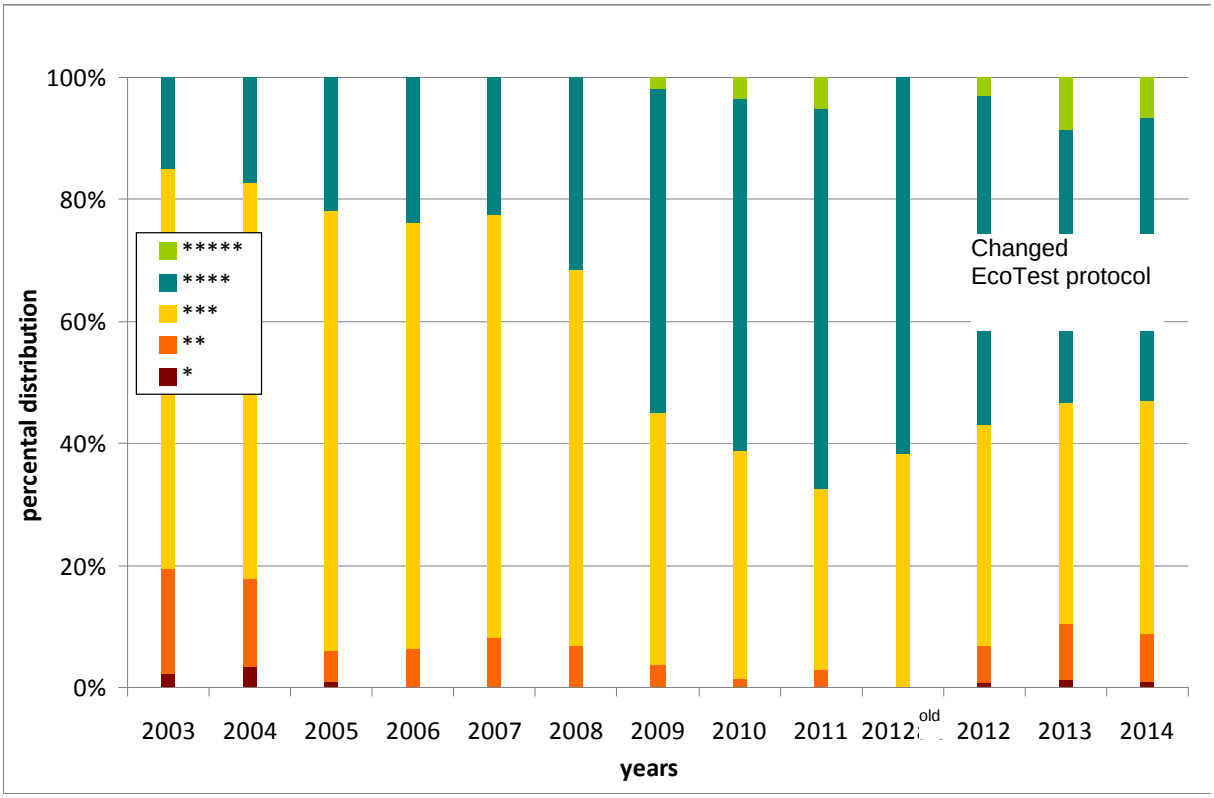

Figure11**:** Star ratings throughout the period from 2003-2014 (as at 31 Dec. 2014)

EcoTest results are published EU-wide, for example by International Consumer Research and Testing (ICRT), the Dutch automobile club (ANWB) and the Finnish automobile club (Autolitto).

6 EcoTest label

The EcoTest label (see **Figure12**) shows the essential details of a vehicle at a glance. Vehicle manufacturers use it in their advertising campaigns. It features all the vital information needed for a comparison:

- Test date
- Vehicle class
- Make and model
- Euro emission levels
- Displacement
- Power
- EcoTest consumption
- EcoTest total score
- Pollutants score
- CO_2 score

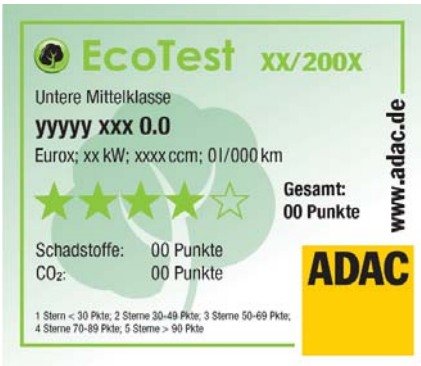

Figure12**:** Sample EcoTest label

7 EcoTest fleet label

EcoTest also serves as the basis for the EcoTest fleet rating. Introduced in 2009, the fleet label (see **Figure13**) is awarded to vehicles that have at least four EcoTest stars. The more EcoTest vehicles with at least four stars a fleet has, the more eco-friendly and fuel-efficient the entire fleet will be.

Figure13**:** 2012 EcoTest fleet label

8 EcoTaxi

In 2010, ADAC Südbayern and ADAC e.V. jointly introduced the EcoTaxi project. Taxi operators can obtain the ADAC EcoTaxi label for any of their taxis that comply with the strict EcoTaxi requirements, based on the ADAC EcoTest. **Figure14** shows the label that the operators may stick on their certified taxis. For more information about this project go to www.adac.de/ecotest. Numerous taxis in different cities (e.g. Munich, Augsburg) already have the label.

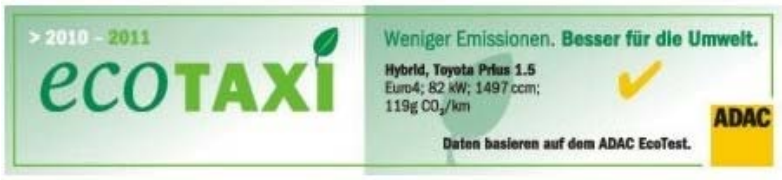

Figure14**:** Sample EcoTaxi label

9 List of abbreviations

AC	air conditioning
ao	extra-urban
CNG	compressed natural gas
CO	carbon monoxide (g/km)
CO_2	carbon dioxide in (g/km)
D_e	distance covered in fully electric mode (km)
D_{av}	25km (average mileage between battery charging cycles)
E	energy (kWh)
FC	fuel consumption
HC	hydrocarbons (g/km)
Hu	minimum calorific value
io	urban

LPG	liquefied petroleum gas
M_i	mass emissions of pollutant i (g/km)
NEDC	New European Driving Cycle
NO_x	nitrogen oxides (g/km)
PM	particulate matter (g/km)
PN	particle number
s	distance
SCR	selective catalytic reduction
SOC	state of charge
SUV	sport utility vehicle
TTW	tank to wheel
v	speed
WLTC	Worldwide harmonized Light vehicles Test Cycle
WTW	well to tank
WTW	well to wheel