

# EURO 5 and 6 emissions standards for cars and vans

## Position Paper

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European Federation for  
TRANSPORT and ENVIRONMENT

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## Summary position

In December 2005, the European Commission presented a long-awaited proposal for 'Euro 5' emission standards for cars and vans (COM(2005)683 final). Member States and the European Parliament are considering adding a 'Euro 6' step to the proposal, in order to achieve long-term certainty and stability.

Environmental NGOs favour 10 modifications to the proposal. We list them below, starting with the most important:

1. For the 'Euro 5' stage, the **NO<sub>x</sub> emission standard(s) for diesel cars** should be tightened from 200 mg/km (proposal) to 75 mg/km,. For the 'Euro 6' stage the standards should be brought in line with California, the US, and the standard for petrol cars. A 40 mg/km standard under 200,000 km durability could achieve this;
2. The proposal should be amended to contain provisions on '**not-to-exceed**' values for NO<sub>x</sub> and PM (in line with provisions for lorry engines) in order to rectify the current practice of cars being just optimised for the test cycle;
3. A **Euro 6** standard should only be set now if it gets **EU standards before 2012 in line with Californian and US** standards (which also includes technology- and fuel neutral standards and a NO<sub>x</sub> standard of maximum 40 mg/km). If the standards are less ambitious it's better to await a new proposal from the Commission;
4. In terms of **timing**, Euro 5 should enter into force in 2008 and Euro 6 in 2011;
5. A standard for **particle numbers** should be in place as of Euro 6;
6. The **PM** standard should be tightened to 2 mg/km (Euro 5) and 1 mg/km (Euro 6)
7. The '**durability**' AND the '**in use compliance**' ages should be increased to 200,000 rather than the proposed 160,000 and 100,000km respectively, as these figures much better represent the lifetime of today's cars;
8. The NO<sub>x</sub> and HC standards for **petrol car** emissions should be tightened by 50 and 75% respectively instead of 25%.
9. There should be **no exemptions** for heavier and/or larger categories of passenger cars, in line with the Commission proposal;
10. A **thorough overhaul** of the regulatory strategy for emissions control should be announced, in particular in-use compliance monitoring, now reports of chip-tuning and other cycle-beating practices are becoming ever-more frequent

Table: T&E position on '**Euro 5**' and '**Euro 6**' emission standards for passenger cars and vans, in mg/km unless otherwise mentioned. Where the NGO position differs from the Commission proposal, the Commission proposal values are ~~struck through~~.

Category	Particulates		NO <sub>x</sub>		HC	HC+NO <sub>x</sub>	CO	
	petrol	Diesel	Petrol	diesel	petrol	diesel	petrol	diesel
M1 (cars)	<del>5</del> 2	<del>5</del> 2	<del>60</del> 40	<del>200</del> 75	<del>75</del> 25	<del>250</del> 100	1,000	500
N1 I (small vans)	<del>5</del> 2	<del>5</del> 2	<del>60</del> 40	<del>200</del> 75	<del>75</del> 25	<del>250</del> 100	1,000	500
N1 II (medium vans)	<del>5</del> 2	<del>5</del> 2	<del>75</del> 50	<del>260</del> 100	<del>400</del> 30	<del>320</del> 130	1,810	630
N1 III (large vans)	<del>5</del> 2	<del>5</del> 2	<del>82</del> 60	<del>310</del> 120	<del>400</del> 35	<del>380</del> 160	2,270	740

Category	Particulates		NO <sub>x</sub>	HC	CO
	Mg/km	Number/km			
M1 (cars)	1	To be set	40	25	500
N1 I (small vans)	1	To be set	40	25	500
N1 II (medium vans)	1	To be set	50	30	500
N1 III (large vans)	1	To be set	60	35	500

# 1 Tighter NO<sub>x</sub> standards for diesel cars

## Key message

*The NO<sub>x</sub> emission standard(s) for diesel cars should be aligned with the US and California. This implies tightening from 200 mg/km (proposal) to 75 mg/km by 2009, and a further 'Euro 6' tightening towards 40 mg/km by 2011. 'Euro 5' would then allow diesel car sales in the majority of the US market, 'Euro 6' in the entire US market.*

This chapter is devoted to the case for stricter Euro 5 and Euro 6 NO<sub>x</sub> standards for diesel cars. The following argument will be dealt with:

- a The why and how of global harmonisation of standards, in particular with the US
- b Why US-level NO<sub>x</sub> standards are technically feasible soon
- c Why the costs will be acceptable
- d No trade-offs: why strict NO<sub>x</sub> standards do not lead to more CO<sub>2</sub>
- e Asia: half the world's population benefits from better and faster EU standards

## A EU lags behind US: the case for harmonisation of standards

There has been much talk in recent years about the need to harmonise global emission standards. In particular, the car industry has always been very keen on this topic. This is easily explained: a car that just has to pass one emissions test could then be sold everywhere, from the US to Europe and Asia.

But in the case of NO<sub>x</sub> emission standards, the Commission's 'Euro 5' proposal of 200 mg/km NO<sub>x</sub> for diesel cars falls far short of such a global harmonisation. Below we describe the emission standards in the US.

US air pollution standards for cars have historically been stricter than in Europe. In particular, the diesel car has always been too 'dirty' to classify for export to the US.

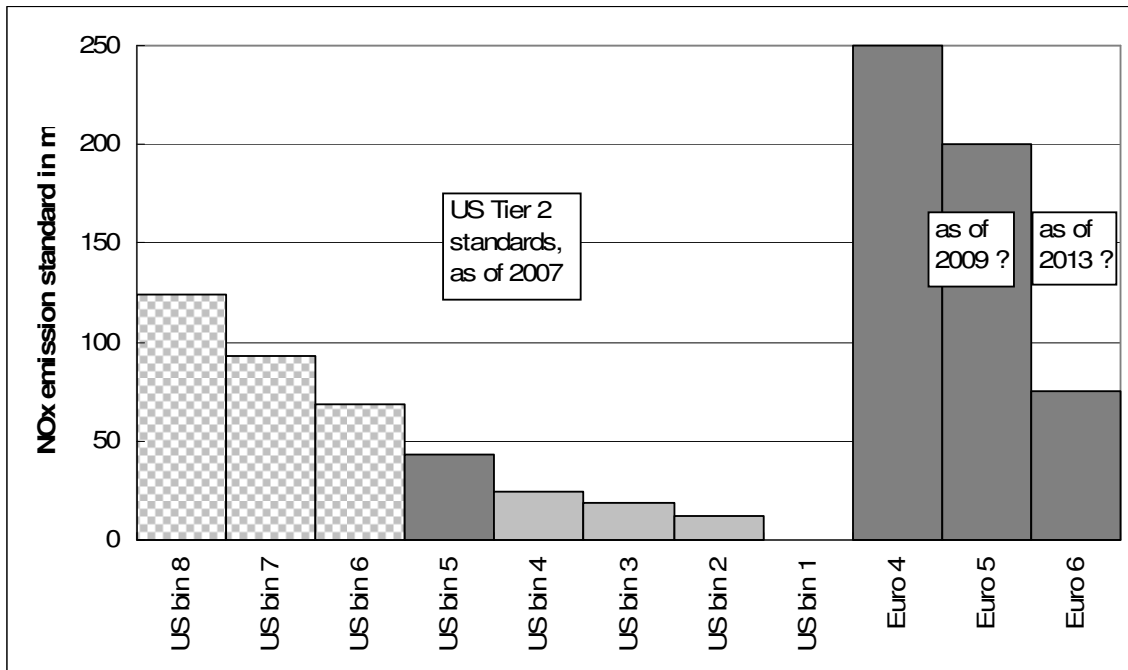
This situation will be reinforced with the introduction of US 'Tier 2' emission standards in 2007. The standards apply to cars, SUVs and light-duty trucks, up to a weight of over 4 tonnes, so even the largest vehicles for passenger transport will have to comply with the rules.

The US federal emission standards are divided into 8 'bins' with increasing stringency. *Every vehicle* sold will have to meet the Bin 8 standard, the NO<sub>x</sub> level of which is 87 mg/km. The *average* vehicle sold has to meet Tier II Bin 5, the NO<sub>x</sub> value of which is 31 mg/km (both values converted from the grams/mile standards on the FTP75 cycle).

In addition, California and 4 other states (New York, Massachusetts, Maine and Vermont) have adopted more stringent standards. In these states Bin 5 is the actual maximum standard, so Bins 6-8 are not marketable in these States.

Therefore, in order to be able to sell a car in the entire US, it must at least comply with 'Tier II Bin 5' or 'T2B5', so meet a NO<sub>x</sub> limit of 31 mg/km (on 80,000 km durability) and 44 mg/km (on 193,000 km). See the graph below for a comparison with EU standards.

**Graph 3:** US and EU NO<sub>x</sub> emission standards for diesel cars. Note that US standards are fuel neutral and hence also apply to petrol cars.



Explanation of the US 'bins': Bins 6 to 8 cannot be sold in California and 4 other states but can be sold in 46 others, provided average certified cars comply with Bin 5. This implies that manufacturers can sell Bins 1-5 in all 50 US States. Bin 5 can therefore be considered as the most important US standard: it is the minimum standard required to sell a car in all 50 states.

The Commission 'Euro 5' proposal for NO<sub>x</sub> emissions from diesel cars, 200 mg/km, is still much more lenient than the US standard. Even the 'Euro 6' standards currently under discussion in the Parliament and the Council for introduction next decade (70 to 80 mg/km) fall far short of the US standard for 2007. See the graph below.

This implies that, if European manufacturers want to sell their diesel car models on the US market, they will have to develop much more advanced technologies than they will have to do for the home market. Thus, European diesel technology will stay relatively uncompetitive in the US in the absence of a supporting home market.

If European regulators, however, decide to introduce NO<sub>x</sub> limits that are close to the US standards, European manufacturers could develop one diesel technology for both markets. Development costs could be spread over many millions of vehicles, which would enable them to make a competitive diesel product for the US market.

A -70% of 75 mg/km NO<sub>x</sub> standard would help tremendously to pave the way for European diesel technology. Such vehicles could comply with the upper bins (7 or 8) in the US legislation, which would be sufficient to pass, provided the manufacturer compensates the still relatively high emissions with clean petrol vehicles in Bin 1 to 4.

A second 'Euro 6' step of 40 mg/km would then come close to a genuine harmonisation of EU and US standards.

## **B Technology: why it is feasible to have US-level NO<sub>x</sub> standards soon**

The Commission has justified its lenient proposal for NO<sub>x</sub> from diesel cars with the observation that the battle between technologies has not yet been won by any one technology.

This position is in stark contrast with the Euro 4 standards. When these were set in 1998 they were considered a serious challenge. So much so that the car industry refused to deliver cost figures for Euro 4 diesel standards because it said that they were 'impossible to reach'. History has proved them wrong. Close to 50% of EU car sales in 2005 were Euro 4-compliant diesels.

Below, we summarise the plans of European manufacturers to sell diesel cars in the US market

Currently the US diesel car market is very small. Sales in 2004 in the light duty sector were just 43,000 in 2004, compared with some 10m in the EU. But many analysts predict a change. Ricardo, for example, predicts in its annual 'diesel report' that the US light duty market for diesel will grow to 1.5 million units in 2015

(<http://www.ricardo.com/engineeringservices/technicalsupport.aspx?page=dieselreport>).

There is also 'on the ground' evidence of European car makers with ambitions to sell diesel cars in the US. The following manufacturers have announced they will go and sell 'Tier II bin 5' (T2B5) compliant diesel cars in the US market as of 2007.

### *Daimler Chrysler*

Daimler Chrysler is generally expected to be the first car maker capable of producing T2B5 compliant diesel cars. A Mercedes 320CDI will be introduced in Autumn 2006 and on other models later. Mercedes calls the technology Bluetec and it will use urea-based Selective Catalytic Reduction (SCR).

### *Volkswagen*

Volkswagen will in 2007 temporarily withdraw its diesels from the US market because it will not have compliant vehicles ready. The company will come back in 2008 with a 'clean diesel' Jetta. Volkswagen is reportedly still studying whether to go for a lean NO<sub>x</sub> trap or for SCR too.

(<http://www.freep.com/apps/pbcs.dll/article?AID=/20060528/BUSINESS01/605280708>)

### *Ford*

In June 2006, Hans Folkesson, Volvo's senior vice president for R&D, said Volvo (Ford owned) wants to launch a diesel car in the United States around the end of the decade.

(<http://autoweek.com/apps/pbcs.dll/article?AID=/20060619/FREE/60619001&Profile=1041>)

### *BMW*

In May 2006, Tom Purves of BMW said BMW would introduce diesels to the US market by 2008. The announcement was already made six weeks earlier at a SAE (Society of Automotive Engineers) conference.

(<http://www.leftlanenews.com/2006/05/22/bmw-wont-offer-diesel-in-us-until-2008>)

## **C Costs: why costs will be acceptable**

A substantial part of the debate about the tightening of the emission standards relates to costs. Stakeholders argue that the costs of the regulations threaten the very existence of the diesel engine and the diesel car.

First, it should be borne in mind that the cost figures used in the debate originate from the industry and not from an independent validation panel. The panel's task was only to assess the cost data supplied by the industry and to make them consistent.

Second, cost figures as supplied by the automotive industry before the introduction of new regulation ('ex-ante') have lost their credibility. There has been an excessive over-estimation of the costs of previous Euro standards. An extensive review by AEA Technology 'An evaluation of the air quality strategy' (December 2004) concludes that

*'If the ex-ante estimates for all four Euro standards are combined, this would lead to an increase in the unit costs per vehicle of €1,585 to €2,565 (petrol cars) and €1,840 to €2,945 (diesel cars).'<sup>1</sup>*

<http://www.defra.gov.uk/environment/airquality/strategy/evaluation/pdf/chapter2.pdf>

The absurdity of these cost estimates can be illustrated by the fact that Renault manages to sell its Euro 4-compliant Dacia Logan at a consumer price of €7,000. If the industry cost estimates were true, then a quarter to a third of the price of the car would come from its anti-pollution equipment.

The same study also points out that the three-way catalysts are currently sold for prices around €50 to €70. Although anti-pollution equipment in a petrol car is more than just the catalyst, the catalyst is the most expensive hardware item. Therefore the gap between this €50 to €70 figure and the several thousand euro figures mentioned earlier is completely unrealistic. An order of magnitude overestimation of costs is quite likely.

The European Commission indicated in its impact assessment that the 'Euro 5' proposal would result in diesel cars becoming €377 more expensive and petrol cars becoming €51 more expensive. The Commission reduced original cost figures from the industry by 33% in order to take account of 'mass production economies of scale'. Given the differences in ex-ante and ex-post cost estimates described above, in our view this 33% reduction is extremely pessimistic.

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<sup>1</sup> Figures in £ converted to € with exchange rate 1.4829 (Sept 2005). The quote can be found on p46 of Chapter 2 of the report

## **D No trade-offs: why strict NO<sub>x</sub> standards are unlikely to lead to more CO<sub>2</sub> emissions**

Many people fear that strict NO<sub>x</sub> standards for diesel cars will lead to higher CO<sub>2</sub> emissions, for two reasons:

1. they fear that the relatively CO<sub>2</sub>-efficient diesel car will fall out of fashion due to the higher costs
2. they fear that diesel cars with low NO<sub>x</sub> emissions will have higher CO<sub>2</sub> emissions

Both fears are unfounded.

1: the diesel car will survive for three reasons:

First, costs will turn out to be lower than the currently foreseen additional € 213 per car for a 75 mg/km NO<sub>x</sub> standard.

Second, there is a broad consensus in the motor industry that the differences between petrol and diesel cars are set to decrease. Diesel cars will become as clean as petrol, and petrol cars as efficient as diesel, with direct injection of petrol and other efficiency-enhancing technologies.

Third, it is likely, and necessary, that by the next decade the EU will have a CO<sub>2</sub> policy for cars that rewards good performance and punishes bad performance, unlike the current voluntary commitment of the car industry. If the diesel is indeed CO<sub>2</sub> efficient, it will get many credits under such a system.

2: SCR technology has positive rather than negative trade-offs

A string of European manufacturers are exploring ways to compete with diesel technology in the US market, and two important ones, Daimler Chrysler and Ford, have expressed their preference for an SCR-based solution.

They argue that over the last years it has become clear that lean NO<sub>x</sub> traps (LNT) face problems in reducing NO<sub>x</sub> by deep percentages, and will probably keep facing durability difficulties and fuel economy / CO<sub>2</sub> penalties. In contrast, Selective Catalytic Reduction (SCR) technology has greatly developed, originally it was just for heavy-duty engines found in lorries.

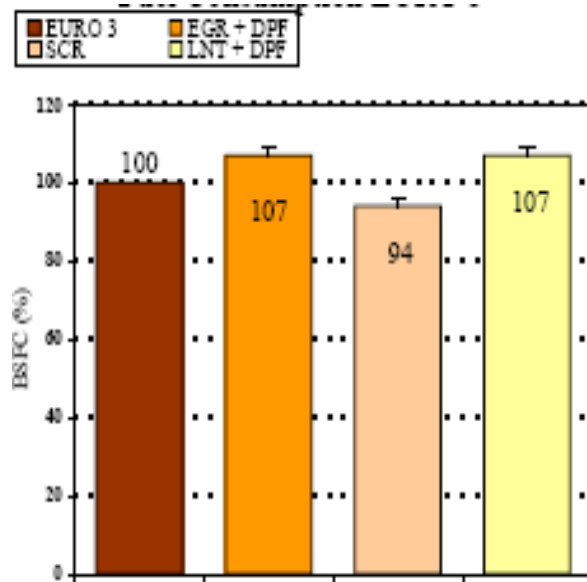
### **ACEA**

In 2003 ACEA published a paper on the application of Selective Catalytic Reduction (SCR) in lorry engines. The paper states:

*'This technology is the only one that offers a solution to the dilemma of the trade-off between exhaust emission levels and fuel consumption. Field tests and extended durability runs have confirmed its effectiveness and reliability.'*

The paper also shows a graph with fuel consumption figures for a Euro 5 lorry compared with a Euro 3 benchmark. See below.





This graph shows that in heavy duty, a Euro 5 lorry with SCR has a 6% fuel consumption benefit compared with a Euro 3 engine. This can be easily explained: the NO<sub>x</sub> after-treatment allows the engine manufacturer to optimise the engine for fuel consumption.

As thermodynamic principles for light and heavy duty diesel engines are comparable, there is no reason why in the light duty sector strict NO<sub>x</sub> limits should lead to higher CO<sub>2</sub> emissions.

#### *Daimler Chrysler*

The plans recently unveiled by Mercedes are noteworthy. Mercedes plans to meet the new US emissions standards with SCR technology and is currently in discussion with US regulators about how to do this, in particular about how to ensure that drivers have permanent access to urea so that NO<sub>x</sub> emissions do not rise when the urea tank runs empty.

A paper by the company (DC 2005) concludes:

- 'The system that best meets the requirements is the SCR urea after-treatment system' ...
- ... 'Due to its high efficiency, engine out NO<sub>x</sub> emissions can remain relatively high, which limits the impact on fuel consumption.'

#### *Ford Motor Company*

In addition, Ford Motor Company last year presented a paper at the Diesel Engine Emission Reduction conference in the US.

After an extensive lifecycle cost benefit analysis this paper concluded: 'Urea SCR systems are expected to be significantly lower cost than LNT (Lean NO<sub>x</sub> Trap) systems'.

The main reason for this is that an SCR system, although substantial upfront investments in urea infrastructure are needed, pays itself back quickly because of savings on fuel consumption. Ford estimated a 5% reduction of fuel consumption compared with alternative abatement scenarios.

### *Aaqius & Aaqius*

The same conference also saw a paper by Aaqius & Aaqius:

[http://www.eere.energy.gov/vehiclesandfuels/pdfs/deer\\_2004/session11/2004\\_deer\\_joubert2.pdf](http://www.eere.energy.gov/vehiclesandfuels/pdfs/deer_2004/session11/2004_deer_joubert2.pdf)

It concluded:

- 'For future emissions regulations in EU & US, SCR in combination with DPF offers a unique and global solution for the most severe regulations
- CO<sub>2</sub> emission will be an issue for the next decade: With SCR fuel consumption are lowest.
- For future emissions regulations in 2010 - 2012, EU & US could use the same technology to comply emissions regulations.
- EU & US have to work closely in order to define standard for SCR. '

### *CAR research*

Finally, the SCR technology was the technology deemed most likely to be available for NO<sub>x</sub> reduction from light duty diesel engines in an expert survey undertaken by the Centre for Automotive Research (CAR)<sup>2</sup>.

#### *Summary of likely impacts of a -70% standard for NO<sub>x</sub> emissions from diesel cars*

First, it is crystal clear that there is widespread belief in the US that advanced after treatment systems will be available and needed in order to comply with the federal 'Tier 2' standards. Some manufacturers even believe that 'Bin 5' standards (31 mg/km) on NO<sub>x</sub> are feasible with diesel SUVs.

The key advantage of a -70% 'Euro 5' NO<sub>x</sub> standard (i.e. 75 mg/km) for diesel cars is that it will most probably incentivise the industry towards EU-wide application of the after treatment technology that is the best from a lifecycle perspective, namely Selective Catalytic Reduction.

SCR offers – in combination with an oxidation catalyst and a particle filter - the possibility to optimise the engine for fuel consumption, and so to avoid important compromises on CO<sub>2</sub> emissions. If we go along with the industry estimate of some 5% savings on fuel, this translates into:

- Some 8 grammes of CO<sub>2</sub> per vehicle kilometre, a major step towards achieving the 120 g/km target of the Community that should be achieved by 2010;
- Some 3 litres of fuel savings per 1,000 km driven, or some 800 litres of fuel over the entire lifetime of the vehicle. Assuming in total 40 million 'Euro 5' vehicles will be sold in the EU25 (8 million per year over 5 years) this would save 30 billion litres of diesel fuel, or some €15 billions on oil imports;
- This equates to some €750 cost savings to consumers over the lifetime of the vehicle
- According to Ford research, these benefits outweigh the cost of SCR technology.

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<sup>2</sup> Center for Automotive Research, Advanced Power Technology Alliance - Advanced Internal Combustion Engine Survey (Light Duty Vehicle Technology), Ann Arbor, April 2004

## **E why strict European standards would benefit half the world's population**

At this moment, most Asian countries follow the EU standards (notable exceptions are Japan and South Korea). To put it another way, countries with a population of 3 billion people (compared with 0.5 billion in the EU27) follow the European standards. The delay in implementation of EU standards is decreasing: their implementation delay used to be 6 to 8 years, but now they generally lag only 3 or 4 years behind.

This gives European legislators a special responsibility. The earlier we introduce standards in the EU, the more perspective there is for cities in China, India and elsewhere to improve their often appalling air quality.

Also, this is a tremendous advantage for the European industry: the new standards are set in the home (EU) market, and when the technologies have matured and costs have come down enormously, a perfect export product is there for a market of approximately 3 billion customers (six times the EU population and half the world's population).

## 2 Introduction of 'not-to-exceed' limit values

*The proposal should be amended to contain provisions on 'no-to-exceed' values for NO<sub>x</sub> and PM (in line with provisions for lorry engines) in order to rectify the current practice of cars being just optimised for the test cycle.*

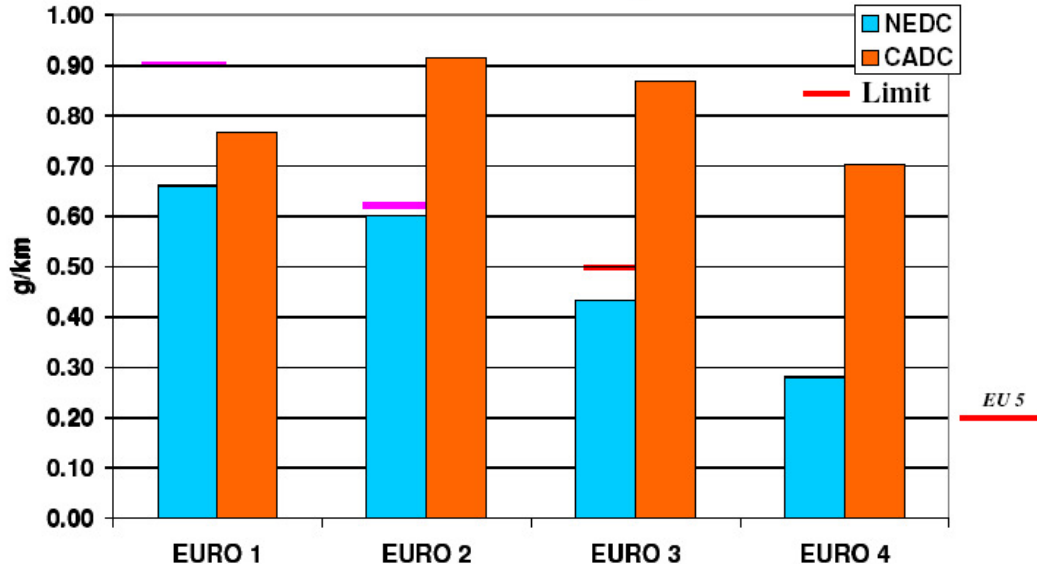
The idea of setting emission standards is that in real life cars will indeed become cleaner and behave more or less like during the test cycle. Unfortunately, this has very often proved not to be the case.


In the heavy duty sector, some seven years ago extensive 'cycle beating' practices were revealed, which sparked legislation to prevent such practices. Subsequently, the concept of 'not to exceed' limit values for heavy duty engines was introduced in Directive 2001/27 and quantitatively fixed 2005/55. This concept implies that under no circumstance emissions may exceed those in the test cycle (by a certain margin).

In case of cars, in recent years widespread cycle beating practices have been systematically discovered. Recent research with 94 diesel cars – from Euro 1 to Euro 4 - shows that this technology has led to extensive use of cycle beating. In other words: real life emissions of diesel cars are much higher than emissions on the official test cycle. See the graph below.

Graph: the differences between NO<sub>x</sub> emission limits for diesel cars, emissions measured on the official test cycle (NEDC) and emissions measured on a test cycle designed to reflect 'real world' driving (CADC)

### How have specific NO<sub>x</sub> emissions of diesel passenger cars evolved in the past?



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Forschungsgesellschaft für Verbrennungskraftmaschinen und Thermodynamik mbH



**NEDC** means emissions measured on the new European Driving Cycle, the official EU test cycle. **CADC** means emissions measured on the Common Artemis Driving Cycle, a driving cycle designed to represent real-world driving in Europe.

Source: presentation by Mr Hausberger, Graz University of Technology, Brussels, 2 February 2006

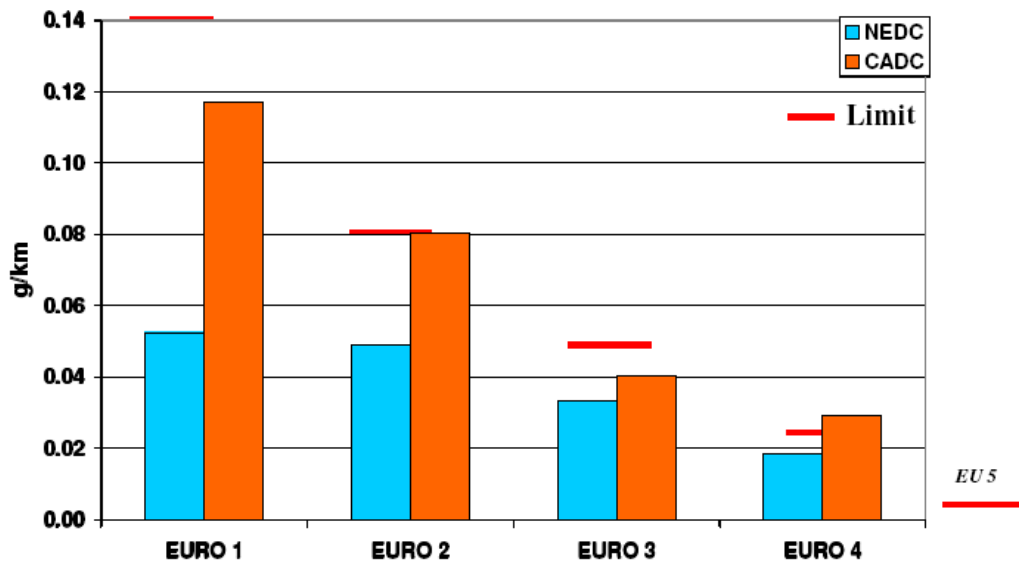
This graph shows that real-life NO<sub>x</sub> emissions per km from diesel cars have hardly, or not at all, decreased since the Euro standards were introduced, despite four con-


secutive tightening steps. Real-life  $\text{NO}_x$  emissions of diesel cars lie in the range of 700 to 900 mg/km, while the 'Euro 4' standard is 250 mg.

Cycle beating was also visible with PM emissions, although to a somewhat lesser degree.

Graph: the differences between PM emission limits for diesel cars, emissions measured on the official test cycle (NEDC) and emissions measured on a test cycle designed to reflect 'real world' driving (CADC)

### How have specific PM emissions of diesel passenger cars evolved in the past?



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Source: presentation by Mr Hausberger, Graz University of Technology, Brussels, 2 February 2006

This graph shows that real-life PM emissions per km from 'Euro 4' diesel cars exceed the emission standards, and have reduced less than standards would suggest. The situation is, however, less serious than in case of  $\text{NO}_x$ .

There are multiple solutions to remedy this urgent situation, such as improvement of the test cycle, adding extra test cycles, and last but not least, the concept of the 'not to exceed' limit which is in principle the most robust approach as it says that under no circumstance emissions may exceed a certain value.

Therefore, the concept of a 'not to exceed' emission values should be introduced as soon as possible, and certainly before the entry into force of Euro 6.

### 3 Euro 6: only if 'fuel neutral' and aligned with US

*A Euro 6 standard should only be set now if it gets EU standards before 2012 in line with Californian and US standards (which also includes technology-neutral and fuel-neutral standards and a NO<sub>x</sub> standard of maximum 40 mg/km). In other cases it's better to await a new proposal from the Commission;*

#### **The case for including a Euro 6 standard**

The proposal from the European Commission left out the definition of a Euro 6 standard. This was seen by many people as a missed opportunity to give long term certainty to the industry and in environmental terms, and also for EU Member States to develop a longer-term car taxation strategy. But the Commission justified its position by insisting that technology had not yet matured enough to make a decent impact assessment for such a proposal.

At this point it is worth recalling one of the key principles for policy making as written down in the CARS21 report:

*Where it is expected that a N+2 stage is needed, as good an indication as possible should be given at the N+1 stage on what such legislation should be. That could help going towards a "long term program" of regulatory work, with more transparent methods.*

This technical sentence says that whenever it is clear that a new car rule would need an extra, second step (as is the case with the Euro 5 proposal) the Commission should be as clear as possible about this second step. It is, in this sense, ironic that the Euro 5 proposal, without any indication for a Euro 6, was published only nine days after the CARS21 report where this principle for policy making was set.

#### **But: only if it is a wise step**

Having said this, including a 'Euro 6' is not automatically a good idea. Technology is developing quickly, so quickly, that setting easy standards now will almost certainly turn out to be a missed opportunity.

#### *Alignment with the US*

The case for aligning emission standards with the US is very strong and has often been repeated. While Euro 5 is probably too early a step for a close alignment, the opportunity to align Euro 6 with the US should not be wasted.

As mentioned earlier, it makes most sense to align with the US '50 state' standard (the standard that would allow sales throughout all US states, including those that follow Californian rules). This implies alignment with US Tier II bin 5 standards, which are 31 mg/km for 80,000 km and 44 mg/km NO<sub>x</sub> for 193,000 km. 40 mg/km and no deterioration factor allowance seems for the EU a good proxy for a harmonised standard.

But the EU should set stricter particle limits than the US. The US has set its particle standards with petrol cars in mind. Diesel particulate emissions have been shown to be much more carcinogenic than particles from petrol engines. Therefore, EU PM standards should be stricter than those in the US.

### *Technology and fuel neutral standards*

Standards should also, as of Euro 6, be identical for diesel and petrol vehicles. The easier emission standards for diesels have often been justified with the CO<sub>2</sub> advantages of diesel cars. This argument should not be used any more:

- Petrol and diesel cars are set to converge in terms of CO<sub>2</sub> emissions. An often-heard slogan is: 'Diesel cars will become as clean as petrol, petrol cars will become as efficient as diesel'. Direct injection petrol engines will close the gap to a significant extent, and when HCCI engines break through the differences will become very small, insignificant even;
- Even if some differences remain in CO<sub>2</sub> emissions of petrol and diesel cars, this is no reason to 'reward' the low-CO<sub>2</sub> technology with easy standards. The far better way is to set up a CO<sub>2</sub> policy for cars that rewards good CO<sub>2</sub> performance and punishes bad CO<sub>2</sub> performance, with standards or economic incentives. Such a regime is urgently needed after 2008 when the failing voluntary commitment to reduce CO<sub>2</sub> emissions will expire. Under such a consistent regulatory regime the best technology for different applications will automatically emerge.

Last but not least, uniform emission standards greatly simplify national vehicle and fuel taxation policies. Currently governments find it difficult to design a good taxation policy as petrol cars are currently cleaner than diesel cars, but consume more fuel and hence emit more CO<sub>2</sub>.

#### **4 Timing: Euro 5 by 2008, Euro 6 by 2011**

In terms of **timing**, Euro 5 should enter into force in 2008 and Euro 6 in 2011. The previous chapters have made it abundantly clear that technology will be there early enough.



## 5 Standard for PM NUMBERS by 2010

*A standard for **particle numbers** should be in place ultimately as of 1 January 2010.*

Such a standard is necessary to ensure that manufacturers do not choose technical solutions to meet the PM standard that allow through large amounts of ultrafine particles – that weigh almost nothing, but have damaging health effects. An example is an open particle filter. Diesel cars with filters do not show a correlation between PM mass and PM numbers, i.e. some filters eliminate ultrafine particles much better than others. Only the good ones should be permitted.

A quote from the summary of a recent paper from the UK to the UN-ECE working group on this matter ([www.unece.org/trans/doc/2006/wp29grpe/PMP-2006-17-01e.doc](http://www.unece.org/trans/doc/2006/wp29grpe/PMP-2006-17-01e.doc))

*“Proposed Euro 5 PM limits can potentially be met with through-flow particulate aftertreatment devices which do not offer the same degree of control over ultrafine particle emissions as DPFs. Particle number measurement controls particle emissions across the size range enabling control of ultrafine emissions.”*

There has been considerable progress in developing a standard for measuring particle numbers – the so-called Particle Measurement Protocol or PMP, and the time is ripe to develop standards for PM numbers. It is important that the standard enters into force way before Euro 6, in order to give a clear signal that Euro 5 vehicles will also be subject to particle number testing and only good filters should hence be fit.

A quote from the same paper:

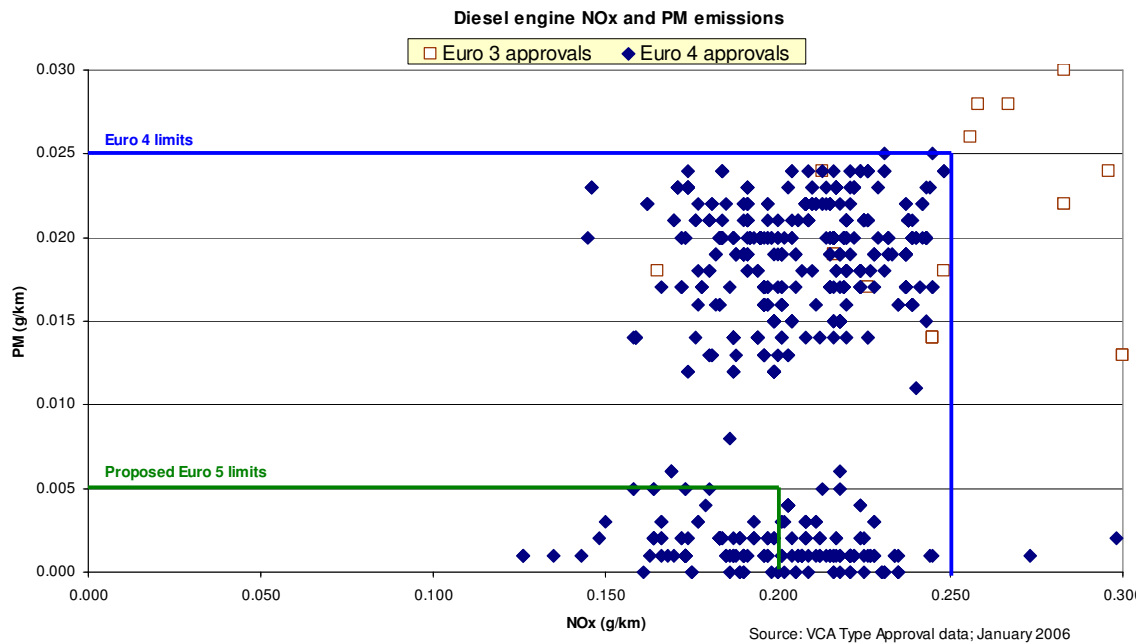
*“The PMP particle number measurement system has been demonstrated to be repeatable and reproducible between laboratories. The validation programme results clearly indicate the particle number performance level attainable by diesel particulate filter (DPF) equipped vehicles of all sizes and the vehicle-vehicle variability. The measurement system has proven itself to be stable and robust.”*

Therefore PM number standards could and should enter into force by 2010. Quote from the same paper:

*“The particle number measurement technique is therefore suitable and useful for regulatory purposes.”*

## 6 Tighter PM standard

The **PM** standard should be tightened to 2 mg/km (Euro 5) and 1 mg/km (Euro 6)  
Graph 2: Overview of diesel car certification data, the Euro 4 standards, different 'Euro 5' scenarios and the 'Euro 5' proposal



This graph shows that diesel cars equipped with particle filters can easily meet the 5 mg/km standards and mostly meet 0, 1 or 2 mg/km.

## **7 Increase of durability and in use compliance ages**

*The 'durability' AND the 'in use compliance' ages should be increased to 200,000 rather than the proposed 160,000 and 100,000km respectively, as these figures much better represent the lifetime of today's cars.*

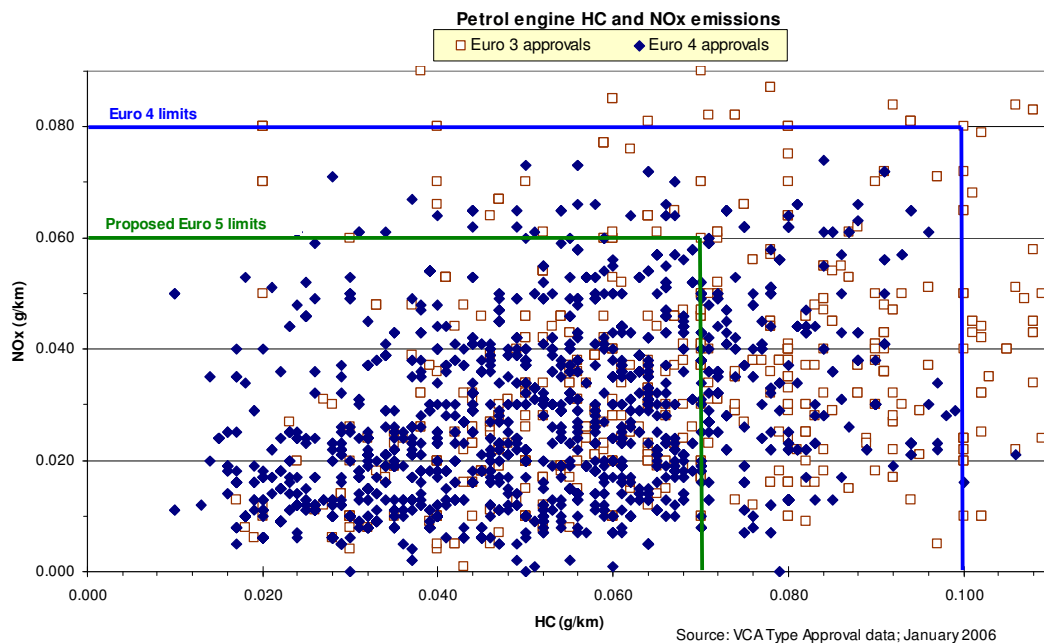
There is ample evidence from national car recycling agencies that cars scrapped today have an average mileage of close to 250,000km, and that the life expectancy of cars on sale today will be even higher. Durability and in-use requirements should reflect these developments.

Therefore, we welcome the proposal by the Commission to increase the durability requirements to 160,000km. However, we are disappointed that the proposal does not make any reference to the, probably even more important, 'in use compliance' period which is still at the obsolete 5 years or 100,000km. We would prefer both to be set at 200,000km, being much better in line with the real "life expectancy" of a car and better in line with US standards (120,000miles = 193,000km).

## 8 Tighter standards for petrol cars

The  $\text{NO}_x$  and HC standards for **petrol cars** emissions cars should be tightened by 50 and 75% respectively instead of 25%.

Graph 1: Overview of petrol car certification data, the Euro 4 standards, different 'Euro 5' scenarios and the 'Euro 5' proposals



This graph shows that the proposed 25% tightening of  $\text{NO}_x$  and HC standards relative to 'Euro 4' is very weak. Even a 75% tightening of both  $\text{NO}_x$  and HC emissions (to 20 mg/km  $\text{NO}_x$  and 25 mg/km HC) would already be met by a significant amount of vehicles.

We regret the lenient standards for petrol vehicles, particularly the fact that the Commission has backtracked from 37.5% reduction (proposal in the CARS21 group) to only 25% reduction, which is more lenient than any of the variants studied. Apart from the fact that we foresee for this reason problems in preparing an impact assessment (no cost figures available!) the graph in Section 2 clearly shows that much stricter limits are easily feasible.

In addition, again the issue of global harmonisation comes up. If we are serious about this, we fail to understand why the Commission proposes standards that are obviously weaker than the US federal standard, let alone the Californian ones. It would be a real waste if manufacturers chose to equip their EU models with different (i.e. worse) catalysts than their US and Californian ones.

Therefore we propose for both Euro 5 and Euro 6 standards a  $\text{NO}_x$  standard of 40 mg/km (-50%) and a HC standard of 25 mg/km (-75%).

## 9 No exemptions for heavier or larger vehicles

**No exemptions** for heavier and/or larger categories of passenger cars, in line with the Commission proposal;

We support the Commission proposal to abolish exemptions from emission legislation, for environmental, simplification and loophole avoidance reasons.

In particular, we see absolutely no reason why SUVs (that are a threat to vulnerable road users) should enjoy exemptions similar to those of ambulances. SUVs have plenty of space to accommodate emissions equipment and are sold to people that are well off.

## 10 Announcement of a thorough overhaul

*A **thorough overhaul** of the regulatory strategy for emissions control should be announced, in particular in-use compliance monitoring, now reports of chip-tuning and other cycle-beating practices are becoming ever more frequent*

For the medium term, the complete strategy for controlling vehicle emissions needs to be thoroughly re-assessed, now tales of cycle-beating and chip tuning are becoming ever more common. This is clearly the issue for the future. The least the EU could do is to move to 'not to exceed' values like the US. But a complete rethink would be even better, including measures to drastically increase on-road checks and improve the roadworthiness test and standards.

## Annex 1: Background

Emissions from cars and vans are regulated by Directive 70/220/EEC and its amendments. These standards prescribe the maximum emission levels in tailpipe exhaust gases for all new vehicles sold in the European Union. New 'Euro' standards are amendments to the Directive. Directive 98/70, for example, introduced the 'Euro 3' and 'Euro 4' standards for cars and vans (the so-called *light duty commercial vehicles*). The current proposal for 'Euro 5' constitutes the next step.

Confusingly, the standard currently in force for heavy duty vehicles is also called Euro 5. A 'Euro 6' proposal is expected next year.

A good overview of EU emission standards for cars and vans can be found on <http://www.dieselnet.com/standards/eu/ld.html>

The discussion on a new 'Euro 5' standard began in 2003. After the publication of a draft proposal in July 2003 and a consultation on the matter, the Commission finally published its proposal on 21 December 2005. The proposal can be found on [http://europa.eu.int/comm/enterprise/automotive/directives/vehicles/2280\\_en\\_final.pdf](http://europa.eu.int/comm/enterprise/automotive/directives/vehicles/2280_en_final.pdf). This document is written as a response to that proposal. It is an updated version of an earlier T&E position paper on a draft proposal the Commission released in September 2005

## **Annex 2: Air quality and cleaner cars**

Road transport is the biggest contributor to NO<sub>x</sub> emissions and the second biggest to PM<sub>10</sub> emissions. Currently, air pollution leads to about 370 000 premature deaths per year in Europe. Other problems include premature mortality, aggravation of respiratory and cardiovascular disease, aggravation of existing asthma, acute respiratory symptoms, chronic bronchitis, and decreased lung function. Numerous studies also link exhaust gases to increased incidence of lung cancer.

Furthermore biodiversity is threatened in more than 60% of European ecosystems because of nitrogen deposition above the critical loads. [5] Although environmental standards have been tightened, this 'does not appear to have a significant influence on the air quality' (EEA 2003). No clear improving trend is (yet?) visible in measurements. Also the ozone problem has remained as bad as it was.

If no additional measures are taken, in the year 2020 air pollution levels will still lead to 292,750 premature deaths and about 88,500 cases of serious hospital admissions for cardiac and respiratory problems. Eutrophication critical loads are exceeded on more than 650,000 km<sup>2</sup> in 2020 [CAFE CBA], an area almost twice the size of Germany.

In particular diesel-fuelled vehicles are responsible for emissions of NO<sub>x</sub> and PM<sub>10</sub>. It has also become clear that traffic-related particles are amongst the most hazardous ones because of their size (generally under 1 micron) and because of their chemical composition.

The recent shift towards diesel passenger cars in most EU member-states makes the case for cleaning up this emission source even more urgent. Europe is approaching the 50 per cent diesel share in new car sales. Knowing that diesels have a much higher annual mileage than passenger cars, by 2020 some two thirds of car kilometres might be diesel-fuelled.

### **The air quality case**

While EURO standards regulate pollutant emissions from the exhaust gases of new motor vehicles, the European air quality legislation focuses on the concentration of air pollutant's in the ambient air, with the aim to protect the environment and human health.

The Air Quality Framework Directive (1996/62/EC) establishes the basic principles for the set of European air quality legislation, setting objectives for ambient air quality in order to avoid, prevent or reduce harmful effects for human health and the environment. It requires that, if limit values are exceeded, Member States devise abatement plans and programmes. The First Daughter Directive (1999/30/EC) on SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>10</sub> and lead is most important in this context. Its limit values for small particulates (PM<sub>10</sub>) have entered into force in 2005 and its limit values for NO<sub>2</sub> will become binding in 2010. Diesel cars are important contributors to ambient air concentrations of both particulates and NO<sub>2</sub>.

The coming-into-force of the PM<sub>10</sub> air quality standard in 2005 has already led to abundant problems in numerous Member States. The legislation sets levels of PM<sub>10</sub> which can only be exceeded on 35 days in a year.

The directives lead primarily to problems in densely populated areas and around motorways, where traffic is by far the most dominant source of emissions. In February 2005 a number of Italian cities saw car bans on certain Sundays as cities hit their 35th day of excessive levels within 60 days of 2005. Other cities, for example in



Germany, are not far behind and similar measures are discussed. In the Netherlands a string of building projects has been stopped. Similar problems will occur in 2010, when new limit values on NO<sub>2</sub> will become legally binding.

In response to the (the threat of) legal challenges, local authorities are scratching their heads about the content of the action plans they should draw up. A number of countries already have introduced measures, such as the 80 km/h zones in the Netherlands, or the low emission zones in Sweden.

The freedom of manoeuvre for national, regional and local authorities is determined to a large degree by Brussels. For example, they may only privilege vehicles on the basis of EU-wide standards, and they may not reject dirty vehicles on roads that belong to the Trans-European Network. To them, every day earlier the 'Euro 5' standards enters into force, and every milligram it is stricter, really counts. Cleaning up the cars, a measure that can only be taken at EU level, would give these member states perspective of meeting the air quality limits.

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