EMIS hearing of 24 May 2016

Questions to European Environment Agency (EEA)

No.	Question	Answer
1	In your 2016 report entitled "Explaining road transport emissions" you noted very significant differences between results of laboratory tests and real driving conditions tests for NOx emissions. It seems that these exceedances should have been noticed and reported by an EU agency much earlier.	
	- When did the EEA learn about the strong divergence of NOx emission in RDE scenarios...	By the mid-2000s, there was increasing evidence that, for various reasons, standardised test cycles used for the type approval of Euro 3 vehicles did not always represent real-world driving emissions. From the mid-2000s onward, EEA has regularly highlighted such findings, in for example The European environment – State and outlook report 2005 (SOER 2005), noting '*There is also a concern that emissions from transport are not falling as quickly as expected due to test cycles not reflecting real-world driving conditions'*.
	- ...and in the NEDC cycle in Euro 6 Diesel cars?	We were first aware of technical reports identifying the divergence of RDE NO_x emissions for then-new Euro 6 standard diesel passenger vehicles after publication of a TNO report in late 2013. This report documented significantly higher real-world NO_x emissions for a small sample of new Euro 6 diesel vehicles, finding that the emissions were approximately equal to those from Euro 4 and Euro

		5 diesel passenger vehicles.
	- What did the EEA do about it?	EEA took action in line with our mandate defined by the European Parliament and Council as an environmental information and knowledge provider, specifically highlighting the on-going problem of higher real-world emissions in this case. The Regulation establishing the EEA and the European environment and information network ((EC) No 401/2009 codified) specifies our operational mandate: to provide the Community and Member States with '*objective, reliable and comparable information at European level enabling them to take the requisite measures to protect the environment, to assess the results of such measures and to ensure that the public is properly informed about the state of the environment...*'. In practical terms, EEA therefore both provides independent information on the environment and supports policy implementation by working with Member States and Commission services on e.g. the reporting of a number of environmental data flows required under EU legislation, such as: • reporting of CO_2 emissions [laboratory test cycle] from new passenger cars and vans; • reporting of national emission inventory data for GHGs and air pollutants including real-world emission estimates for the road transport sector. The EEA has not been given any role in the testing or monitoring of vehicle emissions, nor does the EEA have any inspection capacity. As an information provider, EEA has regularly and repeatedly brought to the attention of decision makers the discrepancies between real-world and test cycle emissions and the subsequent implications for air quality (NO_x) and climate change (CO_2). This was done through a number of publications, press releases etc. including: • EEA's 5 yearly State and Outlook reports on the Environment (SOER) (2005, 2010 and 2015); • Annual Transport and Environment Reporting Mechanism (TERM) reports from 2004 onward; • Annual 'Air Quality in Europe' reports each year from 2011 onward;

		• Annual reports documenting emission inventory data (real-world emissions) reported by Member States under the National Emissions Ceilings Directive, from 2010 onward; • Reports on cars and vans CO_2 reporting (test cycle emissions) from 2014 onward. These reports were circulated widely to the European institutions and Member States. As part of our role supporting Member States with reporting of environmental data, for more than a decade EEA has also supported inclusion of new research findings on real-world emissions into successive updates of the COPERT road transport emission model used by many Member States for the reporting of real-world NO_x emissions in national emission inventories (please see the reply to question 7 for further information on COPERT).
	- Did the EEA had, at any point, difficulties explaining the big differences?	The general reasons for the discrepancies observed between real-world and test cycle emission measurements were understood by the transport emissions community from early on. As summarised in a recent EEA publication '[Explaining road transport emissions]', and as highlighted by the speakers in preceding EMIS hearings, the differences in general can be summarised as being due to three key factors: ▪ The outdated NEDC test procedure used in Europe that does not reflect typical real-world driving conditions; ▪ The permitted 'flexibilities' in the testing procedures that allow manufacturers to optimise certain testing conditions, and thereby achieve lower fuel consumption and emission values e.g. for CO_2 and NO_x; ▪ Several in-use factors which are driver dependent (e.g. driving style) or independent (e.g. environmental conditions, driving terrain etc.).
	- What information in this regard did the EEA communicate to Member States and Commission and at what time?	Please see earlier reply to 'What did the EEA do about it?'

	- What actions have been carried out?	Please see earlier reply to 'What did the EEA do about it?'
	- If none, why?	Please see earlier reply to 'What did the EEA do about it?'
	- What was the role of the EEA to push for better emission regulation?	As described in the earlier reply to 'What did the EEA do about it?', EEA's legal mandate given to us by the European institutions is formally one of an information and knowledge provider. Through our reports, briefings, capacity building and network activities, we inform policy makers and other key stakeholders of the current state of the environment in Europe across the different environmental themes and economic sectors. We do not have any formal role in decision-making on emissions regulation.
2	- What would be the additional health benefits (in terms of prevented premature deaths per year) if RDE tests had been implemented by September 2014 (introduction of Euro 6 standards for all new type approvals)?	EEA has not undertaken the transport and air quality modelling that would be needed to address this. Neither are we aware of any research studies that have looked into this specific question.
	- And with a conformity factor of 1?	While EEA hasn't undertaken modelling in this area, the European Commission's impact assessment (SWD (2013) 531) accompanying the 2013 Communication for a Clean Air Programme for Europe (COM (2013) 918 final) describes the current compliance challenges associated with NO_2 ambient air quality across Europe. It clearly identifies the role of diesel emissions in contributing to both the on-going exceedances of EU air quality standards for NO_2 as well as failures by a number of Member States to comply with the NO_x emission ceilings for 2010 set under the NEC Directive. The baseline modelling described in the impact assessment clearly illustrates that significant future improvements in Europe's NO_2 air quality would be delivered if the introduction of Euro 6 standards for light duty (diesel) vehicles were to be accompanied from 2017 onwards by a new test procedure and enhanced compliance to ensure that real-world emissions are aligned with the Euro limit

		values. More specifically, were real-world emissions to be aligned with Euro standards (i.e. a conformity factor of 1), it is projected that there would be only a handful of exceedances of EU NO_2 air quality standards at AQ monitoring stations by 2025 and 2030. The specific health benefits (avoidance of premature deaths) associated with achieving a conformity factor of 1 were not quantified.
3	- Would you consider the legislation that the EU has put in place as sufficient to tackle environmental problems coming from road transport?	In terms of air quality, the EU's 7th Environment Action Programme (7EAP) contains the objective that by 2020 outdoor air quality in the Union has significantly improved, moving closer to WHO recommended levels. As the EEA (e.g. 'Air Quality in Europe – 2015) and other organisations regularly report, poor air quality remains a persistent and significant problem across Europe, with more than 400 000 premature deaths occurring each year as a result of exposure to poor air quality. The economic damage costs associated with mortality arising from poor air quality were estimated by the European Commission as being at least EUR 330 billion in 2010 (SWD (2013) 531). The OECD (2014) has recently suggested that, depending upon calculation methods, road transport's share of the total economic costs associated with health impacts from air pollution is likely to be around 50% (for a group of 24 EU Member States). In the short term, a number of existing policy instruments will, if fully implemented, deliver further benefits to the environment and human health. Central to this will be compliance with the air quality limit values agreed in the EU Air Quality Directives through the implementation of effective air quality management plans by local, regional, and national authorities, and all Member States achieving the emission ceilings for 2010 defined in the National Emission Ceilings (NEC) Directive (see also preceding answer in relation to reducing NO_2 exceedances). In other world regions e.g. USA, new petrol and diesel vehicles already achieve better on road emissions performance than in the EU, clearly indicating the technical feasibility of further improvements. In Europe however, there clearly remain gaps and weaknesses in the implementation of some existing legislation, as has been seen in the case of higher real-world diesel vehicle emissions for both NO_x and CO_2. This implementation gap has effectively meant that new 'cleaner' generations of vehicles can be just as polluting on the road as previous generations,

		despite the availability of technology that is better for the environment and human health. Although as an independent EU body, we do not have any formal role in decision-making on emissions regulation, our institutional experience in the field would lead us to suggest, for example: • A stronger and more effective focus on implementation and market surveillance; • More frequent legislative updating of vehicle testing procedures to reflect in a more timely way the latest research and scientific findings; • Monitoring of the agreed operational boundary driving conditions for RDE testing to ensure they do represent real-world driving emissions, to avoid repeating the current problem that measurements taken for compliance purposes do not well reflect reality. Should future evidence show that permitted 'flexibilities' in the RDE testing are leading to significant divergences, prompt consideration by decision-makers should be given to their removal. Moreover, several areas are not well addressed, if at all, in current legislation: • We would support the call made by various speakers in previous EMIS hearings concerning the need for legislation to ensure regular in-use 'real-world' emissions testing of vehicle models; • Test cycle and RDE testing would benefit from legislation and investments enabling proactive independent monitoring (e.g. by the JRC or credible third parties); transparency needs to be assured should divergences between type approval and independent testing be found; • Measures to monitor CO_2 emissions from heavy duty vehicles; • Public access to test results and technical parameters is a clear priority. Consumers and other stakeholders presently have no public access to information on official vehicle Euro emission testing results. Future RDE test results will be publically available which is welcomed, and will both help inform consumers and ensure proper recognition of those

		vehicle manufacturers that already are delivering lower emissions. However, access to the various technical vehicle testing parameters is also needed to help facilitate independent testing and verification, and to assure improved transparency compared to the current situation. In the medium and longer term, it is clear that additional policy measures as well as continuing investment in research and innovation are required to reduce emissions of air pollutants and GHG emissions from the transport sector. It may be valuable to enable developments such as: • Improving the reliability of PEMS testing technology for CO_2 to also allow its application to monitoring RDE CO_2 emissions for compliance purposes; • Development of an 'eco-labelling' type approach to promote Super Ultra-Low Emission Vehicles' (SULEV) as proposed by the European Commission in its 2013 Clean Air Programme for Europe.
	- Do we regulate all relevant pollutants or do you see the need for improvement?	In general, it is considered that the main pollutants harming health and the environment are already being addressed via existing legislation. As noted above, efforts to improve policy implementation and compliance will be important in delivering further benefits in the short term. It is noted that there are no vehicle emission limits for certain air pollutants for which EU air quality limits are agreed. This includes for example, NO_2 and benzene. As a result, limited information is available on emissions of these species from new and in-use vehicle technologies. The proportion of nitrogen dioxide (NO_2) in the NO_X emissions of a diesel vehicle is far higher than the proportion found in the emissions of a conventional petrol vehicle. Thus the increasing dieselisation of the vehicle fleet in Europe, coupled with the underperformance of Euro standards in terms of their impact reducing NO_x real-world emissions, has contributed significantly to NO_2 air pollution. The introduction of new technologies to reduce NO_x emissions is also presently leading to some unintended consequences occurring, notably higher emissions of ammonia (NH_3) and nitrous oxide (N_2O) from exhausts. Ammonia contributes to the formation of particle matter in the atmosphere,

		while N_2O is a powerful greenhouse gas. Exhaust emissions of harmful fine particulate matter ($PM_{2.5}$) from the vehicle fleet have more than halved since 1990. However, emissions caused by PM released from vehicle brakes and tyres has in contrast increased by 40% during this period. Together with NO_2, PM contributes to poor air quality, especially in urban areas and hotspots. It is understood plans to regulate emissions from brake wear are presently being developed.
4	- Could you please compare your agency's mandate, competences and capacities with those of the US Environmental Protection Agency particularly with regards to emission testing and prevention?	In terms of respective mandates, the US EPA, founded in 1970 aims to protect human health and the environment. The EEA was founded in 1994, and as noted in our reply to question 1, its mandate defined by the EP and Council is: to provide the Community and Member States with '*objective, reliable and comparable information at European level enabling them to take the requisite measures to protect the environment, to assess the results of such measures and to ensure that the public is properly informed about the state of the environment...*'. Both agencies address a wide spectrum of environment topics as part of their activities. However, the established competences at both organisations differ significantly: unlike EEA the US EPA has a regulatory mandate, including for example establishing regulations to implement legislation, setting national standards, enforcing regulations, as well as studying and assessing the state of the environment and health impacts including within its own laboratories, provision of grants and sponsorships to educational and publishing activities. In contrast, the EEA is a knowledge provider, with no regulatory or compliance competences. The EEA supports policy implementation by collecting and processing environmental data from Member States and partner institutions to assess the state of the environment, and provides access to the resulting data, information and knowledge. The EEA moreover informs policy framing, formulation and evaluation by providing integrated assessments, and a systemic integrated perspective on the challenges ahead. The organisational capacities of both organisations similarly differ significantly: The US EPA operates with a proposed 2017 budget of $ 8.3 billion (€7.3 billion) in funding, with a workforce of around 15 000 staff members (2014 figures) at the headquarters, 10 regional branches and 19 satellite

		locations and laboratories. In comparison, the EEA's proposed core budget for 2017 is €42.2 million, and in 2015 it had 223 statutory staff. Its 350 partner organisations in the European Environment Information and Observation Network (Eionet) cooperate with in-kind contributions. Specifically with regards to emission testing and prevention, the USA and Europe have very different operational models. In the USA, activities are largely centralised within the US EPA. As part of its mandate the US EPA operates the National Vehicle and Fuel Emissions Laboratory (NVFEL). NVFEL provides emission-testing services for motor vehicle, heavy-duty engine, and non-road engine programs in support of rulemakings, enforcement actions, and test procedures development. The NVFEL has more than 400 employees. In Europe however, a more decentralised system is in place, with individual Member State authorities being responsible for the type approval and compliance associated with vehicle monitoring. At the EEA, transport related activities are coordinated within the Air and Climate Change programme. Main activities include supporting the European Commission and Member States with implementation of transport-related reporting obligations, including CO_2 (test cycle) emissions from new cars and vans, fuel quality monitoring, emission inventories for air pollutants and GHGs, as well as providing regular and specific assessment reports. The EEA has no role in the testing or monitoring of vehicle emissions, nor does the Agency have any inspection capacity. Around 4 FTE staff work partly on transport related issues within the programme. They are supported by experts in the EEA's European Topic Centre on Air pollution and Climate Change Mitigation (ACM) which in 2016 has a total budget of € 2 365 000 for all its activities. http://eea.europa.eu https://www3.epa.gov/ https://www.epa.gov/aboutepa/about-national-vehicle-and-fuel-emissions-laboratory-nvfel

5	For air quality modelling such as the EEA does, reliable data is necessary. The Common Artemis Driving Cycles (CADC) is used as a more dynamic test to provide reliable data. Also remote sensing techniques are used, where tail pipe emissions from cars are measured when they drive on the road. We will now also have the RDE tests, using PEMS.	
	- Which measurement technique does the EEA consider the most rigorous?	As noted earlier, EEA has no technical competencies in the area of vehicle emissions testing. We are therefore not technically qualified to comment upon this issue.
	- What adaptations are needed, if any?	Please see preceding answer
	- What is the opinion of the EEA on the track conformity factors in the PEMS test have to follow?	Please see preceding answer
	- What is the view of the EEA on the development of the in-service conformity testing?	As noted earlier, EEA does not hold the technical expertise needed to comment upon technical details of testing developments, however we recognise the importance of regular in-use testing both to increase knowledge of real-world emission trends and to ensure on-going compliance with agreed emission standards to protect air quality.
	- How is it best done?	Please see answer to the first sub-question.
6	Most emission factors are estimated by laboratory tests and modelling, which can only evaluate a limited number of vehicles and cannot replicate real driving conditions.	

	- In what extent are the modelling results influenced by false car emission data?	A differentiation should firstly be made between 'false' data, and the uncertainty inherent to air quality modelling. Such uncertainties include the value of the estimated emissions from different sources, their respective spatial locations, meteorological data used, and the algorithms used in the model to estimate the subsequent pollutant dispersion, reactions, removals, etc. Uncertainties in the input emissions, including road transport emissions, are therefore just one element that affects the final model results. It is also considered good practice to validate the performance of air quality models against air quality measurements, and before using models for air quality compliance assessments. This helps avoid any situation that 'false' model results are used in isolation. It is clear that vehicle emissions are an important contributor to NO_2 air quality in many urban areas, with models indicating they contribute on average 60% or more of the measured air quality. For example, recent UK work published by Defra (2015) reports that '*on average around 80% of NOx emissions in areas where the UK is exceeding NO_2 limits are due to transport, although non-transport sources of NO_2 are still considerable contributors*'.
	- Given the recent revelations regarding exceedances of NOx in real world driving, is it possible that the emission factors are not actually reflecting the real problem of air quality in Europe as their calculation method may not be appropriate?	Emission factors used in the main European road transport emission models are designed to represent real-world emissions as closely as practicable. The emission factors used in such models are therefore typically developed on the basis of a combination of real-word driving measurements made using PEMS, or from laboratory measurements made during test cycles expressly designed to represent real-world emissions (e.g. the Common Artemis Driving Cycle (CADC). Regulatory limit values are typically not used as emission factors in such models, unless real-world measurements have indicated that this is appropriate. Please also see additional information in the reply to question 7 below.
	- When the assessment of the need for monitoring is partly based on the information provided by the modelling, shall the ambient air quality monitoring	According to the Directive on Ambient Air Quality and Cleaner Air for Europe (2008/50/EC), modelling of air quality, as opposed to traditional fixed measurements, may only be used under certain circumstances. More specifically, in zones and agglomerations where the concentration of a pollutants is below an 'upper assessment threshold' (a defined value set below the air quality limit

	in the urban areas be improved?	value itself), combination of techniques (including fixed measurements and modelling techniques) may be used to assess ambient air quality. Where concentrations are below a 'lower assessment threshold', modelling techniques or objective-estimation techniques or both are deemed sufficient for the assessment of air quality. Clearly, the reliability and accuracy of the air quality modelling techniques employed are essential for the reliable assessment of the air quality status and thus also compliance with air quality standards. Current road transport emission models are considered to include up-to-date real-world emission factors for vehicle classes up to Euro 5. As is explained in the reply to question 7 below, emission factors for newer generations of Euro vehicles do however tend to be more uncertain, as they are inevitably based on fewer real-world emission measurements. Thus the current emission factors for Euro 6 vehicles are relatively uncertain, and can be expected to change in the near future as recent real-world emission measurements are incorporated. It should be noted that however as a fraction of total vehicle numbers there are presently relatively few Euro 6 passenger cars, as these have only been available on the market for a short period. We have no quantitative information in terms of the subsequent impacts that uncertainty in Euro 6 emission factors has on the modelling of current air quality concentrations, but it is unlikely to be highly significant.
7	Improvements in air quality, for example from road transport, are measured according to emission factors, which calculate the amount of pollution (e.g. NO2) released from road transport by using emissions data from The European Handbook of Emission Factors for Road Transport (HBEFA).	
	- Does the EEA use emission factors provided by the HBEFA?	HBEFA is a commercially available model/database containing road transport emission factors for vehicles. EEA does not use HBEFA. Instead, for over a decade EEA together with other organisations including the Joint Research

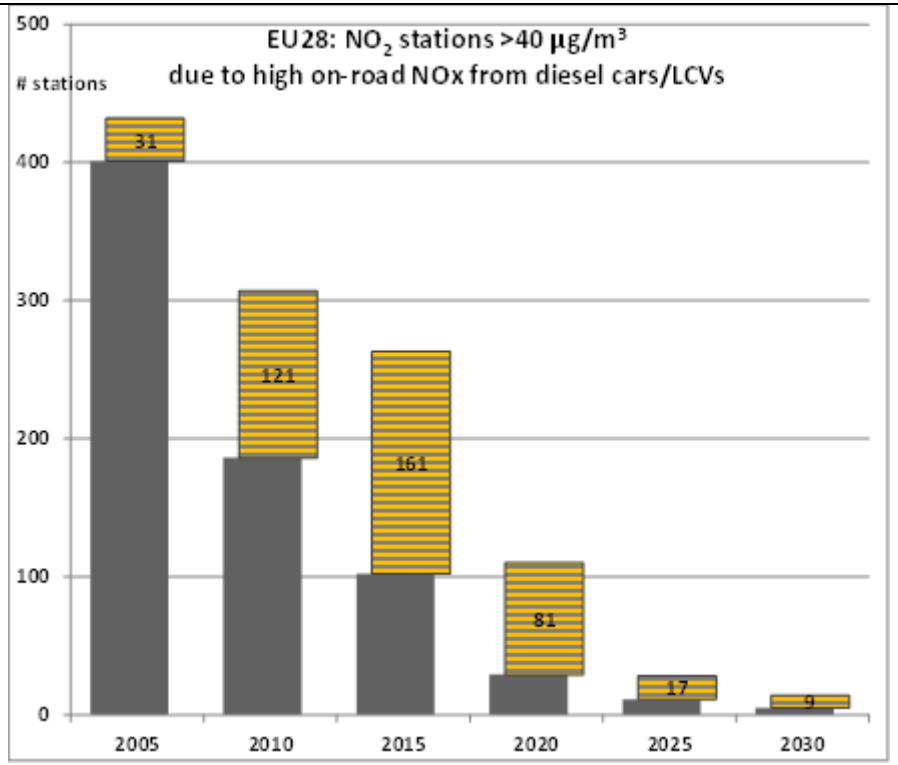
		Centre (JRC) of the European Commission has supported the development of the COPERT road transport emission model. EEA's support is provided through the EEA's European Topic Centre for Air Pollution and Climate Change Mitigation. The COPERT model contains emission factors for real-world emissions of all major air pollutants and GHGs produced by different vehicle categories (passenger cars, light commercial vehicles, heavy duty trucks, busses, motorcycles, and mopeds) and vehicle sizes. HBEFA and COPERT share a range of common methodological aspects. Historically HBEFA has been providing emission factor levels for certain Euro standard 'regulated' pollutants (carbon monoxide, hydrocarbons, NO_x, PM) and COPERT for 'unregulated' pollutants and non-exhaust sources.
	- Do Member States use these emission factors?	The current version of the model – COPERT 4, is used by the majority of Member States for their official reporting of real-world air pollutant and GHG emissions in national emission inventories e.g. for reporting under the National Emission Ceilings (NEC) Directive. In 2015, around 20 Member States used COPERT 4. The remaining Member States use a variety of similar models including HBEFA, VERSIT+, TREMOD etc. COPERT4 is also widely used for other purposes, including to support air quality modelling and is used also by a number of Member State local authorities, researchers and by a number of countries outside the EU.
	- How are emission factors calculated for road transport for the HBEFA (i.e. lab tests or on-road)?	Emission factors used in COPERT (and HBEFA) are generally calculated from a combination of real-word driving measurements made using PEMS, or from laboratory measurements made during test cycles expressly designed to represent real-world emissions (e.g. the Common Artemis Driving Cycle (CADC). The teams developing the COPERT and HBEFA models, as well as many other European modelling groups, researchers, competent authorities etc., all participate within the European Research for Mobile Emission Sources (ERMES) group chaired by the JRC. ERMES supports cooperative research in the field of transport emission modelling and helps ensure that emission factors used in the different models are largely consistent, with remaining differences mainly occurring due to variability in the timing of model updates, the ways in which emission factors are expressed in the

		different models and differences where models are applied for different national conditions.
	- How often are these emission factors revised?	Within COPERT, emission factors for a given Euro 'generation' of vehicle category have tended to be updated 2 or 3 times across different model versions, each time reflecting the greater availability of reliable real-world vehicle measurements as cars of that Euro generation become more common. Therefore emission factors for a certain Euro class tend to become more certain several years after introduction of the relevant Euro standard, as they can be developed using a larger pool of vehicle measurement data.
	- What sample size of cars is used?	As noted above, models are updated as more vehicle measurements become available, therefore the sample size is not fixed. Particularly at the start of a new Euro generation, available measurements are very scarce, and thus tend to be subject to relatively higher uncertainty. As an example, emission factors for Euro 6 passenger vehicles are presently based on a small sample of size of just 7 early demonstrator production vehicles – the number of measurements available around the time the Euro 6 standard was introduced. The COPERT Euro 6 emission factors for diesel passenger cars are presently in the order of 3x higher than the regulatory Euro limit. EEA understands that ERMES will meet later this month to discuss updating the current real-world Euro 6 emission factors on the basis of the new real-world emissions testing performed over past months by researchers and Member State authorities. Should the group recommend changes, it is anticipated the relevant emission factors within COPERT will be updated later in 2016.
	- Which models/Euro standards?	COPERT, and other road transport emission models in general, includes specific emission factors for each combination of: • vehicle categories (passenger cars, light commercial vehicles, heavy duty trucks, busses, motorcycles, and mopeds); • fuel type (diesel, petrol etc.); • vehicle size (COPERT includes for example 4 size ranges for passenger cars); and,

		• Euro generation (from different pre-Euro vehicle types through to Euro 6).
8	There have been discussions surrounding cold starts of vehicles and the issue of manufacturers constructing vehicle engines so that nitrogen oxides are being emitted unfiltered into the air at low temperatures. In cold climatic conditions, cold starts and cold ambient temperatures are normal conditions for several months a year.	
	- How do you view the current technology used (for filtration of NOx)?	As noted earlier, EEA has no technical competencies in the area of vehicle emissions testing. We are therefore not technically qualified to comment upon this issue. We have however noted comments from previous speakers at EMIS hearings observing the lower emission levels able to be achieved in the USA where the NO_x emission standards are stricter and therefore where vehicle manufactures have been incentivised/required to implement more effective solutions e.g. use of combined emission control technologies.
	- What would your recommendations for improvement be to the automobile industry?	Please see preceding answer.
	- Should data from cold starts and cold ambient temperatures as well as gradient of the roads be taken into account when analysing the data from the "real" driving conditions?	Please see preceding answer. We would only add that the concept of monitoring RDE emissions is that they should reflect as far as practicable real driving emissions under real operational conditions. It will be important that the agreed RDE protocols are fully respected and representative of real conditions.
9	- Can you quantify the impacts of exceedance of EU NO2 limit values as regards the environment and public	This assessment was performed by EEA for the first time in 2015, and the results are documented in the Air Quality in Europe – 2015 report. Significant health benefits would be gained were Member States to meet the air quality limit for NO_2 in all areas. The estimated health gain attributable to

	health?	compliance with the NO_2 annual mean limit value of 40 µg/m^3 at all locations (in terms of avoided years of life lost (YLL) would have been approximately 205 000 life years for the EU‑28 in 2012. This compared to a total of 800 000 years of life lost attributable to NO_2 exposure in that year. In estimating these health impacts, EEA follows the recommendations of the World Health Organization (WHO) that potential impacts at concentrations below 20 µg/m^3 are not quantified. The estimated benefits may therefore be underestimated (and there remain large uncertainties associated with the estimation of health impacts of air pollution). There are a number of on-going initiatives that aim to improve the state of knowledge on this topic.
	- Can you explain the difference between the estimated premature deaths as assessed by the DEFRA for the UK and the ones included in EEA report from November 2015?	The EEA's Air Quality in Europe – 2015 report estimates 14 100 premature deaths were attributable to NO_2 exposure for the UK in 2012. A 2015 Defra report reports a higher estimate of 23 500 deaths annually in the UK. The differences in estimates are due to the different assumptions and methodological approaches undertaken. The EEA methodology is designed to allow a comparable estimate of health impacts for all its member countries. The method is relatively conservative, considering concentrations at 'background' stations (both rural and urban/suburban), in order to elaborate concentration maps at 10 km x 10 km resolution for all of Europe. These maps are subsequently merged into a 1 x 1 km map using a population density grid. For NO_2, following the recommendation by WHO, EEA only estimates impacts for concentrations above 20 µg/m^3, which can therefore lead to some underestimation of the impacts. We understand that the DEFRA report applies different methods, informed e.g. for NO_2 by interim recommendations from the UK Committee on the Medical Effects of Air Pollutants (COMEAP) working group on NO_2.. A more detailed national model is used (1 x1 km resolution), coupled with population weighted concentrations. Also, impacts for all NO_2 concentration levels are considered in the calculation – this is likely to be a main reason for the different estimates.

10	- What is the impact of discrepancy between emissions of diesel vehicles in normal use and the type approval limit values on ambient air concentrations of NO2? - To what extent are the exceedances of the EU NO2 limit values by Member States due to the non-compliance of diesel vehicles as regards the NOx limits for Euro5 and Euro6 in normal use?	Two issues presently hinder a robust analysis of these questions: • First, the type approval measurement values for vehicle NO_x emissions are not publicly available. This is in contrast to type approval CO_2 measurements which are available to allow such comparisons. Instead, at present researchers can only assume that all vehicles emit as a maximum the type approval (Euro) limit value when tested. • Second .there remain only limited measurements of real-world driving emissions (RDE) NO_x emissions for different vehicle types. Thus significant uncertainties remain in estimating road transport emissions, particularly for newer Euro technologies for which relatively few real-world vehicle measurement have been available. This situation should improve in the future as a result of the recent agreements on RDE monitoring. Nevertheless, it will be important that this new information is easily and publicly accessible to allow its use in environmental assessments to inform policy. Recent work by the International Institute for Applied Systems Analysis (IIASA) for the Environment Directorate-General of the European Commission as part of work on the revision of the Thematic Strategy on Air Pollution has, however, gone a long way in terms of addressing these questions. IIASA modelled the difference between real-world and the type approval (Euro) limit values for diesel passenger cars and vans, and modelled the resulting estimated number of exceedances of the EU NO_2 limit value for more than 2000 monitoring stations across the EU-28 (see shaded areas on chart). Their estimates show that in 2015 for example, ca. 60% of the expected EU NO_2 exceedances are due to the emissions gap.

		 Source: IIASA.
11	The EEA states that emissions from petrol cars have decreased significantly since 2000, in line with the increasingly stringent emissions limits. This is in sharp contrast to the emissions from diesel vehicles: their emissions have not improved over the same period of time. You state that even modern diesel cars may emit the	

	same amount of NOx as earlier Euro technologies or even pre-Euro cars (page 27 of your report "Explaining road transport emissions").	
	- What did the EEA do in order to push for a better protection of the environment and an improved compliance of road emission policies?	Please see answer to question 1.
12	It is the Commission's responsibility to make sure that air quality standards are maintained.	
	- How can the EEA contribute to this goal?	It is indeed the European Commission's responsibility to ensure enforcement and compliance with air quality standards, and the European Commission uses for that purpose data and information reported through the EEA / European environment and information network (Eionet). Effective implementation, more broadly, is the responsibility of the European Commission together with the Member States. EEA can contribute by expanding the knowledge base for policy implementation and this is a key focus of the EEA's work programme. In concrete terms, we aim to do this by improving the content, accessibility and use of European-level environmental information by providing policy-relevant feedback to long-established and emerging policy frameworks, objectives, and targets through reporting on progress in recognised environmental themes.
	- How would you assess and evaluate the contribution of your Agency to this goal?	The EEA strives to work effectively within the mandate it was given by the European institutions, making full use of its allocated resources to deliver its annual work programme. In doing so, it aims to deliver the specific mandate defined by the European Parliament and the Council: to provide the Community and Member States with '*objective, reliable and comparable information at European*

		level enabling them to take the requisite measures to protect the environment, to assess the results of such measures and to ensure that the public is properly informed about the state of the environment...'. As acknowledged in the most recent independent evaluation of the Agency, the EEA has achieved the objectives that have been established for the Agency while operating in a complex, multi-level and multi-actor governance setting at EU, national, and global levels. This setting also includes research institutes, businesses, and NGOs. In the specific case of reporting on the differences between results of laboratory tests and real driving conditions for NO_x emissions, the Agency has reported regularly and consistently on this issue for over a decade but remains keen to continually improve its targeting of such messages, albeit in the knowledge that other actors will also put forward information in the multi-actor governance setting at EU, national, and global levels.