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**558340 DT Two- or Three-wheel vehicles and Quadricycles
Impact Assessment**

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Accompanying document to the

Proposal for a
REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
on the approval and market surveillance of two- or three-wheel vehicles and quadricycles

Impact Assessment

This report commits only the Commission departments involved in its preparation and does not prejudge the final form of any decision to be taken by the Commission.

Lead DG: DG Enterprise and Industry

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BACKGROUND INFORMATION AND POLICY CONTEXT

Please refer to Annex XX at the back of this report for a list of abbreviations and a glossary of terminology.

'L-category vehicles' is a term covering a wide range of different vehicle types with two or three or four wheels, e.g. two- or three-wheel mopeds, two- or three-wheel motorcycles and motorcycles with side-cars. Examples of four-wheel vehicles, also known as quadricycles or quads, which also belong to the L-category vehicle family, are quads used on public roads, all-terrain vehicles (ATVs), which are quads designed to be used off-road, and mini-cars. Annex I provides more details of the current categorisation criteria for L-category vehicles.

Type-approval requirements for new vehicles in the L category are currently set out in Directive 2002/24/EC[1] (the 'Framework Directive'). In addition, a series of directives referred to in the Framework Directive contain detailed technical requirements relating to L-category vehicles. The Framework Directive became mandatory on 9 November 2003 for new types of vehicles.

Type-approval legislation was addressed in the political initiative 'CARS 21'[2]. This initiative was launched in 2005 to carry out a regulatory and policy review of the automotive sector to advise the Commission on future policy options. One of the reasons for launching CARS 21 was the concern expressed by automotive stakeholders that the cumulative cost of regulation had a negative effect on competitiveness, and made vehicles unnecessarily expensive. The CARS 21 Final Report[3] concluded that while most of the legislation in force should be maintained for the protection of consumers and the environment, a simplification exercise should be undertaken so as to rationalise the regulatory framework and move towards international harmonisation. This simplification exercise was planned in the 'Commission second progress report on the strategy for simplifying the regulatory environment'[4]. Any possible initiative should be aligned with this strategy.

In line with the European strategy on air quality[5], the EU has constantly strengthened emission standards for motor vehicles, in particular for hydrocarbons, carbon monoxide, nitrogen oxides and particulate matter. The contribution of L-category vehicles to the overall reduction sought in greenhouse gases is another environmental aspect that is covered in this Impact Assessment.

The new initiative should be aligned with the European Road Safety Action Plan 2011-2020 and the European Road Safety Charter (ERSC)[6], 2000-2010. The ERSC aimed to halve the number of road fatalities by 2010, but this challenging target will unfortunately not be met. Unfortunately, L-category vehicle riders belong to a vulnerable road user group with the highest fatality and injury rates among all road users.

Annex IX provides detailed information on the market for L-category vehicles, as registered by EuroStat. Where data were not available from EuroStat, the industry associations were requested to provide relevant information. The market is broadly composed of two sub-markets, the first comprising motorcycles and the second for scooters and mopeds. The motorcycle market is dominated by Japanese imports from companies such as Honda, Yamaha, Kawasaki and Suzuki. In a globalised world it is not any longer appropriate to refer only to traditional European companies with their main development and production footprint based in Europe. These large companies with their head offices in Japan also produce and develop models in Europe; they employ many European citizens and account for approximately 50 per cent of sales in the EU market. Large traditional EU-based motorcycle producers, also with their head offices in Europe are Piaggio, Peugeot, BMW, and a number of mid-sized companies like KTM and Ducati, which account for approximately 17 % of the market between them. In recent years there has been a significant increase in imports from China. The United States is the largest export market for motorcycles from the EU.

The second sub-market is the market for mopeds and scooters. This market is much more fragmented than the motorcycle market. Piaggio, Peugeot and Derbi are the main traditional European producers. Asian manufacturers are again strongly represented in this segment, including manufacturers from China, Thailand and India, but they have less market share than in the motorcycle segment.

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1 Directive 2002/24/EC of the European Parliament and of the Council of 18 March 2002 relating to the type-approval of two or three-wheel motor vehicles and repealing Council Directive 92/61/EEC, OJ L 124, 9.5.2002, p. 1. For further information on the background to the type-approval system refer to Annex VIII.

2 http://ec.europa.eu/enterprise/automotive/pagesbackground/competitiveness/cars21.htm.

3 http://ec.europa.eu/enterprise/automotive/pagesbackground/competitiveness/cars21finalreport.pdf.

4 COM(2008) 33 final, 30.1.2008, proposal No 49, p. 32.

5 http://ec.europa.eu/environment/archives/cafe/general/keydocs.htm.

6 http://www.erscharter.eu/.

In all, the number of vehicles currently in circulation in the EU is estimated at over 30 million. The EU produces over 1.1 million vehicles annually, but this is a relatively low number in comparison with China, which produces over 20 million vehicles per year, India, which produces 8 million, and Taiwan, which produces 1.5 million vehicles. However, European vehicles are considered to provide greater added value and higher quality.

It is estimated that there are approximately 100 manufacturers of motorcycles or mopeds in the EU, about half of which are owned by European companies. The estimate was based on different data sources including EuroStat, data from the type-approval authorities and a study by the University of Bologna, which was commissioned by industry. The number of SME producers operating in both the motorcycle and scooter markets is small, although the scooter market has more SMEs. The combined market segments have a turnover of approximately €4.1 billion.

While approximately 60 000 people are employed in the manufacture of motorcycles and cycles, the total number of persons employed by the industry as a whole is estimated at approximately 165 000, when all aspects of the market are taken into consideration, including the upstream and downstream sectors. As regards employment, the main countries are Italy, Spain, France, Germany and the United Kingdom.

A third, downstream sub-market is the sale, maintenance and repair of motorcycles. This market is extremely significant and, in 2006, generated €3.4 billion in value added from a turnover of over €24.8 billion in the EU-27 (EuroStat estimate). 105 000 persons were employed by the 37 000 enterprises in the motorcycle distribution sector It is estimated that 72 % of the total industry's turnover is generated in this sector.

The Impact Assessment Board (IAB) of the EU Commission issued an opinion on the present report after its meeting on 16 December 2009. The Board's recommendations were used to revise and improve the presentation of the analysis and the overall quality of the report. The references to the annexes to chapters 5, 6 and 7 were made into links so that all the qualitative and quantitative elements of every policy option are readily accessible in the main report. The 'industry self-regulation' option for advanced brake systems was elaborated on in chapter 6.3.1 and additional information on the industry proposal for new emission limits was added in chapter 6.2.1.1 to meet the IAB recommendation to make it clearer whether self-regulation is a feasible option or not. The desirable use of international standards, like UNECE regulations, was explained in more detail in chapters 4.1, 4.2.11, 5.1 and 6.1. The global impacts of the measures on international trade were explained in Annex VIII, chapters 3.3 and 3.4. The Commission's level of ambition regarding suggested standards for pollutant emissions was also added to chapter 3.1.2. A summary table of preferred options with associated references to the detailed analysis and comparison in the main text was added to chapter 6.5. Chapters 5.2.1.3 and 6.2.1.3 were further developed regarding CO_2 emissions and fuel consumption determination and reporting at type approval to pave the ground for future introduction of energy efficiency labelling. Finally, the references to monitoring and evaluation arrangements were improved in chapter 7 by inserting active links to this topic in Annexes XVIII and XIX. In addition, it was explained who would be responsible for collecting data for monitoring and evaluation and when a study was to be conducted to evaluate and compare the regulator's target with the actual situation at a future point in time.

1. PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

1.1. Organisation and timing

This proposal is an item in the Commission's Work Programme 2010 and is scheduled in its Agenda Planning under the reference 2010/ENTR/02.

A roadmap has been established for this proposal, including an impact assessment, and has been included in the Agenda Planning for 2010. An Impact Assessment Steering Group, consisting of members of the Commission services concerned (DG ENV, DG MOVE and DG ECFIN), was set up and met on 14 August, 5 November and 16 November 2009

1.2. Public consultation

A public consultation[7] was held from 22 December 2008 to 27 February 2009 to seek the opinions of associations, companies and public authorities on key aspects of potential measures for the type-approval of L-category vehicles. In particular, stakeholder views were sought on the simplification of the current legislation, on the environmental and safety aspects of L-category vehicles and on the possible need to align legal measures with technical developments. Opinions were sought especially on items perceived to be controversial, e.g.:

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[7] http://ec.europa.eu/enterprise/automotive/consultation/2_3_wheelers/contributions.htm.

– Obligatory fitting of advanced brake systems[8] on powered two-wheelers. On this point, 29 % of all respondents were against, 24 % were neutral or had no opinion and 49 % were favourable or relatively favourable.

– Environmental measures, e.g. introduction of revised, lower emission limit values. In response to the question 'Do you support the introduction of new emission limits for motorcycles equivalent to the Euro 5 limits for petrol cars?', 17 % were against, 32 % had no comments and 52 % were favourable or relatively favourable.

Please see Annex II for the executive summary of the consultation report[9], summarising the results of this public consultation. The present report explains how the opinions of stakeholders were taken into account in weighing up the different pros and cons of the policy options considered.

In addition to the public consultation over the internet, some 20 bilateral meetings were held with stakeholders in 2009. From 2002 onwards, two working groups, the Motor Cycle Working Group[10] (MCWG) and the Motor Vehicle Emission Group (MVEG), met on a number of occasions[11] to discuss L-category vehicle legislation. At these meetings, Member State experts, associations representing the L-category vehicle industry and vehicle users, and non-governmental organisations expressed their views on what the new regulation was supposed to achieve and on the envisaged policy options. The most recent MCWG meetings were held in February and June 2009. A third MCWG meeting was held on 14 December 2009.

1.3. External expertise

Two studies were carried out in the course of 2008 and 2009 with the aim of evaluating the economic, social and environmental impacts of proposals for L-category vehicle type-approval.

TRL Ltd was brought in as an external consultant to study potential safety measures for L-category vehicles and also to investigate the impact of simplification on existing L-category vehicle legislation. A report ('the TRL report[12]') was issued and published on the Commission's website. A consortium of institutes comprising TNO (lead institute), the University of Thessaloniki (LAT), BAST, EMPA and TÜV Nord produced a study report on potential environmental measures for L-category vehicles[13] ('the LAT report'). These two policy reports provided the main inputs to the impact assessment. The quantitative cost and benefit estimates in the present report are based on both policy reports. Annex III and Annex IV provide a brief overview of the methodology used by both contractors.

1.4. Industry self-regulation and legislative proposals

ACEM, the European motorcycle industry association, proposed self-regulation on certain safety aspects of L-category vehicles, e.g. fitting of advanced brake systems on powered two-wheelers. They also proposed a package of environmental measures to be included in the new L-category vehicle regulation in order to proactively address various environmental and safety concerns identified and described in the TRL and LAT reports. The commitments proposed by ACEM can be found in Annexes V, VI, and VII.

2. PROBLEM DEFINITION AND RIGHT TO ACT

2.1. Problem definition

The Commission has identified a number of key concerns associated with the current provisions for the type-approval of L-category vehicles:

2.1.1. Complexity of the current legal framework

It has been pointed out to the Commission that the existing system for L-category vehicles is too complex and that there is therefore scope for simplification and international harmonisation.

The type-approval system is generally recognised as an effective framework for tackling various aspects (functional and occupational safety, environment). However, the national authorities in charge of applying the Framework Directive are facing unnecessary additional costs in their attempts to operate in this complex regulatory framework. Many stakeholders have called upon the Commission to simplify the regulatory

8 Refer to the glossary at the end of this report for a technical explanation of anti-lock brake systems.
9 http://ec.europa.eu/enterprise/automotive/consultation/2_3_wheelers/results_report.pdf.
10 http://ec.europa.eu/enterprise/automotive/mcwg_meetings/index.htm.
11 http://ec.europa.eu/enterprise/automotive/mveg_meetings/index.htm.
12 http://ec.europa.eu/enterprise/automotive/projects/report_new_measures_l_category.pdf.
13 http://ec.europa.eu/enterprise/automotive/projects/report_measures_motorcycle_emissions.pdf.

framework in order to ensure a less burdensome and less time-consuming approach to type-approval. This objective has thus been included in the Simplification Rolling Plan.

L-category vehicles have to comply with a series of requirements found in a number of separate directives. The Framework Directive is linked to 13 detailed technical directives, which themselves have been amended by 21 amending directives so as to ensure that they accurately reflect technical progress (for example, by allowing the use of an alternative world-standard driving cycle with associated EU-defined exhaust gas limits). For formal reasons, all these separate directives must be applied individually.

The Framework Directive lays down the legal type-approval requirements for light two-, three- and four-wheel vehicles such as mopeds, motorcycles, tricycles and quadricycles. Both the enacting terms of the technical directives and their annexes are highly detailed and leave Member States practically no room for discretion when transposing them. Thus, some Member States simply make direct reference to those directives, while others opt to develop a completely new legislative text to transpose those requirements.

In addition, many directives contain references to regulations and standards applied worldwide, such as those adopted by UNECE[14], which are subject to amendments. Ultimately, the disparate nature of regulations governing the type-approval of L-category vehicles leads to a lack of legal and regulatory clarity. Industry and regulators need to be familiar with 37 EU directives and in parallel 34 UNECE regulations, which may be equivalent. To consistently update these can be a burdensome process and results in additional costs for administrations and industry. For industry, this regulatory complexity and uncertainty leads to unnecessary compliance costs for the type-approval of new vehicles. Other concerns expressed in the public consultation were the weakening of existing EU requirements and less transparency owing to the decision-making process taking place in a 'remote' international institution such as UNECE.

Nevertheless, amending directives have to be transposed by Member States, and this has led to difficulties for EU manufacturers, as national transpositions may differ slightly, for example concerning dates of publication and entry into force and even (mis-)interpretations with regard to the substantive requirements, leading to misunderstanding between type-approval authorities. This problem is inherent in any EU legislation adopted in the form of a directive, but it is particularly acute in this case, where the requirements are highly technical, very detailed, and likely to be often amended owing to frequent adaptations to technical progress. Transposition then makes demands on the resources of national administrations without adding any value in terms of safety or environmental protection. Additional administrative resources are consequently required to solve the resulting problems of interpretation, which crop up on a regular basis in the Type-Approval Authorities Meeting (TAAM), bringing together representatives of Member States and Commission departments.

Regulations adopted by UNECE, under the 1958 Agreement, are widely recognised in countries inside and outside the EU, and the EU has acceded to many of these. The promotion of international standards is supported by industry. But in the current situation, provisions are often duplicated in European legislation, or are similar in terms of technical requirements but differ in formal details. An example is the date of entry into force of an amendment to a directive, which is usually different as a result of (lengthy) procedures to update the directive after e.g. UNECE has introduced an amendment in its regulation on the same subject. This gives rise to concerns of non-transparency and unnecessary administrative burden.

The administrative burden in this 'no change' scenario is significant. Based on the cost estimates of six Member States, the cumulative cost to the EU27 Member States between 2009 and 2020 was estimated by the consultant to be €3.1 million in total, despite the fact that the scenario is called 'no change'.

This high cost will remain and is likely to increase if no simplification exercise is carried out to delete obsolete measures and to reduce complexity.

2.1.2. High level of emissions

The internal combustion engines of L-category vehicles, which convert chemical energy (fuel) into movement and heat, emit toxic air pollutants and greenhouse gases as undesirable by-products. Evaporative emissions, mainly hydrocarbons from positive-ignition (PI) fuel storage and supply systems are also considered to be toxic. Toxic air pollutants, e.g. certain hydrocarbons, are known or suspected to cause cancer or other serious health effects, such as reproductive or birth defects, or may cause other adverse environmental effects.

14 http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29pub/wp29pub2002e.pdf.

Two pollutants, fine particulate matter and ground-level ozone, are generally recognised as the most significant in terms of health impacts. Long-term and peak exposures can lead to a variety of health effects, ranging from minor effects on the respiratory system to premature mortality. Since 1997, up to 45 % of Europe's urban population may have been exposed to ambient concentrations of particulate matter above the EU limit set to protect human health; and up to 61 % may have been exposed to levels of ozone that exceed the EU target value. It has been estimated that PM2.5 (fine particulate matter) in air has reduced statistical life expectancy in the EU by more than eight months[15]. Common pollutants[16] that are currently regulated for L-category vehicles are hydrocarbons, carbon monoxide and nitrogen oxides. Particulate matter emissions are not regulated[17].

The introduction of the Euro 5 & 6 passenger car emission standards and the Euro VI heavy-duty emission standards means that the contribution of L-category vehicles will become increasingly important in the years to come. For example, it is estimated (in the LAT report) that total hydrocarbons (THC) emitted by L-category vehicles will increase from a share of 38 % to **62 %** of the total hydrocarbon emissions (sum of evaporative and exhaust emissions) of the entire road transport sector by 2020, if no additional measures are taken. This is mainly due to the significant reductions in hydrocarbon emissions from other road transport categories. Mopeds are already today one of the most significant contributors to hydrocarbon emissions, and are expected to account for **36 %** of total road transport emissions by 2020.

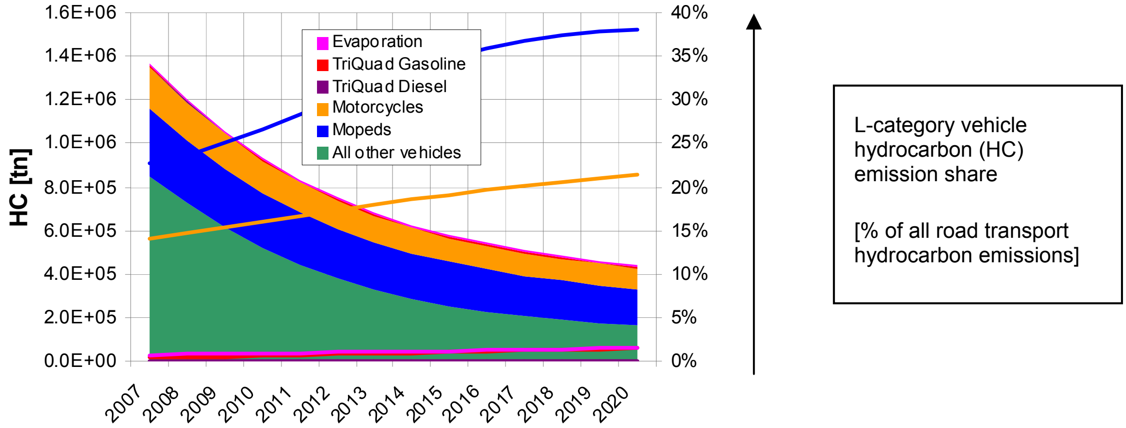
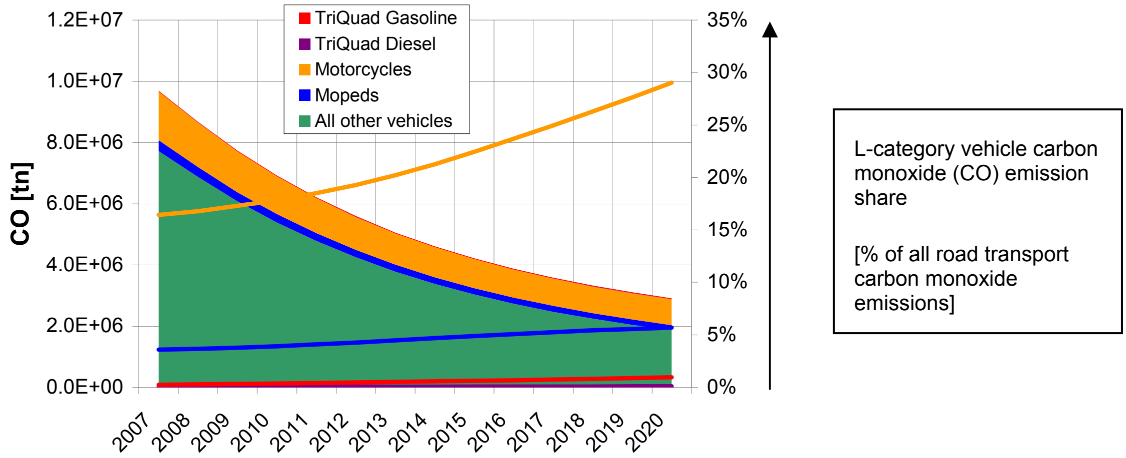


Figure 1: For L-category vehicles, trend over time in absolute and relative shares of hydrocarbon emissions, assuming no change in policy[18]

CO emissions are high and are expected to rise from a share of about 20 % to around **36 %** of total road transport emissions in 2020.



15 Quote from EEA: http://www.eea.europa.eu/themes/air/about-air-pollution.

16 Health effects of common pollutants: http://www.eea.europa.eu/publications/2599XXX/page008.html.

17 http://pubs.healtheffects.org/view.php?id=282.

18 NB. 'All other vehicles' includes passenger cars, delivery vans, trucks and buses. Source: LAT report. Primary Y-axis (left): HC = hydrocarbon emissions; 2.0E+05 = 200 000, 1.0E+06 = 1 000 000, 1 tn = 1000 kg. Secondary Y-axis (right): L-category vehicle hydrocarbon (HC) emission share as % of all road transport HC emissions

Figure 2: For L-category vehicles, trend over time in, absolute and relative share of carbon monoxide emissions, assuming no change in policy[19].

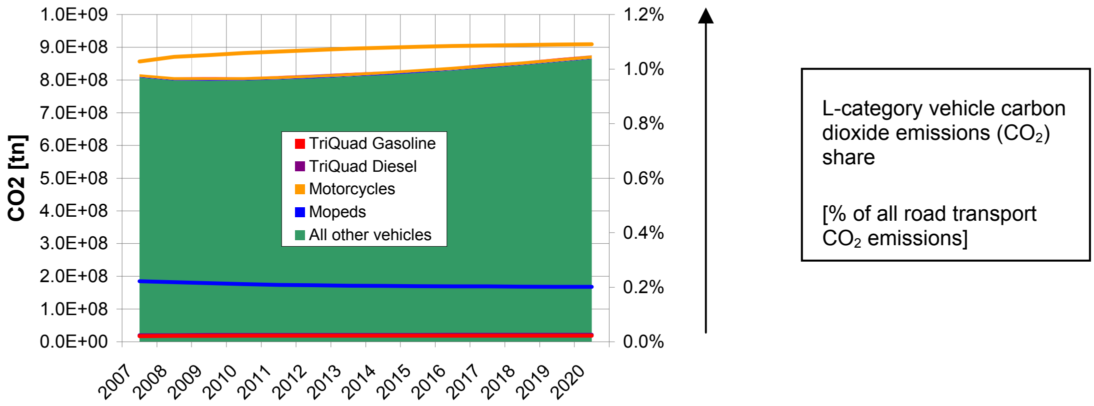
In a number of southern European cities, powered two wheelers are banned from city traffic in the event of a fine dust alarm on hot summer days to prevent excessive particulate emissions. EU legislation for trucks and cars is proving successful in sharply reducing overall emitted pollutant levels throughout Europe, going by the most recent emission levels measured. L-category vehicles need to contribute proportionately to this success story, especially given that they will produce significantly more total hydrocarbons (from exhaust and evaporative emissions) than passenger cars and trucks together in 2020. At the same time, they are responsible for only 3 % of total road transport mileage. The source of the emission problems are the polluting vehicles currently in circulation. As powered two-wheelers have on average a longer life[20] than e.g. passenger cars, it takes a long time before new emission limits take effect on air quality.

The present legal framework for L-category vehicles emissions was adopted in 2002. Since then technology has evolved rapidly. Given the wide diversity of vehicle construction, design and propulsion technology now on the market, the current legal framework is no longer up to date in environmental terms.

Another concern is the proliferation of laboratory testing cycles[21] currently used to test the emissions of the different L-category vehicles. The results of an emission test carried out under laboratory conditions should reflect the vehicle's real-world emission performance. In order to be able to compare different means of transport in terms of environmental performance and fuel consumption, there should ideally be only one single testing cycle, regardless of whether a truck, a passenger car, a motor cycle or a quadricycle is being tested. For historical and certain physical reasons, this has not been the case, which means that there are currently four different testing cycles for the seven subcategories of L-category vehicles. For L3e motorcycles alone there are two optional testing cycles, although manufacturers only seem to use the World-wide Motorcycle emissions Testing Cycle WMTC) to type-approve a vehicle. The traditional European Driving Cycle (EDC) with associated limits and testing procedures may therefore have become obsolete. In addition, consumers are complaining that the fuel consumption measured in the laboratory test cycle does not match real-world fuel consumption, so the fuel bill for consumers can be higher than expected if the published fuel consumption is based only on the figure measured in a non-representative test cycle.

UNECE WP29 is eagerly waiting for the EU to publish new emission limits that match the WMTC test cycle[22] and help address global pollutant emission concerns. The WP29 contracting parties are considering incorporating the new Euro limit values into global[23] technical regulation No. 2. This will be the first time in WP29 history that contracting parties adopt emission performance limits in a global emission test cycle, as historically only test conditions have been regulated and each contracting party has had its own proprietary testing cycle and emission pollutant limits for type-approval or self-certification. Consequently, the speed with which possible Euro limits enter into force in the EU is a possible global concern.

The non-toxic greenhouse gases (GHGs) emitted by PTWs, e.g. CO_2, represent overall a very small share of total road transport emissions.



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19 NB. 'All other vehicles' includes passenger cars, delivery vans, trucks and busses. Source: LAT report. Primary Y-axis (left): CO = carbon monoxide emissions; 2.0E+06 = 2 000 000; 1.0E+07 = 10 000 000, 1 tn = 1000 kg. Secondary Y-axis (right): L-category vehicle carbon monoxide (CO) emission share as % of all road transport CO emissions.

20 The LAT report, chapter 2.2.

21 In the LAT report, chapter 2.3.1, pp.37 – 39, the three different test cycles are described in more detail.

22 http://www.unece.org/trans/doc/2009/wp29/ECE-TRANS-WP29-2009-132e.pdf.

23 http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29registry/gtr2.html.

Figure 3: For L-category vehicles, trend over time in absolute and relative share of CO_2 emissions, assuming no change in policy[24].

However, it is not obvious to the average consumer if a vehicle is fuel-efficient and what level of CO_2 it emits, as there are currently no labelling requirements (unlike for passenger cars). The L-category vehicle manufacturer is not obliged to officially declare the CO_2 emissions of an L-category vehicle, nor must the fuel consumption be determined and officially declared to obtain type-approval for a new vehicle. Given the much lower CO_2 emissions of PTWs per passenger, compared to passenger cars, an increase in trips made using PTWs instead of passenger cars will actually have a positive effect in reducing overall CO_2 emissions by road transport. To inform the consumer in a clear, concise and harmonised way, objective measurement data are needed, e.g. measurements of CO_2 emissions and fuel consumption in type-approval demonstration testing. For passenger cars, for example, such objective measurement data are officially reported and used as a basis for a labelling scheme, which is currently not the case for L-category vehicles. This is therefore a concern from the perspective of consumer information.

At the 9th meeting of the MVEG on 20 October 2008, the exhaust after-treatment industry association, AECC, presented a study[25] on durability testing. For one of the five tested motorcycles CO emissions reached the Euro 3 limit after only a mileage of 2000 km and NOx type-approval limits were already exceeded after 5 000 km. Mileage accumulation was stopped after 20 000 km, as NOx had reached the stop criterion for the test, set at 200 % of the Euro 3 NOx limit. This vehicle was analysed and no obvious failure was found, leading to the conclusion that the exhaust after-treatment system had aged rapidly and had lost its ability to reduce emissions. This means in practice that older vehicles in use may emit more than twice the limits after only 20 000 km. The deterioration in emission performance over vehicle life is not a specific problem of L-category vehicles. For other road vehicles with combustion engines (cars, trucks) equipped with exhaust after-treatment systems, this concern was already raised several decades ago. L-category vehicles are currently the only type approved vehicle types not subject to any legal durability requirements in the EU. Other countries (USA, India, China, Thailand, Taiwan and Singapore) have durability requirements for such vehicles too.

An integral approach involving periodical technical inspection (PTI)[26], road-side inspection (RSI)[27] and in-use conformity (IUC) testing and limits may be required for vehicles already in use in order to identify possible environmental and/or safety concerns with such vehicles. In practice, only a proper balance in testing effort and frequency employing a mix of PTI, RSI and IUC testing will ensure that the emissions of mass-produced vehicles remain under the type-approval limits, as there is a certain overlap between these types of tests. Applying only one of these three test types has proven with passenger cars to be insufficient to guarantee effective and efficient monitoring of vehicle emissions and safety over vehicle life. It is therefore not conducive to effective and efficient repair and maintenance over vehicle life if only one of these tests is regularly carried out. Environmental or safety problems may be caused by a component suddenly breaking down or by degradation or reduced efficiency of vehicle components and systems over vehicle life, due possibly to bad vehicle maintenance, bad quality of replacement components, etc. PTI and RSI legislation fall outside the scope of this new Regulation for the type-approval of new vehicles. This means that only the impact of IUC testing is considered in the present Report. The main problem is that none of the three tests are currently harmonised or covered in the EU legal framework. This means that once a limited number of representative new vehicles have passed type-approval demonstration testing there is no further harmonised monitoring or market surveillance mechanism to check whether mass-produced vehicles continue to comply with emission and safety regulations while ageing and accumulating mileage.

Finally, a clean vehicle may turn into a high polluter if an emission-relevant component or system fails or excessively degrades. In order to effectively and efficiently repair such failures, any independent repair shop needs:

- Standardised diagnostic information on possible malfunctions leading to environmental and/or safety problems. The on-board diagnostic system on a vehicle should make this information available to a generic scan tool (not just a proprietary OEM scan tool obtainable only by contract repairers). Such information is critical to understanding what the actual problem is with the vehicle and what needs to be done to effectively and efficiently repair the vehicle.

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24 NB. 'All other vehicles' includes passenger cars, delivery vans, trucks and buses. Source: LAT report. Primary Y-axis (left): CO_2 = carbon dioxide emissions; 1.0E+08 = 100 000 000; 1.0E+09 = 1 000 000 000,; 1 tn = 1000 kg. Secondary Y-axis (right): L-category vehicle carbon dioxide (CO_2) emission share as % of all road transport CO_2 emissions

25 http://ec.europa.eu/enterprise/automotive/mveg_meetings/motos/aecc.pdf.

26 http://en.wikipedia.org/wiki/Vehicle_inspection.

27 http://ec.europa.eu/transport/road_safety/vehicles/roadworthiness/roadside_en.htm.

- Access to repair and maintenance information developed by the manufacturer of the vehicle. Unfortunately, this is currently possible only for contract repair shops, not for independent dealers, which is not only a competition problem but also has high pollutant emissions as a negative side-effect.

2.1.3. High road fatalities and safety risks

L-category drivers face a much higher risk of fatal or serious accidents than other drivers. The fatality rate per million kilometres travelled is, on average, 18 times greater than for passenger cars. In 2006, powered two wheelers accounted for 2 % of the distance travelled but 16 % of road deaths in the EU-25 (ETSC, 2007). Furthermore, while other vehicle types have seen significant decreases in fatalities and serious injuries over time, the figures for powered two wheelers have fallen much more slowly or remained static.

In 2008, 5 520 PTW riders died in road accidents. In addition the number of serious injuries is estimated to be 5.5 to 13 times higher than the number of fatalities (30 000 – 72 000). The number of slight injuries, which is even more difficult to estimate, might be between 12 to 28 times higher (66 000 – 155 000 riders) in the EU-27.

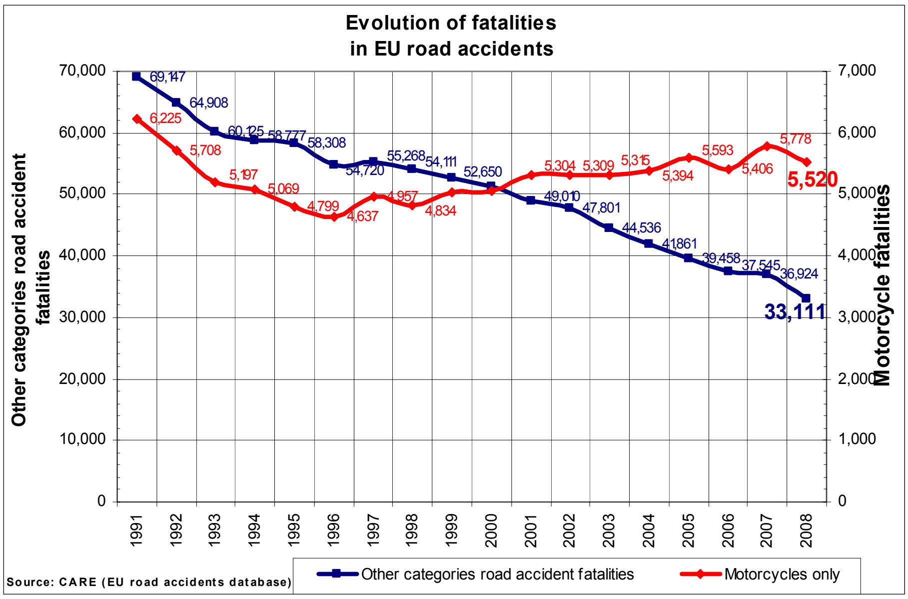

Figure 4: Road fatalities among powered two wheeler riders in the EU over time

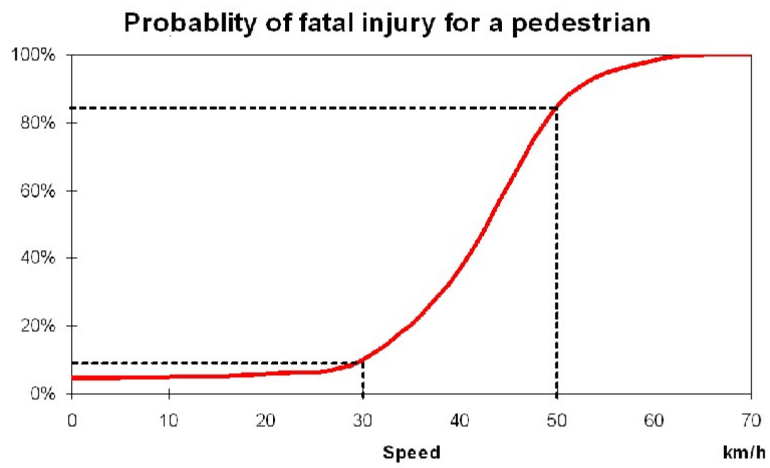

Figure 5: Probability of fatal injury depending on relative speed upon collision.
Source: OECD presentation, International Transport Forum and Vulnerable Road User workshop (DG TREN, 15 July 2009)

The human body's tolerance to physical force is limited. According to the World Health Organisation, pedestrians incur a risk of around 80 % of being killed at an impact speed of 50 km/h. However, this risk is reduced to only 10 % at 30 km/h. There is no difference between a slow-moving pedestrian hit by a fast-moving car or a PTW rider colliding with a fixed object at 50 km/h. It is the difference in speed upon collision that leads to fatalities and heavy injuries in road accidents.

In general, on a competitive market aiming to satisfy consumer preferences, vehicle manufacturers will try to find the best compromise between driveability and performance (torque and power) on the one hand and fuel consumption and fulfilling legal emission requirements on the other. This delicate balance achieved by the manufacturer during development may be significantly disturbed through after-sales tampering with the type-approved settings by or on behalf of the consumer. Tampering may improve driveability and engine performance but at the cost of significantly higher emissions and fuel consumption. At the same time, higher engine performance increases the maximum vehicle speed beyond that for which the other vehicle components are designed, leading e.g. to under-performing brakes, power train components not able to withstand forces acting upon them, etc. All this can easily lead to an unsafe vehicle for both rider and environment. For this reason, anti-tampering measures are included in the current Framework Directive for mopeds and low-displacement motorcycles. However, due to the shift from mechanical to electronic engine control or the use of other types of propulsion (e.g. electrical or hybrid engines), the current measures may no longer be effective or may even be obsolete.

Mini-cars are defined as four-wheel vehicles with limited performance and mass. These are typically used in rural areas by older people who have never obtained a driving licence. Other users in urban areas may be younger drivers starting to learn to drive or drivers with court convictions who have been banned from driving a car. Some Member States even today have no driving licence requirements for this vehicle type. The problem with these vehicles is that drivers may assume the same level of active and passive safety as in passenger cars. However, their design concept, lower maximum speeds and less strict type-approval requirements means that this assumption is not necessarily correct. The lower safety of mini cars in comparison with passenger cars has therefore been identified as a concern.

Another area of concern for safety is that certain quadricycles, quads designed to be used off-road (all-terrain vehicles or ATVs) are frequently driven on public roads. As their name suggests, these vehicles are mainly intended to be used off-road. Often, non-certified versions of an ATV, for use only off-road, are also sold in the same shop. Using ATVs on the road may raise safety issues because of their high acceleration capability and their high centre of gravity, which can result in the vehicle rolling while cornering. The absence of a differential on the driven axle(s), which is advantageous in terrain, causes the vehicle to drift through bends on asphalt. Every other type of three- or four-wheel vehicle driven predominantly on asphalt is equipped with a differential[28] or a similar device, as this is a basic safety feature of such vehicles. The absence of a differential can be compared with a passenger car equipped without windscreen wipers during rainfall. The vehicle will drive and the driver may adapt its speed to move through traffic, but it is far from being safe, both for drivers and their environment. In a number of EU cities, the use of such vehicles is prohibited. In 2003, the total fleet was estimated to be only 95 000 vehicles. Four years later in 2007, 158 000 vehicles of this type were sold and the fleet size was estimated at 800 000 vehicles on EU roads.

Gaseous fuels, for example CNG, LPG and hydrogen, are perceived by consumers as dangerous and as a potential safety risk, although they may provide significant environmental benefits. Safety concerns may include e.g. unsafe fuel storage design or the possibility of fuel tubing connectors becoming loose due to engine vibrations, etc. At the time of analysis in the impact assessment hydrogen technology for L-category vehicles was considered to be not mature. Other alternative propulsion technology may be mature for mass vehicle production, but may at the time of the impact assessment be not statistically relevant for the accident and safety statistics yet.

2.1.4. Lack of a legal framework for new technologies

L-category vehicle technology has evolved very fast over the last decade. The development of the associated legislation has been much slower, with the result that certain vehicles can no longer be allocated to the right L-vehicle category and a number of current measures under the Framework Directive are no longer appropriate. For example, the current measures do not apply to L-category vehicles with purely electric propulsion. For a moped with a small combustion engine, anti-tampering measures should mainly address mechanical manipulation, whereas measures to prevent engine management tuning may be more appropriate for both electric vehicles and vehicles equipped with a traditional combustion engine. For hybrid vehicles, both types of measures may be required. Categorisation is therefore an issue affecting many aspects of the concerns raised above: complexity of the legal framework, safety and environmental issues.

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[28] When cornering, the inner wheel needs to travel a shorter distance than the outer wheel, so with no differential, the result is the inner wheel spinning and/or the outer wheel dragging, resulting in difficult and unpredictable handling, damage to tires and roads, and strain on (or possible failure of) the entire drive train. http://en.wikipedia.org/wiki/Differential_(mechanical device).

For example, on-road quads, off-road quads and mini-cars currently all fall within the same subcategory, L7e, and are all subject to the same requirements. However, quads and mini-cars are inherently so different in design that they each require specific legal requirements to be safe and comply with appropriate environmental standards. Low-power electric cycles (less than 250 W, up to 25 km/h) currently fall outside the legal framework. In addition, more powerful cycles of up to 1 000 W are also becoming very popular[29] throughout the EU. At the moment, these more powerful cycles are classified as mopeds. These cycles must hence comply with the type-approval requirements for vehicles with combustion engines, which are not appropriate for a purely electric vehicle.

2.2. EU competence and subsidiarity

Prior to the introduction of EU (then EU) type-approval for L-category vehicles, regulations were established at Member State level. The legislation adopted by Member States often differed and manufacturers selling on several markets were obliged to vary their production for each market and have their vehicles tested in each Member State in question, which was time-consuming and costly. Different national rules consequently hindered trade, and had a negative effect on the internal market.

It was therefore necessary to establish standards at EU level, especially to tackle EU-wide concerns regarding safety and the adverse health and environmental effects of air pollution. High emissions in local urban settings may be controlled by measures taken by individual Member States, but global emissions do not stop at borders. This Europe-wide concern can only be addressed by harmonised, EU-wide measures. Framework Directive 2002/24/EC was designed to do this and aimed to establish an internal market while ensuring a high level of protection of health, safety and the environment. Such a rationale is still valid today as EU action is needed to avoid fragmentation of the internal market and to ensure a high and equal level of protection across Europe.

A further added value of EU legislation is that harmonised legal requirements allow industry to profit from economies of scale: for instance, products can be made for the whole European market, instead of being customised to obtain national type-approval for every single Member State. Consumers will benefit from lower product prices, which are constantly under pressure owing to EU-wide competition.

3. OBJECTIVES

3.1. General objectives

The general objectives of the initiative are to simplify of the current legal framework, to contribute to a lower, more proportionate share of overall road transport emissions, and to increase functional safety for new vehicles entering the market.

3.1.1. Specific objectives: simplification of existing EU legislation

The specific simplification[30] objective is to develop a less complex regulatory approach that ensures greater efficiency, less time loss and less burdensome adaptation to technical progress. Replacing existing provisions in the Framework Directive by references to equivalent or more appropriate UNECE regulations has a high priority for the Commission in order to pursue the high-level goals set out in CARS 21.

Another specific objective is to see how duplication of international standards can be reduced so that stakeholders are not confronted with several sets of requirements addressing the same aspects.

3.1.2. Specific environmental objectives

A specific objective for environmental measures is to keep the share of L-category vehicle emissions in total road transport emissions at least constant compared to current levels, or preferably to reduce them in proportion to actual use/total mileage compared to other road vehicle categories. In addition, evaporative emissions must be addressed to help achieve the specific pollutant emission reductions targeted by the Commission. The long-term aim (2020 – 2021) is to reduce the share of L-category vehicle emissions in total road transport emissions by at least 16 % for CO, 15 % for HC, 37 % for PM and 27 % for NOx (in tonnes) compared to the ‘no change’ scenario.

In the long run, the Commission also wants transparency in the choice between alternative modes of transport in terms of environmental performance, and is considering using only one emission laboratory testing cycle (WMTC) instead of the four testing cycles used today.

29 See the economic market overview of L-category vehicles in this report, electric cycles, Annex IX.

30 http://europa.eu/scadplus/glossary/legislation_simplification_en.htm.

3.1.3. Safety specific objectives

The specific objectives are to help achieve the same high reductions in road accident fatalities and casualties as for other means of road transport, with the falling trend in passenger car fatalities since 2000 as the benchmark, to maximise accident mitigation to prevent serious and minor injuries as much as possible, and to help close the gap between actual road accident fatalities and casualties and the medium- to long-term road safety targets.

3.1.4. Specific objectives for legal requirements and technology developments

A number of technology developments should be reflected in legal requirements at EU level in order to allow the industry to type-approve a product only once and then to market and sell certified products not only in the EU internal market but also in countries that opt to apply UNECE regulations. With clearer criteria for the various subcategories of L-category vehicles, this can be achieved more effectively and efficiently.

4. POLICY OPTIONS

A number of options have been analysed for each of the areas addressed by the objectives. As analysis has shown that there are no significant trade-offs between the different areas, the options will be presented as separate sets.

4.1. Simplification of existing EU legislation

The assessed policy options were the following:

(1) No policy change

No change would be made to the current regulatory framework. The Framework Directive would still lay down the EU type-approval system, while technical requirements would still be established under separate directives, which require transposition into national legislation. Amending directives would also require transposition. The Commission would have to continue monitoring transposition into the national legislation of 27 Member States.

(2) Repeal current directives and replace with a minimum number of regulations

The Framework Directive, the 13 technical directives and their 21 amendments would be repealed. A new Regulation adopted through the ordinary legislative procedure would contain the fundamental requirements of the EU type-approval system, while all detailed technical requirements would be gathered into a small number of implementing regulations, to be adopted and more easily updated in future through the committee procedure (‘comitology’).

Similar to what has been introduced for motor vehicles in the General Safety Regulation (GSR), if equivalent technical standards have been adopted by UNECE, the provisions of EU directives could be repealed and replaced by a reference to these international standards. This option could take different forms:

- Full references, where the text is copied in full and published by the EU;
- Simple fixed (static) references, where the EU legislation links to a dated international regulation;
- General (dynamic) references, where the EU legislation links to a regulation of an international standardisation body, but without dating it: this would allow automatic adjustment in line with updates of these technical requirements.

From the point of view of legal certainty and control over EU legislation, the latter possibility (dynamic references) seems unacceptable. In consequence, this is not further analysed. The same split-level approach could be followed as when legislation was introduced for other EU vehicle categories, e.g. light- and heavy-duty vehicles.

(3) Recast the current Framework Directive 2002/24/EC

The current Framework Directive would be revised and re-enter into force from a given date. Some measures in the Framework Directive would be amended in order to update them and align them with technical progress. References to UNECE Regulations would be used consistently. The same process would apply to the 13 implementing directives and their 21 amendments. These would be codified and their provisions as much as possible replaced by references to global UNECE regulations. The split-level approach is assumed for this option as well.

4.2. Environmental measures

For obtaining a type-approval certificate for a new vehicle design, the manufacturer must demonstrate to the type-approval authorities that a new vehicle type complies with the set of rules defined by the regulatory framework and more specifically with the detailed technical provisions in associated legal acts. In order to demonstrate to the type-approval authorities that a mass-produced series of vehicles complies with all these legal requirements, demonstration tests must be performed in the presence of the type-approval authorities well before the start of mass production, during the development of a new vehicle design. In these demonstration tests, performed with a limited number of representative vehicles, vehicle emissions are tested in a certified emission laboratory equipped with an engine dynamometer, on which the vehicles are tested following mandatory test procedures.

The emission laboratory is equipped with certified measuring equipment that collects the exhaust gas flow in bags while the vehicle is tested on the engine dynamometer using e.g. the World-wide Motorcycle emissions Testing Cycle (WMTC). The contents of the bags are analysed at the end of the test and the test results must be below the legal emission limits. The test cycle simulates a representative real-world driving profile and the test results are supposed to reflect the real-world emission performance of the tested vehicle, which in turn is supposed to be representative of the emission performance of the mass-produced vehicles that the manufacturer intends to market after obtaining type-approval.

Possible policy options for requirements prior to the start of production to obtain type-approval are listed in chapter 4.2.1. Policy options to control vehicle emissions after start of mass production and after type-approval are listed in chapter 4.2.2. If the latter type of options is included in the new legal framework, the vehicle manufacturer must ensure that these requirements continue to be met to retain type-approval.

In order to reduce and/or control the emissions from L-category vehicles over vehicle life, a number of policy options are considered as a package applicable before and after type-approval of a new vehicle.

4.2.1. New or revised environmental measures for the type-approval of new vehicles

4.2.1.1. Revised lower emissions limits.

Different options have been developed and analysed with regard to new emission limits for different pollutants:

(1) No action;

(2) Use of the traditional R47 test cycle but including cold start and a 30 % weighting factor for cold start in this emission laboratory test cycle are proposed. In this option the emission limits remain unchanged for mopeds and all other L-category vehicles.

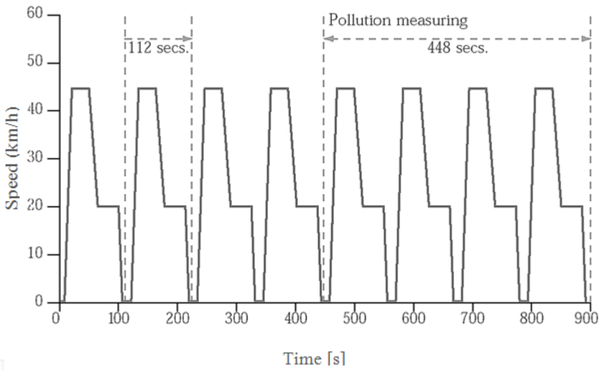


Figure 6: R47, driving cycle for mopeds (Euro 1 and Euro 2);

Pollutant sampling is conducted from sub-cycle 5 to 8 for Euro 2 mopeds. In option 2, which is a possible Euro 3 measure for mopeds, cycles 1 to 4 will also be sampled, but only weighted for 30 % of the total pollutant emissions sampled over the whole test. The reason for a lower weighting factor in the phase where the engine is cold and warming up (sub-cycle 1 to 4) is that under real-world conditions the engine will operate for a higher percentage of time when it is warm. Hence, in line with the assumptions behind the R47 test sampling definition for Euro 2 mopeds, the moped will, under real-world conditions, be started two to four times a day with a cold engine and then warmed up. The moped engine is thus assumed to be warm for most of its operating time. In option 2, this is represented by a (100 % — 30 % =) 70 % weighting factor for the warm engine phase (cycles 5 to 8). For Euro 2 mopeds it does not matter how much the moped engine emits in sub-cycles 1 to 4, which means that the manufacturer must only optimise the emissions of the warm engine (represented by cycles 5 to 8), which have a weighting factor of 100 % in a Euro 2 test.

In option 2, consequently, the moped manufacturer must ensure that moped emissions in the cold phase are controlled by an exhaust after-treatment system that also operates under cold engine conditions (lower light-off or operating temperature) and/or by optimising engine calibration (tuning) to take account of cold-start conditions and warming-up of the moped engine. As cold-start emissions are also included in the test result in option 2, total measured pollutant emissions will be higher, which will make it more challenging for the manufacturer to meet the same emission limits if option 2 were retained as a Euro 3 measure.

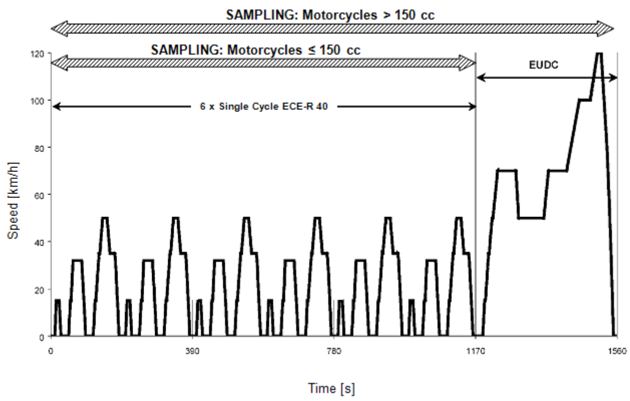
(3) This option reflects the motorcycle industry proposal[31]. Among many other scenarios (17 for categories L1e to L7e in total), the manufacturers propose a -25 % reduction for L3e motorcycles compared to Euro 3 levels when the new regulation enters into force (2013) and a second reduction 3 years later of approximately -50 % compared to Euro3 levels. This general reduction is not applicable to the other L-category vehicles (L1e, L2e, L5e, L6e and L7e), for which individual reductions are proposed by the motorcycle industry association, ACEM.

(4) New measures based on the best available technology applied to L-category vehicles sold today in the market.

(5) New limits for all L-category vehicles equivalent in absolute terms to the Euro 5 stage for passenger cars.

The five different options for the possible revision of emission limits and the associated analysis are summarised in detail in Annex XI and Annex XIV.

4.2.1.2. Use of a revised World-wide Motorcycle emissions Testing Cycle (WMTC) for all L-category vehicles[32].



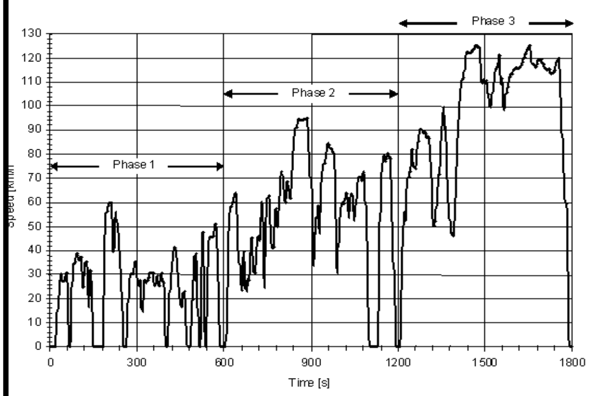


Figure 7: R40 European Driving Cycle for Euro3 L3e motorcycles. WMTC alternative driving cycle for the type-approval of Euro3 L3e motorcycles

Under the umbrella of UNECE, a Worldwide Harmonised Motorcycle Test Cycle (WMTC), stage one, was developed, which manufacturers in the EU have been able to use since 2006 to type-approve a new L3e motorcycle. Manufacturers may continue to use the traditional European Drive Cycle (R40 cycle) for type-approval testing. Mopeds and light quadricycles are currently type-approved using the R47 test cycle (distinct from the Motorcycle EDC R47 and the WMTC).

Stage 2 of the WMTC includes a number of technical revisions to widen the scope of use and improve WMTC stage one. Specific type-approval emission limits were developed for WMTC stage one. In this impact assessment, the pros and cons of using only WMTC stage two, completely abandoning the EDC cycle, are assessed for motorcycles. For other L-category vehicles (mopeds, quadricycles) the impacts of using a revised WMTC and replacing the currently used R47 and R40 test cycles are assessed as well, with a view to harmonising the testing cycle across the L-category. The assessed options:

(1) No change;

(2) Use of a revised World-wide Motorcycle emissions Testing Cycle (WMTC) for all L-category vehicles.

4.2.1.3. Type-approval requirements to measure CO_2 emissions and to determine fuel consumption

CO_2 emissions from L-category vehicles represent overall a very small share of total CO_2 emissions from road transport. Initially, therefore, obligatory CO_2 emission measurement and fuel consumption determination and reporting at type-approval to pave the ground for the introduction of an energy efficiency labelling

[31] Explained in detail in Annexes VI and VII of the IA report. In the LAT report cf. chapter 3.2.2. At the MCWG of 29 June 09, this was summarised in: http://circa.europa.eu/Public/irc/enterprise/automotive/library?l=/mcwg_motorcycle/meeting_june_2009/emisia_report_v2pdf/_EN_1.0_&a=d.

[32] http://ec.europa.eu/enterprise/automotive/projects/report_measures_motorcycle_emissions.pdf (ch. 2.3.1).

scheme at a later stage was not included in the public consultation. An energy efficiency labelling scheme as such is not within the scope of this impact assessment but the data to be provided by the manufacturers as input for labelling is analysed. This item which obliges the manufacturer to measure CO_2 emissions and to determine fuel consumption at type-approval was addressed during an extended stakeholder consultation conducted in parallel to the impact assessment process in order to obtain additional information and stakeholder views on topics that emerged during the impact analysis.

The market seems to be split into two regarding the lowering of CO_2 emissions and fuel consumption. Riders who buy a PTW or any other L-category vehicle purely for leisure purposes and sports use may be relatively indifferent to fuel consumption and CO_2 emissions. This may still continue to be the case in future as L-category vehicles are often perceived as emotional products and not as just an alternative means of transport. On the other hand, riders who use their vehicles to commute back and forth to work and for professional purposes may be very interested in continuous improvements in fuel consumption and lower CO_2 emissions.

Lightweight PTWs with relatively small engines frequently have much better performance than passenger cars, but in many cases unfortunately have the same fuel consumption and CO_2 emissions as heavier passenger cars equipped with much bigger engines. Consumer information is one of the most obvious and effective ways to address this issue. In addition, the effectiveness of a future labelling scheme may be further strengthened by fiscal incentives (e.g. vehicle tax linked to CO_2 emissions). This has been the case for passenger cars, and it is likely that such schemes will evolve to include other categories of vehicles. If consumers are better informed and compare products not only on engine performance (power and torque) but also on CO_2 emissions and fuel consumption when buying a new motorcycle, the incentives for manufacturers to provide buyers with more fuel-efficient vehicles will also increase, regardless of whether these vehicles are used purely for leisure or for commuting to work and other professional reasons.

Policy options assessed:

(1) No change;

(2) Type-approval requirements for CO_2 measurement and fuel consumption determination and reporting.

4.2.1.4. Evaporative emissions test and limit

In addition to exhaust gas emissions, emissions may occur through evaporation of fuel from the fuel tank filler opening or from the fuelling system, especially under hot ambient conditions. As in the case of passenger cars, a limit on such evaporative emissions needs to be assessed. There would be a requirement to perform a SHED test for type-approval and to comply with a limit for hydrocarbons similar to what has been compulsory for gasoline passenger cars since 2000. Policy options assessed:

(1) No change;

(2) Replacement of all new carburetted models with fuel-injected models. Due to the closed circuit, fuel injection engines produce much lower evaporation emissions than carburetted engines;

(3) Evaporative emissions test and limit ensuring evaporative emission control for L-category vehicles.

4.2.1.5. Durability requirements

Vehicle emissions should preferably deteriorate very little over vehicle life, so it may prove to be necessary to limit the acceptable deterioration over vehicle mileage in emissions, which are obviously very much influenced by the quality and functionality of exhaust after-treatment components and systems like catalytic converters and lambda sensors. Also, an increase in raw engine-out emissions over vehicle life due e.g. to engine wear will lead to higher emissions, even if the exhaust after-treatment systems deteriorate only very little. Consequently, durability requirements should apply not just to exhaust after-treatment systems, but to the whole vehicle. Assessed policy options:

(1) No change;

(2) Deterioration reduced to 10 % over useful vehicle life and linear extrapolation for higher mileages. This means that the manufacturer must guarantee that well-maintained, aged vehicles with a defined useful vehicle life, e.g. 50 000 km for L3e motorcycles, do not exceed the type-approval pollutant limits.

(3) Useful life increased by 60 %, i.e. similar trend comparable with the increase for passenger cars on the move from Euro 3 (80 000 km) to Euro 5 (160 000 km) stages. This means that, over and above option 2, useful life would be defined as 1.6 x 50 000 km for L3e motorcycles, i.e. 80 000 km instead of 50 000 km.

4.2.2. New measures to control vehicle emissions over vehicle life.

4.2.2.1. In-use conformity (IUC) testing and limits

IUC exhaust and/or evaporative emissions could be tested and analysed on in-use vehicles. For this purpose a representative number of vehicles should be selected to perform IUC testing. This representative sample would then be tested under vehicle-emission laboratory conditions and employing testing methods similar to the accurate and advanced methods used to test new vehicles in type-approval demonstration testing.

Ultimately, if a high number of vehicles in the sample failed to comply with the exhaust and/or evaporative emission limits, the vehicle manufacturer could be obliged to recall the vehicles in the field to correct the root cause of the failure. The burden of conducting this type of test would be borne mainly by the vehicle manufacturers and the national authorities. Using IUC testing as instrument to keep vehicle emissions under type-approval limits would be scrutinised. This policy option could be part of the integral approach towards environmental measures to guarantee that the emission performance of a vehicle degrades over vehicle life only up to the defined levels. The following policy options regarding IUC testing are assessed:

(1) No change (IUC not applicable to any L-category vehicle);

(2) IUC procedure mandatory for all Euro 3 motorcycles.

4.2.2.2. On-board diagnostic (OBD) systems and access to repair information

If an emission-relevant component or system were to fail suddenly or slowly degrades beyond acceptable levels, a clean vehicle may turn into a highly polluting vehicle. In such cases, the driver will ideally need to be informed quickly, to take the vehicle to the garage at the next opportunity and have it repaired.

The OBD system is the vehicle's self-diagnostic and reporting capability. OBD systems give the vehicle owner, a repair technician or a PTI (periodical technical inspection) officer access to state-of-health information for various vehicle sub-systems and/or components. For passenger-car PTI testing, Directive 2009/40/EC[33] allows OBD information to be used instead of gaseous (CO) testing, but this is not the case for L-category vehicles.

Failing environmental and/or safety-relevant components or systems need to be rapidly diagnosed and indicated to riders, so that they can go to the garage to have the failure quickly repaired. This may mitigate adverse environmental and/or safety effects of such failures.

During the repair cycle (diagnosis and analysis of problem/failure, repair of smallest identifiable component or ordering of replacement part and replacement of smallest exchangeable unit), access to repair information is critical and directly relies on obtaining standardised diagnostic information from the OBD system with a generic scan tool.

Therefore, all these aspects of these integral requirements for the effective and efficient repair of a vehicle were assessed as one combined measure. Assessed policy options:

(1) No change (no introduction of OBD systems and access to repair and maintenance information);

(2) OBD systems using a similar technology as for passenger cars (European OBD), including catalyst efficiency and misfire monitoring for all L-category vehicles. Provision for access to repair and maintenance information, similar as for passenger cars;

(3) Use of best available OBD technology: minor malfunction monitoring (e.g. circuit integrity check) (OBD stage 1) for all L-category vehicles, no catalyst efficiency monitoring. Provision for access to repair and maintenance information, similar as for passenger cars.

4.3. Safety measures

With the aim of improving safety for vulnerable road users, the Commission intends to focus on a number of critical policy areas. However, these do not all fall under the scope of this impact assessment, which is only limited to type-approval measures for new vehicles. Examples of measures not falling in the scope include the planning, design and operation of road networks, compliance with key road safety rules, helmet design and use, protective clothing, licensing, testing and training, periodical technical inspections and road-side inspections. However, other possible policy instruments for achieving road safety objectives involve new or amended measures related to the type-approval of new vehicles, e.g. use of passive and/or active safety systems such as the fitting of advanced brake systems and a number of other functional safety-related vehicle features listed under the policy options. These do fall within the scope of this impact assessment.

A number of the safety measures assessed below may be left optional, made mandatory or left up to voluntary manufacturer initiatives. It may be necessary to combine all the measures, to apply them

[33] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:141:0012:0028:EN:PDF, Annex II, Ch. 8.2.1.b, 4(iii).

individually, or to mandate them as different groups of measures, depending on the outcome of cost-effectiveness calculations.

Main possible measures assessed:

4.3.1. Obligatory fitting of advanced brake systems

(1) No change; in this case the fitting of advanced brake systems on PTWs would be entirely left to the market, i.e. depending on supply and demand.

(2) Anti-lock brake systems[34] on all powered two-wheelers (PTWs);

(3) Anti-lock brake systems on PTWs with cylinder capacity[35] > 125 cm^3 and advanced brake systems (combined brake systems (CBS) and/or anti-lock brake systems (ABS)) on motorcycles with 50 cm^3 < cylinder capacity ≤ 125 cm^3;

(4) Obligatory fitting of advanced brake systems (combined brake systems and/or anti-lock braking systems) on motorcycles conforming to the performance criteria for the A2 driving licence[36]. Obligatory fitting of anti-lock brake systems on all other L3e class motorcycles;

(5) Industry self-regulation, Annex V

4.3.2. Anti-tampering measures

In addition to chapter 4 of the TRL report, a separate report[37] on anti-tampering was published on the Commission's website explaining all the issues related to tampering in 2003. Many of its elements are still valid today, but technology developed fast in the last decade, which means that the report should be updated before finalising any detailed technical provision if opting for option 3. Assessed policy options

(1) No change;

(2) Repeal Chapter 7 of Directive 97/24/EEC (currently obsolete anti-tampering measures);

(3) New measures on anti-tampering.

4.3.3. 74kW power limitation for motorcycles

The initial intention to limit motorcycle power to 74 kW was to increase safety by inherently limiting maximum acceleration and vehicle speed. This concept is reassessed in this impact assessment for the following options:

(1) No change;

(2) Repeal the option given to Member States to limit power to 74kW;

(3) Set a harmonised limit of 74kW;

(4) Use an alternative limitation, e.g. power-to-mass ratio.

4.4. Improved categorisation of L-category vehicles

4.4.1. Electrical cycles (currently outside the scope of the Framework Directive), tricycles (L5e) and quadricycles (categories L6e and L7e)

(1) No change;

(2) Exclude quadricycles and electrical cycles and tricycles from the new Regulation;

(3) Return to the original spirit of the legislation for mini-cars, reintroducing small external dimensions and the original vehicle weight classification criteria (400 kg / 550 kg);

(4) Improve the legislation by adding new requirements for mini-cars based on car requirements;

(5) Refine the vehicle categories by introducing new sub-categories in L1e, L5e, L6e, and L7e. Add new/revised requirements for these sub-categories.

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34 Definition from TRL report: Anti-lock braking systems (ABS) monitor the speed at which the wheels are rotating and rapidly modulate the brake pressure when imminent wheel lock is detected in order to increase effective braking and prevent deceleration being dictated by the sliding friction between tyre and road. ABS is the **only technical solution** that directly monitors and prevents wheel locking and has been shown in test conditions to result in generally higher braking deceleration by maintaining the wheel slip such that friction is above the level provided by locked wheels. Preventing wheel lock under emergency braking gives the rider greater confidence to apply higher brake forces, leads to shorter stopping distances and prevents the rider from falling.

35 The figure of 125 cm^3 corresponds to the thresholds in Directive 2006/126/EC (recast Driving Licence Directive) for class A1: motorcycles with a cylinder capacity not exceeding 125 cm^3, power not exceeding 11kW and a power/weight ratio not exceeding 0.1 kW/kg.

36 Thresholds obtained from Directive 2006/126/EC (recast Driving Licence Directive) for class A2: 1) power not exceeding 35 kW, 2) a power/weight ratio not exceeding 0.2 kW/kg, and 3) not derived from a vehicle of more than double the power. These are EU-wide criteria for distinguishing less powerful PTWs that beginners are allowed to ride within the first two years of getting their driving licence from powerful motorcycles that may only driven by more experienced motorcycle riders.

37 http://ec.europa.eu/enterprise/automotive/projects/report_anti_tampering_devices.pdf.

4.4.2. *Specific requirements for category L7e vehicles*

(1) No change;

(2) Exclude off-road quads (ATVs) from the new Regulation and add new requirements on safety and emissions for on-road quadricycles (on-road quads and mini-cars);

(3) Keep the existing L7e category and add new requirements on safety for all quadricycles;

(4) Create new categories in L7e with specific requirements for off-and on-road quadricycles.

4.4.3. *Specific requirements for gaseous alternative fuels and other non-traditional propulsions*

The same technology trends can be observed as in light-duty vehicle technology. Different and new types of gaseous fuels and/or alternative propulsion technologies are being introduced for L-category vehicles alongside or in addition to conventional gasoline or diesel fuels. Blends with ethanol, LPG, and CNG or even hydrogen may be used in future to propel vehicles. The first requests to type-approve hydrogen-propelled motorcycles have already been received by the type-approval authorities of at least two Member States. Hybrid and purely electric technologies may also be adopted by manufacturers. All these different technology choices and mixes of technologies are only partly covered by the current legal framework or not at all. The policy options assessed in the impact assessment:

(1) No change (legislation at national level);

(2) Legislation at European Union level through a more refined vehicle categorisation with specific measures for different vehicles and propulsion technologies.

5. ANALYSIS OF IMPACTS

5.1. Simplification of legislation

Annex X	Full analysis, including all available quantitative and qualitative aspects, of the 3 policy options for simplification: **Option 1:** No policy change; **Option 2:** Repeal current directives and replace with a minimum number of regulations; **Option 3**: Recast the current Framework Directive 2002/24/EC.

Table 1: Click on 'Annex' to display the full, detailed analysis of policy options 1, 2 and 3

Summary:

Option 1: No policy change

The main disadvantage of option 1 is that the problems described in chapter 2.2.1.of this impact assessment report will not be resolved. This is not in line with the Commission's better regulation objective, in particular as there will be no improvement in terms of safety or environmental impacts. Continuing this approach would thus only place additional administrative burden on stakeholders.

A positive point is that requirements will not be "diluted" by replacing provisions of EU Directives with references to international standards like those of UNECE. Indeed, some respondents to the public consultation have expressed concern that such referencing could reduce safety and environmental protection. Some even fear a loss of transparency and loss of complete European control over international regulation by EU regulatory institutions. Another positive aspect of option 1 could be that specialists who are already familiar with the current legal text need not spend costly time reviewing a completely new legislative text. However, these benefits cannot be expressed in monetary terms and can therefore only be taken into account in the qualitative analysis.

Option 2: Replace the current set of directives by a small number of regulations

The exact number of implementing regulations, setting technical requirements via the comitology procedure, would still need to be determined. These provisions could be grouped by themes, like road safety or environmental protection. The advantage of referring as much as possible to UNECE international regulations is explained under the discussion of option 3.

This option would have the advantage of allowing technical experts to deal with coherent sets of issues via comitology. It is thus purely a practical approach, intended to facilitate adoption of the requirements, but will not affect the requirements themselves. Such an approach, using several sets of delegated acts containing the technical details, also aims to increase the clarity of the regulatory framework for manufacturers who have to comply with it to obtain type-approval. This clarity for industry is an important benefit of the simplification exercise, in particular for SMEs, which have limited administrative resources to deal with the complex regulatory requirements for obtaining type-approval. The aim of providing a clear and logical structure is supported by industry representatives.

As far as costs for administrations are concerned, these would be lower because there would no longer be any need to transpose directives into national law, leading to reduced costs for the Member States. The Commission would no longer be responsible for the time-consuming scrutiny of transposition. Both national and EU administrations would thus benefit from the new format. Grouping the regulations into sets will allow experts to deal more coherently with aspects of similar, limited objectives. The decision to opt for one or more implementing regulations should be agreed with the comitology committees. In the assessment, it was not possible to quantify the benefits of simplification in terms of lower cost to industry or for consumers.

A negative aspect of using a small number of implementing regulations can be the lengthy process involved: agreeing on one text including all requirements may take a lot of time for the committee and will involve different experts depending on the aspects covered. Another perceived disadvantage of this option may be the shift of control and scrutiny from national parliaments to the EU institutions. Basically, the EU Commission proposes a legal text for the new Regulation and this text is scrutinised and voted on by the co-legislators, the EU Parliament and Council. As soon as the Regulation is adopted and published in the EU Official Journal[38], it will enter into force in all the 27 Members States simultaneously on the specified dates, without the extra step of having to be transposed into national law.

From the cost perspective[39], an average cost of €2.4 million may be incurred from 2009 until 2020, within a range of €58 400 to €8.8 million. The annual cost of making amendments to the legal text would be slightly lower owing to the fact that technical progress can already partly be anticipated when the new legislation is developed and adopted, which means that further amendments to adapt to technical progress can already be partly included. This effect cannot be quantified. For the timeframe 2009 to 2020, an average cumulative benefit of €421 000, within a range of €78 000 to €786 000, was calculated for this option. The cost-benefit ratio was on average 1.2, within a range between 1.1 and 2.5. The break-even point is estimated to be reached between the years 2017 and 2019.

Table 8, p. 17, of the TRL report[40] provides an overview of the quantitative and qualitative impacts for simplification options 1 and 2.

Option 3: Recast the current Framework Directive 2002/24/EC, simplify by referring to UNECE regulations, and maintain the implementing measures.

An alternative to option 2 could be to recast[41] the current Framework Directive 2002/24/EC, referring as much as possible to UNECE regulations. This will benefit all actors dealing with this legislation, whether national authorities responsible for type-approval or manufacturers whose vehicle types have to comply with these requirements. In particular SMEs will benefit, as they have limited resources to devote to reviewing regulatory matters. To respond to concerns as to a weakening of requirements, it should be stated clearly that references will be proposed only in cases where the international standards are at least equal to the relevant EU directives.

The disadvantage mentioned under option 2, regarding a shift from national control and scrutiny to control by EU institutions, is not applicable in option 3. As the Framework Directive and its implementing measures will not be turned into a Regulation, the recast Directives will need to be transposed[42] into national legislation. On the other hand, the additional cost of this transposition remains.

Manufacturers will continue to select the approval tests needed among the UNECE and remaining EU standards. There will be no additional administrative or type-approval costs compared with those under option 2. The requirements of repealed directives will be replaced by equivalent requirements. There is therefore no additional cost, but also no direct benefit in terms of cost reductions for manufacturers. The envisaged benefit will be simplification and clarification of the regulatory framework, but this is particularly hard to quantify.

The cost of this option is estimated to be in the same range as option 2, except that the cost of transposition needs be added. Although the precise differences between option 2 and 3 cannot be quantified, it is assumed that the cost-benefit ratio of option 3 is lower (higher cost owing to transposition, more or less the same benefits). This also means that the break-even point will be reached later than the 2017 – 2019 timeframe. Again, it was not possible to exactly quantify these financial indicators.

The societal impacts of option 3 are similar to those of option 2, but as it involves recasting directives, option 3 does not eliminate transposition and implementation costs for the administrations in the Member States. It is again likely to yield a low cost-benefit ratio and result in the break-even point being reached at a later date.

38 http://eur-lex.europa.eu/JOIndex.do?ihmlang=en.
39 http://ec.europa.eu/enterprise/automotive/projects/report_new_measures_l_category.pdf.
40 TRL report, http://ec.europa.eu/enterprise/automotive/projects/report_new_measures_l_category.pdf, chapter 2.
41 http://europa.eu/scadplus/glossary/legislation_recasting_en.htm.
42 EU directives are transposed into local legislation.

Unfortunately, this hypothesis for option 3 cannot be supported with data. This scenario was not included in the extended policy report and, owing to timing constraints on collecting data after this report was published, only an estimate can be made, based on previous experience with the recasting of the Framework Directive for Euro 5 & 6 passenger cars. The option to refer to global standards, also used in the General Safety Regulation for motor vehicles, is widely supported by stakeholders, as expressed in their replies to the public consultation.

5.2. Environmental measures

5.2.1. New or revised environmental measures for the type-approval of new vehicles

5.2.1.1. Revised lower emissions limits

Annex XI Annex XI Ch. 1.1 Annex XI Ch. 1.2	Revised lower emissions limits, detailed analysis of proposed limits for L-category vehicles, subcategories L1e to L7e, by comparison with light-duty M1 emission limits; Qualitative analysis of the 5 policy options to revise the emission limits.
Annex XI Ch. 1.2 Opt. 1 Annex XI Ch. 1.2 Opt. 2	**Option 1:** No policy change; **Option 2:** New emission limits for L1e mopeds: a cold-start R47 test cycle and a 30 % weighting factor for cold start are proposed (scenario 1 from LAT report). No change in limits for other L-category vehicles;
Annex XI Ch. 1.2 Opt. 3 Annex XI Ch. 1.2 Opt. 4	**Option 3**: Motorcycle industry proposal (scenario 2 from LAT report); **Option 4:** New measures based on best available technology for L-category vehicles sold today in the market (scenario 3 from LAT report);
Annex XI Ch. 1.2 Opt. 5	**Option 5**: New limits for all L-category vehicles equivalent in absolute terms to Euro5 M1 light-duty vehicles (scenario 4 from LAT report);
Annex XI Ch. 1.3	Quantitative analysis: policy options for new emission limits, summary of the cost-effectiveness of the proposed emission limit options.

Table 2: Click on 'Annex' links to display the full, detailed analysis of policy options 1 to 5

Summary:

Chapter 1.1 of Annex XI lists the current emission limits and the proposed new limits as a percentage of the Euro 5 passenger car limits. At the MCWG[35] of 29 June 09 (agenda item 6a) it was explained why L-category vehicle emission limits and those for passenger cars are directly comparable in order of magnitude. Looking at the high limits for THC and CO it becomes obvious why the shares of these emissions from the L-category vehicle fleet compared to all other means of transport are currently a concern, and will grow to a disproportionate 62 % for HC and 35 % for CO by 2020 if the emission limits are not revised. Chapter 1.2 provides a quantitative analysis of the pros and cons of every option and, finally, chapter 1.3 discusses the cost-effectiveness of each.

Option 2 only covers one critical category, mopeds, and only one single aspect: cold-start weighting in the emission test. Therefore this option can be regarded as a technical sensitivity study to show that the impact of a cheap, simple measure on the overall exhaust emissions of one vehicle class can have a slightly positive effect. One positive impact is its relatively high cost-effectiveness. A negative impact is that mopeds may be among the highest emitting road vehicles, but only a minimum reduction will be obtained in comparison with the benchmark passenger cars. Another negative impact is that all other high-emitting vehicles in the L-category are not subject to revised emission limits. Therefore, the overall reduction will be only 7 % for HC and 2 % for CO.

For option 3, the industry proposal for emission reductions in two steps, a technical sensitivity study presented at the MCWG35 of 29 June 2009 showed that the level of the limit has only a limited effect on total L-category vehicle emissions for the assessed timeframe until 2020. The effect will be more significant if the models were able to predict overall emissions until 2030. However; this is technically not feasible for the moment, so the comparison base is 2009–2020. The rapid introduction of the limits is the most important factor in reducing L-category vehicle emissions on the short to medium term. Option 3 can in principle be introduced quickly, is still reasonably cost-effective and is supported by the industry (minimal implementation time anticipated). The negative impact is that HC and CO emissions will remain disproportionately high compared to all other means of transport up to 2020 and beyond.

This latter disadvantage also applies to option 4 and even option 5, where the limits are assumed to be equivalent in absolute terms to EURO 5 for passenger cars. A further negative impact of option 4 is its low potential to reduce HC (only 2 % by 2020). A negative impact of option 5 is its high cost for industry in the short to medium term. A positive aspect of option 5 is that it is the best performing option in terms of emission reduction: it is expected to yield reductions of 19 % in CO, 28 % in HC, 40 % in PM and 37 % in NOx.

5.2.1.2. Use of a revised World-wide Motorcycle emissions Testing Cycle (WMTC) for all L-category vehicles

Annex XI, Ch. 1.4	**Option 1:** No policy change; **Option 2:** Use of a revised World-wide Motorcycle emissions Testing Cycle (WMTC) for all L-category vehicles.

Table 3: Click on 'Annex' to display the full, detailed analysis of policy options 1 and 2

Summary:

The disadvantage of option 1 is that the benefits from common improvements to the test cycle as adopted by the UNECE cannot be completely leveraged for L3e motorcycles type-approved for the use in the EU market. Another disadvantage is that the proliferation of testing cycles for L-category vehicles will remain, which makes it difficult to compare the emission performance of the various vehicle subcategories. In addition, it will continue to be impossible for consumers to compare alternative vehicle types within the L-category in terms of CO_2 emissions and fuel efficiency. A positive aspect is the minimised compliance costs for manufacturers.

Option 2 has a number of advantages in economic, environmental and societal terms. Owing to the higher share of 'transient manoeuvres', it is generally accepted that the WMTC reflects real-world conditions better than the currently used R40 and R47 test cycles. Opting for stage-two as against stage-one WMTC is also assumed to be emission- and cost-neutral. If, however, the R47 test cycle for mopeds is replaced by a future revised WMTC-based test cycle, there may initially be increased compliance costs, although the measure is estimated to be cost-neutral in the medium to long term. A replacement for the R47 test cycle currently does not exist, but it is feasible to define such a test cycle, based on WMTC, in collaboration with the global community represented in UNECE WP29. It is expected that fewer test cycles worldwide will be advantageous for L-category vehicle producers in the EU owing to reduced global compliance costs for type-approving vehicles and more transparency for consumers purchasing vehicles in the EU in terms of toxic emission reduction performance, green house gas emissions and fuel consumption. This may also stimulate L-category vehicle use as an alternative to other means of transport. A compulsory labelling scheme for CO_2 and fuel consumption is expected to be useful to support consumers in their purchasing decisions in order to obtain best value for money.

5.2.1.3. Type-approval requirements for CO_2 measurement and fuel consumption determination and reporting

Annex XI, Ch. 1.5	**Option 1:** No policy change; **Option 2:** Type-approval requirements for CO_2 measurement and fuel consumption determination and reporting

Table 4: Click on 'Annex' to display the full, detailed analysis of policy options 1 and 2

Summary:

Option 1, no change, has the disadvantage that type-approval demonstration testing does not provide a full environmental picture of the vehicle: only the emissions of pollutants are measured and compared to the type-approval limits, whereas CO_2 and fuel consumption need not even be measured or reported, although the measurement of this data comes at zero cost for the manufacturer. A further disadvantage of option 1 is that consumers do not consistently get fuel efficiency information to allow them to choose the most fuel-efficient form of road transport. This is a pity, as L-category vehicles are light and therefore have an inherent advantage in comparison to passenger cars. The advantage of option 1 is that the cost of introducing a product labelling system for manufacturers, importers and dealers is minimised, and it is left to the initiative of industry to fully inform its customers.

Option 2 calls for CO_2 measurement and fuel consumption determination and reporting at type-approval and to be indicated on the type-approval certificate and on the certificate of conformity . This data can then be used in a next step as a basis for a class A — G labelling system (as for other energy-consuming products), similar to that proposed for passenger cars with Directive 1999/94/EC. The disadvantage of option 2 is the additional cost and effort of labelling vehicles for the manufacturer and, further downstream, for the dealer. As a fuel efficiency labelling scheme as such did not fall under the scope of this impact assessment It was not possible to quantify the total cost to manufacturers and how much would be passed on to the end-customer. It was assumed that the cost of measurement for manufacturers would be insignificant, as CO_2 must be measured anyway for type-approving pollutant emissions (to provide a base for pollutant measurement correction). Fuel consumption is calculated based on CO_2, CO and HC emission measurements. The market will decide whether this low cost is passed on to the consumer or absorbed by industry. Another advantage of this option is that motorcycles in future may no longer compete on only engine performance (power and torque), but also on their ability to perform well with minimised fuel consumption. A further possible future advantage of option 2 is an EU-wide CO_2 and fuel consumption labelling system, if introduced, avoiding the need for national labelling systems that may be costly to industry and confusing to consumers if they compare vehicles in different Member States. Therefore, making labelling mandatory just at national level may be ineffective and may have little added value for consumers. Again the labelling system as such was not the topic of this assessment, but obligatory measurement and determination of its input data at type approval.

5.2.1.4. Evaporative emissions test and limit.

Annex XI, Ch. 1.6	**Option 1:** No policy change; **Option 2:** Replacement of all new carburetted models with fuel-injected models (scenario; **Option 3:** Evaporative emissions test and limit ensuring evaporative emission control for L-category vehicles

Table 5: Click on 'Annex' to display the full, detailed analysis of policy options 1, 2 and 3

Summary:

The major disadvantage of option 1 is that it does not address the disproportionately high HC emissions. However, no hardware or software changes are required, nor must a special test facility be rented or bought by manufacturers, so this option has the advantage of no extra costs for manufacturers and consumers.

Option 2 has advantages, but the high cost of fitting electronic fuel injection (EFI) to every L-category vehicle just to reduce the high share of evaporative HC emissions makes it seem largely academic. As the stricter emission limits under option 3 may lead to substantially more vehicle categories being equipped with EFI, the advantages of this option will automatically apply owing to organic growth in the share of vehicles with EFI. The basic reason for introducing EFI is better control of fuelling, which allows exhaust gas emissions to be minimised and more flexibility for the manufacturer to optimise vehicle drive-ability. The reduction of evaporative emissions is just an advantageous and desirable side-effect.

The disadvantage of option 3 is additional vehicle complexity and thus cost for the manufacturer, which will be passed on to the consumer, hence increasing vehicle prices. The advantage is that this is one of the more cost-effective policy options, as identified in the current and previous versions of the LAT report (2004 and 2008). This means that the disproportionately high HC emissions can be reduced by a relatively simple and cost-effective method.

5.2.1.5. Durability requirements

Annex XI, Ch. 1.7	**Option 1:** No policy change; **Option 2:** (Scenario 2 from the LAT report): deterioration reduced to 10 % over useful life with linear extrapolation for higher mileages; **Option 3**: (Scenario 2 from the LAT report): useful life increased by 60 %, i.e. equivalent to the increase for passenger cars upon the move from Euro 3 (80k km) to Euro 5 (160k km).

Table 6: Click on 'Annex' to display the full, detailed analysis of policy options 1, 2 and 3

Summary:

Option 1, no change, basically means that the policy options for new emission limits, as summarised in chapters 5.2.1.1 and 5.2.1.4, will be ineffective. If there is no need for a manufacturer to guarantee that emissions, as measured in demonstration testing for type-approval with a single new vehicle, remain within acceptable limits during vehicle life (e.g. over an accumulated mileage of e.g. 12 000 km for mopeds or 50 000 km for motorcycles, tricycles and on-road quads), the emission limit met by this new vehicle, as demonstrated to the type-approval authorities before the start of mass production and before introduction on the market, may be largely irrelevant. There is a high risk that once vehicles start to accumulate mileage under real-world conditions their tailpipe emissions will deteriorate, as described in the durability test report published by the AECC (see chapter 2.1.2, problem definition, footnote). The same may hold for evaporative emissions. If an aged carbon canister, used to store HC until it can be fed back into the engine for combustion, is not tested prior to the start of production as part of the demonstration testing programme[43], the type-approval authorities will be unable to determine if this part of the emission abatement system will do what it is designed to: to significantly reduce evaporative emissions over vehicle life.

The advantage of options 2 and 3 is that these concerns will be addressed. As IUC testing was discarded for reasons explained in the next chapter, there is no direct market surveillance mechanism within the EU to monitor and feed back to the legislator if and to what extent these concerns actually materialise. In PTI and RWT testing, which are only employed at national level in some Member States, it is not possible to verify what the exact level of degradation of the vehicle fleet is in terms of exhaust and evaporative emissions over vehicle life. This can only be verified in an emission laboratory with measurement equipment as used for type-approval demonstration testing. Therefore, durability requirements as defined in options 2 and 3 are the only way to ensure upfront of market introduction that vehicles may be still acceptably close to the type-approval emission test results when accumulating mileage under real-world conditions. The disadvantage of options 2 and 3 is that the manufacturer carries the full burden of guaranteeing that the vehicles fulfil the durability requirements, which means increased compliance costs and longer development programmes, so the time-to-market for new products may also increase. An additional disadvantage of option 3 is that moving from no durability requirements at present to high mileages may lead to initially uncompetitive products, as extending the mileage in durability testing is costly and time-consuming. This may result in manufacturers requiring more time to bring new products to the market, and the additional cost may be transferred to the consumer. It is necessary to monitor and evaluate the emission performance of the vehicle fleet some time after a durability measure is introduced to determine if a higher vehicle mileage should be set for useful life at a later stage. Annex XI, Ch. 1.7, contains a proposal for the initially assumed useful life of the different L-category vehicles subject to type-approval emission limits.

43 Introducing a SHED test limit value of e.g. 2 g for a new/degreened canister.

5.2.2. New measures to control emissions from vehicles in use

5.2.2.1. In-use conformity (IUC) testing and limits

Annex XI, Ch. 2.1	**Option 1:** No policy change; **Option 2:** (Scenario 1 from LAT report): IUC procedure mandatory for all Euro 3 motorcycles.

Table 7: Click on 'Annex' to display the full, detailed analysis of policy options 1 and 2

Summary:

Owing to the many disadvantages, e.g. the low likelihood of finding appropriate, representative vehicles on the market for an IUC test sample and its low cost-efficiency, option 2 was discarded. Although option 2 only assessed motorcycles, the same arguments apply to other L-category vehicles such as mopeds, ATVs and mini-cars.

5.2.2.2. On-board diagnostic (OBD) systems and access to repair information

Annex XI, Ch. 2.2	**Option 1:** No policy change; **Option 2:** (Scenario 1 in LAT report): application of OBD systems using a similar technology as for passenger cars (EOBD), including catalyst efficiency monitoring for all L-category vehicles. Provision for access to repair and maintenance information, as for passenger cars; **Option 3:** (Scenario 2 in LAT report): use of best available technology (BAT): minor malfunction monitoring (e.g. circuit integrity check) (OBD stage 1) for all L-category vehicles, no catalyst efficiency monitoring. Provision for access to repair and maintenance information, as for passenger cars.

Table 8: Click on 'Annex' to display the full, detailed analysis of policy options 1, 2 and 3

Summary:

Option 1, no change, does not require an on-board diagnostic system for L-category vehicles. The disadvantage of this approach is that that there will be no standardised diagnostic socket to connect a cheap, generic scan tool used by independent repairers or riders that wish to repair vehicles themselves, there will be no standardised communication protocol for the engine control module to `talk´ to a generic scan tool, no diagnostic information, such as diagnostic trouble codes (DTCs) or freeze-frame information, will be available to a generic scan tool, and independent repairers will be unable to effectively or efficiently diagnose simple failures that may lead to high emissions or unsafe situations. In addition, will there be no obligatory standardised malfunction indicator light to indicate to the rider that there is a serious problem with the engine or vehicle which ought to be repaired in order to prevent environmental damage or a safety risk.

The disadvantages associated with option 1 are addressed by options 2 or 3, which is an advantage of both options. The disadvantage of option 2 is that it may need some additional development for motorcycles in order to find cost-effective solutions to detect misfire at high engine speeds (maximum engine speeds may be up to twice that of typical passenger car engines). In addition, robust catalyst diagnostics may be for the moment still problematic, and the additional hardware and software development needed to support full EOBD, as in passenger cars, is considered to be rather expensive for the industry over the short term.

Option 3, however, calls for introducing the simplest form of OBD, termed OBD stage I, combined with access to repair information for independent repairers and riders who wish to repair their own vehicles, as already applicable today in the passenger car industry. All vehicles equipped with electronic control units (fewer mopeds, but all other new vehicles in the L-category) already have this proprietary functionality on-board. Therefore, the cost of introducing this option is expected to be low — vehicles need to be have a standardised diagnostic connector, two wires in the wiring harness from the connector to the ECU, and a standardised communication protocol(CAN), possibly a CAN interface in the ECU. In addition, minimum software development is required since 95 % can be copied from passenger car applications and can be re-used over the next decade on new models. A very small calibration, verification and validation effort is also needed, but can be re-used to a great extent for other types and variants or successor models. So, option 3 requires a one-off moderate investment by the manufacturer but can then be carried over and re-used to a great extent over a long period. Accordingly, the high costs of OBD stage I implementation as identified in the LAT report were found to be too high by the Commission, at least over the medium to long term, and hence were rejected. Even for vehicles mass-produced on just a fraction of the scale compared to passenger cars, as in the case of L-category vehicles (lower economy of scale), the total cost for the manufacturer is estimated to be 25 % to 50 % of the cost estimated in the LAT report, which obviously leads to significantly better cost-effectiveness and hence represents an advantage for this option. The disadvantage for the manufacturer, apart from the one-off investment, is slightly increased compliance costs. However, as many contract dealers may be independent repairers for other brands, harmonised OBD information will also be advantageous to this sector. Moreover, riders who are technically interested and opt to repair their own vehicles will benefit from standardised, basic diagnostic information, as generic scan tools can be purchased on the market.

5.3. Safety measures

5.3.1. Obligatory fitting of advanced brake systems

Annex XII Annex XII Ch.1	Qualitative and quantitative analysis of policy options for obligatory fitting of advanced brake systems

Annex XII Ch. 1.1	**Option 1:** No policy change;
Annex XII Ch. 1.2	**Option 2:** Anti-lock brake systems on all powered two-wheelers (PTWs);
Annex XII Ch. 1.3	**Option 3:** Anti-lock brake systems on PTWs with cylinder capacity >125 cm^3 and advanced brake systems (combined brake system and/or anti-lock brake systems) on motorcycles with 50 cm^3 < cylinder capacity ≤ 125 cm^3 (NB: 125 cm^3 relates to vehicle performance criteria for the A1 driving licence);
Annex XII Ch. 1.4	**Option 4:** Obligatory fitting of advanced brake systems (combined brake systems and/or anti-lock braking systems) on motorcycles conforming to the performance criteria for the A2 driving licence. Obligatory fitting of anti-lock brake systems on all other L3e motorcycles;
Annex XII Ch. 1.5	**Option 5:** Industry self-regulation.

Table 9: Click on the 'Annex' links to display the full, detailed analysis of policy options 1 to 5

Summary:

Option 1, no change, does nothing about the unacceptable fact that every year many PTW riders die in road accidents, e.g. 5520 PTW riders in 2008, and even many more of them get seriously injured or even disabled for the rest of their lives.

Option 2, obligatory fitting of anti-lock brake systems on all PTWs (two-wheel mopeds and motorcycles), was found to be technically very advantageous as it is best way of preventing critical wheel lock. Wheel lock often leads to a longer stopping distance and may also cause the rider to fall because the vehicle becomes uncontrollable. Also, riders will have confidence that wheel lock will not occur with anti-lock brakes fitted so that they actually dare to brake. A number of studies have reported that no traces are often found on the road after accidents, indicating that the rider did not attempt to brake at all. However, this option has a number of disadvantages, mainly economic. Cost-effectiveness is controversial and difficult to estimate, as it is dependent on a large number of factors. Overall, the literature points to a solid positive cost-effectiveness, and the high cost–benefit ratios (around 3 as the best average) noted in the TRL report seem to confirm this assumption.

Options 3 and 4 are basically attempts to decrease the cost for industry without compromising too much the safety benefits offered by anti-lock brake systems. The major advantages of option 3 are the high estimated fatality and injury reductions. Additionally, the high cost–benefit ratios are very attractive. Major negative impacts of this option are the possible price increases for consumers and possible non-availability of anti-lock brake system technology to SME manufacturers. The latter is because an SME might not be able to take on the minimum volumes demanded by bigger automotive suppliers or alternatively could be confronted with high development costs, as suppliers might not be able to justify investment in tooling to produce ABS components owing to the SME's small series production. The major advantage of option 4 is that it employs the same categorisation of low- and high-performance motorcycles as used in the Driving Licence Directive (matching vehicle type-approval and driving licence criteria, hence ensuring coherence). This makes a clear distinction between non-powerful and powerful PTWs, thus indicating which type of vehicle must to be fitted with an anti-lock brake system and which can be fitted with either an anti-lock brake system, a combined brake system or both, depending on what manufacturers deem to be cost-effective and to offer the best level of safety for their customers. On the other hand, the technical effectiveness of both options 3 and 4 is expected to be lower than for option 2, as the Commission considers that combined brake systems can only help to reduce critical wheel lock up to a certain level, not eliminate it altogether, resulting in a smaller reduction in fatalities and injuries. The economic impact of option 3 and 4 is estimated as being in the same order of magnitude. For option 4, no cost-benefit estimate was in fact calculated by the consultant as this scenario was added at a late stage. Owing to the similarity with option 3, the same cost range and benefit data were assumed for both options, based on the calculations for option 3.

Option 5 was unfortunately referred to in the policy option assessment report as 'no change' (option A). It is obvious and appreciated by the Commission that the industry is seriously attempting to address the high level of fatalities and serious injuries by voluntarily offering self-regulation. Consequently, the industry is committed to offering, by 2015, 75 % of street motorcycle models with an advanced braking system as an option or fitted as standard. One question remains: does this option go far enough to meet the objective of significantly reducing fatalities and casualties among PTW riders involved in road accidents ?

Despite the commitment by manufacturers since 2004 to introduce advanced brake systems as an option on powered two-wheelers, the road fatality statistics have not fallen, but remain more or less the same or have even slightly increased (up to 2008). The TRL report estimates that only 23 % of the fleet will be equipped with anti-lock and/or combined brake systems by 2020 under the current self-regulation. However, this would nonetheless save 1436 lives with a corresponding saving of € 1.2 billion and reduce injuries with savings in the order of € 1.1 billion as best estimates.

According to the TRL report (Table 12, p. 26), actual take-up by customers of antilock brake systems, combined brake systems or both will grow from 20 % in 2011 to 41 % by 2020. Effectively, this means that 9% of the PTW fleet in 2011 will be equipped with such systems. This will grow to an estimated 23 % of the vehicle fleet by 2020. The advantages of industry self-regulation are significantly lower burdens to industry and less complex and prescriptive legislation. On the other hand, a major negative impact is a significantly lower reduction in fatalities and injuries. Although voluntary self-regulation has already applied since 2004 and is on schedule (35 % of all PTWs offered have advanced brake systems), the fatality statistics have so far not significantly decreased and remain static or are even slightly increasing.

5.3.2. Anti-tampering measures

Annex XII, Ch. 2	**Option 1:** No policy change; **Option 2:** Repeal Chapter 7 of Directive 97/24/EEC, currently partly obsolete anti-tampering measures; **Option 3:** New measures on anti-tampering.

Table 10: Click on 'Annex' to display the full, detailed analysis of policy options 1, 2 and 3

Summary:

Option 1 suffers from an extensive list of disadvantages, as the baseline safety and environmental concerns would not be addressed. One might consider a benefit to be the technical know-how that amateur vehicle tuners can acquire from "creative" engine tuning activities, which is the starting point and motivation for many engineering careers. Another controversial benefit is the fact that the tuning industry could continue to make revenue and employ people. However, these benefits may not go at the cost of safety and/or environmental protection.

Option 2 has the same extensive list of disadvantages, but in this case the effects are several orders of magnitude worse. One additional advantage for vehicle manufacturers is a lower burden, as one type-approval less would be required to obtain whole-vehicle type-approval.

Finally, while option 3 would not completely eliminate the disadvantages of options 1 and 2, it would eliminate costly obsolete measures and align measures with the substantial progress in technology development. Only a qualitative assessment was carried out owing to a lack of economic information. All vehicles with electronic engine management systems, for which the current anti-tampering measures enforced are ineffective, will be covered by the new Regulation in addition to the mopeds and light motorcycles currently included.

5.3.3. 74kW power limitation for motorcycles

Annex XII, Ch. 3	**Option 1:** No policy change; **Option 2:** Repeal the option given to Member States to limit power to 74kW; **Option 3:** Set a harmonised limit of 74kW; **Option 4:** Use alternative limitation criteria.

Table 11: Click on 'Annex' to display the full, detailed analysis of policy options 1, 2 and 3

Summary:

In the literature, no clear evidence was found to suggest that limiting the power of a motorcycle to 74kW has a positive impact on the number of road accidents involving motorcycles. Other factors such as rider attitude, experience and the issues listed under the previous chapters have a greater influence on accident risk.

Option 1 suffers from the major disadvantage that manufacturers have to develop special products to meet the power limitation requirement, currently imposed by only one Member State. These products have to be separately distributed as well, so development and distribution costs are estimated to be higher.

Option 2 offers the optimum economic benefits to manufacturers as compliance costs would be reduced and the concerns associated with option 1 would be avoided. The cost-effectiveness of option 3 is doubtful, as already indicated. The advantage of option 4 is that alternative, more cost-effective limitation criteria could be used. The drawback, however, is that no data are currently available to determine possible alternative criteria such as power-to-mass ratio.

5.4. Improved categorisation of L-category vehicles

5.4.1. Recategorise electrically assisted cycles (currently outside the scope of the legal framework), tricycles (category L5e) and quadricycles (categories L6e and L7e)

Annex XIII, Ch. 1	**Option 1:** No policy change; **Option 2:** Exclude quadricycles and electrical cycles from the Regulation; **Option 3:** Return to the original spirit of the legislation for mini-cars; **Option 4:** Improve the legislation by adding new requirements for mini-cars based on car requirements; **Option 5:** Refine vehicle categories by introducing new subcategories in L1e, L5e, L6e and L7e. Add new / revised requirements for these subcategories.

Table 12: Click on 'Annex' to display the full, detailed analysis of policy options 1 to 5

Summary:

The disadvantage of option 1 is the volume of the current legal text, which has proliferated over the years and contains inappropriate or obsolete measures or no measures at all (e.g. obligatory fitting of an elementary safety feature such as a differential on a four-wheel powered vehicle), where such measures are considered essential for environmental protection and safety. One of the root causes of this problem is inappropriate or non-existent classification criteria.

The disadvantage of option 2 is even greater confusion among stakeholders owing to the absence of appropriate rules and the need for L1e, L5e L6e and L7e vehicle manufacturers to have their vehicles type-approved at national level. Noise, emission and fuel consumption levels may also increase. To a lesser extent, these negative impacts are also applicable to option 3.

As Option 4 would drive up costs for mini-car producers to very high levels, this industry, which is completely composed of SMEs (the market leader with the highest sales volume employs about 200 people), would not be able to survive if subjected to such a high burden on the short to mid term.

Option 5 deals with the concerns but has the major disadvantage of potentially significant compliance costs. Unfortunately, no economic data are available for any of these options, although the results of the quantitative analysis, weighing the pros and cons, point to option 5 as the optimum solution. In particular, the better coherence within L-category legislation and also with the legislation applicable to other means of road transport is a clear advantage. Other positive impacts are increased clarity for industry and stakeholders and the possibility for the legislator to be able to develop more effective measures in terms of environmental protection and safety.

5.4.2. Specific requirements for category L7e vehicles

Annex XIII, Ch. 2	**Option 1:** No policy change; **Option 2**: Exclude off-road quads (ATVs) from the Regulation and add new requirements on safety and emissions for on-road quadricycles (on-road quads and mini-cars); **Option 3:** Keep the existing L7e category and add new requirements on safety for all quadricycles; **Option 4:** Create new subcategories within L7e with specific requirements for off- and on-road quadricycles.

Table 13: Click on 'Annex' to display the full, detailed analysis of policy options 1 to 4

Summary:

Option 1 is disadvantageous from the safety, environmental, economic and societal perspectives, as three completely different vehicle types (mini-cars, on-road quads and off-road quads), are allocated to the same category L7e even though their only common characteristic is that they have four wheels. It is not considered possible to address the individual concerns associated with each specific vehicle type with appropriate and cost-effective measures. No positive impacts could be determined for this scenario.

Option 2 offers the advantage that the environmental and safety concerns of on-road quads and mini-cars can be effectively addressed by specific measures. In addition, if ATVs are excluded, they will fall automatically under the Machinery Directive with regard to safety and under the Non-Road Mobile Machinery Directive as regards environmental requirements. This is already partly the case today, so for ATVs this would be the most cost-effective option. As the requirements for ATVs are similar to those for other 'non-road mobile machinery', manufacturers would benefit from lower compliance costs and could pass this on in the form of lower consumer prices. In particular, SMEs in the agricultural and forestry sector, which purchase ATVs as a cheap alternative to tractors, could benefit from such lower prices.

Option 3 is advantageous in that it offers the possibility to revise or develop more appropriate environmental and safety measures for all quadricycles, which may address the concerns identified in this field. The disadvantage is that three different vehicle sub-types would still be assigned to a single subcategory, which makes it difficult to develop specific measures for a specific vehicle type, e.g. to separate off-road, on-road quads and mini-cars.

Finally, option 4 offers the highest flexibility to recategorise the three vehicle types. It also provides the possibility to further split up quads into subcategories for on-road quads and mini-cars. Both the latter types again might need different measures as they are designed for different uses. On-road quads would need to offer the same level of safety and environmental performance as other road transport vehicles.

A special subcategory for 'on-road quads' would increase clarity for stakeholders as to which requirements must be met for this vehicle to be considered safe and environmentally acceptable for use on public, paved roads. The disadvantages of option 4 could be that consumer prices for 'on-road' quads might increase and manufacturers might have to meet more requirements before such vehicles could be type-approved and allowed to travel on public roads. Further analysis of this scenario indicates that it is unfeasible to find enough characteristic design criteria to separate on-road quads sufficiently well from off-road quads. For example, on-road quads could at first be type-approved as off-road quads and then retrofitted with a kit to make them roadworthy, but not necessarily compliant with EU safety and emission standards. Such vehicles would benefit from the advantages of a virtual off-road quad subcategory, but would circumvent the safety and environmental measures developed specifically for on-road quads. In addition, only on-road vehicles traditionally fall under the scope of type-approval legislation, but this concern could possibly be addressed as for agricultural vehicles, which are also designed predominantly for off-road use, but which are still type-approved.

5.4.3. Specific requirements for gaseous alternative fuels and other non-traditional propulsions

Annex XIII, Ch. 3	**Option 1:** No policy change; **Option 2**: Legislation at EU level through a more refined vehicle categorisation with specific measures for the different vehicles and propulsion technologies.

Table 14: Click on 'Annex' to display the full, detailed analysis of policy options 1 and 2

Summary:

Option 1 suffers from the common disadvantages for manufacturers that want to market their products EU-wide: potentially different national approval requirements that need to be met. There is a risk that divergent requirements may lead to trade barriers. There may be inappropriate environmental and safety measures, or no measures at all, reducing the environmental benefit inherently offered by these types of propulsions in comparison to using 'conventional' diesel and gasoline fuels.

Option 2 provides the flexibility to develop measures to address fuel-specific environmental and safety concerns, which is an advantage. The level of innovation in safety and environmental technology may be stimulated by introducing specific measures for gaseous alternative fuels and other non-traditional propulsions. The disadvantages are that the cost of compliance for manufacturers may be higher initially and that in general consumers perceive gaseous fuels to be dangerous and difficult to handle. There could be an economic benefit for manufacturers if the measures were designed carefully, international standards (UNECE) were used as much as possible, and this type of technology were to be subsidised at Member State level, in other words to provide incentives to manufacturers and consumers to make alternative propulsion concepts more attractive. This could allow manufacturers to produce vehicles for the whole EU market and subsequently for global markets, which could cut the cost of these technologies in the long run owing to economies of scale. Once it is demonstrated to consumers that the advantages of alternative propulsions significantly outweigh the disadvantages, demand for such products may rise.

5.4.4. Proposal to combine the results of the preferred options for improved categorisation of L-category vehicles

Annex XVII, Ch. 4	Revise the categorisation for L-category vehicles by combining the preferred options of sections 5.4.1 to 5.4.3.

Table 15: Click on 'Annex' to see the detailed proposal to recategorise L-category vehicles

6. COMPARISON OF OPTIONS AND CONCLUSIONS

6.1. Simplification of legislation

Annex XIV	**Option 1:** No policy change; **Option 2:** Repeal current directives and replace with a minimum number of regulations; **Option 3**: Recast the current Framework Directive 2002/24/EC.

Table 16: Click on 'Annex' for the full, detailed comparison of policy options 1, 2 and 3

Summary:

In terms of efficiency, options 2 and 3 perform equally well, especially because both call for the current legal text to be replaced by technical equivalent or more appropriate UNECE regulations as far as possible, which should simplify the Regulation and in particular the associated technical implementing measures. For the new Regulation on approval and market surveillance of L-category vehicles, only the intention to use UNECE regulations can be indicated. The subsequent delegated acts containing technical details, to be developed after adoption of the Regulation, will clarify which specific text of the repealed implementing directives can be replaced with UNECE regulations.

Regarding efficiency, option 2 is better in terms of transposition and implementation costs and is expected to reduce the risk of delay in dealing with urgent matters or changes. As a result, the benefits of any new measures can be obtained more rapidly. Option 2 is therefore preferred.

6.2. Environmental measures

6.2.1. New or revised environmental measures for the type-approval of new vehicles

6.2.1.1. Revised lower emissions limits

Annex XV, Ch. 1.1	**Option 1:** No policy change; **Option 2:** New emission limits for L1e mopeds: a cold-start R47 test cycle and a 30 % weighting factor for cold start are proposed (scenario 1 from LAT report). No change in limits for other L-category vehicles; **Option 3**: Motorcycle industry proposal (scenario 2 from LAT report); **Option 4:** New measures based on best available technology for L-category vehicles sold today in the market (scenario 3 from LAT report); **Option 5**: New limits for all L-category vehicles equivalent in absolute terms to Euro5 M1 light-duty vehicles (scenario 4 from LAT report).

Table 17: Click on 'Annex' to display a detailed comparison of policy options 1 to 5

Summary:

The main criteria for comparing between the 5 different options over the short to medium term are implementation time and cost-effectiveness. Option 3 scores best for these aspects. However, over the long term, the disproportionately high HC, CO and PM emissions must be addressed, and this can only be achieved with option 5. Even option 5 will not be sufficient to bring emissions into line with the very low total vehicle mileage accumulated with L-category vehicles (2 – 3 % of total road vehicle mileage), but it is considered to be the most that can be done by the L-category vehicle industry to ensure clean vehicles over the long term. Therefore, the optimum solution will be a combination of a slightly modified option 3 (separate limits, which means no combined HC & NOx limits for all L-category vehicles) over the short to medium term (2013 – 2016 timeframe) and option 5 for the long term (2019–2020) depending on the results of an additional environmental effect study to be carried out by 2016. This strategy should provide industry with a longer lead-time and therefore help to mitigate the burden and the long-term effects of the current financial crisis on the industry. While option 3 is based on the self-regulation proposal put forward by the industry, the legal instrument used would be the new Regulation on approval and market surveillance of L-category vehicles, which will make these limits obligatory for type-approval.

Although PM will not be limited, the expectation is that the THC limit will automatically lead to a reduction in VOC, especially taking into account the particular composition and volatility of the particulates emitted by L-category vehicles in comparison to e.g. those emitted by diesel passenger cars.

6.2.1.2. Use of a revised World-wide Motorcycle emissions Testing Cycle (WMTC) for all L-category vehicles

Annex XV, Ch. 1.2	**Option 1:** No policy change; **Option 2:** Use of a revised World-wide harmonised Motorcycle emissions Testing Cycle (WMTC) for all L-category vehicles.

Table 18: Click on 'Annex' to display the detailed comparison of policy options 1 and 2

Summary:

The advantages of using the stage-two WMTC only for L3e category vehicles over the short term and a revised WMTC other L-category vehicles over the medium to long term outweigh the disadvantages by far. Therefore, option 2 is the preferred solution for the long term. In order to provide industry with sufficient lead-time a transition towards the use of WMTC for all L-category vehicles is proposed as summarised in Annex XV, Ch. 1.2, Table 2. Certain L-category vehicles (L1B, L2e, L5e, L6e, and L7e) do not yet come under UNECE global technical regulation 2 (WMTC). The Commission will need to launch an initiative within UNECE to include these subcategories in the long term (2020).

6.2.1.3. Type-approval requirements for CO_2 measurement and fuel consumption determination and reporting

Annex XV, Ch. 1.3	**Option 1:** No policy change; **Option 2:** Type-approval requirements for CO_2 measurement and fuel consumption determination and reporting

Table 19: Click on 'Annex' to display the detailed comparison of policy options 1 and 2

Summary:

The ratings for effectiveness, efficiency and coherence are overall positive to highly positive for option 2. Consumers need to have additional information presented in a standardised form for them to be able to compare the fuel efficiency of different vehicles within the L-category and to be able to compare with alternative means of road transport. This will allow them to purchase the most fuel-efficient vehicle or to choose the optimum transport alternative in terms of fuel cost and will make them aware of the green house gas emissions per kilometre travelled. The motorcycle riders' association, FEMA, for example welcomes the introduction of a compulsory labelling scheme, for which the data obtained through option 2 will be used as input. The preferred solution is therefore option 2. As L-category vehicles only contribute little to the overall CO_2 emissions of road transport as a whole, an explicit limit value was not deemed necessary. In fact, if the pollutant concerns of PTWs were addressed (currently their emissions are disproportionately high compared to all road transport based on mileage travelled), it would be advantageous if heavy, big passenger cars were to be substituted by light, flexible L-category vehicles. This may help to bring down the overall high fuel consumption of road vehicles and significantly reduce emissions of green house gas emissions like CO_2.

6.2.1.4. Evaporative emissions test and limit

Annex XV, Ch. 1.4	**Option 1:** No policy change; **Option 2:** Replacement of all new carburetted models with fuel-injected models; **Option 3:** Evaporative emissions test and limit ensuring evaporative emission control for L-category vehicles;

Table 20: Click on 'Annex' to display the detailed comparison of policy options 1, 2 and 3

Summary:

As the high hydrocarbon emissions of L-category vehicles can only be influenced to a relatively small extent by type-approval measures addressing evaporative emissions, an effective low-cost measure that can be implemented quickly is preferable. The advantages of option 2 will become automatically available if more stringent emission thresholds will need to be fulfilled and the highest part of the financial burden to the manufacturers will already be amortised by the necessary hardware changes under this policy option to introduce revised tailpipe emission limits. Option 3 is estimated to be the only cost-effective way of reducing evaporative emissions from L-category vehicles and is therefore the preferred option.

6.2.1.5. Durability requirements

Annex XV, Ch. 1.5	**Option 1:** No policy change; **Option 2:** (Scenario 2 from the LAT report): deterioration reduced to 10 % over useful life with linear extrapolation for higher mileages; **Option 3**: (Scenario 2 from the LAT report): useful life increased by 60 %, i.e. equivalent to the increase for passenger cars upon moving from Euro 3 (80k km) to Euro 5 (160k km).

Table 21: Click on 'Annex' to display the detailed comparison of policy options 1, 2 and 3

Summary:

Option 1 was discarded as this makes the introduction of revised emission limits ineffective. Option 3 is regarded as very expensive and may inhibit manufacturers from introducing new products on the market. The introduction of durability requirements for L-category vehicles in option 2 already addresses the majority of the concerns identified at an acceptable cost to industry, so is therefore the preferred solution.

6.2.2. New measures to control vehicle emissions over vehicle life

6.2.2.1. In-use conformity (IUC) testing and limits.

Annex XV, Ch. 2.1	**Option 1:** No policy change; **Option 2:** (Scenario 1 from LAT report): IUC procedure mandatory for all Euro 3 motorcycles.

Table 22: Click on 'Annex' to display the detailed comparison of policy options 1 and 2

Summary:

Owing to the many disadvantages, including impracticability and only moderate cost-effectiveness, IUC was discarded. However, this is one of the assumptions which will be re-examined in the environmental effect study referred to in chapter 6.2.1.1.

6.2.2.2. On-board diagnostic (OBD) systems and access to repair information

Annex XV, Ch. 2.2	**Option 1:** No policy change; **Option 2:** (Scenario 1 in LAT report) application of OBD systems using a similar technology as for passenger cars (EOBD), including catalyst efficiency and misfire monitoring for all L-category vehicles. Provision for access to repair and maintenance information, as for passenger cars; **Option 3:** (Scenario 2 in LAT report) use of best available technology (BAT): minor malfunction monitoring (e.g. circuit integrity check) (OBD stage 1) for all L-category vehicles, no catalyst efficiency monitoring. Provision for access to repair and maintenance information as for passenger cars.

Table 23: Click on 'Annex' to display the detailed comparison of policy options 1, 2 and 3

Summary:

A distortion of competition arises in the internal EU market, as independent repairers are not able to retrieve standardised diagnostic on-board information from vehicles and are therefore not able to repair failures as effectively and efficiently as contract dealers and repairers. In the repair cycle (diagnosis and analysis of problem, repair of smallest identifiable component or ordering of replacement parts and replacement of smallest exchangeable unit) the availability of harmonised diagnostic information from the OBD system is essential for an independent dealer or even for a vehicle owner, to effectively and efficiently repair a vehicle. As option 3 is estimated to have a much better cost-effectiveness than option 2, this is the preferred option for the short term (2017). In addition, option 3 paves the way for a possible introduction of option 2 in the long term (2019), if proven cost effective in the environmental effect study referred to in chapter 6.2.1.1.

6.3. Safety measures

6.3.1. Obligatory fitting of advanced brake systems

Annex XVI, Ch. 1	Qualitative and quantitative analysis of policy options for obligatory fitting of advanced brake systems **Option 1:** No policy change;
Annex XVI Ch. 1.1	**Option 2:** Anti-lock brake systems on all powered two-wheelers (PTWs);
Annex XVI Ch. 1.2 Annex XVI Ch. 1.3	**Option 3:** Anti-lock brake systems on PTWs with cylinder capacity >125cm^3 and advanced brake systems (combined brake systems and/or anti-lock brake systems) on motorcycles with 50 cm^3 < cylinder capacity ≤ 125 cm^3 (NB 125 cm^3 relates to the vehicle performance criteria for the A1 driving licence);
Annex XVI Ch. 1.4	**Option 4:** Obligatory fitting of advanced brake systems (combined brake systems and/or anti-lock braking systems) on motorcycles conforming to the performance criteria for the A2 driving licence. Obligatory fitting of anti-lock brake systems on all other L3e motorcycles;
Annex XVI Ch. 1.5	**Option 5:** Industry self-regulation.

Table 24: Click on 'Annex' to display the detailed comparison of policy options 1 to 5

See also Annex XVI, Ch. 1.6 for an impact assessment of anti-lock brake system technology fitted to vehicles manufactured and type-approved by SMEs.

Summary:

Recently, three retrospective studies[44] were published, which were not included in the literature study for the TRL report. The value of these studies is that the results were based on an analysis of actual accident data, unlike in the majority of the literature assessed, which was predominantly forward-looking. The Spanish study provided relevant statistics on motorcycle accident fatalities, indicating that motorcycles with a higher engine displacement are overrepresented in fatal accidents. The Swedish and US studies confirmed the high cost-effectiveness of anti-lock brake systems, with estimates even higher than for most of the studies summarised in the TRL report. The estimates ranged from 11 to 17 % in the Swedish study. On the other hand, the 38 % cost-effectiveness found in the US study was not statistically relevant, although the results indicated that 'there is considerable confidence that anti-lock brake systems prevent fatal crashes among motorcyclists'.

In terms of reducing fatalities and injuries, options 2, 3 and 4 are superior to options 1 and 5, which are therefore considered insufficient. In terms of cost-benefit ratios, options 3 and 4 are considered to be similar, and are under the given assumptions slightly worse than option 2. Option 5 lags significantly behind options 2, 3 and 4 in terms of saved lives and casualty prevention. The fact that the fatality statistics have remained more or less the same in recent years, despite the self-regulation already 'in force' since 2004, seems to indicate that the number of vehicles equipped with advanced brake systems in the EU market is not yet high enough to result in the significant road fatality reductions necessary to meet the safety objectives.

A concern with industry self-regulation is that offering vehicles with advanced brake systems as an option does not automatically mean that the vehicles sold are actually equipped with these systems. The industry depends on the demand from customers and their actual purchase decisions. If customers choose to save money and do not opt for advanced brake systems, even more in current times of economic difficult times, only a small part of the fleet will actually be equipped with these systems. If the current trend continues, only 23 % from the vehicle fleet are estimated to be equipped with anti-lock brake systems by 2020, as estimated in the TRL report, which is not regarded as sufficient to meet the safety objectives.

It should also be pointed out that ACEM's members are responsible for 90 % of the production of powered two-wheelers (PTWs) in Europe and up to 95 % of the market. This means that the remaining 10 % of vehicles produced by the 5 % of manufacturers not affiliated to ACEM are likely to continue producing vehicles not equipped with advanced brake systems, in order to sell products as cheap as possible. A further problem for the EU is that some vehicles on the market do not seem to meet any type-approval requirements relating to safety and the environment. This can only be addressed by better market surveillance, which is another priority for the European Commission, which will be addressed with this Regulation. The Commission appreciates the effort and good-will of the motorcycle industry to offer PTWs with advanced braking systems, but considers, for the above reasons and in view of other aspects listed in the detailed analysis, that self-regulation as not sufficiently effective to achieve its ambitious safety goals.

It is acknowledged that estimates of the cost of advanced brake systems are controversial, as no independent information is available from e.g. EuroStat, which is why best estimated values for options 2, 3 and 4 vary so widely. Chapter 3.5.1 in the TRL report (Table 11) gives best estimates of the price of advanced brake systems for option 5 at the point of sale (anti-lock brake system: € 539; combined brake system: € 150). In Table 14 of chapter 3.5.1, the best estimated price for both anti-lock brake systems and combined brake systems was € 150 for option 2. Despite of the controversy of this assumption it is assumed that the high demand from manufacturers to their suppliers for anti-lock brake systems and combined brake systems if they are made obligatory will result in similar economies of scale for options 3 and 4 and hence lower prices than for the other options.

Given the difference in complexity between anti-lock brake systems and combined brake systems, it seems obvious that the best estimated cost for combined brake systems will be lower than for anti-lock brake systems. It is therefore assumed that it is cheaper for a manufacturer to equip a PTW with a combined brake system than with an anti-lock brake system. For cheaper, less powerful PTWs in particular, the consumer price may be significantly increased if a more expensive anti-lock brake system is fitted instead of a cheaper combined brake system. Therefore, from a purely cost perspective, options 3 and 4 offer more advantages for the manufacturer and consumer than option 2. The best estimated price for combined brake systems (€ 150) is considered to be on the conservative side.

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44 1) Swedish Road Administration: The effectiveness of anti-lock brake systems on motorcycles reducing real-life crashes and injuries — 29 June 2009. 2) pp. 41 – 43: http://www.dgt.es/portal/es/seguridad_vial/estudios_informes/estudios_informes084.htm. 3) US Insurance Institute for Highway Safety: Effectiveness of Antilock Braking Systems in Reducing Fatal Motorcycle Crashes — October 2008.

Option 3 and to a lesser degree option 4 seem to offer the best compromise between significant fatality and injury reductions, on the one hand and an estimated moderate increase in cost to the end-consumer in the low-price PTW segment (mopeds and light motorcycles) on the other. In particular, linking the driving licence classification criteria to the type-approval criteria will also improve the coherence of EU legislation. For this reason, the preferred options are 3 or 4.

6.3.2. Anti-tampering measures

Annex XVI, Ch. 2	**Option 1:** No policy change; **Option 2:** Repeal Chapter 7 of Directive 97/24/EEC, currently obsolete anti-tampering measures; **Option 3:** New measures on anti-tampering.

Table 25: Click on 'Annex' to display the detailed comparison of policy options 1, 2 and 3

Summary:

Although no explicit cost information was available, option 1 is considered the no-cost option. On the other hand, no identified concern would be addressed. Option 2 is even worse and is considered to be a step back in time (before 1996). It would lead to a lot of undesirable amateur tuning, resulting in high vehicle speeds and unsafe and environmentally unfriendly vehicles. Option 3 is probably the most expensive of the threes, but has the potential to partly address the adverse effects of tampering and associated safety and environmental concerns. The preferred option is therefore option 3.

6.3.3. 74 kW power limitation for motorcycles

Annex XVI, Ch. 3	**Option 1:** No policy change; **Option 2:** Repeal the option given to Member States to limit power to 74kW; **Option 3:** Set a harmonised limit of 74kW; **Option 4**: Use alternative limitation criteria.

Table 26: Click on 'Annex' to display the detailed comparison of policy options 1, 2 and 3

Summary:

The anticipated societal impact of all the options is neutral. Option 2 is expected to have a positive economic impact. Both options 3 and 4 are likely to have a negative economic impact, but option 4 has the potential for a larger positive environmental impact. However, the magnitude of the environmental impacts is currently uncertain. Owing to the lower cost for manufacturers and the availability of more effective safety measures, such as the introduction of anti-lock brake systems, option 2 is the preferred option.

6.4. Improved categorisation of L-category vehicles

6.4.1. Recategorise electrically assisted cycles (currently outside the scope of the legal framework), tricycles (L5e) and quadricycles (categories L6e and L7e)

Annex XVII, Ch. 1	**Option 1:** No policy change; **Option 2:** Exclude quadricycles and electrical cycles and tricycles from the Regulation; **Option 3:** Return to the original spirit of the legislation for mini-cars; **Option 4:** Improve the legislation by adding new requirements for mini cars based on car requirements; **Option 5:** Refine vehicle categories by introducing new subcategories in L1e, L5e, L6e and L7e. Add new / revised requirements for these subcategories.

Table 27: Click on 'Annex' to display the detailed comparison of policy options 1 to 5

Summary:

Options 1 to 3 do not address the root problems. Option 4 can resolve these concerns for mini-cars, but still leaves a confusing set of rules for the L1e, L5e and L7e subcategories. The best solution for effective environmental protection and safety is correct classification, as proposed in option 5. Its disadvantage may be higher compliance costs for industry initially, but this would depend on how carefully the current classification is overhauled. New measures may emerge once appropriate subcategories are defined, e.g. there are currently no specific measures for the electrical safety of electric vehicles. UNECE regulation No. 100 on the safety of electrical vehicles could apply to such vehicles in future, but should not cover traditional vehicles equipped solely with internal combustion engines. The preferred solution after weighing the pros and cons is therefore option 5.

6.4.2. Specific requirements for category L7e vehicles

Annex XVII, Ch. 2	**Option 1:** No policy change; **Option 2**: Exclude off-road quads (ATVs) from the Regulation and add new requirements on safety and emissions for on-road quadricycles (on-road quads and mini-cars); **Option 3:** Keep the existing L7e category and add new requirements on safety for all quadricycles; **Option 4:** Create new subcategories within L7e with specific requirements for off-and on-road quadricycles.

Table 28: Click on 'Annex' to display the detailed analysis of policy options 1 to 4

<u>Summary:</u>

In analysing the pros and cons of the four different policy options, the advantage of flexibility to develop specific requirements addressing the specific concerns of different vehicle types became obvious. Initially, therefore, this led to a high preference for option 4, with a subcategory L7Be for ATVs, a subcategory L7Ce for mini-cars and a subcategory L7Ae for all other quadricycles classified as 'on-road' quads. The initial plan was also not to register off-road quads (ATVs) or equip these vehicles with a special registration plate and put a note in its vehicle papers that this vehicle type may only travel a short distance on public, hard-surfaced roads. This would have helped the enforcement authorities, as such vehicles could then be easily identified as not permitted in cities and far away from off-road areas.

On the other hand, not registering ATVs would have lead to identification concerns for enforcement authorities if a vehicle could not be stopped. Special registration plate requirements are solely individual Member State business and can therefore not be proposed by the Commission as EU wide legislation.

Unfortunately option 4 had to be discarded owing to the fact that off-road vehicles do not legally fall under the scope of the type-approval legislation for L-category vehicles. This legislation is only supposed to cover the type-approval of vehicles used on public roads. In addition, it was not possible to identify a sufficient number of critical vehicle characteristics able to distinguish sufficiently well between an off-road quad (ATV) and an on-road quad, as between e.g. a passenger car and a class G (off-road) vehicle. The design criteria initially selected could too easily be circumvented by retrofitting a cheap kit to adapt the original type-approved off-road vehicle to make it fit to drive on public roads. This would not have meant that such a retrofitted vehicle would then also comply with the specific safety and environmental measures specially designed for subcategory L7A. So, from a practical point of view as well, this concept had to be abandoned.

With options 1 and 3, either the problems identified are not addressed or the manufacturer of one vehicle type must comply with requirements developed to address concerns with the other vehicle types. Given this complex set of advantages and disadvantages, option 2 was chosen as the only feasible option. Furthermore, it still provides the best way to address the environmental and safety concerns of on-road quads and mini-cars in particular. ATVs will consequently no longer come under the L-category vehicle legislation and will be covered by the Machinery Directive 2006/42/EC with regard to safety aspects. ATVs will also need to comply with the Non-Road Mobile Machinery Directive 97/68/EC as amended by Directive 2002/88/EC as regards environmental requirements. The coherence of option 2 was considered to be better than for options 1, 3 and 4, as e.g. off-road motorcycles are also not covered by the L-category vehicle legislation and are therefore also classified as machines. Circumventing the stricter on-road quad requirements for retrofitted ATVs cannot unfortunately be completely prevented with option 2 at European level, so additional national rules will be needed to prevent this.

6.4.3. Specific requirements for gaseous alternative fuels and other non-traditional propulsions

Annex XVII, Ch. 3	**Option 1:** No policy change; **Option 2**: Legislation at EU level through a more refined vehicle categorisation with specific measures for the different vehicles and propulsion technologies.

Table 29: Click on 'Annex' to display the detailed comparison of policy options 1 and 2

<u>Summary:</u>

Gaseous fuels are in general perceived to be dangerous by consumers. To use these types of fuels on small vehicles such as PTWs, with very limited space available to e.g. incorporate a fuel tank, may sound exotic, but a small number of such vehicles are already nationally approved, so it is physically possible. It may become more attractive to manufacturers to develop and market these vehicles on a larger scale if such vehicles can be type-approved and sold on the whole EU market. By complying with appropriate, uniform international safety requirements, these vehicles will be as safe as or safer than vehicles propelled with conventional fuels. This will hopefully contribute to an improved safety perception among consumers, and demand for these vehicles may grow, especially because e.g. LPG, CNG or electricity are rather cheap in comparison to conventional fuels.

Providing the possibility to type-approve a vehicle propelled by alternative gaseous fuels or any other shape of form of alternative propulsions may make it attractive for consumers in the Member States to drive such vehicles and may encourage manufacturers to spend more on environmental technology development, thus increasing the pace of innovation in environmental technology. In particular, SMEs would benefit from this increased focus on niche market technologies. These are the reasons why option 2 is the preferred option. Despite this preference for including gaseous fuels within the new Regulation, hydrogen would for the time being remain excluded. There are many developments in hydrogen technology for light-duty vehicles (passenger cars), and EU legislation is being developed for four-wheel vehicles. In order to learn and benefit from this legislative development, more time is needed before drafting generic legal requirements for L-category vehicles propelled with hydrogen. Rather technological developments of this type of propulsion and associated requests to type-approve vehicles propelled with hydrogen will be handled on a case-by-case basis.

6.5. Overview of preferred options, detailed analysis and comparison with other options

Objective	Preferred policy option(s)	Link to detailed analysis of preferred policy option	Link to detailed comparison of policy options
Simplification of existing EU legislation	**Option (2)** Repeal current directives and replace with a minimum number of regulations	Annex X	Annex XIV
Environmental measures: new or revised measures for the type-approval of new vehicles	**Revised lower emissions limits**: **Option (3**) motorcycle industry (ACEM) proposal for the short to mid-term and **Option (5)** Equivalent Euro 5 passenger car limits for the long term	Annex XI Ch. 1.2 Opt. 3 AND Annex XI Ch. 1.2 Opt. 5	Annex XV, Ch. 1.1
	Emission laboratory test cycle: Option (2) Use of a revised World-wide Motorcycle emissions Testing Cycle (WMTC) for all L-category vehicles	Annex XI, Ch. 1.4	Annex XV, Ch. 1.2
	Type-approval requirement for CO_2 measurement and fuel consumption determination and reporting: Option 2: Actual introduction of type-approval requirements for CO_2 measurement and fuel consumption determination and reporting.	Annex XI, Ch. 1.5	Annex XV, Ch. 1.3
Environmental measures: New measures to control vehicle emissions over vehicle life.	**Evaporative emissions test and limit: Option (3)** Evaporative emissions test and limit ensuring evaporative emission control for L-category vehicles.	Annex XI, Ch. 1.6	Annex XV, Ch. 1.4
	Durability requirements: Option (2) Deterioration reduced to 10 % over useful life and linear extrapolation for higher mileages	Annex XI, Ch. 1.7	Annex XV, Ch. 1.5
	In-use conformity (IUC) testing and limits: Option (1) No change	Annex XI, Ch. 2.1	Annex XV, Ch. 2.1
	On-board diagnostic (OBD) systems and access to repair information: Option (3) Use of best available technology (BAT): minor malfunction monitoring (e.g. circuit integrity check) (OBD stage 1) for all L-category vehicles, no catalyst efficiency of misfire monitoring. Provision of access to repair and maintenance information, as for passenger cars.	Annex XI, Ch. 2.2 Opt. 3	Annex XV, Ch. 2.2
Safety measures	**Obligatory fitting of advanced brake systems: Option (3)** Anti-lock brake systems on PTWs with cylinder capacity >125 cm^3 and advanced brake systems (combined brake systems and/or anti-lock brake systems) on motorcycles with 50 cm^3 < cylinder capacity ≤ 125 cm^3; (NB 125 cm^3 relates to the performance criteria of PTWs that can be driven with an A1 driving licence) **OR** **Option (4)** Obligatory fitting of advanced brake systems (combined brake systems and/or anti-lock braking systems) on motorcycles that conform to the performance criteria for the A2 driving licence. Obligatory fitting of anti-lock brake systems on all other L3e motorcycles;	Annex XII Ch. 1.3 OR Annex XII Ch. 1.4	Annex XVI Ch. 1.3 OR Annex XVI Ch. 1.4
	Anti-tampering measures: Option (3) New measures on anti-tampering.	Annex XII, Ch. 2.2 Opt.3	Annex XVI, Ch. 2
	74kW power limitation for motorcycles: Option (2) Repeal the option given to Member States to limit power to 74kW;	Annex XII, Ch. 3	Annex XVI, Ch. 3

Improved categorisation of L-category vehicles	**Recategorise vehicle types such as electric cycles, motorcycles (L3e), tricycles (L5e) and quadricycles (categories L6e and L7e):** **Option (5)** Refine vehicle categories by introducing new sub-categories in L1e, L3e, L5e, L6e, and L7e. Add new/revised requirements for these sub-categories.	Annex XIII, Ch. 1	Annex XVII, Ch. 1
	Specific requirements for category L7e vehicles: **Option (2)** Exclude off-road quads (ATVs) from the Regulation and add new requirements on safety and emissions for on-road quadricycles (on-road quads and mini-cars);	Annex XIII, Ch. 2	Annex XVII, Ch. 2
	Specific requirements for gaseous alternative fuels and other non-traditional propulsions: **Option (2)** Legislation at EU level through a more refined vehicle categorisation with specific measures for the different vehicles and propulsion technologies.	Annex XIII, Ch. 3	Annex XVII, Ch. 3

Table 30: Summary table of preferred policy options with links to the detailed analysis, including all available quantitative and qualitative elements, and the detailed comparison with other policy options in terms of effectiveness, efficiency and coherence

7. MONITORING AND EVALUATION

7.1. Simplification

See Annex XVIII for the complete list of recommended monitoring and evaluation parameters. These mainly concern the number of amendments and the required time and cost of implementing these changes.

7.2. Environmental measures

7.2.1. New or revised environmental measures for the type-approval of new vehicles

7.2.1.1. Revised lower emissions limits

Four years after first application, the new legal framework should be reviewed to determine whether the assumptions and modelled emissions conform to reality at that point in time. An increase in the number of mass-produced hybrid and electrical vehicles may have a positive impact on local pollutant reduction. In 2016 – 2017 timeframe, the Commission should assess whether the additional promotion of electrified vehicles would effectively address the disproportionately high emissions from L-category vehicles equipped with combustion engines. In addition, it should assess the need to include off-cycle emission provisions in 2020 for vehicles equipped with traditional propulsion technology. The long-term preferred option 5 will initially be between braces, and further monitoring and evaluation by both the Member States and the Commission will be required in the period up to 2016, during which option 3 will be in force.

7.2.1.2. Use of a revised World-wide Motorcycle emissions Testing Cycle (WMTC) for all L-category vehicle categories

No specific monitoring and evaluation are deemed necessary, other than a comparison of actual pollutant emissions vs. predicted average emissions based on test cycle measurements. The same applies to real-world fuel consumption and the value determined in the test cycle. For mopeds, a WMTC-based test cycle does not yet exist. A study will be started in 2011 and an initiative will be launched by the Commission within UNECE in the informal group for WMTC development in order to extend the scope of the WMTC to mopeds, so that the type-approval emission test better reflects real-world driving conditions.

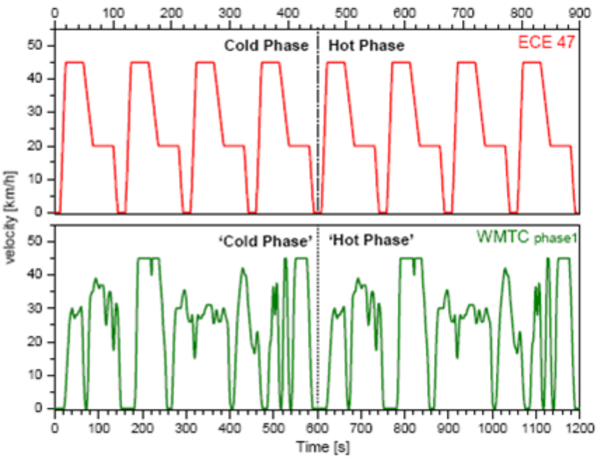

Figure 8: WMTC-based moped test cycle proposal (bottom) to replace the conventional R47 moped test cycle (top)

7.2.1.3. Type-approval requirements for CO_2 measurement and fuel consumption determination and reporting

For this policy option as well, real-world fuel consumption and CO_2 emissions should be monitored by both the Member States and the Commission and should be compared to the modelled results, which are based on the measurements obtained in the test cycle. For example, three years after the introduction of a future energy efficiency labelling system consumers should be asked if this additional, standardised information has substantially influenced their purchasing decisions towards more fuel-efficient vehicles.

7.2.1.4. Evaporative emissions test and limit

Actual and modelled HC emissions must be compared by the Member States and the Commission, e.g. in 2016 – 2017 timeframe, in order to judge if cost-effectiveness is as good as anticipated. Manufacturers should be asked to present the actual costs compared with the anticipated costs as presented in the various Motor Cycle Working Group meetings.

7.2.1.5. Durability testing of anti-pollution devices and aged vehicles

The Member States and the Commission should run a stand-alone durability test programme and have a statistically relevant sample of aged vehicles from the field, with a known maintenance history, by 2016. The actual test results of these vehicles should be compared with aged emission results from type-approval demonstration testing. This will indicate if the accelerated-ageing methods used to demonstrate aged vehicle emissions are effective and if there is a need to increase the durability mileage requirement as suggested by option 3.

7.2.2. New measures to control vehicle emissions over vehicle life

7.2.2.1. In-use conformity (IUC) testing and limits

In the 2016 – 2017 timeframe, this policy option should be reassessed by Member States and the Commission in the environmental assessment study to see if it should remain discarded or if the conditions or assumptions have changed to allow it to be reconsidered. Experience gained with e.g. passenger-car IUC may provide a better evidence base than available today.

7.2.2.2. On-board diagnostic (OBD) systems and access to repair information

In the 2016 – 2017 timeframe an environmental impact study should be conducted by the Commission with input from the Member States to assess the success of this option. The environmental advantages should be more accurately quantified and independent repairers should be asked if their current competitive disadvantage has changed for the better.

7.3. Safety measures

7.3.1. Obligatory fitting of advanced brake systems

See Annex XIX, Ch. 1, for the complete list of recommended monitoring and evaluation parameters. These mainly relate to the number of powered two wheel rider casualties, non-fatal casualty data and the equipment fitted. Crucial data such as Anti-lock brake system or combined brake system costs and the effect of the large-scale fitment of systems on market price were lacking and should continue to be sought after one of the recommended policy options has been adopted. These should be used as input for a study to be conducted by the Commission four years after first application of the new Regulation (2017).

7.3.2. Anti-tampering measures

See Annex XIX, Ch. 2, for the complete list of recommended monitoring and evaluation parameters. Recommendation from TUEV Nord report: spot checks on two- and three-wheeled vehicles registered before and after 17 June 1999, reported in 2003; EU-wide accident research including the state of the vehicles involved; where carried out, inclusion of unauthorised manipulations in periodical technical inspections; observing the market in electronic tuning devices; and practical research into the effect of electronic tuning on emissions, noise and maximum speed. There has since been significant technical progress with new power-train developments (electrical vehicles, hybrids), which could not be covered in the study at that time. The Commission should therefore have the study updated in 2011 to include the latest technology.

7.3.3. 74kW power limitation for motorcycles

See Annex XIX, Ch. 3, for the complete list of recommended monitoring and evaluation parameters. Baseline data need to be determined, including: sales data with respect to engine power/acceleration potential or whatever limitation measure is used; accident rates with respect to engine power/acceleration potential or whatever limitation measure is used; and emissions/noise data with respect to engine power/acceleration potential or whatever limitation measure is used. These data must be monitored by the Member States in relation to any other changes that could influence accident numbers, emissions or noise, for example anti-tampering measures, etc.

7.4. Improved categorisation of L-category vehicles

7.4.1. Electrical cycles (currently outside the scope of the Framework Directive), tricycles and quadricycles

See Annex XX, Ch. 1, for the complete list of recommended monitoring and evaluation parameters. Significant uncertainties remain regarding key costs in the approvals process and in the casualty and environmental impacts of the proposed options. These should be monitored by the Member States and used as input for an evaluation conducted by the Commission in 2016. Further data obtained to refine the assessments of potential impacts should be collected by the Member States. More detailed accident data are required to provide information on the safety of tricycles and quadricycles and to allow the impact of any measures to be assessed. A more specific categorisation of tricycles and quadricycles would allow the safety impact of future measures to be monitored.

7.4.2. Specific requirements for category L7e vehicles

See Annex XX, Ch. 2, for the complete list of recommended monitoring and evaluation parameters. Data on the costs of the proposed options could be gathered for evaluation purposes by monitoring type-approval costs prior to 2012 (the earliest proposed implementation of any change) and further investigating the costs of national approval, to be carried out by the Member States and the Commission. This would allow the costs of approval processes to be more accurately quantified for all proposed options. For all options, it is important that a means of collecting European accident data for quadricycles is implemented and that these accident data are disaggregated for different tricycle and quadricycle types and accident locations (on-road and off-road). This would enable a clearer assessment of the societal benefits of future safety improvement measures.

7.4.3. Specific requirements for gaseous alternative fuels and other non-traditional propulsions

See Annex XX, Ch. 3, for the complete list of recommended monitoring and evaluation parameters. It has not been possible in this report or in the TRL report to conduct a cost-benefit analysis of the options for gaseous fuel-powered or other alternative propulsion equipped category L vehicles due to insufficient information on: the shares of current environmental impacts from road transport that are due to each category of vehicle; the rate at which gaseous fuel-powered and other non-traditional propulsions for category L vehicles will be introduced in the EU27; the costs of these non-traditional propulsion category L vehicles (design, fitment, etc.); the costs of type-approval; and a full energy cycle assessment. More statistical data should be collected by the Member States and used as input for a study by the Commission in the 2016 – 2017 timeframe.

ANNEX I: L-CATEGORY VEHICLE DEFINITIONS

Definitions of L-category vehicles according to Framework Directive 2002/24/EC, chapter 1, article 1.2:

Category	Vehicle Name	Vehicle characteristics
L1e	Moped	**Two wheels** and maximum designed vehicle speed of not more than **45** km/h **and** characterised by: • cylinder capacity does not exceed **50 cm^3** in the case of the internal combustion type, or • maximum continuous rated **power** is no more than **4 kW** in the case of an **electric motor**;
L2e	Three-wheel Moped	**Three wheels** and maximum designed vehicle speed of not more than **45** km/h **and** characterised by: • cylinder capacity does not exceed **50 cm^3** if of the **spark (positive) ignition** type, or • maximum net **power** output does not exceed **4 kW** in the case of **other internal combustion engines**, or • maximum continuous rated **power** does not exceed **4 kW** in the case of an **electric motor**;
L3e	Motorcycles	**Two-wheels**, without a sidecar fitted with an engine having a cylinder capacity of **more than 50 cm^3** of the internal combustion type and/or having a maximum designed vehicle speed of **more than 45 km/h**,
L4e	Motorcycle & Sidecar	**Two-wheels**, **with a sidecar** fitted with an engine having a cylinder capacity of **more than 50 cm^3** if of the internal combustion type and/or having a maximum designed vehicle speed of **more than 45 km/h**,
L5e	Tricycles	**Three** symmetrically arranged **wheels** fitted with an engine having a cylinder capacity of **more than 50 cm^3** if of the internal combustion type and/or a maximum design speed of **more than 45 km/h.**
L6e	Light Quadricycles	**Four wheels**, unladen mass is not more than **350 kg** not including the mass of the batteries in case of electric vehicles, whose maximum design vehicle speed is **not more than 45 km/h**, and • whose engine cylinder capacity does **not exceed 50 cm^3** for spark (positive) ignition engines, or • whose maximum net **power** output does **not exceed 4 kW** in the case of **other internal combustion engines**, or • whose maximum continuous rated power does **not exceed 4 kW** in the case of an **electric motor**. These vehicles shall fulfil the **technical requirements applicable to three-wheel mopeds of category L2e** unless specified differently in any of the separate directives;
L7e	Heavy Quadricycles	**Four wheels**, other than those referred to in ca theory L6e whose unladen mass is **not more than 400 kg** (**550 kg** for vehicles intended for **carrying goods**), not including the mass of batteries in the case of electric vehicles, and whose maximum net engine **power** does **not exceed 15 kW**. These vehicles shall be considered to be motor tricycles and shall fulfil the technical requirements applicable to motor tricycles of category L5e unless specified differently in any of the separate Directives.

Table 31: overview table with design criteria for L-category vehicles, according to Framework Directive 2002/24/EC, Chapter 1, Article 1.2

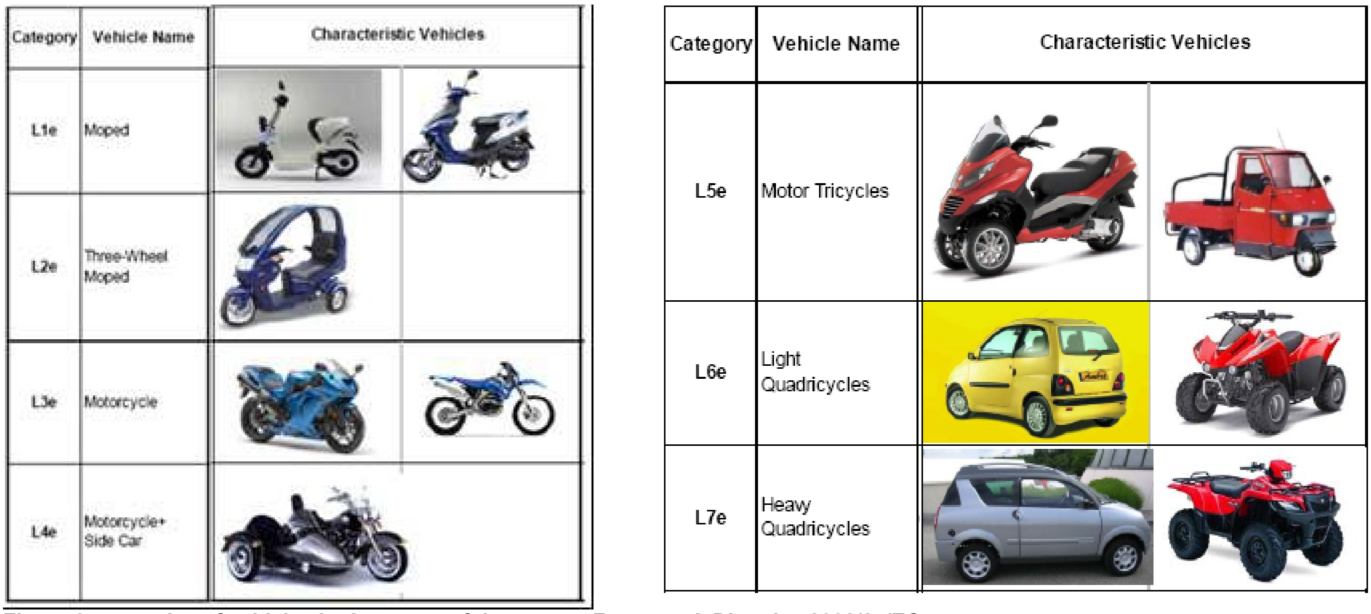

Figure 9: examples of vehicles in the scope of the current Framework Directive 2002/24/EC

Please note that no differentiation is currently made in the classes L6e and L7e between Quads for public road use, all terrain vehicles (ATVs) and mini cars. As long as the minimum design criteria of Framework Directive 2002/24/EC, Chapter 1, Article 1.2 are fulfilled all three types of vehicles may be associated to L-vehicle, class L6e, respectively L7e.

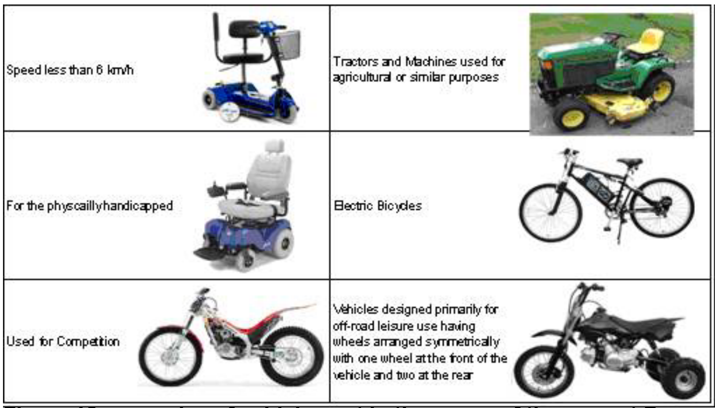

Figure 10: examples of vehicles not in the scope of the current Framework Directive 2002/24/EC

Besides the classification as defined in Framework Directive 2002/24/EC, Chapter 1, Article 1.2 there are also other classifications used to refer to sub-categories of L-category vehicles. Examples of other categorisation within the L-category vehicle families:

– Mopeds, besides the traditional widely known one-track vehicles there are also e.g. electrical cycles with a power higher than 250 W (0.25 kW), which are considered to be a Moped and must therefore be type approved as such a vehicle.

– Powered Two Wheelers (abbreviated PTWs): this is a summary expression for one-track (2-wheel) vehicles combining L-category vehicles L1e and L3e.

– Trikes or Motor Tricycles, this is a wide variety of different two-track vehicle types, some with 2 wheels in the front and one in the rear, others with a configuration of 2 wheels at the rear and one in the front. The greater shares of these vehicles are equipped with gasoline engines, but there are also a number of vehicles, which are equipped with a Diesel engine.

– Quadricycles: two-track 4-wheel vehicles like quads used on public roads, all terrain vehicles used mainly off-road and mini cars. Quads used on public roads are predominantly powered by gasoline engines, mini cars are in general equipped with small industrial diesel engines.

ANNEX II: PUBLIC CONSULTATION ON OUTLINE PROPOSALS FOR A REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL FOR L-CATEGORY VEHICLES — SUMMARY OF RESPONSES

1. CONTEXT

The Commission launched an open public consultation seeking to gather views of interested parties on its outline proposals for new legislation for L-category vehicles. A consultation document has been published[45] to provide background and ask for opinions on this new framework, which should replace the Framework Directive and 13 separate directives and their many amending directives. These outline proposals are thus embedded in the EU strategy to improve the regulatory environment towards simplification, safety and environmental aspects.

The public consultation was targeted at those groups that would be most affected by the proposals, including type-approval authorities in Member States, manufacturers, suppliers and consumers; published on a specific website created for the purposes of the consultation; and published in English, French and German.

The Commission has acknowledged the receipt of all stakeholder responses to the consultation, and these have been made publically available. [46] . The results of the public consultation were published in a report.[47]

The written consultation was discussed on 29 June 2009 in a meeting of the Commission's Working Group on Motorcycles[48] (MCWG) to which all relevant stakeholders were invited. The preliminary impact assessment study results will be presented in the MCWG planned to take place on 26 November 2009. The public consultation met with the Commission's minimum standards for consultation.

2. OVERVIEW OF RESPONDENTS AND ANALYSIS METHOD

In total fifty-seven respondents completed the survey and sent back their replies to the functional mailbox of the Commission services. Forty-one respondents replied on behalf of an association, a company or a public authority, while sixteen replies were received from individual citizens.

The unfiltered responses from all respondents can be accessed directly on the Commission's website. In order to obtain a balanced, the responses from associations, companies and public authorities were combined.

Although 16 individual citizens participated to the public consultation, in many cases the questions were left uncommented. The citizen replies that were applicable and which could be associated with the various questions have been summarised in a separate chapter. Individuals' e-mail and postal addresses have been removed in line with the pre-questionnaire privacy statement.

The next step was to classify the replies in an overview table per question. The final results were interpreted and summarised in the summary report.

3. SUMMARY OF RESPONSES

L-category vehicles refer to a classification of a wide range of 2-, 3- and 4 wheel vehicles like e.g. 2- & 3-wheel Mopeds, 2- and 3-wheel Motorcycles, Tricycles, All Terrain Vehicles/Quads and other quadricycles like mini-cars. All these different types of vehicles are currently type approved under the scope of EU framework directive 2002/24/EC and its fourteen associated implementing directives.

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45 http://ec.europa.eu/enterprise/automotive/consultation/2_3_wheelers/index.htm.

46 http://ec.europa.eu/enterprise/automotive/consultation/2_3_wheelers/contributions.htm.

47 http://ec.europa.eu/enterprise/automotive/consultation/2_3_wheelers/results_report.pdf.

48 http://ec.europa.eu/enterprise/automotive/mcwg_meetings/29_06_2009/index.htm.

A number of potential policy options were developed in order to meet the overall objectives. Subsequently a public consultation paper was published on the Internet at the end of 2008. This questionnaire, including a brief explanation on every potential policy option and 20 associated open questions, was published on the Commission's website with a request to reply from Associations, Public Authorities and individual citizens. The replies to this consultation paper were collected, classified, analyzed and again published on the Commission's website. In total fifty-seven replies were received, as summarised in attachments #2 to this report.

Questions 1, 2 and 3 were related to simplification. The majority of the respondents were in favour, but some respondents doubted whether this proposal was actually going to deliver the promised simplification or not. More transparency, better harmonisation, and reduction of unnecessary administrative costs were anticipated by some respondents as justification to simplify the current legal requirements. Also using equivalent international UNECE regulations to replace current EU directive requirements was perceived as positive by the majority of the respondents. A small number of critical voices feared that increasing the use of references to UNECE regulations would create a costly bureaucratic burden and generate a democratic gap from transferring future regulatory work from the EU process to this United Nations body.

Questions 4 and 5 were dedicated to questions regarding emission measures. About half of the total number of survey respondents representing associations, companies and public authorities (a total of forty-one), were supportive on the introduction of new emission limits equivalent to Euro 5 limits for petrol cars. An additional fifteen percent from the total number of this group of respondents were conditionally in favour, summarised as 'Relatively Favourable'. The conditions were mainly comprised of a sufficiently long lead time or a multi step approach for Industry to develop technology. Four respondents of this group of forty-one and the majority of the sixteen individual citizens were absolutely against the proposal fearing that more severe emission requirements would lead to a significant higher customer price. The majority of the respondents were also in favour of additional related emission measures like e.g. durability requirements, evaporative emission limits and CO_2 and fuel consumption measurements.

Questions 6 to 17 were related to safety measures. Question number 6 requested for the survey participant's view on mandatory fitting of Anti-lock Brake Systems (ABS) on Powered Two Wheelers (PTW) and potential alternative solutions. Explicitly being in favour or against mandatory fitting of ABS were approximately 30 % each of the forty one respondents from the mix of associations, companies and public authorities. However, an additional seventeen percent of this group of respondents were conditionally in favour of mandatory fitting of ABS, referred to as 'Relatively Favourable'. Examples of these conditions were: mandatory fitting of ABS only for bigger PTWs, optional / voluntary fitting for small versions or other conditions like 'a robust Impact Assessment analysis should first demonstrate a positive cost-benefit ratio'. Question number 7 required the respondents view on other or supplementary solutions better suited for certain categories (i.e. coupled brake systems, stability control systems, etc.) that would produce the same/better effect than ABS at better (lower) cost. The top two of suggestions by the respondents: 'alternative advanced brake systems' (20 %) and 'no alternative solution but ABS' (10 %).

Questions 8 and 9 requested feedback on potential anti-tampering measures and asked for suggestions for alternative measures with respect to tampering prevention. A wide majority of survey participants (29 %) that responded (52 % of the 41 respondents) is opposed to additional anti-tampering measures. Frequently expressed opinion among the survey participants, including the ones from the individual citizens, is that there is a need for anti-tampering measures with respect to Mopeds (L1e, L2e), but that additional anti-tampering measures for motorcycles (L3e, L4e, L5e) would be 'adverse to users' rights to make modifications to their motorcycles, providing these do not compromise their safety and impact on the environment.'. The top two responses to question number 9 if other solutions would be preferable: a shared first place for 'No additional solutions' and 'Periodical technical Inspections' (both 7 % from the 41 survey participants from associations, companies and public authorities) and on number two 'Measures covering the electronic devices controlling the vehicle's maximum speed, the inter-changeability of components, the CVT components, the exhaust silencing system and marking (5 % of total).

A high response rate (66 % of total) was noted on questions 10 and 11 regarding power limitation and its alternatives. The absolute majority (51 % of total 41 respondents from associations, companies and public authorities) were absolutely against power limitation, supported by nearly all individual citizens, owing to the opinion that a correlation between vehicle power and accident frequency was not scientifically proven. The top two of alternatives suggested by the respondents; a shared first place through education/training and power/mass ratio limitation (with each 12 % of total), the second place for regular safety inspections with 5 % of total.

Questions 12 and 13 were related to mini-cars (categories L6e and L7e). 32 % of the respondents were of the opinion that that EU legislation on these vehicles is justified, 7 % was relatively favourable and 12 % was not agreeing to this statement. The adversaries of this statement predominantly thought that these types of vehicles should be regulated under national legislation of the Member States. Regarding the question whether these vehicles should have designated safety requirements or comply with the same safety standards as passenger cars only 12 % of the respondents were in favour for passenger car safety measures compliance. The majority would like to see measures that are specifically designated to these types of vehicles.

Questions 14 to 16 were related to quads. The majority of respondents is favourable (39 % if the share ‘relatively favourable’ is included) to the question if these vehicles should be in the scope of type approval whereas they are not designed to be used on the road. Not a single respondent agreed with the statement that at present the category in which these vehicles are type approved is adapted to the design of such vehicles. The majority of the respondents would like to see new specific requirements be added to improve the safety of such vehicles.

The last question related to L-category vehicle safety, number 17, was related to the need if in the scope of the EU legislation hydrogen vehicles should be included. There was a slight majority in favour of EU legislative requirements regarding L-category vehicles fuelled with Hydrogen. Most of the stakeholders that are against this policy option argue that the technology is still in its early stage of development and that legislation may hinder innovation. The Motorcycle Industry and individual citizens were of the opinion that EU legislation on hydrogen Powered Two Wheelers is not needed for the very next future. Prototypes could be individually type-approved at national level or to be subject to an exemption of the current framework directive.

Questions 18 to 20 were related to the overall impact of new L-category vehicle legislation on the competitiveness of the EU industry. Only one third of the survey participants decided to reply to these questions. Question 18 requested for the view of the participants on the impact of measures related to the competitiveness of the EU industry, and in particular on the Small and Medium Enterprises (SMEs)? The reply of 22 % of the respondents was positive, 10 % anticipated a negative impact on the Industry. Question 19 asked for the view on the impact of employment within the EU, which 15 % of the respondents thought this will be influenced negatively. Only 7 % considered a positive effect and was optimistic for the future of e.g. suppliers owing to the development of new technologies and increased production of components and systems owing to higher demand from their customers. Finally on question 20 asking for the potential impact from new legislative requirements on the final customer price, the survey participants that responded were all of the same opinion, 34 % of total thought there would be a negative impact of new measures on the end customer price.

ANNEX III: DESCRIPTION OF THE TASKS REQUESTED TO THE EXTERNAL CONSULTANT TRL AND METHODOLOGY USED — POLICY ASSESSMENT REPORT REGARDING POSSIBLE SAFETY MEASURES

1. DETAILED DESCRIPTION OF THE TASK TO BE PERFORMED

In general terms, the impact assessment shall include an identification and estimation of the likely economic, safety and social effects of the following policy options, compared to the 'no policy change' baseline scenario. The baseline for the impact assessment will be the state of play of the legislation today.

The study will provide overview of the state of the art of safety as well as the trend in terms of market and technology development. For the European market, the share between vehicles produced in Europe and vehicles produced outside Europe will also have to be provided. Then, for each policy option, both positive and negative impacts at EU level on road safety and costs for the manufacturer should be considered as well as the time at which they are likely to occur (short, medium or long-term). In each of the mentioned cases the cost of the measures to be introduced will include manufacture, assembly, testing and final type approval of vehicles. In assessing the costs of the possible measures, the contractor should seek to collect cost data from the different stakeholders (manufacturers, suppliers, etc) and take into account the reduction in costs when a technology is produced in high volumes following new regulatory requirements. The Contractor will therefore asses and highlight the uncertainties in costs and benefits.

Overall, the time and effort put down in assessing the various impacts should be proportionate to their likely significance. Therefore, more focus should be put on the assessment of impacts which are likely to be important (e.g. potentially the economic and safety ones) than on those that are potentially less important (e.g. potentially the social ones but understanding that in this case, measures applied to two and three-wheel motor vehicles may have a higher social cost on users than similar measures applied to passenger cars).

The contractor shall include wherever possible the EU 27 Member States. The measures would be introduced in 2011 at the earliest. The following possible options had to be assessed:

– ABS/coupling braking devices for motorcycles
– Anti-tampering for mopeds, motorcycles, tricycles and quadricycles
– 74 kW power limit for motorcycles
– Quadricycles (L6e and L7e)
– Off-road quads
– Safety of hydrogen powered L category vehicles.
– Simplification of the legislation

2. METHODOLOGY

The contractor will provide a comprehensive analysis covering the above mentioned issues and will present a series of recommendations indicating the respective advantages and disadvantages of the different policy options, clearly outlining and taking into account:
The positive and negative impacts of the options selected, particularly in terms of quantified economic, social, safety and environmental consequences.
Other additional effects. Description in qualitative terms and quantified as far as possible.
Impacts over time (time scale 10 years).
Spread of impacts on social groups or economic sectors.
The reports from the contractor will be structured in accordance with the Commission document SEC (2005)791 'Impact Assessment Guidelines', updated in March 2006. The contractor's methodology will be based on the Impact Assessment Guidelines and its Annexes.
The contractor will perform the above analyses on the basis of:
existing legislative measures in place for two- and three-wheel vehicles in other world markets;
the published literature;
experimental data in the hands of the contractor or available in the public domain;
the information circulated in the Commission's motorcycles working group;
and any additional data the contractor will provide for the benefit of the study.

ANNEX IV: DESCRIPTION OF THE TASKS REQUESTED TO THE EXTERNAL CONSULTANT LAT AND METHODOLOGY USED — POLICY ASSESSMENT REPORT REGARDING POSSIBLE SAFETY MEASURES

1. SUBJECT OF THE SERVICE REQUEST

The subject of the service request is an assessment study of possible measures on motorcycles emissions, which will be based on the study conducted by the University of Thessaloniki (LAT) in 2004.

1.1. Detailed description of the tasks to be performed

The study will identify and evaluate the likely economic, environmental and social impact of four different **policy options**, taking into account the foreseen legislation for light duty vehicles (Euro 5-6) and heavy duty engines (Euro VI):

No policy change: This policy option corresponds to the situation where no additional measures to those defined in the Directives 2002/51/EC and 2006/72/EC will be taken for the control of the motorcycle emissions.

Initial Commission proposal: This policy option reflects the proposal prepared by the European Commission on the basis of the agreed measures in the MVEG-motor group as well as the results of the LAT study, with a possible amendment of the equivalent Euro 3 limit values for the WMTC to account for the recent modifications of the test cycle and new experimental data on the emission performance of Euro 3 motorcycles.

Euro 5 passenger cars equivalent limits: This policy option differs from the 'Commission proposal scenario' only in the introduction of more stringent emission limits for motorcycles that would be equivalent to the Euro 5 limits for cars.

Best available technology: This policy option will consider the introduction of a range of measures that will reflect the application of what is assumed to be today the 'best available technology' for two and three-wheel motor vehicles.

The technical measures to be considered in the formulation of the above policy options will include:

A procedure to check the durability of emission control systems.

A procedure to check the in-use conformity of the motorcycles.

The technical provisions for the type-approval with respect to CO_2 emissions and fuel consumption.

The new set of pollutant emission limit values for tricycles and quadricycles discussed in the MVEG group.

The introduction of OBD systems on two and three-wheel motor vehicles.

The control of evaporative emissions from two and three-wheel motor vehicles.

The introduction of the WMTC as the only test cycle for EU type-approval.

A possible introduction of the 'family concept' in the type approval procedure.

The new set of pollutant emission limit values for mopeds discussed in MVEG, on the basis of the policy options.

The tasks that will be performed in the framework of this study are:

Task 1. Information collection and analysis

Task 1.1. Overview of the technical legislation on emissions from two and three wheelers and quadricycles used in the main markets of the world including developing countries (US, Japan, India and China).

Task 1.2. Overview of the technology currently used in the main markets and the latest technological developments.

Task 1.3. Revision of the equivalent Euro 3 limits for WMTC

Task 1.4. Clarification of the policy options.

Task 2. Evaluation of the environmental, economic and social impact of the different policy measures.

Task 2.1. Estimation of the financial effects associated with the introduction of the different policy options.

Task 2.2. Estimation of the environmental benefits associated with the introduction of the different policy measures.

Task 2.3. Identification and characterisation of any social impact associated with the introduction of the different policy measures.

Task 2.4. Cost effectiveness of the different policy measures

1.2. Methodology

A methodological approach similar to the one followed in the LAT study will be applied, with proper revisions and enhancements where necessary. The study team will provide a comprehensive analysis covering the above mentioned issues and will present a series of recommendations indicating the respective advantages and disadvantages of the different policy options, clearly outlying and taking into account:
The positive and negative impacts of the options selected, particularly in terms of economic, social and environmental consequences.
Other additional effects. Description in qualitative terms and quantified as far as possible.
Impacts over time at short medium and long-term. The evaluation time will span over 10 years.
Spread of possible impacts on social groups other or economic sectors, with special reference to SME's.
Following the guidelines outlined in the Commission document SEC (2005)791 'Impact Assessment Guidelines', the method to be used comprise:
Step 1: Information collection and analysis
Step 2: Formulation of the different policy options
Step 3: Simulation
Step 4: Impact assessment/cost-effectiveness

ANNEX V: SELF OBLIGATION EUROPEAN MOTORCYCLE INDUSTRY ASSOCIATION (ACEM)

Advanced Braking Systems

ACEM Commitment on Advanced Brake Systems offer deployment on Powered Two-Wheeler vehicles in the framework of a road safety agreement between the European Commission and ACEM

ACEM, the Motorcycle Industry in Europe, is the professional body representing the interests and combined skills of 12 manufacturers, responsible for a total of 25 motorcycle, scooter and moped brands. The members of ACEM account for 90% of the European production and powered two-wheeler market.

Background Information

1. Brake/tyre combinations on today's powered two-wheelers have very high performance capabilities in a very wide variety of traffic and road conditions. In some emergency situations, when the rider has to make decisions in a split second, human 'decision failures' and faulty collision avoidance manoeuvres sometimes lead to loss of control, tyre lock up, rear tyre slide out, etc. In other cases, the accident happens without sufficient warning for the rider to take any action.

2. In 2004, in an effort to provide simpler-to-use Braking systems to riders and especially novice riders in emergency as well as in all other braking situations, ACEM manufacturers have jointly committed to the European Road Safety Charter to progressively supply powered two-wheelers with advanced braking systems, taking into account their distinctive characteristics.

3. As a result of this commitment, 35% of the motorcycles sold by the ACEM manufacturers and registered in Europe in 2008 were equipped with advanced braking systems.

4. Demand and market acceptance are crucial to the development of advanced braking systems on powered two-wheelers, and largely depend on the appropriateness of the solutions offered, technically and in terms of cost, to the specific market segment and model.

5. ACEM believes that it would be impractical and nearly impossible to try to translate into legislation the rich variety of systems and combinations of systems and their adaptation to the variety of motorcycles and uses. A legislative approach (that, by definition, would need to be simple, clear and rigid) would lose the benefits of this diversity and would be detrimental to technology innovation.

Introduction and Principles

(1) This new Commitment is part of the ACEM road safety strategy that is based on the three following main pillars

- Improving the knowledge about motorcycling safety,
- Developing an integrated approach, and act on:
  - The human factor,
  - The vehicle,
  - The infrastructure,
- Cooperating with institutions and stakeholders.

(2) This commitment has the support of all ACEM powered two-wheeler manufacturing companies including their respective affiliated companies and commercial brands:

- Bayerische Motoren Werke AG (BMW Motorrad) as well as its affiliated company Husqvarna Motorcyles S.r.l.,
- BRP European Distribution s.a
- Ducati Motor Holding S.p.A.,
- Harley-Davidson Europe Ltd. as well as its affiliated company Buell, MV Agusta and its commercial brand Cagiva,
- Kawasaki Motors Europe N.V.,
- KTM-Sport motorcycle AG,
- Honda Motor Europe Ltd., as well as its affiliated company Montesa,
- Peugeot Motorcycles,
- Piaggio & C. S.p.A. as well as its affiliated company Derbi, and its commercial brands Vespa, Gilera, Aprilia, Scarabeo and Moto Guzzi
- Suzuki International Europe GmbH,
- Triumph Motorcycles Ltd.,
- Yamaha Motor Europe n.v. , as well as its affiliated company MBK Industries.

These companies have agreed to make every endeavour to contribute to ACEM's road safety goals to reducing accidents by funding research, financing and participating to road safety projects and acting towards the common objective of improving the road safety of powered two-wheeler users through “shared responsibility” initiatives.

(3) This Commitment is in line with the European Union's undertakings under the European Road Safety Action Programme and in particular with the European Road Safety Charter, whose principles were adopted by ACEM and its members after ACEM became one of the first signatories at the Dublin Charter event in April 2004.

(4) At the same time this commitment aims at preserving the diversity of the product offerings of the manufacturers, reflecting the diversity of motorcycle use, encouraging the development of innovative solutions especially in the domain of brake systems. This commitment also seeks to not negatively influence competitiveness, as well as the financial performance and employment of the European powered two-wheeler industry.

(5) ACEM is assuming that this Commitment provides complete and sufficient substitute for all new regulatory measures to mandate any advanced braking systems on powered two-wheelers of any category, as long as it is being honoured and produces satisfactory results in terms of market penetration.

(6) The European powered two-wheeler industry's braking commitment is very ambitious in the light of present and future technologies, and the industry is willing and prepared to commit substantial development efforts to implement it.

(7) Together with the European Commission, ACEM will ensure that the Commitment is implemented in a manner that is in line with applicable competition rules.

ACEM Commitment

(8) This new ACEM Commitment is based on the experience and expected results from the ACEM braking commitment agreed among powered two-wheeler manufacturers under the umbrella of the European Road Safety Charter in 2004.

(9) The motorcycle industry in Europe commits to progressively supply more motorcycles (powered two-wheelers above 50 cm^3) equipped with advanced braking systems to the market of the European Union.

(10) As before, this new commitment will take account of the main purposes of motorcycles, their distinctive characteristics and specificities, e.g. balance, weight, dynamics, and general capacities, and the cost-effectiveness of the technical solutions.

(11) As a result of this commitment 75% of street motorcycle models offered on the market in 2016 will be available with an advanced braking system as an option or as standard fitment.

(12) To assess compliance and results with this commitment, there will be a joint ACEM/Commission monitoring of the relevant factors with regard to this commitment i.e. % of manufacturers' offering of motorcycle and market penetration. The Commission could decide to follow up the commitment and its results through an independent auditor.

Definitions and Scope

(13) An Advanced Braking System is a braking system in which either an antilock brake system and/or a combined brake system is present. An Antilock Brake System is a system for sensing and controlling the amount of relative slip velocity between the tyre and road surface during braking. A Combined Brake System / CBS is a type of PTW braking system in which each brake manipulator (i.e., either lever and/or pedal) actuates a brake on the front wheel and a brake on the rear wheel. Definitions and performance and construction requirements for each of these brake systems are as laid down in ECE 78 or GTR3.

(14) Both braking systems (ABS and CBS) can be combined and complemented with additional features e.g. rear lift off protection, automatic brake force distribution, powered braking system, braking-by-wire system etc. Any other brake system with a function and braking performance equivalent to ABS or CBS, or better, is considered as Advanced Brake System.

(15) Any innovative architecture of motorcycles (powered two-wheeler above 50 cm^3) with a brake system, whose function and braking performance are equivalent to ABS or CBS, or better, will be consolidated in the above mentioned monitoring of Advanced Brake System deployment.

(16) The commitment covers street motorcycles. The commitment does not cover certain categories of vehicle known as enduro and trial motorcycles. Enduro and trial motorcycles are primarily designed for off-road use and are therefore incompatible with ABS and indeed coupling braking devices: being able to intentionally lock the wheels is essential in certain off-road conditions. The industry commitment therefore excludes those vehicles corresponding to the following characteristics:

Enduro Motorcycles

– Minimum seat height: 900 mm and

– Minimum ground clearance: 310 mm and

– Minimum overall gear ratio in the highest gear (primary ratio x gear ratio x final drive ratio) of 6, 0;

Trial Motorcycles

– Maximum seat height: 700 mm and

– Minimum ground clearance: 280 mm and

– Maximum fuel tank capacity: 4 l and

– Minimum overall gear ratio in the highest gear (primary ratio x gear ratio x final drive ratio) of 7, 5.

(17) The Industry commitment also excludes vehicles intended for production in small series of up to a maximum of 200 units a year per type of vehicle, per system, per component or per separate technical unit.

Accompanying Provisions

1. Promotion of advanced braking system technologies

This commitment is based on the assumption of an unhampered distribution of motorcycles fitted with advanced braking systems into the market via competition amongst ACEM members and other market participants which is expected to result in market mix changes. Therefore it is fundamental that any measures which might hamper the distribution process will be taken into consideration in the monitoring procedure.

2. Acceptance of innovations

The acceptance by the Commission, that innovative concept of vehicles/features offering better performance than conventional braking systems comply with the Commitment.

Monitoring

The Motorcycle Industry in Europe will regularly communicate a status report on the progress of advanced braking systems available on the market. The joint ACEM / Commission monitoring procedure should cover:

(18) The development of the manufacturers' offering of motorcycles available with advanced braking systems.

(19) The development of the market penetration of registered motorcycles fitted with advanced braking systems.

(20) The assessment of new technologies and vehicle architectures that can be agreed to be in the spirit of this Commitment.

(21) The percentage offered with an advanced brake system shall be measured by calculating the number of types offered with an Advanced Brake System variant or version versus the total number of types offered (type, variant and version as defined in framework directive 2002/24/EC).

To allow manufacturers to collect all data on new model line ups, the actual calculations of the status of the commitment will happen at the end of a year (first time end of 2015).

The Commission's official reports on the monitoring results may refer to individual companies' achievements. ACEM is willing to provide the necessary data to achieve the objectives of the monitoring.

ACEM and the Commission will review the situation on the basis of the monitoring reports and make any necessary adjustments in good faith, in particular also if the impacts of this Commitment on the European motorcycle industry and market, the employment situation and the global competitive environment, would appear to be detrimental.

ANNEX VI: SELF OBLIGATION EUROPEAN MOTORCYCLE INDUSTRY ASSOCIATION (ACEM) ENVIRONMENTAL ASPECTS

acem

The Motorcycle Industry in Europe

Brussels, 11th of February 2009

Reduction of polluting emissions from Powered Two-Wheelers

ACEM Proposal

ACEM, the Motorcycle Industry in Europe, is the professional body representing the interests and combined skills of 11 powered two wheelers (PTWs) manufacturers producing a total of 24 motorcycle and moped brands, and 15 national associations out of 13 European countries.
ACEM members are responsible for 90% of the European production and up to 95% of the European market, which touched the 2.5 million units landmark at the end of 2007. The product range goes from small 50cc town vehicles, up to motorcycles of 1000cc and over, and products are divided into different segments such as moped, scooter, super-sport, touring, commuter, custom, traditional and off-road bikes. ACEM members represent a turn-over of 10 bn EURO and provide jobs to over 200.000 people.

Market and current economic environment
Market trends clearly show that PTWs answer the mobility needs of an increasingly higher share of the European population. The fleet has been steadily growing over the last few years, reaching about 33 million PTWs in use in 2006. According to market projections the fleet is expected to continue to grow and reach between 35 and 37 million vehicles in 2020. Motorcycles above 50cc would benefit more from this market evolution than 50cc mopeds, and account for 2/3 of the future PTW circulating park. However, the negative impact on the sector of the current economic situation remains to be fully gauged. This furthermore requires the development of a legislative timeframe for PTWs compatible with industrial development, taking into account the economic situation.

PTW emissions
Since the development of PTW emissions legislation began within the EU, ACEM has been a full participant in the ongoing process. To date, ACEM has provided key expertise and considerable resources to the development of the GTR2 test cycle and also to the package of measures agreed at the December 1st 2005 MVEG meeting. More recently, ACEM has provided input and assistance to the Commission's consultants LAT, in a fully open and cooperative way.

In view of the growing participation in European's mobility, ACEM therefore welcomes the continuation of a process that will lead to further reduce the PTW contribution to the total road transport emissions. Consequently, **ACEM wishes to support measures aimed at achieving equivalence with passenger car emissions at Euro 5/6** (gasoline engine).

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Brussels, 11th of February 2009

However, the technological challenges the PTW industry will face at the emissions levels commensurate with this goal will run far beyond a simple upgrade of existing emissions control technology. Indeed, the solutions required will be neither simple nor inexpensive. ACEM members anticipate that new engines will have to be developed completely, or at least the inlet-combustion-exhaust areas of existing engines radically revised, including other major measures. Coupled to this will be a need for more advanced fuel delivery and exhaust systems, with inevitable consequences for other areas of the vehicle.

In assessing the implications, in particular given the current economic situation, ACEM members have stated that development of these solutions require sufficient lead time. Mindful of the need and desire to progress in the reduction in PTW emission levels in the shorter term, ACEM therefore proposes a two-stage reduction process as follows:

- A first stage comprising of the package of additional measures agreed at the 1/12/05 MVEG and a 25% reduction in tailpipe emissions for motorcycles from 2006/72/EC row C limit values. This step, applicable simultaneously with the future regulation, also foresees the introduction of the new test cycle for mopeds and the limit values for quadricycles, both agreed in December 2005.
- The second stage, following a minimum of three years later, realising the goal of motorcycle equivalence with car Euro 5/6 (gasoline) using the calculation method presented by LAT in the October 2008 MCWG meeting.
- In both proposed stages, the needs of motorcycles equipped with two-stroke engines must be considered. We propose that limit values for vehicles equipped with two-stroke engines be specified in terms of an HC+NOx limit value by simple addition of the separate limit values for four-stroke engines (i.e. no change in the level of stringency).
- These emission stages should be accompanied by fiscal measures supporting the renewal of the moped and motorcycle fleet.

With this proactive proposal, which we believe should be mutually acceptable, ACEM is fully prepared to work with the Commission and member states to develop the text of legislation to be presented for co-decision to the European Parliament and Council in 2009. ACEM is also committed to positively cooperate to European Commission initiatives during the comitology process in order to finalise the set of technical regulations as expeditiously as possible.

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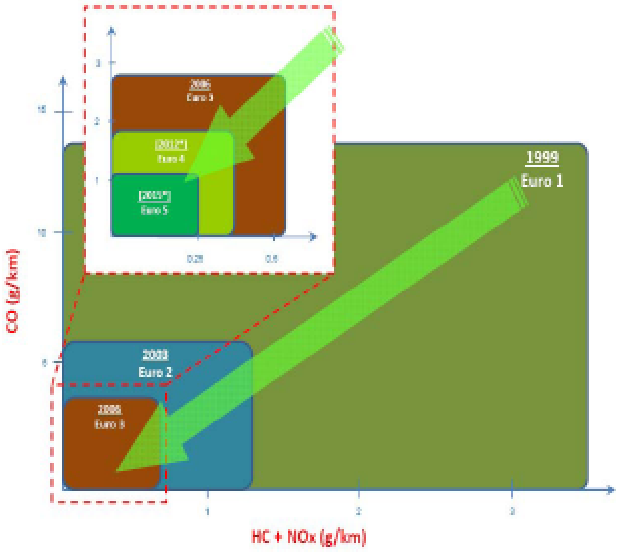
ACEM Proposal: Motorcycle Equivalence with Passenger Cars

- Euro 4 = - 25 % / Euro 3
- Euro 5 = Parity with Euro 5/6 Passenger Cars



*Earliest possible proposed implementation dates (subject to legislative process)
Note: the combined HC+NOx emission limit axis is used for representational purposes only

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ANNEX VII: SELF OBLIGATION EUROPEAN MOTORCYCLE INDUSTRY ASSOCIATION (ACEM) ENVIRONMENTAL ASPECTS — REVISED EMISSION LIMITS

Emission thresholds overview (mg / km)

Vehicle Type	Category	Scenario	THC (mg/km)	THC & NOx (mg/km)	CO (mg/km)	NOx (mg/km)	PM (mg/km)	Approx. Type Approval entry	Classification criteria	Test Cycle
2W Mopeds, EU3, Prop. ACEM, cold weighting	**L1**	**3**		1200	1000			[01/01/2012]	PI & <50cc	ECE R47 & cold
2W Mopeds, EU4, Prop. ACEM, cold weighting	**L1**	**3**		800	1000			[01/01/2015]	PI & <50cc	ECE R47 & cold
3W Mopeds, EU3, Prop. ACEM, cold weighting	**L2**	**3**		1200	3500			[01/01/2012]	PI & <50cc	ECE R47 & cold
3W Mopeds, EU4, Prop. ACEM, cold weighting	**L2**	**3**		900	1900			[01/01/2015]	PI & <50cc	ECE R47 & cold
2W 2-Stroke Motorcycles, EU 4 Prop. ACEM 2012 < 130 km/h	**L3 & L4**	**3**	_	691	1965	_	-	[01/01/2012]	PI & (-25%*EU3 WMTC)	WMTC, ph2
2W 4-Stroke Motorcycles, EU 4 Prop. ACEM 2012 < 130 km/h	**L3 & L4**	**3**	563	-	1965	128	-	[01/01/2012]	PI & (-25%*EU3 WMTC)	WMTC, ph2
2W 2-Stroke Motorcycles, EU 4 Prop. ACEM 2012 ≥ 130 km/h	**L3 & L4**	**3**	-	413	1965	-	-	[01/01/2012]	PI & (-25%*EU3 WMTC)	WMTC, ph2
2W 4-Stroke Motorcycles, EU 4 Prop. ACEM 2012 ≥ 130 km/h	**L3 & L4**	**3**	248	-	1965	165	-	[01/01/2012]	PI & (-25%*EU3 WMTC)	WMTC, ph2
2W 2-Stroke Motorcycles, Euro 5, Prop. ACEM 2015 < 130 km/h	**L3 & L4**	**3**	-	443	570	-	-	[01/01/2015]	**WMTC corr.:** THC=1.10, CO=1.31, NOx=1.47 **PC EU5/EU3 fact.:** THC=0.50, CO=0.435,	WMTC, ph2
2W 4-Stroke Motorcycles, Euro 5, Prop. ACEM 2015 < 130 km/h	**L3 & L4**	**3**	375	-	1140	68	-	[01/01/2015]	**WMTC corr.:** THC=1.10, CO=1.31, NOx=1.47 **PC EU5/EU3 fact.:** THC=0.50, CO=0.435,	WMTC, ph2
2W 2-Stroke Motorcycles, Euro 5, Prop. ACEM 2015 ≥ 130 km/h	**L3 & L4**	**3**	-	253	1140	-	-	[01/01/2015]	**WMTC corr.:** THC=1.10, CO=1.31, NOx=1.47 **PC EU5/EU3 fact.:** THC=0.50, CO=0.435,	WMTC, ph2
2W 4-Stroke Motorcycles, Euro 5, Prop. ACEM 2015 ≥ 130 km/h	**L3 & L4**	**3**	165	-	1140	88	-	[01/01/2015]	**WMTC corr.:** THC=1.10, CO=1.31, NOx=1.47 **PC EU5/EU3 fact.:** THC=0.50, CO=0.435, NOx=0.40	WMTC, ph2
3W Motorcycles PI, Euro 3, Prop ACEM EDC	**L5**	**3**	1000	-	4000	250	-	[01/01/2012]	PI	ECE R40
3W Motorcycles, PI, Euro 4, Prop ACEM EDC	**L5**	**3**	550	-	2000	250	-	[01/01/2015]	PI	ECE R40
3W Motorcycle CI, Euro 3, Prop ACEM EDC	**L5**	**3**	150	-	1000	650	100	[01/01/2012]	PI	ECE R40
3W Motorcycles CI, Euro 4,Prop ACEM EDC	**L5**	**3**	100	-	600	550	80	01/01/2015	CI	ECE R40
4W, Light Quadricycle, EU2	**L6**	**0**	-	1200	3500	-	-	01/01/2003	PI & <50cc	ECE R47
4W, Light Quadricycle, Euro 3,Prop. ACEM	**L6**	**3**		1200	3500	-	-	[01/01/2012]	PI & <50cc	ECE R47 & cold
4W, Light Quadricycle, Euro 4, Prop. ACEM	**L6**	**3**		900	1900	-	-	[01/01/2015]	PI & <50cc	ECE R47 & cold
4W, Heavy Quadricycle, Euro 3, Prop. ACEM	**L7**	**3**	1000	-	4000	250		[01/01/2012]	PI	ECE R40
4W, Heavy Quadricycle, Euro 3, Prop. ACEM	**L7**	**3**	150	-	1000	650	100	[01/01/2012]	CI	ECE R40
4W, Heavy Quadricycle, Euro 4, Prop. ACEM	**L7**	**3**	550	-	2000	250		[01/01/2015]	PI	ECE R40
4W, Heavy Quadricycle, Euro 4, Prop. ACEM	**L7**	**3**	100	-	600	550	80	[01/01/2015]	CI	ECE R40

NB scenario #	Reference to emission study LAT & ACEM proposals for introduction into the upcoming EU legislation
3	Proposal ACEM, categories L1 to L7 (for L3 the 2-step approach and the calculated multiplication factor vs EU3)

Table 32: Proposed L-category vehicle emission limits by European motorcycle industry association ACEM

ANNEX VIII: BACKGROUND TO THE TYPE-APPROVAL SYSTEM

How the system works

Before the EU developed the type-approval system most Member States (MS) used to have their own, differing national requirements for new vehicles to be allowed on the market. The directives for L-Category vehicles (2002/24/EC) were set up to counter the problems for industry created by these differences and separate approval procedures by harmonising the minimum requirements to be fulfilled. Execution of testing and approval activities was left to the MS. In the directives it is stated that other MS have to accept approvals given in one MS (mutual recognition, based on EU requirements; an approach of mutual recognition based on –differing- national requirements has been discussed in the past but has never been accepted by Member States).

Costs: the system has inherent costs: the directives have to be developed (meetings of experts, drafting by Commission services and experts from MS; procedural costs related to getting the draft approved by the co-legislators; cost of implementing directives in national legislation and its verification by the Commission; costs for manufacturers to get their product tested (including provision of products for testing) and approved; follow-up costs if product needs to be adapted and again approved. Available figures are in this report and the supporting external report.

Every Member State appoints a 'Type-approval authority'. This TAA must be notified to the Commission and other MS to perform the necessary tests or other institutes (test houses) can be notified for this purpose.

A manufacturer, who proposes a new vehicle or component (e.g. headlamp) contacts the TAA and the test house, submits the prescribed completed information document, makes the vehicle or component available for testing and pays the fees.

It may prove that the test is not passed; in such case the product can be adapted and resubmitted for testing.

If all is well the manufacturer obtains the test report(s) and approval form(s). These forms are defined in the Separate Directives (SDs). Then the manufacturer is able to sell his product everywhere in the EU, provided she / he puts the prescribed marking on the product and, for vehicles, provides a Certificate of Conformity (CoC) with every vehicle delivered.

In case of a vehicle, the manufacturer can obtain TA in one step (all testing etc in one go), or step-by-step (separate approvals for every component / system; in the end, for the vehicle as a whole, she / he submits the approvals given before. In the latter case, which is must usual, many part-approvals may have been obtained by other (component) manufacturers. Another option foreseen is that one manufacturer builds a basic but incomplete vehicle and the next finishes it by e.g. building the bodywork on it, or modifying it for a specific purpose: multi-stage approval.

A manufacturer can submit a product for TA only in one MS, to one TAA (no 'shopping').

The TAA must inform the other authorities about TA's given, denied or withdrawn. The latter because the TAA is responsible towards the others in case it is found that products are marketed which are not in line with the TA given.

As long as the EU system allows options, this means that the manufacturer may choose to apply for an EU TA for the vehicle or component. EU requirements are often somewhat stricter than national requirements and thus the product may have to be somewhat more expensive; on the other hand if his markets are in more MS she / he can choose his best option.

The approval procedure for a vehicle may be time-consuming, often starting in the first year of development, lasting 3 to 4 years. It's important for the manufacturer not to have to repeat this number of times in different countries.

ANNEX IX: THE MARKET FOR L-CATEGORY VEHICLE IN THE EU

1. THE STRUCTURE OF THE EU MARKET

The powered two-wheeler (PTW) segment of the L-category market is the most important in terms of manufacturing, turnover and employment. However, in order to keep the analysis in line with the structure of other sections of the impact assessment, the analysis is carried out in the following order:

(1) Electrical cycles
(2) Powered Two Wheelers: Mopeds and motorcycles. This also includes motorcycles with side car.
(3) Off-road Quads; also called All Terrain Vehicles (ATVs)
(4) Mini-cars

2. ELECTRICAL CYCLES

Currently electrical cycles fall out of the scope of L-category vehicles (less than 0.25 kW, maximum vehicle speed of 25 km/h). More powerful electric cycles are categorised as mopeds and fall in the scope of type approval legislation.

The market is still very young and very fragmented. Most of the electric bike manufacturers who entered the market first, originally produced conventional bikes and gradually added the production of electric bikes to their activities. The number of vehicles produced is either not available or still very low. Only 6 companies produce relevant numbers, in 2009 ranging from an estimated 6 000 to 50 000 cycles. They have accordingly relevant revenues ranging from €350 000 to €2.7 million in 2009.

The electric cycle industry is a very international business, with companies located in Europe, America and the Far East. The overall majority of the companies are very small, often even micro companies. Quite a number of them have no prior history in the cycle business. All large companies are companies that are adding electric cycle activities to their original activities in the field of conventional cycles. The overall majority of the companies are active in various electric vehicle categories. The production of the overall majority of the companies is still in a very early stage. As a result production volume and revenues are low, whereas R&D costs are relatively high.

2.1. Sales of Electric Cycles

The European Commission has received the following data from professional organisations (ETRA) and the data has not been verified independently.

France:
Sales in 2008 were at 15 800 units, which is a 50 % improvement of the 2007 result.

Germany:
In 2008, an estimated 100 000 electric cycles were sold, which is 2.5 % of total sales volume. Growth is considerable: +62.5 % in 2007, +54 % in 2008 and a forecasted +20 % in 2009.

Italy:
Sales in 2008 are estimated at 10 000, whereas for 2009 they are expected to increase to 30 000. Sales may well be further encouraged as a result of the renewed cycling incentive scheme. The Italian government has allocated another €7.6 million euro to spur consumers to purchase (electric) cycles. In a first phase, the Italian government has already granted €11.4 million euro as incentives for buying (electric) bikes. The incentive was extremely successful.

The Netherlands:
In 2008, almost 140 000 electric bikes were sold at an average retail price of €1 900. Thus electric cycles have generated 1/3 of the total revenue from sales of new bikes in The Netherlands.

UK:
Sales in 2008 are estimated at 15 000, whereas for 2009 a 50 % increase is forecasted. Sales are reported to be mainly to commuters who are replacing car or public transport journeys by electric bike journeys. Sales have been bolstered by tax breaks on cycle purchases.

Belgium:

There are no statistics available but the most important suppliers all confirm the success of the electric cycle. Since 2007, Sparta, which is one of the most popular brands in Belgium reports growth of 10 to 15 % a year, with a +15 % prognosis for this year. With that, sales of electric bikes are reported to increase more than other types of bikes.

Worldwide Electric Bike Sales as Estimated in the Electric Bikes* Worldwide Reports 2008					
Year	**2007**	**2008**	**2009**	**2010**	**2011**
China	21,000,000	21,000,000	21,000,000	25,000,000	30,000,000
India	85,000	120,000	300,000	500,000	700,000
Japan	300,000	317,000	325,000	325,000	350,000
European Union	250,000	550,000	800,000	1,200,000	2,500,000
Taiwan	10,000	10,000	11,000	12,000	14,000
SE Asia	200,000	800,000	1,000,000	2,000,000	5,000,000
USA	120,000	170,000	220,000	350,000	500,000
Total	**21,965,000**	**22,967,000**	**23,656,000**	**29,387,000**	**39,064,000**

Table 33: Worldwide Electric cycle sales and sales forecasts

3. POWERED TWO-WHEELERS (PTW)

This is the largest and most important sector of the industry and includes motorcycles, including those with a side car, mopeds and scooters. PTW market statistics

3.1. EuroStat data

The manufacturing of motorcycles is classified under the NACE activity classifications of 35.4 and 35.5. However, this particular classification does not disaggregate the manufacture of motor-cycles from the manufacture of cycles. In addition, the classification is so broad that a manufacturer which contributes in any way to the manufacture of a vehicle is included. Using this classification, EuroStat estimates that there are 2.300 companies manufacturing motorcycles and cycles. This would seem to be an over-estimate of the reality of the market-place. A study by the University of Bologna estimates that that stripping out the cycle manufacturing companies would yield an estimated 870 companies which manufacture motorcycles. However, in order to get a more accurate estimate of the number of manufacturing companies, data has been gathered from the 'type approval' authorities and analysed to produce a more accurate picture of the number of manufactures in the EU. The results are discussed below in chapter 3.2.

EuroStat also provides data for Prodcom classifications, which indicates the number of units produced and the production value for certain classifications of manufacturing activities. Motor-cycles and scooters are classified under subsectors 35.4 and 35.5, classified by cylinder displacement. The most recent full year data is for 2007.

The data indicates that for 2007, the EU produced 1.136 million L-category vehicles. Overall, the statistics indicate that the value of production of motorcycles and scooters in the EU was €4.1 billion in 2007. The most important segment in terms of value is the large motor-cycle segment, where the engine size is greater than 800cc; the production value is €1 billion for this segment. In terms of number of vehicles, more scooters are produced than motorcycles, but their overall value is less and was valued at €840 million in 2007.

The production of 'parts and accessories' is also an important segment, with a production value of €1.6 billion.

Powered Two Wheelers sub categories	1000's of units	€ million
Motorcycles, and cycles fitted with an auxiliary motor, with an engine capacity <= 50cc	493	631
Scooters with an engine capacity > 50cc but ≤ 250cc	360	840
Motorcycles with an engine capacity > 50cc but ≤ 250cc (excluding scooters)	120	250
Motorcycles with an engine capacity > 250cc but ≤ 500cc	158	587
Motorcycles with an engine capacity > 500cc but ≤ 800 cc	109	692
Motorcycles with an engine capacity > 800 cc	180	1,000
Motorcycle side-cars	40	127
Total	**1,136**	**4,127**

Table 34: Production volume Powered Two Wheelers 2007, EuroStat data

3.2. Type Approval data

The data generated by type-approval authorities are a more market based source of information and can be particularly useful to assess the structure of the market because the type approval data indicates which manufacturers had a vehicle type-approved in order to place it on the market. Initially a sample of type-approval data from March 2008 to 2009 was analysed. Following on from that analysis, a large sample from January 4th 2005 to March 2009 was analysed to ensure that the results are consistent. This later sample involved over 15.000 type-approvals for vehicles.

The analysis of the type-approval data indicates a far smaller cohort of active companies who manufacture L-category vehicles and place them on the market, than that indicated by the EuroStat data. Having analysed in detail the type approval data from March 2008 to 2009, the analysis results indicated that 42 EU companies applied for type approval for an L-category vehicle. Of the 42 companies, 18 are Italian, 10 are German, 5 are French, 2 are Spanish, 2 Swedish and one each from UK (Triumph), Poland, Greece, Austria and Switzerland. However, further investigations yield the information that companies which are based in the EU sought type-approval for vehicles which they did not actually manufacture themselves, but they imported the vehicles from China and then marketed and sold the vehicles in Europe.

Finally, of the 42 companies, we estimate that 17 are SME's. The remaining 25 of the 42 companies are owned by large companies or large corporations. The analysis of the type-approval data is reasonably consistent with data recently received from industry (ACEM). ACEM have indicated that their estimate is that 106 companies manufacture motorcycles. This figure of 106 includes non-EU companies from Japan, China, Thailand and the United States.

Having analysed the data for one year above, a larger sample was analysed covering the timeframe January 4th 2005 to March 2009. Since 2005, approximately 280 EU companies sought type approval to place a vehicle on the market. This results in an average of 56 companies per year. Consequently it was estimated that there are between 42 and 56 European companies manufacturing motorcycles in the EU. However, over the same time period, 398 non-EU companies applied for type-approval to place vehicles on the market. Among the non-EU, by far the most significant group were Chinese companies seeking type-approval.

3.3. Import and export of motorcycles and motorcycle parts

The following import into the EU and export from the EU data were obtained from EuroStat and extracted using the COMEX database from 1999 to 2008. The most significant trend is high and sustained imports from Japan from 1999 to 2008, from companies such as Honda, Suzuki, Kawasaki and Yamaha, as shown in the sales data below. Following from Japan, the main imports are from China, USA and Taiwan. As mentioned above, the imports from China are often rebranded and marketed under a European name such as Hartford (UK) and Geopolis (Greek company). The value of imports from China and Taiwan has increased dramatically from 178.1 million Euros in 1999 up to 646.5 million Euros in 2008.

As regards exports, the largest export market for motorcycles manufactured in the EU is the USA, increasing from 220.5 million Euros in 1999 to 359.4 million Euros in 2008. After the USA, the largest markets are Australia and Switzerland. There is no significant export yet from the EU to China and Taiwan.

PTW	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
IMPORTS [x 1,000 €]										
Extra European	2,840,946	3,091,244	2,710,645	2,390,600	2,531,612	2,798,560	3,019,010	3,181,156	3,206,480	2,881,422
Japan	2,305,627	2,489,032	2,141,665	1,909,956	1,879,365	1,964,394	1,918,938	2,119,349	2,075,018	1,690,580
China	11,198	19,958	31,865	51,329	100,606	176,613	371,894	391,425	447,815	496,554
USA	218,584	260,033	295,635	204,668	307,167	333,784	378,525	348,575	344,392	351,517
Taiwan	166,931	209,501	136,778	132,891	150,587	176,416	186,226	181,024	178,059	149,960
Thailand	606	357	1,835	5,903	18,356	39,011	49,546	28,106	49,459	109,466
EXPORTS [x 1000 €]										
Extra European	510,394	700,753	775,878	831,399	775,699	764,477	832,953	970,691	1,014,522	1,063,138
USA	220,552	331,803	341,230	337,489	335,957	301,612	314,640	397,172	374,727	359,402
Australia	29,666	42,337	49,129	53,253	52,745	72,880	79,165	90,990	91,115	115,410
Switzerland	75,865	87,554	86,165	81,468	100,109	92,231	87,805	86,216	99,586	94,178
Japan	55,153	76,280	95,741	92,309	80,287	71,225	69,961	66,497	70,798	793,353
Vietnam		103	208	2,192	4,769	18,586	24,096	35,721	61,144	62,355

Table 35: Import in the EU and Export from the EU of motorcycles, 1999 – 2008

Similar trends as for complete motorcycles can also be observed for motorcycle parts. The majority of motorcycle parts come from Japan, Taiwan and China, again with the greatest amounts of imports from Japan. The value of imports of parts is almost twice that of exports. The ratio of imports to exports for motorcycle parts with Japan has declined from 11.4 in 1999 to 9.0 in 2008, however the value remains substantive. Imports have continued to increase from China and Taiwan from 52.3 million Euros in 1999 up to 226.7 million Euros in 2008, which is 4.3 times more than in 1999. As regards exports of motorcycle parts from Europe, the main exports are to the USA where exports increased from €43.3 million in 1999 to €135.7 million in 2008. After the USA, the next most important markets are those of Brazil and Switzerland.

Motorcycle parts	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
IMPORTS [x 1,000 €]										
Extra European	340,746	489,969	481,118	447,030	494,501	562,346	591,841	629,977	689,039	690,406
Japan	200,540	294,890	277,034	271,174	276,935	291,195	278,790	268,689	274,978	247,848
Taiwan	48,998	78,010	70,336	57,876	60,712	75,159	87,571	104,765	111,178	118,887
China	2,313	8,263	14,455	26,724	42,642	58,332	67,996	80,467	96,809	107,805
USA	66,255	78,362	83,304	46,045	61,177	60,869	67,426	67,958	74,795	75,137
Thailand	7,533	13,246	15,621	20,158	25,195	40,417	45,426	51,903	57,160	65,493
EXPORTS [x 1000 €]										
Extra European	144,458	182,408	201,897	248,520	244,119	240,791	251,697	291,352	312,061	338,389
USA	43,262	62,321	66,578	101,538	108,164	110,844	104,006	133,776	136,938	135,733
Brazil	4,595	4,982	7,640	5,979	3,988	4,235	8,297	8,049	10,115	29,152
Switzerland	13,778	17,838	21,436	18,569	17,178	21,295	23,649	24,969	28,002	28,245
Japan	17,550	24,188	25,074	27,817	32,508	28,962	30,869	29,250	27,404	27,407
Australia	7,022	6,237	7,072	7,601	9,676	10,024	12,659	14,685	16,707	16,997

Table 36: Import in the EU and Export from the EU of motorcycle parts, 1999 – 2008

3.4. The impact of the new measures on international trade

The EU imported €2.8 billion worth of motor-cycles from outside the EU in 2008, with the main import countries being Japan €1.7 billion and China € 0.5 billion. Chinese imports have grown from €11 million to € 0.5 billion since 1999. Imports from Thailand have also increased significantly from €606.000 to €109 million in the same time period. The EU exported €1.06 billion, the main markets being the United States and Switzerland. The trend for international trade is to see increased imports from China and other Asian countries into the EU. Given the patterns that have emerged from the analysis of the type-approvals over recent years, the indication is that this will continue.

The safety aspects of the new regulation will be crucial to prevent unsafe vehicles being placed on the European market and to protect the consumer from purchasing unsafe products. In conjunction with this, it is necessary to put in place increased market surveillance to prevent such vehicles being placed on the EU markets. The labelling of vehicles with information regarding carbon dioxide emissions will assist the consumer to choose the most energy efficient vehicles irrespective of country of origin of the vehicle and ensure a level-playing field for all manufacturers. The price of motorcycles in the EU may increase if the cost of the improved safety features and meeting lower pollutant emission targets and other necessary environmental measures is passed on to customers.

3.5. Production of PTWs

The activity of the manufacture of motorcycles is grouped under NACE code 35.41 by EuroStat. According to the *2009 EuroStat Facts and Figure,* the EU-27's motorcycles and cycles manufacturing subsector consisted of 2300 enterprises which created €2.4 billion of value added in 2006. The sector employed 55900 persons. Italy was the largest producer of motorcycles and cycles in the EU-27, with a 40% share of EU-27 value added and a 35% share of the workforce. Italy and Lithuania were the most specialised producers of motorcycles and cycles within the EU-27 in terms of the sector's contribution to non-financial business economy value added. In 2007 motorcycles and cycles manufacturing output in the EU-27 grew by 2.2%, following 1.8% growth in 2006.

In 2006 the EU-27's motorcycles and cycles manufacturing subsectors combined an apparent labour productivity of €42600 per person employed with average personnel costs of €30900 per employee to leave a wage adjusted labour productivity ratio of 138% which is very high. In most Member States value added per person employed exceeded personnel costs per employee, the exceptions being Slovenia and France where the wage adjusted labour productivity ratio was below 100%, and in Ireland where negative value added resulted in a large, negative wage adjusted labour productivity ratio.

Description	PRODCOM code	Production Value (€million)	Volume sold (1000 units)	Production Value (€million)	Volume sold (1000 units)
		2006		2007	
Parts and accessories for motorcycles, mopeds and scooters (excluding saddles)	35.41.20.90	1,720		1,452	
Scooters with an engine capacity > 50 cm^3 but ≤ 250 cm^3	35.41.12.13	1,255	622	840	360
Motorcycles, and cycles fitted with an auxiliary motor, with an engine capacity ≤ 50 cm^3	35.41.11.00	678	530	706	530
Motorcycles with an engine capacity >250 cm^3 but less than 500 cm^3	35.41.12.30	368	77		
Motorcycles with an engine capacity > 500 cm^3 but ≤ 800 cm^3	35.41.12.50	983	172	693	109
Motorcycles with an engine capacity > 800 cm^3	35.41.12.70			1,000	180

Table 37: Production PTWs for 2006 and 2007- Source EuroStat

Table 7 gives a snap-shop of data for the production of PTWs using PRODCOM data for 2006 and 2007 for the various categories of motorcycles, scooters and parts. The figures reveal that in 2007, the value of motorcycle production of vehicles over 800cc was the most lucrative and was valued at €1 billion, producing 180 000 vehicles. The second highest value was for scooters at 840 million producing 360 000 scooters. This was followed by 530 000 motorcycles with capacity of less than 50 cm^3 worth €706 million. A total of 109 000 vehicles were produced in the EU with engine displacements between 500 and 800cc at a value of €693 million.

QUANTITY and VALUE of L-Category Vehicles By ENGINE CAPACITY		
	QUANTITY [thousand units]	VALUE IN Million €
Motorcycles, and cycles fitted with an auxiliary motor, with an engine capacity <= 50 cm		
EU15 TOTALS		
Jan.-Dec. 2000	1,324	1,451
Jan.-Dec. 2001	927	994
Jan.-Dec. 2002	900	900
Jan.-Dec. 2003	720	900
Jan.-Dec. 2004	600	900
Jan.-Dec. 2005	600	400
EU27 TOTALS		
Jan.-Dec. 2003	796	1,000
Jan.-Dec. 2004	600	880
Jan.-Dec. 2005	600	400
Jan.-Dec. 2006	510	657
Jan.-Dec. 2007	530	706
Jan.-Dec. 2008	493	631
Scooters with an engine capacity > 50 cm but <= 250 cm		
EU15 TOTALS		
Jan.-Dec. 2000	565	1,155
Jan.-Dec. 2001	477	944
Jan.-Dec. 2002	452	886
Jan.-Dec. 2003	335	711
Jan.-Dec. 2004	368	783
Jan.-Dec. 2005	586	1,179
EU27 TOTALS		
Jan.-Dec. 2003	335	711
Jan.-Dec. 2004	368	783
Jan.-Dec. 2005	586	1,179
Jan.-Dec. 2006	376	799
Jan.-Dec. 2007	360	840
Jan.-Dec. 2008		
Motorcycles with an engine capacity > 50 cm but <= 250 cm (excluding scooters)		
EU15 TOTALS		
Jan.-Dec. 2000	100	261
Jan.-Dec. 2001	90	240
Jan.-Dec. 2002	120	320
Jan.-Dec. 2003	60	250
Jan.-Dec. 2004	80	210
Jan.-Dec. 2005	150	280
EU27 TOTALS		
Jan.-Dec. 2003	60	250
Jan.-Dec. 2004	80	210
Jan.-Dec. 2005	150	280
Jan.-Dec. 2006	120	360
Jan.-Dec. 2007	120	250
Jan.-Dec. 2008		
Motorcycles with an engine capacity > 250 cm but <= 500 cm		
EU15 TOTALS		
Jan.-Dec. 2000	49	192
Jan.-Dec. 2001	41	160
Jan.-Dec. 2002	44	187
Jan.-Dec. 2003	78	334
Jan.-Dec. 2004	60	400
Jan.-Dec. 2005	87	363
EU27 TOTALS		
Jan.-Dec. 2003	80	337
Jan.-Dec. 2004	83	400
Jan.-Dec. 2005	89	365
Jan.-Dec. 2006	77	369
Jan.-Dec. 2007	158	587
Jan.-Dec. 2008		

Table 38: Quantity and value of L-Category Vehicles by engine capacity, part 1

QUANTITY and VALUE of L-Category Vehicles By ENGINE CAPACITY		
	QUANTITY [thousand units]	VALUE IN Million €
Motorcycles with an engine capacity > 500 cm but <= 800 cm		
EU15 TOTALS		
Jan.-Dec. 2000	126	560
Jan.-Dec. 2001	91	477
Jan.-Dec. 2002	96	539
Jan.-Dec. 2003	108	659
Jan.-Dec. 2004	145	826
Jan.-Dec. 2005	165	851
EU27 TOTALS		
Jan.-Dec. 2003	108	659
Jan.-Dec. 2004	146	826
Jan.-Dec. 2005	165	851
Jan.-Dec. 2006	128	767
Jan.-Dec. 2007	109	693
Motorcycles with an engine capacity > 800 cm		
EU15 TOTALS		
Jan.-Dec. 2000	125	898
Jan.-Dec. 2001	140	1,201
Jan.-Dec. 2002	180	1,400
Jan.-Dec. 2003	120	1,135
Jan.-Dec. 2004	100	1,075
Jan.-Dec. 2005	150	1,205
EU27 TOTALS	0	0
Jan.-Dec. 2003	120	1,137
Jan.-Dec. 2004	100	1,077
Jan.-Dec. 2005	150	1,207
Jan.-Dec. 2006	126	1,173
Jan.-Dec. 2007	180	1,000
Jan.-Dec. 2008		
Motorcycle side-cars		
EU15 TOTALS		
Jan.-Dec. 2000	3	16
Jan.-Dec. 2001	4	20
Jan.-Dec. 2002	4	23
Jan.-Dec. 2003	3	17
Jan.-Dec. 2004	1	2
Jan.-Dec. 2005	2	17
EU27 TOTALS		
Jan.-Dec. 2003	3	17
Jan.-Dec. 2004	2	3
Jan.-Dec. 2005	2	17
Jan.-Dec. 2006	6	28
Jan.-Dec. 2007	3	16
Jan.-Dec. 2008	40	128
QUANTITY and VALUE of L-Category Vehicles By ENGINE CAPACITY		
	units]	**VALUE IN Million €**
Saddles for motorcycles, mopeds, and scooters		
EU15 TOTALS		
Jan.-Dec. 2000	3,500.00	45.00
Jan.-Dec. 2001	2,000.00	35.00
Jan.-Dec. 2002	2,800.00	28.00
Jan.-Dec. 2003	1,800.00	20.00
Jan.-Dec. 2004	1,500.00	27.00
Jan.-Dec. 2005	2,400.00	60.00
EU27 TOTALS		
Jan.-Dec. 2003	1,800.00	20.00
Jan.-Dec. 2004	1,500.00	27.00
Jan.-Dec. 2005	2,400.00	60.00
Jan.-Dec. 2006	1,600.00	28.00
Jan.-Dec. 2007	2,400.00	40.00
Jan.-Dec. 2008	1,200.00	28.00
Parts and accessories for motorcycles, mopeds and scooters (excluding saddles)		
EU15 TOTALS		
Jan.-Dec. 2000		1,225
Jan.-Dec. 2001		1,263
Jan.-Dec. 2002		1,320
Jan.-Dec. 2003		1,467
Jan.-Dec. 2004		1,497
Jan.-Dec. 2005		1,535
EU27 TOTALS		0
Jan.-Dec. 2003		1,479
Jan.-Dec. 2004		1,514
Jan.-Dec. 2005		1,578
Jan.-Dec. 2006		1,444
Jan.-Dec. 2007		1,450
Jan.-Dec. 2008		1,604

Table 39: Quantity and value of L-Category Vehicles by engine capacity, part 3

Tables 8 & 9 give a more extended and detailed picture of the market from 2001 to 2008. This tables yield the Prodcom data for the value of production and quantity of goods produced since 2001, for EU 15 and then for EU 27. The production is broken down in detail motorcycles and scooters by engine capacity.

3.6. PTW Price development over time

The **consumer price indices** from EuroStat have data for all EU 27 countries in a category ‘Motor cycles, cycles and animal drawn vehicles’. The following table illustrates prices on an annual base from 2000 to 2008.

	2000	2001	2002	2003	2004	2005	2006	2007	2008
EU 27	98.0	99.5	98.4	99.1	100.2	100.0	100.0	101.1	102.9

Table 40: consumer price indices in category ‘Motor cycles, cycles and animal drawn vehicles’ in EU 27 countries

As a practical example of how prices have changed over time, an OEM has provided an example of price development over time for a popular 1200 cm^3 motorcycle with standard fittings. The prices include VAT. The company name is with-held for reasons of confidentiality.

Month	Year	Price
January	2004	€ 11 500
January	2005	€ 11 700
January	2006	€ 12 050
January	2007	€ 12 360
January	2008	€ 12 500
January	2009	€ 12 650
May	2009	€ 12 800

Table 41: Example of price development over time for a popular 1200 cm^3 motorcycle (Source: anonymous motorcycle manufacturer)

3.7. Sales of PTWs

In line with the automotive industry, the PTW industry was affected by the economic crisis in the final quarter of 2008 and also again in 2009. The market in 2008 decreased by 7.4 % on a year by year basis over 2007. In the first quarter of 2009, PTW sales were down 37 % on the same period in 2008.

Few countries have taken demand measures to stimulate the sales of new vehicles, Italy being the main exception. Italy has put a scrapping scheme in place: vehicles with low cylinder capacity benefited from a € 500 contribution for scrapping obsolete vehicles. This had a positive effect on the market. However, sales still decreased by 20 %. Spain has adopted a motorcycle scrapping scheme in July 2008 but this has not been implemented. Between January and August 2009 in Spain Moped sales were down by 52 % and PTW sales were down by 43 % on the same period in 2008 .

MOTORCYCLES				MOPEDS			
Ranking	Brand	Sales	Market share	Ranking	Brand	Sales	Market share
1	HONDA	235,906	17.2%	1	YAMAHA	34,687	9.1%
2	YAMAHA	213,661	15.6%	2	PIAGGIO	26,639	7.0%
3	SUZUKI	149,090	10.9%	3	PEUGEOT	25,027	6.6%
4	PIAGGIO	130,065	9.5%	4	DERBI	23,680	6.2%
5	KAWASAKI	82,624	6.0%	5	KYMCO	21,991	5.8%
6	BMW	67,448	4.9%	6	BAOTIAN	16,620	4.4%
7	KYMCO	55,673	4.1%	7	KEEWAY	15,016	3.9%
8	APRILIA	41,921	3.1%	8	APRILIA	12,008	3.2%
9	HARLEY	39,935	2.9%	9	RIEJU	9,804	2.6%
10	KTM	32,137	2.4%	10	SYM	8,345	2.2%
11	TRIUMPH	27,966	2.0%	11	CPI	5,531	1.5%
12	DUCATI	25,497	1.9%	12	BETA	4,626	1.2%
13	SYM	24,238	1.8%	13	MBK	4,374	1.2%
14	PEUGEOT	19,240	1.4%	14	TGB	3,805	1.0%
15	DAELIM	11,906	0.9%	15	GILERA	3,477	0.9%
16	HYOSUNG	8,631	0.6%	16	HONDA	3,123	0.8%
17	MALAGUTI	8,480	0.6%	17	DAELIM	1,874	0.5%
18	DERBI	6,642	0.5%	18	SKYTEAM	1,473	0.4%
19	GILERA	6,234	0.5%	19	SAMADA	1,329	0.4%
20	HUSQVARNA	6,208	0.5%	20	MALAGUTI	1,291	0.3%
	OTHERS	89,855	6.6%		OTHERS	133,887	35.1%

Table 42: Sales data and market share for 2008- (Source ACEM)

7.4.4. Motorcycles

The first four left hand columns relate to refers to sales of motorcycles in the EU during 2008. Japanese companies have captured 50 % of the market for motor-cycles in the EU. The most successful European company is Piaggio with a market share of 9.5 %, followed by BMW with a share of 4.9 %. Large companies are dominant in the market for motorcycles.

7.4.5. Mopeds

The moped market is more fragmented than the market for motorcycles and the total supplied ‘by others’ is 35 % of the market. Industry sources indicate that the overall market share for Chinese companies for motorcycles and mopeds combined is 20 % and anecdotal evidence suggests that the EU moped market is most under threat from cheap imports from the Far East (with the exception of Japan).

3.8. Upstream-Suppliers

The number of suppliers to the industry is estimated at around 500. These suppliers have traditionally been European concentrated in Italy, Spain, France, the United Kingdom, Germany and the Netherlands. In recent years competition from Asian suppliers has increased. In response to this competition some European suppliers have in turn moved part of their activities to Asia. However, European component suppliers rely exclusively on orders from European producers. There are an estimated 20 000 jobs in the components sector, located mainly in Italy, Spain, France, the United Kingdom, Germany, the Netherlands and Hungary. These activities are included in the NACE 35.41 classification.

3.9. Downstream- sale, maintenance and repair

The downstream activities of the sale, maintenance and repair of motorcycles are gathered under NACE 50.4. This distribution sector generated € 3.4 billion of value added in the EU-27 million in 2006 from a turnover of over €25 billion. 105 000 persons were employed by the 37 000 enterprises in the motorcycles distribution sector. It is estimated that 72 % of the total industry’s turnover is generated in this sector.

The distribution and assistance network works in proximity to its users which is specific to motorcycles (especially as regards mopeds and scooters): in the EU there are around 37 000 active points of sale and after-sales assistance, often run by family businesses. Italy, France, the United Kingdom, Germany, Spain, the Netherlands, Greece and Sweden account for 91 % of turnover in the distribution and assistance sector; this figure rose by 5 % between 2004 and 2006.

3.10. Employment PTW industry

The total number of persons employed for the motorcycle and cycle industry as a whole is estimated at approximately 184 000, between manufacturers, upstream and downstream sectors. As mentioned above the NACE class DM3541 for 'the manufacture of motorcycles and cycles' does not disaggregate motorcycles from cycles, so both are included in the values below. Given that caveat, in 2004 the most recent EuroStat data show that 59 000 people were employed in the manufacturing sector. From the NACE class 50.4 which analyses the sale, maintenance and repair of motorcycles below, it can be derived that 105 000 persons were employed in this sub-category. Finally supplier's organisations estimate the numbers of persons employed in supplier industry is 20 000 persons.

Employment in this market is concentrated in Italy, Spain, France, Germany and the United Kingdom. However, in terms of specialisation, Italy and Latvia are the most specialised, in terms of the importance of the industry to their own economy. The seasonal nature of the motorcycle market which is busier in the spring and summer months causes production peaks at certain times of year, during which manufacturers take on seasonal workers.

Amount of employees	1-9	10 - 19	20-49	50-250	>250	Total
Member State BE	7					7
BG	89	3	3			95
CZ	33	4	14	12	2	65
DK		7	3	4		14
DE						
ES	68	19	14	9	4	114
FR	161	16	17	9	3	206
IT	560	116	63	42	12	793
CY						
LV						
LT				2	1	3
LU			1			1
HU	25	3	5			33
MT						
NL	70	10	10	10		100
AT	9	2	1	1	1	14
PL	75	4	6	10	3	98
PT	29	11	11	8		59
RO	5	2	2	3		12
SI	14			2		16
SK	11	4				15
FI	11	1		1		13
SE	82	6	6	9		103
UK	163	17				180
Totals	1,412	225	156	122	26	1,941

Table 43: Number of SME's manufacturing motorcycles and cycles for 2006-NACE code DM3541

Table 14 analyses the size of companies involved with the manufacture of motorcycles and cycles. There are two caveats with the statistics. The first is that the EuroStat statistics do not disaggregate motorcycles from cycles; therefore the statistics may be skewed. The second caveat is that the statistics do not include the numbers for Germany which are unavailable for reasons of confidentiality.

It is estimated that there are approximately 100 manufacturers of either motorcycles or mopeds in the EU, about half of which are owned by European companies. The number of SME's operating in both motorcycle and scooter markets is very small.

4. All Terrain Vehicles (ATVs)

There are no statistics gathered by EuroStat and the Impact Assessment must rely on data and statistics presented by the professional organisations. The industry for On-road quads is not represented by a professional organisation. However, Off-road quads (ATVs) are represented by ATVEA. According to ATVEA, this sector of the industry employs directly or indirectly 12.000 people and have a turn-over of €2 billion.

4.1. All Terrain Vehicle (ATV) sales in Europe

TOTAL ECONOMIC VALUE 2008			**2,011,818,750**	**EUR**
TAX CONTRIBUTION			***395,949,664***	**EUR**
ESTIMATED TOTAL FLEET	**730,000**	**units**		
NEW UNIT SALES				
DESCRIPTION	VALUE		TOTAL MARKET VALUE	NOTE
2008 new unit sales	155,000	units		
Average CIF T1 costs	3,000	EUR/unit	465,000,000	
Import Duties	7%		32,550,000	
Avg Cost + import duties	3,210	EUR		
Transport	100	EUR/unit		
Distribution Margin	890	EUR		
Average Wholesales	4,200	EUR		
Average Dealer Margin	800	EUR		
Average Retail (excl. VAT)	5,000	EUR	775,000,000	
VAT	19%		147,250,000	
TOTAL TAX			179,800,000	
TOTAL UNIT SALES (INCL. TAX)			922,250,000	
ACCESSORIES + GEAR				
DESCRIPTION	VALUE		TOTAL MARKET VALUE	NOTE
Average (new units only)	175	EUR/unit		
VAT	19%			
Average (new units only) incl. VAT	208			
TOTAL TAX			5,153,750	
TOTAL UNIT SALES (INCL. TAX)			32,278,750	
USED UNIT SALES				
DESCRIPTION	VALUE		TOTAL MARKET VALUE	NOTE
ratio against new units	70%			% of units compared to new unit sales
used units	108,500	units		
average cost	2750	EUR/unit		
average sales	3500	EUR/unit		
margin	750	EUR/unit		
VAT	19%			
TOTAL TAX			15,461,250	
TOTAL UNIT SALES (INCL. TAX)			379,750,000	
REGISTRATION				
DESCRIPTION	VALUE		TOTAL MARKET VALUE	NOTE
Local registration ratio	50%	% of units		
Local registration costs	500	EUR/unit		
Margin	300	EUR/unit		
Local registration sales	800	EUR/unit		
VAT	19%		32,395,000	
Local registration sales (INCL. TAX)	952	EUR/unit	147,560,000	
TOTAL TAX			32,395,000	
TOTAL UNIT SALES (INCL. TAX)			147,560,000	
PETROL				
DESCRIPTION	VALUE		TOTAL MARKET VALUE	NOTE
Average milage	2000	km/unit/year		
Consumption	10	liter/100 km		
Average liter	200	liter/unit/year		
Fuel cost	0.50	EUR/liter	73,000,000	
Fuel tax	0.60	EUR/liter	87,600,000	
VAT	19%		13,870,000	
Fuel (retail)	1.20	EUR/liter		
TOTAL TAX			101,470,000	
TOTAL SALES (INCL. TAX)			174,470,000	
RENTAL				
DESCRIPTION	VALUE		TOTAL MARKET VALUE	NOTE
units in operation at rental companies	2%	% of total		
units in operation at rental companies	14,600	units		
rental fee	42	EUR/hr		
VAT	19%			
rental fee (incl. VAT)	50			
billed hours per day	3	hours/day		
billed days per year	120	days/year		
total rental income per unit / year	18,000	EUR	262,800,000	
TOTAL TAX			41,959,664	
TOTAL SALES (INCL. TAX)			262,800,000	
INSURANCE				
DESCRIPTION	VALUE		TOTAL MARKET VALUE	NOTE
insurance fee	100	EUR/unit/year		
insurance tax	8%			
VAT	19%			
insurance (retail)	127	EUR/unit/year		
TOTAL TAX			19,710,000	
TOTAL SALES (INCL. TAX)			92,710,000	

Table 44: All Terrain Vehicle (ATV) sales in Europe (source: ATVEA)

4.2. Employment ATV industry

TOTAL EMPLOYMENT 2008			12,454
NEW + USED UNIT SALES			
2008 new + used unit sales	263,500	units / staff	
dealer staff (sales, service)	8,783	30	
distributors	527	500	
headquarters	176	1,500	
others (incl. logistics, accounting, finance etc)	176	1,500	
TOTAL EMPLOYMENT			9,662
ACCESSORIES + GEAR			
turnover	32,278,750	to / staff	
dealer staff	646	50,000	
distributors	40	800,000	
European headquarters	22	1,500,000	
others (incl. logistics, accounting, finance etc)	10		
TOTAL EMPLOYMENT			717
REGISTRATION			
number of variants put on the market in 2008	300		
homologation officials	0.1	employment per variant per year	
homologation development	0.1	employment per variant per year	
total homologation employment	60		
TOTAL EMPLOYMENT			60
PETROL			
liters of fuel consumed per year	146,000,000		
liters of fuel per employee	1,000,000	assumption 1M liter of fuel require 1 FTE	
total staff required to sell and distribute fuel	146		
TOTAL EMPLOYMENT			146
RENTAL			
units in rental operation	14,600	lifetime is 1 year	
average fleet / rental company	12		
number of rental companies	1,217		
staff per rental company	2		
TOTAL STAFF			1,825
INSURANCE			
number of total ATVs	730000		
total manhours required	60,833	5 minutes total jobtime per ATV	
hours per staff per year	1400	average workhours per year per staff	
insurance staff required	43		
TOTAL STAFF			43

Table 45: Employment ATV industry (source: ATVEA)

5. MINI-CARS

The market is comprised of mini cars which are constructed for the primary purpose of on-road transport. These vehicles are exclusively built by specialised European SMEs. EuroStat do not compile statistics on mini-cars and hence the European Commission are dependent on professional organisations to provide statistics. The European fleet of mini-cars manufactured by member companies of EQUAL, the mini car industry association, totals about 340 000 vehicles. Mini-cars represent 1.1 % of the L-category fleet and are vehicles meeting a specific need. The market is more mature in France, Spain, and Italy. The global sales for 2007 were 35 000 vehicles, more than 90 % were equipped with very small, industrial, compression ignition engines, manufactured by industrial suppliers (Lombardini, Kubota, Yanmar) who do not develop a specific automotive product. The average annual mileage is estimated to be between 5 000 to 7 000 kilometres.

At present there are 11 manufacturers, without exception SMEs, of mini-cars in Europe who are established in various Member States. The global market leader as producer for this vehicle type, employed 200 people in 2008, and produced 13 500 vehicles per year of which 1 500 electrical vehicles (200 – 300 utility vehicles).

- In France: Aixam, Automobiles Ligier, Bellier, Chatenet, JDM-Simpa, Microcar,
- In Italy: Casalini ; Grecav, Piaggio, Tasso,
- In Germany: ATW.

These manufacturers are often established in regions lacking a developed industrial network (in France: Savoie, Vendée, in Italy: Abruzzi). On a larger scale, the mini-cars industry entertains a complex network of partners, on which depend 20000 jobs in Europe.

Annex X: Details chapter 5 — Impact analysis — Simplification of legislation

In summary:

Type of impact:

(yellow)	Economical
(green)	Environmental
(orange)	Safety
(blue)	Societal

Option 1: No policy change

Positive	Negative	Neutral / No agreement in public consultation	Remarks
No risk of loss or gain in quality of current requirements	Current problems like complexity, time-consuming implementation task, obsolete or non-aligned measures with technology, lack of legal and regulatory clarity, increased proliferation of text etc. will not be resolved.	Minimal impact	

Benefit Low	Benefit Mean	Benefit High	Cost Low	Cost Mean	Cost High	Other indicators	Remarks
0 €	0 €	0 €	€ 160,000	€ 3,100,000	€ 10,500,000		cumulative EU27 2009 - 2020
			€ 22,000	€ 25,000	€ 28,000		**Annual** estimated translation cost

Option 2: Repeal current directives and replace with a minimum number of regulations

Positive	Negative	Neutral / No agreement in public consultation	
Improved global harmonization, better and clearer structure of legal text	Length of processing: agreeing on one text including all requirements	Transparency	Lack of Transparency was an issue for a minority of respondents to the public consultation, therefore was transparency rated neutral to positive, hence, listed in both columns
After initial investment, reduced annual costs of regulatory system		Bureaucratic burden	Same argument as mentioned for transparency applicable for bureaucratic burden
Translation cost eliminated if direct reference to technical standard		Democratic gap	Same argument as mentioned for transparency applicable for democratic gap
Technical standards meeting effort reduced for Industry/EU-27		Loss in safety and environmental protection	Technical standards meeting effort reduced for Industry/EU-27: not quantified; magnitude of change uncertain
Standardisation of component and vehicle design leading to economies of scale		Will final result of simplification of the current legal text and at the same time adding new measures to align with technical progress as end result truly simplify ?	Economies of scale: not quantified; will only lead to savings for OEMs if standard design can be sold in more countries
Time taken for implementation of regulatory change deceased so benefits can be accrued more rapidly			More rapid accrued benefits: not quantified; potential large safety/environmental benefit depending on the performance of proposed change and how much quicker it can be implemented compared with current situation
More transparent regulatory system. Intangible benefits to all stakeholders; All Industry; potentially larger benefits for SMEs and new entrants			More transparent regulatory system: not quantified; benefits difficult to quantify
Emissions resulting from travel to/from technical standards meetings reduced for Industry/EU-27			Reduced travelling: not quantified; benefits uncertain

Benefit Low	Benefit Mean	Benefit High	Cost Low	Cost Mean	Cost High	Remarks / Other indicators	
€ 78,000	€ 420,000	€ 786,000	€ 58,000	€ 2,400,000	€ 8,800,000		cumulative 2009 - 2020. The benefit must be offset to the cost e.g. net mean cost: € 1,980,000.
€ 22,000	€ 25,000	€ 28,000					Saved annual estimated translation cost

Benefit to cost ratio Low	Mean	High
1.1	1.2	2.5

Break-even in year 2017 - 2019

Option 3: Recast the current framework Directive 2002/24/EC

Positive	Negative	Neutral / No agreement in public	
Improved global harmonization, better and clearer structure of legal text	Length of processing: agreeing on one text including all requirements	Transparency	Lack of Transparency was an issue for a minority of respondents to the public consultation, therefore was transparency rated neutral to
	Costs of regulatory system to implement and maintain EU Directives	Bureaucratic burden	Same argument as mentioned for transparency applicable for bureaucratic burden
Translation cost eliminated if direct reference to technical standard	Solution is not sustainable. Current problems like complexity, time-consuming implementation task, obsolete or non-aligned measures with technology, lack of legal and regulatory clarity, increased proliferation of text etc. may only be resolved for the short to medium timeframe . For the mid to long term the same concerns as with option 1 may partly reappear.	Democratic gap	Same argument as mentioned for transparency applicable for democratic gap
Technical standards meeting effort reduced for Industry/EU-27		Will final result of simplification of the current legal text and at the same time adding new measures to align with technical progress as end result truly simplify ?	Technical standards meeting effort reduced for Industry/EU-27: not quantified; magnitude of change uncertain
Standardisation of component and vehicle design leading to economies of scale			Economies of scale: not quantified; will only lead to savings for OEMs if standard design can be sold in more countries

Table 46: Analysis table policy options simplification

ANNEX XI: DETAILS CHAPTER 5 — IMPACT ANALYSIS VEHICLE TYPE APPROVAL ENVIRONMENTAL MEASURES

1. NEW OR REVISED ENVIRONMENTAL MEASURES FOR THE TYPE APPROVAL OF NEW VEHICLES

1.1. Revised lower emissions limits, detailed analysis of proposed limit by comparison with light duty M1 emission limits

In the LAT report an overview of current European and global L-category vehicle emission limits were given. In the tables and graphs on the next pages the current emission limits and the different considered emission scenarios were summarised. The current and proposed limits were expressed as a percentage of Euro5 M1 passenger cars (mainly gasoline (PI) cars, but if appropriate for e.g. 3- and 4 wheel vehicles also diesel (CI) cars.

Emission thresholds overview (ALL in mg / km or in %)

#	Emission Scenario #	Label graphs	Vehicle Type	Category	Number of wheels	Engine Type / Combustion Cycle	Euro level	THC	THC (% of M1 Euro5)	THC & NOx	THC & NOx (% of M1 Euro5 veh.)	CO	CO (% of M1 Euro5 veh.)	NOx	NOx (% of M1 EU4 veh.)	NOx (% of M1 Euro5 / EU6 veh.)	PM	PM (% of Euro5 veh.)	Approx. Type Approval entry	Classification criteria & Comments	Test Cycle
1	0	1) 2W Mopeds, Euro2, Option 1	Moped	L1	2	PI / 4S	2	-	-	1200	750%	1000	100%	-	-	-	-	-	17/06/2002	PI < 50cc	ECE R47
2	1	2) 2W Mopeds, Euro3, cold weighting, 2010, Option 2	Moped	L1	2	PI / 4S	[3]	-	-	1200	750%	1000	100%	-	-	-	-	-	01/01/2010	PI < 50cc	ECE R47 & cold weighting
3	2	3) 2W Mopeds, Euro3, cold weighting, 2012, Option 3	Moped	L1	2	PI / 4S	[3]	-	-	1200	750%	1000	100%	-	-	-	-	-	[01/01/2012]	PI < 50cc	ECE R47 & cold weighting
4	2	4) 2W Mopeds, Euro4, cold weighting, 2015, Option 3	Moped	L1	2	PI / 4S	[4]	-	-	800	500%	1000	100%	-	-	-	-	-	[01/01/2015]	PI < 50cc	ECE R47 & cold weighting
8	4	8) 2W&3W Mopeds, Euro3, cold weighting, 2013, Option 5	Two & Three-wheel Moped	L1 & L2	2 & 3	PI / 4S	[3]	165	165%	-	-	1140	114%	88	110%	147%	-	-	01/01/2013	PI < 50cc	ECE R47 & cold weighting
9	4	9) 2W&3W Mopeds, Euro4, cold weighting, 2016, Option 5	Two & Three-wheel Moped	L1 & L2	2 & 3	PI / 4S	[4]	100	100%	-	-	1000	100%	60	75%	100%	-	-	01/01/2016	PI < 50cc	WMTC, adapted
	Ref.	Reference PI Passenger Car, M1, PI, Euro5	Passenger Car	M1	4	PI / 4S	5	100	100%	160	100%	1000	100%	60	75%	100%	5	100%	01/09/2011	PI	NEDC
5	0	5) 3W Mopeds, Euro2, Option 1	Moped	L2	3	PI / 4S	2	-	-	1200	750%	3500	350%	-	-	-	-	-	17/06/2002	PI < 50cc	ECE R47
6	2	6) 3W Mopeds, Euro3, cold weighting, 2012, Option 3	Three-wheel Moped	L2	3	PI / 4S	3	-	-	1200	750%	3500	350%	-	-	-	-	-	[01/01/2012]	PI < 50cc	ECE R47 & cold weighting
7	2	7) 3W Mopeds, Euro4, cold weighting, 2015, Option 3	Three-wheel Moped	L2	3	PI / 4S	[4]	-	-	900	563%	1900	190%	-	-	-	-	-	[01/01/2015]	PI < 50cc	ECE R47 & cold weighting
8	4	8) 2W&3W Mopeds, Euro3, cold weighting, 2013, Option 5	Two & Three-wheel Moped	L1 & L2	2 & 3	PI / 4S	[3]	165	165%	-	-	1140	114%	88	110%	147%	-	-	01/01/2013	PI < 50cc	ECE R47 & cold weighting
9	4	9) 2W&3W Mopeds, Euro4, cold weighting, 2016, Option 5	Two & Three-wheel Moped	L1 & L2	2 & 3	PI / 4S	[4]	100	100%	-	-	1000	100%	60	75%	100%	-	-	01/01/2016	PI < 50cc	WMTC, adapted
	Ref.	Reference PI Passenger Car, M1, PI, Euro5	Passenger Car	M1	4	PI / 4S	5	100	100%	160	100%	1000	100%	60	75%	100%	5	100%	01/09/2011	PI	NEDC

Table 47: Overview current, proposed and bench mark emission limits for 2 & 3 wheel Mopeds (classes L1e & L2e)

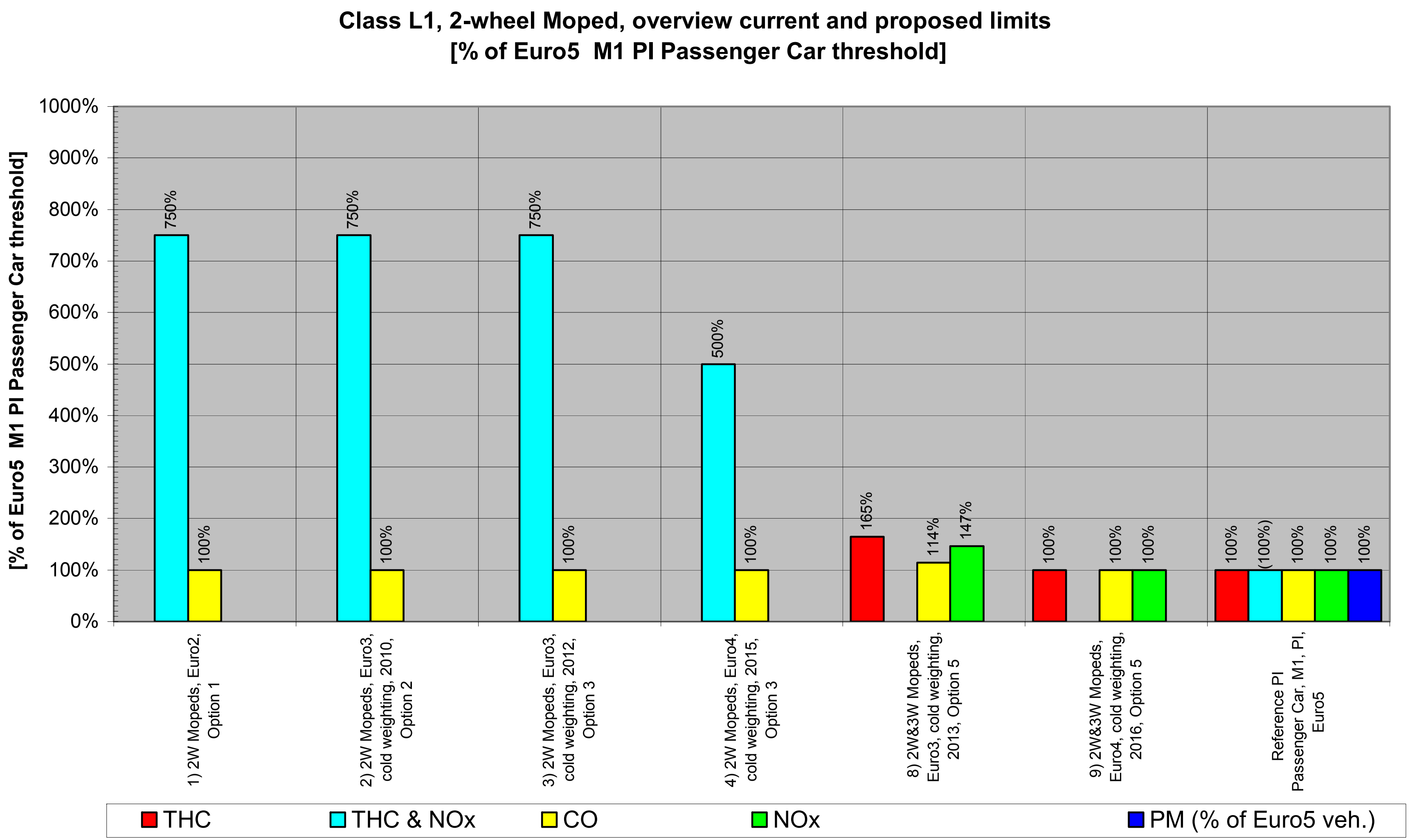

Figure 11: Overview current, proposed and bench mark emission limits for 2 wheel Mopeds (classes L1e)

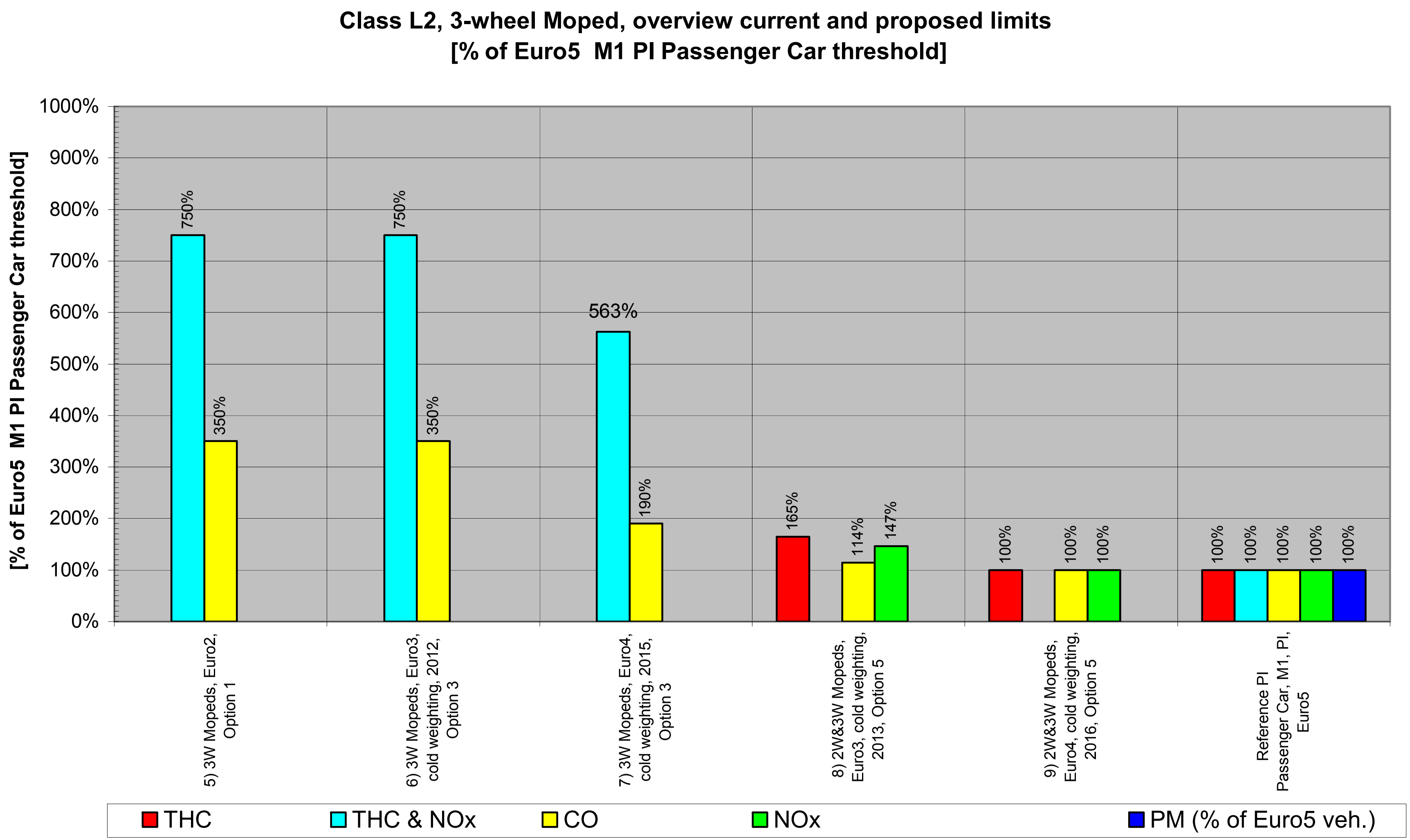

Figure 12: Overview current, proposed and bench mark emission limits for 3 wheel Mopeds (classes L2e)

Emission thresholds overview (ALL in mg / km or in %)

#	Emission Scenario #	Label graphs	Vehicle Type	Category	Number of wheels	Engine Type / Combustion Cycle	Euro level	THC	THC (% of M1 Euro5)	THC & NOx	THC & NOx (% of M1 Euro5 veh.)	CO	CO (% of M1 Euro5 veh.)	NOx	NOx (% of M1 EU4 veh.)	NOx (% of M1 Euro5 / EU6 veh.)	PM	PM (% of Euro5 veh.)	Approx. Type Approval entry	Classification criteria & Comments	Test Cycle
10	**0**	**10) 2W Motorcycle, < 150cc, Euro3, EDC, Option 1**	Motorcycle	L3 & L4	2 (3)	PI / 4S	3	800	800%	-	-	2000	200%	150	188%	250%	-	-	01/01/2006	PI & < 150cc	ECE R40
11	**0**	**11) 2W Motorcycle, L3& L4 ≥ 150cc Euro3, EDC, Option 1**	Motorcycle	L3 & L4	2 (3)	PI / 4S	3	300	300%	-	-	2000	200%	150	188%	250%	-	-	01/01/2007	PI & ≥ 150cc	ECE R40 + EUDC (120 km/h)
12	**0**	**12) 2W Motorcycle, vmax, < 130 km/h, Euro3, WMTC, Option 1**	Motorcycle	L3 & L4	2 (3)	PI / 4S	3	750	750%	-	-	2620	262%	170	213%	283%	-	-	01/01/2007	PI, < 130 km/h	WMTC, ph1
13	**0**	**13) 2W Motorcycles, vmax, ≥ 130 km/h, Euro3, WMTC, Option 1**	Motorcycle	L3 & L4	2 (3)	PI / 4S	3	330	330%	-	-	2620	262%	220	275%	367%	-	-	01/01/2007	PI, ≥ 130 km/h	WMTC, ph1
14	**3**	**14) 2W Motorcycles, < 130 km/h, Euro3, WMTC, 2010, Option 4**	Motorcycle	L3 & L4	2 (3)	PI / 4S	[4]	630	630%	-	-	1570	157%	94	118%	157%	-	-	01/01/2010	PI, < 130 km/h	WMTC, ph2
15	**3**	**15) 2W Motorcycles, vmax, ≥ 130 km/h, Euro3, WMTC, 2010, Option 4**	Motorcycle	L3 & L4	2 (3)	PI / 4S	[4]	228	228%	-	-	1380	138%	110	138%	183%	-	-	01/01/2010	PI, 150-750 cc	WMTC, ph2
16	**2**	**16) 2W 2S Motorcycles, Euro4, 2012, < 130 km/h, Option 3**	Motorcycle	L3 & L4	2 (3)	PI / 2S	[4]	-	-	691	*432%*	1965	197%	-	-	-	-	-	[01/01/2012]	PI, 2S, < 130 km/h	WMTC, ph2
17	**2**	**17) 2W 4S Motorcycles, Euro4, 2012, < 130 km/h, Option 3**	Motorcycle	L3 & L4	2 (3)	PI / 4S	[4]	563	563%	-	-	1965	197%	128	160%	213%	-	-	[01/01/2012]	PI, 4S, < 130 km/h	WMTC, ph2
18	**2**	**18) 2W 2S Motorcycles, Euro4, 2012, ≥ 130 km/h, Option 3**	Motorcycle	L3 & L4	2 (3)	PI / 2S	[4]	-	-	413	*258%*	1965	197%	-	-	-	-	-	[01/01/2012]	PI, 2S, ≥ 130 km/h	WMTC, ph2
19	**2**	**19) 2W 4S Motorcycles, Euro4, 2012, ≥ 130 km/h, Option 3**	Motorcycle	L3 & L4	2 (3)	PI / 4S	[4]	248	248%	-	-	1965	197%	165	206%	275%	-	-	[01/01/2012]	PI, 4S, ≥ 130 km/h	WMTC, ph2
20	**2**	**20) 2W 2S Motorcycles, Euro 5, 2015, < 130 km/h, Option 3**	Motorcycle	L3 & L4	2 (3)	PI / 2S	[5]	-	-	443	*277%*	570	57%	-	-	-	-	-	[01/01/2015]	PI, 2S, < 130 km/h	WMTC, ph2
21	**2**	**21) 2W 4S Motorcycles, Euro 5, 2015, < 130 km/h, Option 3**	Motorcycle	L3 & L4	2 (3)	PI / 4S	[5]	375	375%	-	-	1139.7	114%	68	85%	113%	-	-	[01/01/2015]	PI, 4S, < 130 km/h	WMTC, ph2
22	**2**	**22) 2W 2S Motorcycles, Euro 5, 2015, ≥ 130 km/h, Option 3**	Motorcycle	L3 & L4	2 (3)	PI / 2S	[5]	-	-	253	158%	1140	114%	-	-	-	-	-	[01/01/2015]	PI, 2S, ≥ 130 km/h	WMTC, ph2
23	**2**	**23) 2W 4S Motorcycles, Euro 5, 2015, ≥ 130 km/h, Option 3**	Motorcycle	L3 & L4	2 (3)	PI / 4S	[5]	165	165%	-	-	1140	114%	88	110%	147%	-	-	[01/01/2015]	PI, 4S, ≥ 130 km/h	WMTC, ph2
24	**4**	**24) 2W & 3W Motorcycles, Euro4, 2013, WMTC, Option 5**	Motorcycle & Tricycle	L3 & L4 & L5	2 (3)	PI & CI / 4S	[4]	165	165%	-	-	1140	114%	88	110%	147%	25	500%	01/01/2013	PI & CI, PM for CI only	WMTC, ph2
25	**4**	**25) 2W & 3W Motorcycles, Euro5, 2016, WMTC, Option 5**	Motorcycle & Tricycle	L3 & L4 & L5	2 (3)	PI & CI / 4S	[5]	100	100%	-	-	1000	100%	60	75%	100%	5	100%	01/01/2016	PI & CI, PM for CI only	WMTC, ph2
	Ref.	**Reference PI Passenger Car, M1, PI, Euro5**	Passenger Car	M1	4	PI / 4S	5	100	100%	*160*	*100%*	1000	100%	60	75%	100%	5	100%	01/09/2011	PI	NEDC

Table 48: Overview current, proposed and bench mark emission limits for 2 wheel motorcycles (classes L3e & L4e)

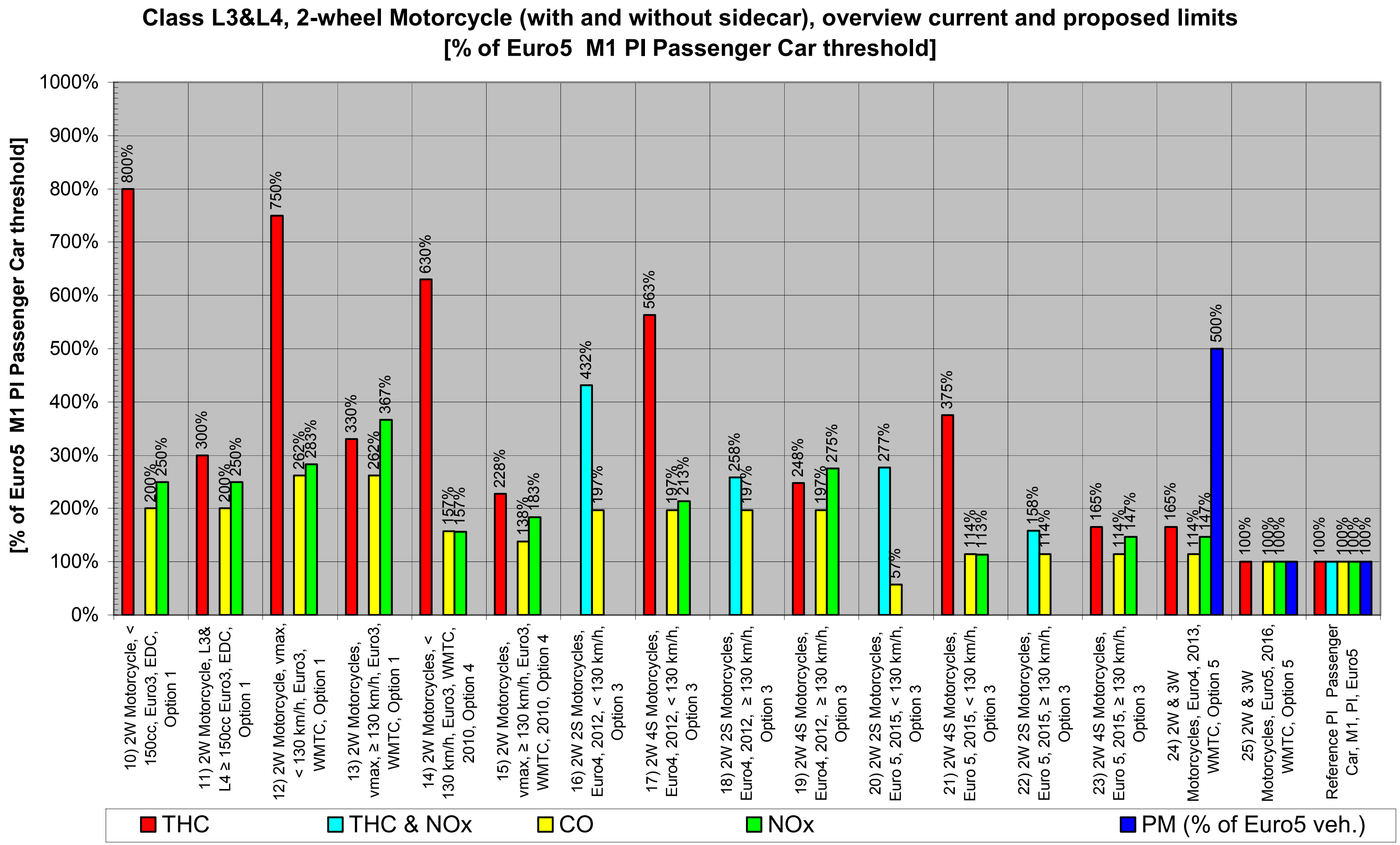

Figure 13: Overview current, proposed and bench mark emission limits for 2 wheel motorcycles (class L3e) and motorcycles with sidecar (class L4e)

Emission thresholds overview (ALL in mg / km or in %)

#	Emission Scenario #	Label graphs	Vehicle Type	Category	Number of wheels	Engine Type / Combustion Cycle	Euro level	THC	THC (% of M1 Euro5)	THC & NOx	THC & NOx (% of M1 Euro5 veh.)	CO	CO (% of M1 Euro5 veh.)	NOx	NOx (% of M1 EU4 veh.)	NOx (% of M1 Euro5 / EU6 veh.)	PM	PM (% of Euro5 veh.)	Approx. Type Approval entry	Classification criteria & Comments	Test Cycle
26	**0**	**26) 3W Motorcycles, PI, Euro2, EDC, Option 1**	Tricycle	L5	3	PI / 4S	2	1500	1500%	-	-	7000	700%	400	500%	667%	-		01/01/2003	PI	ECE R40
28	**2**	**28) 3W Motorcycles PI, Euro 3, 2012, EDC, Option 3**	Tricycle	L5	3	PI / 4S	[3]	1000	1000%	-	-	4000	400%	250	313%	417%	-		[01/01/2012]	PI	ECE R40
29	**2**	**29) 3W Motorcycles, PI, Euro 4, 2015, EDC, Option 3**	Tricycle	L5	3	PI / 4S	[4]	550	550%	-	-	2000	200%	250	313%	417%	-		[01/01/2015]	PI	ECE R40
24	**4**	**24) 2W & 3W Motorcycles, Euro4, 2013, WMTC, Option 5**	Motorcycle & Tricycle	L3 & L4 & L5	2 (3)	PI & CI / 4S	[4]	165	165%	-	-	1140	114%	88	110%	147%	25	500%	01/01/2013	PI & CI, PM for CI only	WMTC, ph2
25	**4**	**25) 2W & 3W Motorcycles, Euro5, 2016, WMTC, Option 5**	Motorcycle & Tricycle	L3 & L4 & L5	2 (3)	PI & CI / 4S	[5]	100	100%	-	-	1000	100%	60	75%	100%	5	100%	01/01/2016	PI & CI, PM for CI only	WMTC, ph2
	Ref.	**Reference PI Passenger Car, M1, PI, Euro5**	Passenger Car	M1	4	PI / 4S	5	100	100%	*160*	*100%*	1000	100%	60	75%	100%	5	100%	01/09/2011	PI	NEDC
27	**0**	**27) 3W Motorcycles, CI, Euro2, EDC, Option 1**	Tricycle	L5	3	CI / 4S	2	1000	2000%	-	-	2000	400%	650	361%	361%	-		01/01/2003	CI	ECE R40
30	**2**	**30) 3W Motorcycle CI, Euro 3, 2012, EDC, Option 3**	Tricycle	L5	3	CI / 4S	[3]	150	300%	-	-	1000	200%	650	361%	361%	100	2000%	[01/01/2012]	CI	ECE R40
31	**2**	**31) 3W Motorcycles CI, Euro 4, 2015, EDC, Option 3**	Tricycle	L5	3	CI / 4S	[4]	100	200%	-	-	600	120%	550	306%	306%	80	1600%	01/01/2015	CI	ECE R40
24	**4**	**24) 2W & 3W Motorcycles, Euro4, 2013, WMTC, Option 5**	Motorcycle & Tricycle	L3 & L4 & L5	2 (3)	PI & CI / 4S	[4]	165	165%	-	-	1140	114%	88	110%	147%	25	500%	01/01/2013	PI & CI, PM for CI only	WMTC, ph2
25	**4**	**25) 2W & 3W Motorcycles, Euro5, 2016, WMTC, Option 5**	Motorcycle & Tricycle	L3 & L4 & L5	2 (3)	PI & CI / 4S	[5]	100	100%	-	-	1000	100%	60	75%	100%	5	100%	01/01/2016	PI & CI, PM for CI only	WMTC, ph2
	Ref.	**Reference CI Passenger Car, M1, CI, Euro5**	Passenger Car	M1	4	CI / 4S	5	*50*	*100%*	230	100%	500	100%	180	100%	100%	5	100%	01/09/2011	CI	NEDC

Table 49: Overview current, proposed and bench mark emission limits for 3 wheel motorcycles (Tricycles, class L5e)

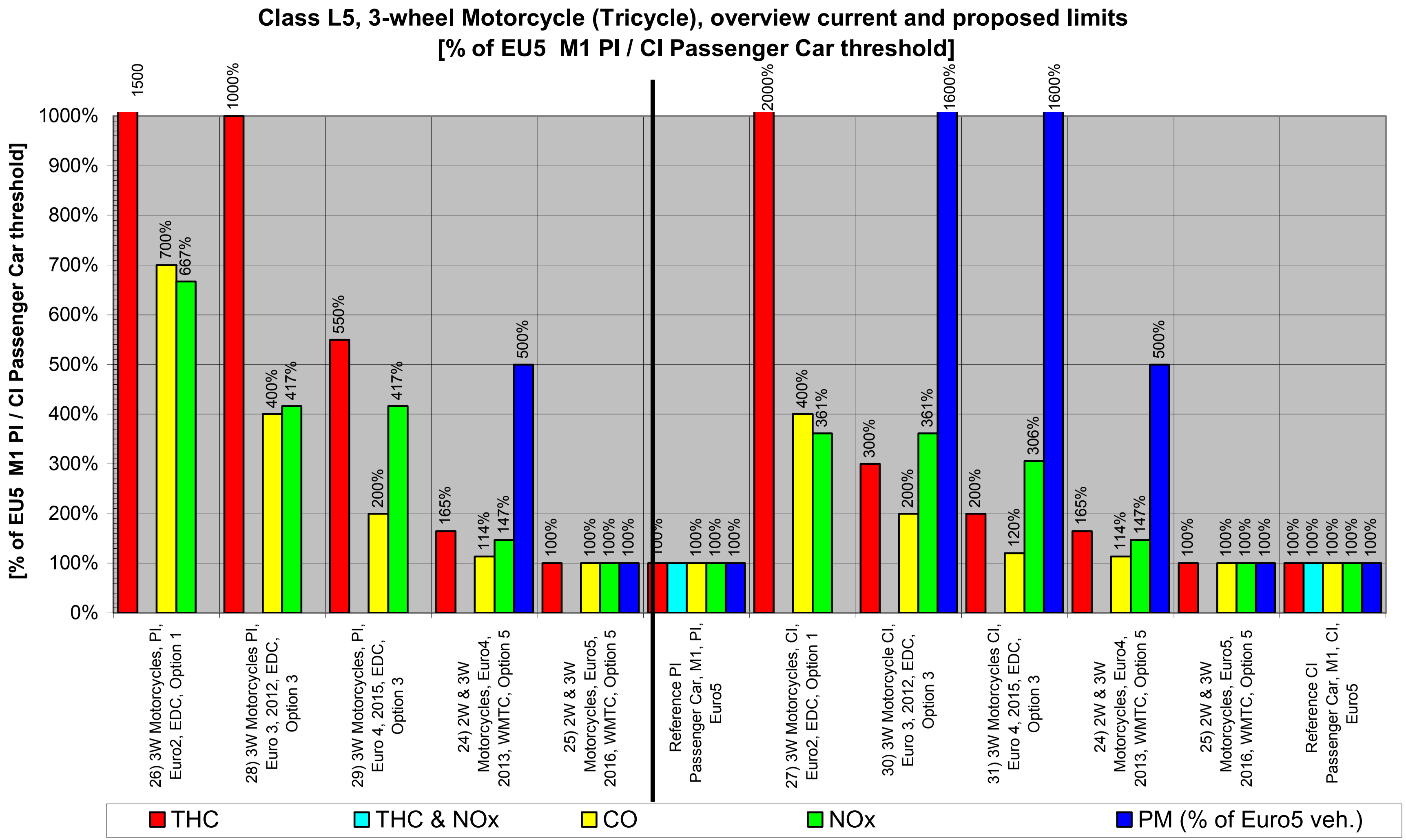

Figure 14: Overview current, proposed and bench mark emission limits for 3 wheel motorcycles (Tricycles, class L5e)

Emission thresholds overview (ALL in mg / km or in %)

#	Emission Scenario #	Label graphs	Vehicle Type	Category	Number of wheels	Engine Type / Combustion Cycle	Euro level	THC	THC (% of M1 Euro5)	THC & NOx	THC & NOx (% of M1 Euro5 veh.)	CO	CO (% of M1 Euro5 veh.)	NOx	NOx (% of M1 EU4 veh.)	NOx (% of M1 Euro5 / EU6 veh.)	PM	PM (% of Euro5 veh.)	Approx. Type Approval entry	Classification criteria & Comments	Test Cycle
32	**0**	**32) 4W, Light Quadricycle, Euro2, Option 1**	Light Quadricycle	L6	4	PI / 4S	2	-	-	1200	*750%*	3500	350%	-	-	-	-	-	01/01/2003	PI & <50cc	ECE R47
33	**2**	**33) 4W, Light Quadricycle, Euro 3, 2012, Option 3**	Light Quadricycle	L6	4	PI / 4S	[3]	-	-	1200	*750%*	3500	350%	-	-	-	-	-	[01/01/2012]	PI & <50cc	ECE R47 & cold
34	**2**	**34) 4W, Light Quadricycle, Euro 4, 2015, Option 3**	Light Quadricycle	L6	4	PI / 4S	[4]	-	-	900	563%	1900	190%	-	-	-	-	-	[01/01/2015]	PI & <50cc	ECE R47 & cold
35	**4**	**35) 4W, Light Quadricycle, Euro3, PI, 2013, Option 5**	Light Quadricycle	L6	4	PI & CI / 4S	[3]	165	165%	-	-	1140	114%	88	110%	147%	-	-	01/01/2013	PI & <50cc	ECE R47 & cold
36	**4**	**36) 4W, Light Quadricycle, Euro4, PI, 2016, Option 5**	Light Quadricycle	L6	4	PI & CI / 4S	[4]	100	100%	-	-	1000	100%	60	75%	100%	-	-	01/01/2016	PI & <50cc	WMTC, adapted
	Ref.	**Reference PI Passenger Car, M1, PI, Euro5**	Passenger Car	M1	4	PI / 4S	5	100	100%	*160*	*100%*	1000	100%	60	75%	100%	5	100%	01/09/2011	PI	NEDC
37	**0**	**37) 4W, Heavy Quadricycle, Euro2, PI, Option 1**	Heavy Quadricycle	L7	4	PI / 4S	2	1500	1500%	-	-	7000	700%	400	500%	667%	-	-	01/01/2003	PI	ECE R40
39	**2**	**39) 4W, Heavy Quadricycle, Euro 3, PI, 2012, Option 3**	Heavy Quadricycle	L7	4	PI / 4S	[3]	1000	1000%	-	-	4000	400%	250	313%	417%	-	-	[01/01/2012]	PI	ECE R40
41	**2**	**41) 4W, Heavy Quadricycle, Euro 4, PI, 2015, Option 3**	Heavy Quadricycle	L7	4	PI / 4S	[4]	550	550%	-	-	2000	200%	250	313%	417%	-	-	[01/01/2015]	PI	ECE R40
43	**4**	**43) 4W, Heavy Quadricycle, Euro3, PI, 2013, Option 5**	Heavy Quadricycle	L7	4	PI / 4S	[3]	165	165%	-	-	1140	114%	88	110%	147%	-	-	01/01/2013	PI	WMTC ph2
44	**4**	**44) 4W, Heavy Quadricycle, Euro4, PI, 2016, Option 5**	Heavy Quadricycle	L7	4	PI & CI / 4S	[4]	100	100%	-	-	1000	100%	60	75%	100%	-	-	01/01/2016	PI	WMTC ph2
	Ref.	**Reference PI Passenger Car, M1, PI, Euro5**	Passenger Car	M1	4	PI / 4S	5	100	100%	*160*	*100%*	1000	100%	60	75%	100%	5	100%	01/09/2011	PI	NEDC
38	**0**	**38) 4W, Heavy Quadricycle, Euro2, CI, Option 1**	Heavy Quadricycle	L7	4	CI / 4S	2	1000	2000%	-	-	2000	400%	650	361%	361%	-	-	01/01/2003	CI	ECE R40
40	**2**	**40) 4W, Heavy Quadricycle, Euro 3, Option 3 , CI, 2012, Option 3**	Heavy Quadricycle	L7	4	CI / 4S	[3]	150	300%	-	-	1000	200%	650	361%	361%	100	2000%	[01/01/2012]	CI	ECE R40
42	**2**	**42) 4W, Heavy Quadricycle, Euro 4, CI, 2015, Option 3**	Heavy Quadricycle	L7	4	CI / 4S	[4]	100	200%	-	-	600	120%	550	306%	306%	80	1600%	[01/01/2015]	CI	ECE R40
45	**4**	**45) 4W, Heavy Quadricycle, Euro3, CI, 2013, Option 5**	Heavy Quadricycle	L7	4	CI / 4S	[3]	-	-	300	130%	1000	200%	250	139%	139%	25	500%	01/01/2013	CI	WMTC ph2
46	**4**	**46) 4W, Heavy Quadricycle, Euro4, CI, 2016, Option 5**	Heavy Quadricycle	L7	4	CI / 4S	[4]	-	-	230	100%	500	100%	180	100%	100%	5	100%	01/01/2016	CI	WMTC ph2
	Ref.	**Reference CI Passenger Car, M1, CI, Euro5**	Passenger Car	M1	4	CI / 4S	5	*50*	*100%*	230	100%	500	100%	180	100%	100%	5	100%	01/09/2011	CI	NEDC

Table 50: Overview current, proposed and bench mark emission limits for Light quadricycles (class L6e) and heavy Quadricycles (class L7e)

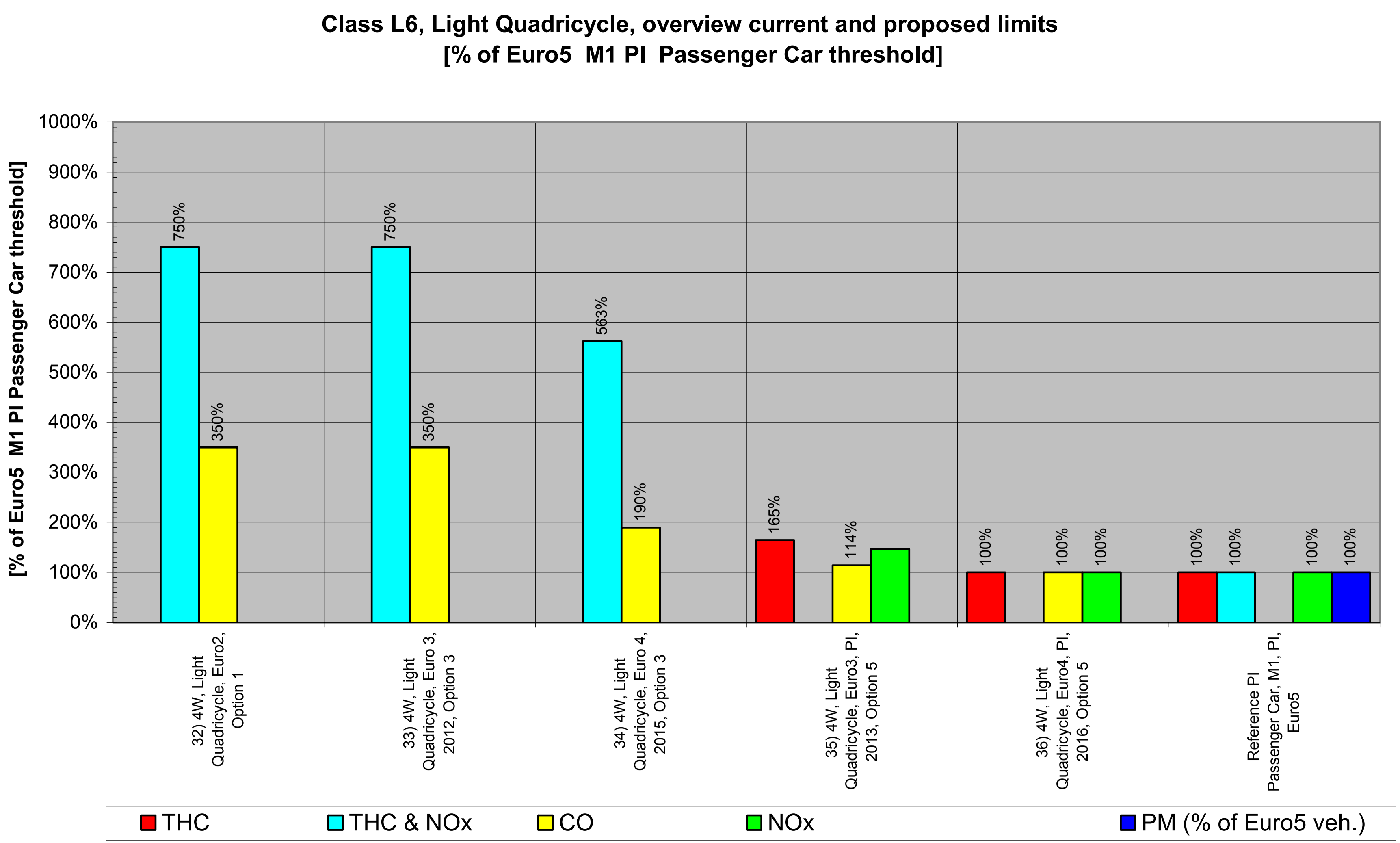

Figure 15: Overview current, proposed and bench mark emission limits for Light quadricycles (class L6e)

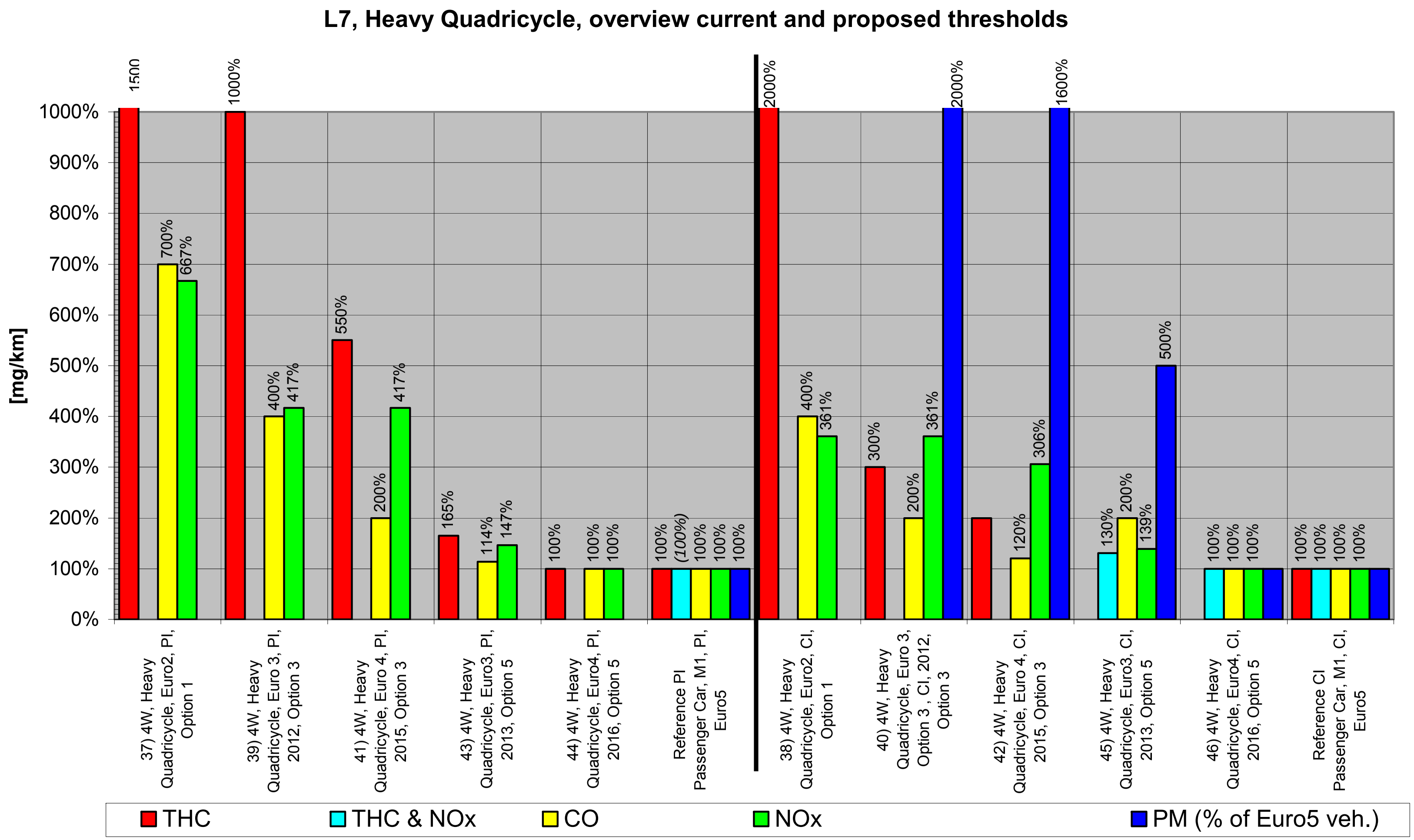

Figure 16: Overview current, proposed and bench mark emission limits for Heavy quadricycles (class L7e)

For comparison reasons the following graphs show the Total HydroCarbons (THC), Carbon Monoxide (CO), NOx (Nitrogen Oxides) and Particulate Matter (PM) emissions across all L-category vehicle emissions as a percentage of Euro5 passenger car limits (100 %). The next graphs contain current, proposed and benchmark M1 passenger car limits for all L-category vehicle categories.

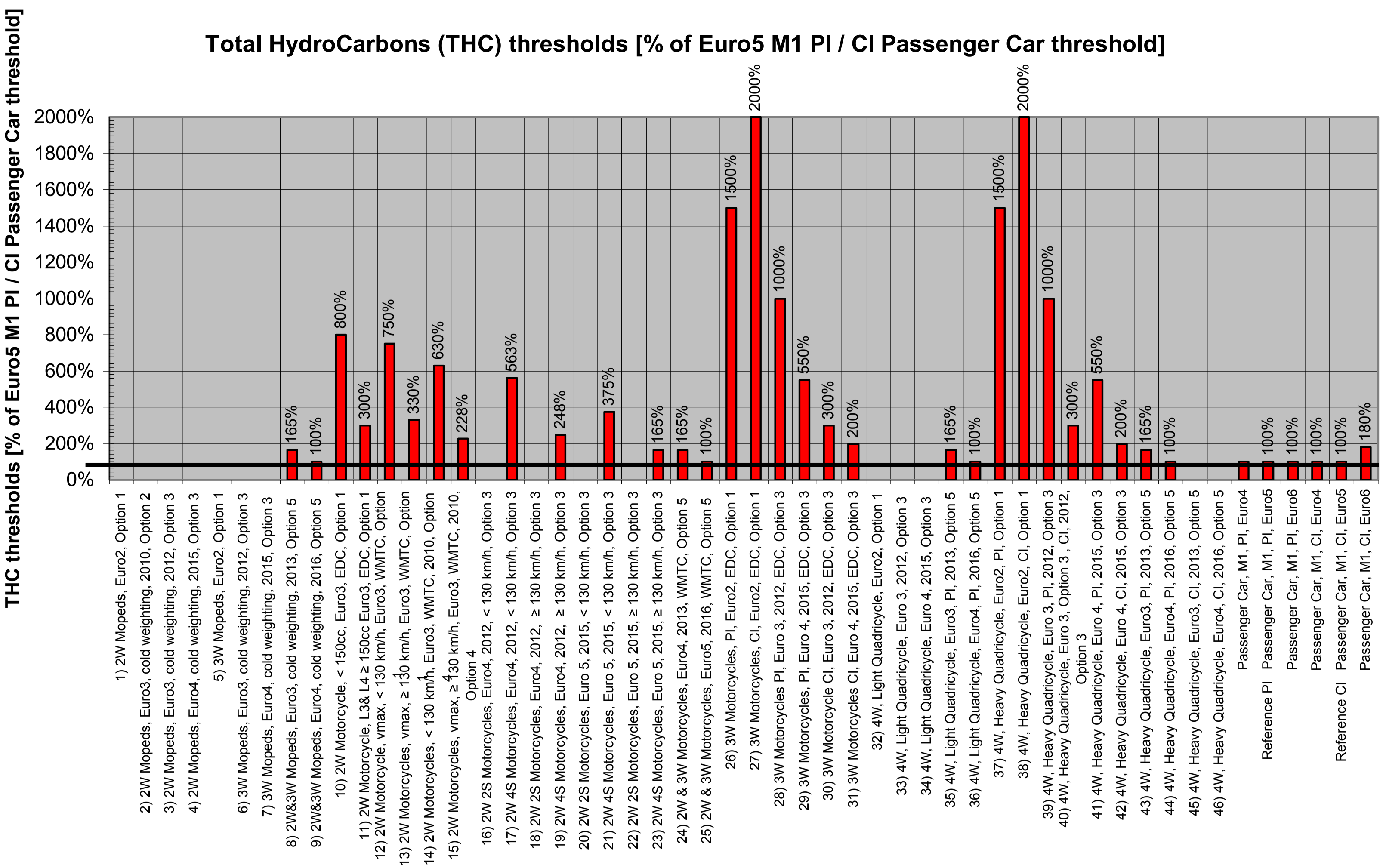

Figure 17: Overview current, proposed emission limits for all L-category vehicle categories vs. passenger car M1 benchmark limits: Total HydroCarbons (THC

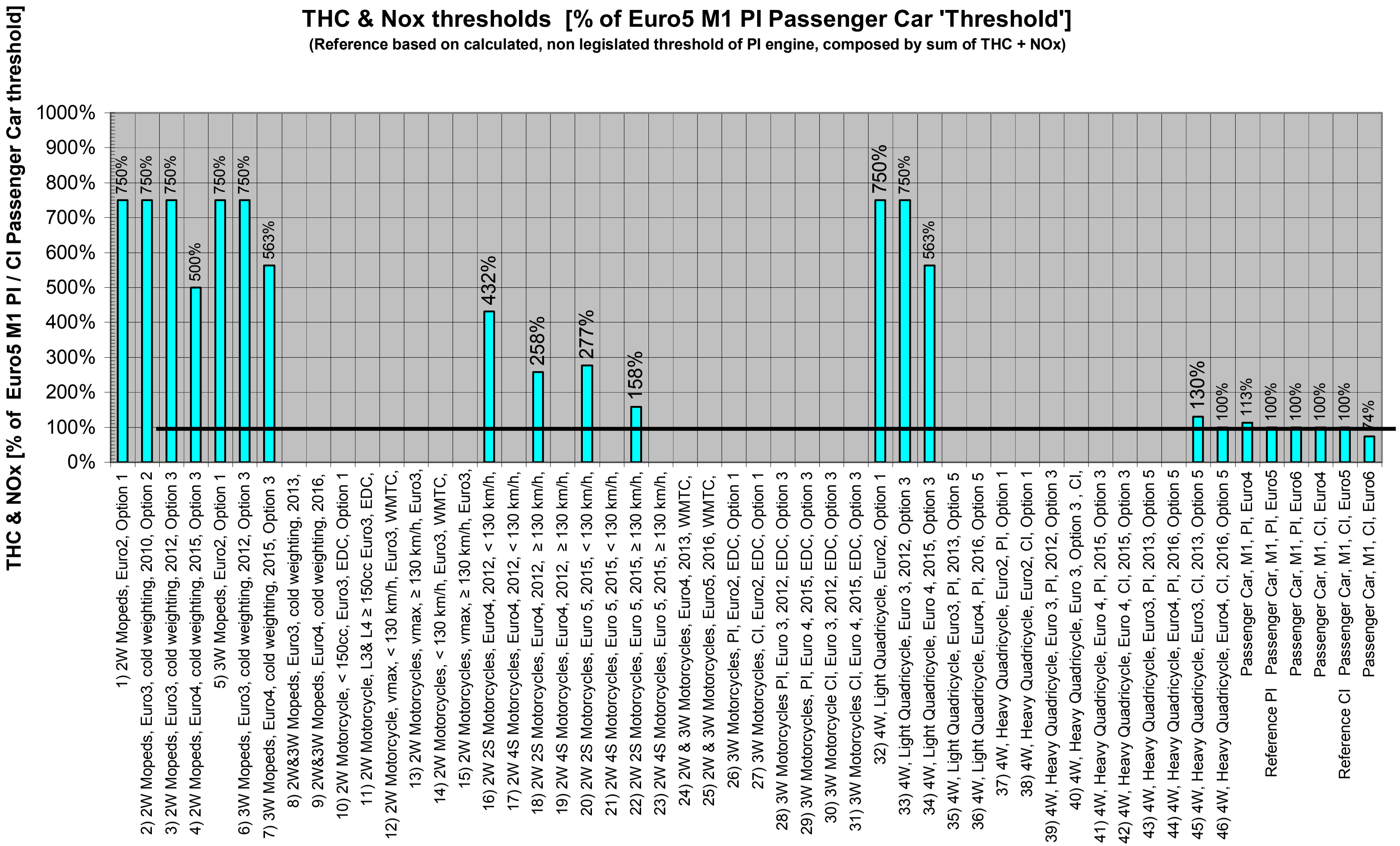

Figure 18: Overview current, proposed emission limits for all L-category vehicle categories vs. passenger car M1 benchmark limits: Total HydroCarbons (THC)

NB. The euro5 reference value for PI engines were arithmetically determined by adding up the separate THC and NOx limits. This was only done to show the order of magnitude and should not be interpreted as absolute limit comparison, unlike the euro5 Diesel passenger car M1 limits, which actually consists of a combined THC&NOx limit and a separate NOx limit.

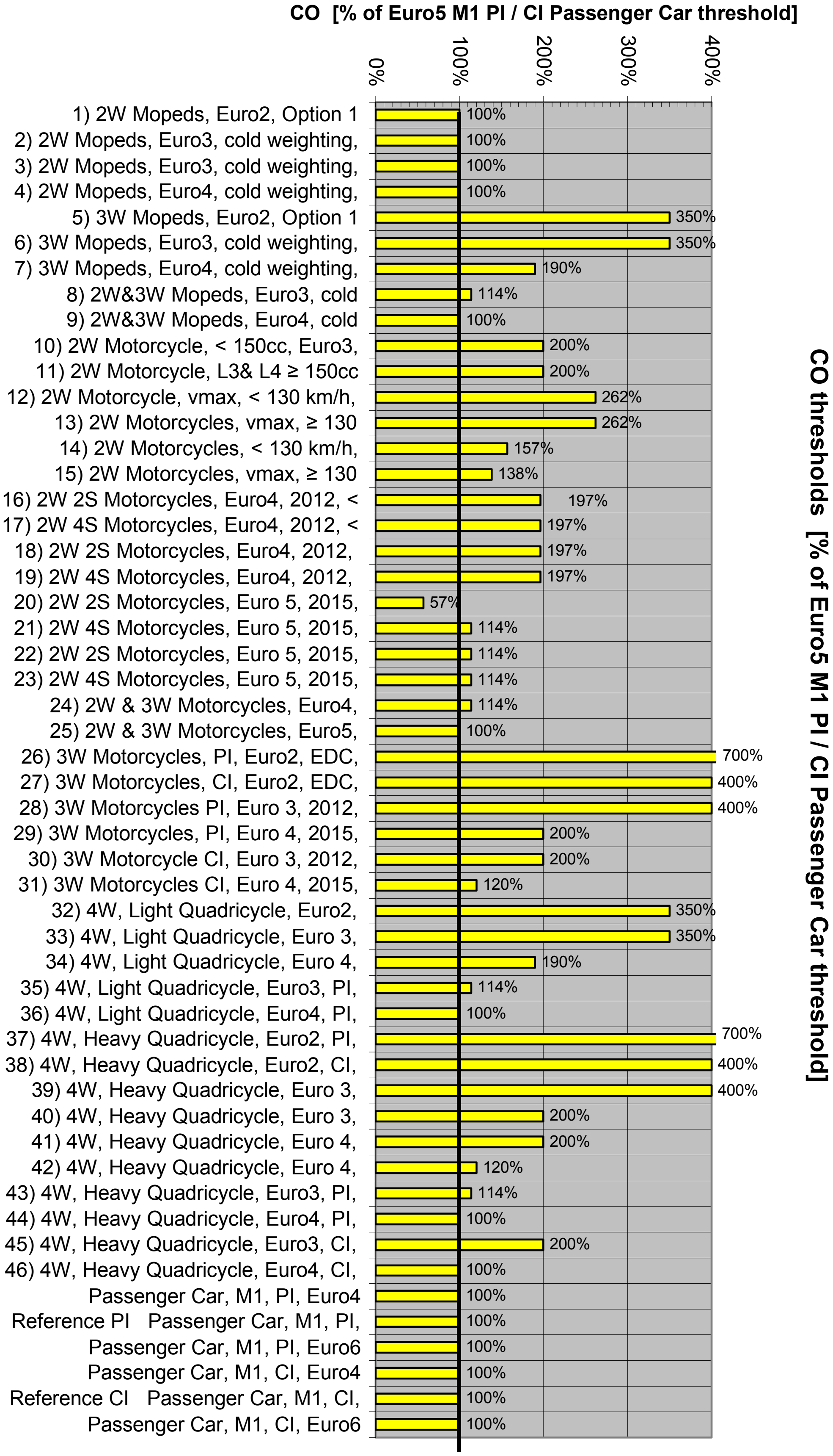

Figure 19: Overview current, proposed emission limits for all L-category vehicle categories vs. passenger car M1 benchmark limits: Carbon Monoxide (CO)

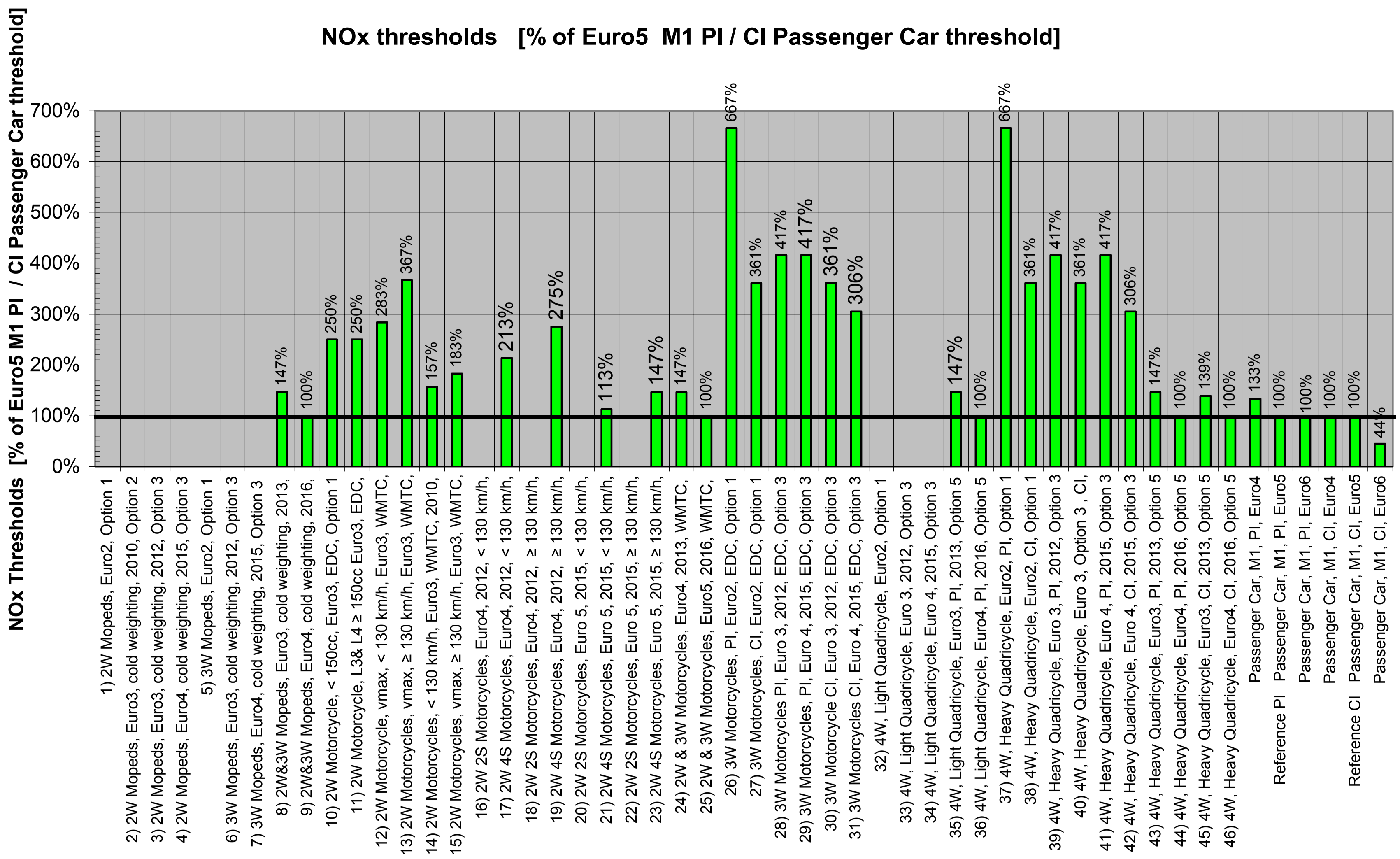

Figure 20: Overview current, proposed emission limits for all L-category vehicle categories vs. passenger car M1 benchmark limits: Nitrogen Oxides (NOx)

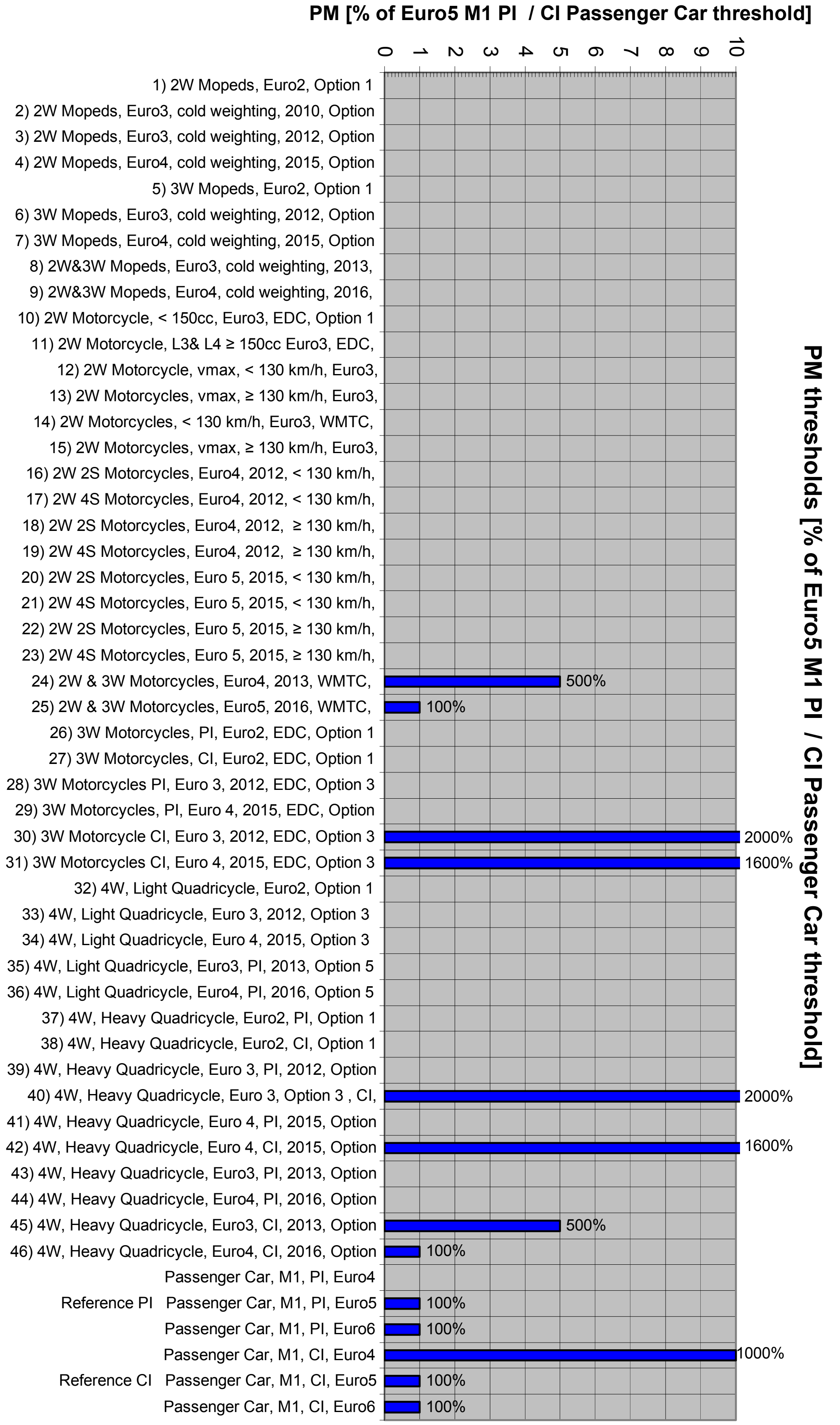

Figure 21: Overview current, proposed emission limits for all L-category vehicle categories vs. passenger car M1 benchmark limits: Particulate Matter (PM)

1.2. Qualitative analysis of the policy options to revise the emission limits

Type of impact:

(yellow)	Economical
(green)	Environmental
(orange)	Safety
(blue)	Societal

Option 1: No change		
Positive	**Negative**	**Neutral / Remarks**
	Extreme high share of hydrocarbons (HC) emitted by L-category vehicles (rising to 62% of total in 2020 if no new measures applied) compared to other means of road transport. Same for CO (rising to over 30% of total in 2020). High share of urban PM emissions. L-category vehicles only responsible for 3% of total vehicle mileage, therefore level of emissions not proportional to level of use.	Compliance cost of manufacturers
	Emission reduction mandated for other means of road transport beyond 2020 will become marginal, if Mopeds and all other L-category vehicle type emissions not further reduced.	

Table 51: Analysis table policy options new emission limits, option 1

Option 2: : New emission limits for L1 mopeds: a cold-start r47 test cycle and a 30% weighing factor for the cold start are proposed to be applied. (Scenario 1 from LAT report). No change in limits for other L-category vehicles.		
Positive	**Negative**	**Neutral / Remarks**
With minor modifications to the test cycle result analysis a fractional share of HC emissions can be reduced.	All other categories of L-category vehicles which produce significant high emissions are not affected by the need to comply with lower limits. Current high overall pollution level for new L-category vehicles maintained. Adverse health and environmental effects by air pollution cannot be efficiently and effectively addressed. Scenario 1 achieves 2%, 7%, and 27% reduction in CO, HC, and PM respectively. NOx marginally increases.	Effect of Type Approval threshold reduction on the overall level of pollutants is marginal in comparison to the highly polluting L-category vehicle fleet. The average vehicle replacement timeframe is much longer as for e.g. passenger cars. It takes much longer before the effect of new vehicles, which pollute less, becomes effective. The other road transport vehicles had to comply already 10 years ago with relatively severe type approval thresholds. The benefit of this early adoption becomes obvious owing to the significant overall pollutant reduction of all other vehicles (refer to figure 3.1 to 3.5 of the LAT report, p59 - 61
Sensitivity study presented in MCWG of 29 June 09 (EMISIA SA Report No: 09.RE.005.V2, Scenarios on the future regulation of Power Two Wheelers) showed that the threshold level has relatively little effect on total L-category vehicle emissions for the assessed timeframe until 2020. The speed of threshold introduction is the most important factor to reduce emissions on the mid to long term. Option 2 can be fast introduced and is supported by the industry. If it would have been possible to extend the assessed timeframe up to 2030, this positive impact may have been a	Emission reduction mandated for other means of road transport in 2020 will become marginal, if Mopeds and all other L-category vehicle type emissions not further reduced.	
Low cost scenario. With regard to HC and PM option 2 appears as most cost-effective, but only 6,5% HC reduction achievable in 2020 leading to 60% of THC emission from all road transport in comparison to option 1, which would lead to 62% of total HC emissions from road transport.	Minimised weaknesses and threads of the introduction of new emission limit values for L-category vehicles as identified in LAT report, ch. 3.3 (again listed under option 3)	
Only slight compliance cost increase for Moped manufacturers. For all other manufacturers no change in compliance cost compared to option 1.		

Table 52: Analysis table policy options new emission limits, option 2

Option 3: Motorcycle industry proposal (Scenario 2 from LAT report)		
Positive	**Negative**	**Neutral / Remarks**
Using the strength of new emission limit values for L-category vehicles as identified in the LAT report (ch. 3.3): - reduction of harmful atmospheric substances (HC, NOx, CO, PM) that directly affect a large fraction of the population - reduction of harmful species that contribute to the formation of photochemical pollution (HC, NOx) - minor reduction of greenhouse-gas (mainly CO2) emissions - reduction of visible smoke	Current high overall pollution level for new L-category vehicles maintained as this can only be very little influenced by type approval compliance with low thresholds. Adverse health and environmental effects by air pollution cannot be efficiently and effectively addressed. Option 3 leads to 16%, 15%, 37% and 27% reductions in CO, HC, PM, and NOx, respectively.	Effect of Type Approval threshold reduction on the overall level of pollutants is marginal in comparison to the highly polluting L-category vehicle fleet. The average vehicle replacement timeframe is much longer as for e.g. passenger cars. It takes much longer before the effect of new vehicles, which pollute less, becomes effective. The other road transport vehicles had to comply already 10 years ago with relatively severe type approval thresholds. The benefit of this early adoption becomes obvious owing to the significant overall pollutant reduction of all other vehicles (refer to figure 3.1 to 3.5 of the LAT report, p59 - 61
Possible using the opportunities as identified in the LAT report ch. 3.3: - good environmental performance is a marketing asset for all products sold today. Improving emissions will also have a positive impact on PTWs' image - low CO2 vehicles are promoted and are increasingly desirable. Clean and efficient motorcycles are a very good candidate - emission standards from other vehicle categories become more stringent; this provides the ground to reduce emissions from PTWs as well	Emission reduction mandated for other means of road transport beyond 2020 may become marginal, if Mopeds and all other L-category vehicle type emissions not further reduced.	
Sensitivity study presented in MCWG of 29 June 09 (EMISIA SA Report No: 09.RE.005.V2, Scenarios on the future regulation of Power Two Wheelers) showed that the threshold level has relatively little effect on total L-category vehicle emissions for the assessed timeframe until 2020. The speed of threshold introduction is the most important factor to reduce emissions. Option 3 can be fast introduced and is supported by the industry (minimised implementation time anticipated).	The weaknesses of introducing new emissions as identified in the LAT report (ch. 3.3): - costly measures with the cost transferred to the customers - generally, cost increases with increasing stringency of emission standards - the emission threshold should have appeared earlier to maximize benefit	
Additional possible impacts from SWOT analysis from LAT report (ch 3.3) - products (motorcycles, mopeds, three and four wheelers) of superior quality withstanding global competition. - possible generation of new jobs in suppliers of emission control systems	The threads as identified in the LAT report (ch. 3.3): - small motorcycles and mini-cars are mostly sold due to their low price, while large motorcycles and ATVs are mainly used as recreational and not prime transport vehicles; hence PTWs market is inherently more sensitive to price increases; large price increases may lead to loss of jobs including SMEs (- increasing cost may shift buyers to other vehicle classes (i.e. small cars); shift of the market to cars will increase congestion and greenhouse gas emissions. Shift to (small) diesel cars may also increase pollutant emissions - increasing cost may also lead to less frequent PTWs replacement, hence degrading the rate of reducing emissions - stringent emission standards may lead to loss of performance which is a marketing asset for motorcycles; hence increasing tampering practices	

Table 53: Analysis table policy options new emission limits, option 3

Option 4: New measures based on the Best Available Technology applied on L-category vehicles sold today in the market (Scenario 3 from LAT report)		
Positive	**Negative**	**Neutral / Remarks**
Using the strength of new emission limit values for L-category vehicles as identified in the LAT report (ch. 3.3): - reduction of harmful atmospheric substances (HC, NOx, CO, PM) that directly affect a large fraction of the population - reduction of harmful species that contribute to the formation of photochemical pollution (HC, NOx) - minor reduction of greenhouse-gas (mainly CO2) emissions - reduction of visible smoke.	Current high overall pollution level for new L-category vehicles maintained as this can only be very little influenced by type approval compliance with low thresholds. Adverse health and environmental effects by air pollution cannot be efficiently and effectively addressed. Option 4 achieves reductions of 15%, 2% and 22% for CO, HC and NOx, respectively. No PM reduction could be assessed based on the available experimental data.	Effect of Type Approval threshold reduction on the overall level of pollutants is marginal in comparison to the highly polluting L-category vehicle fleet. The average vehicle replacement timeframe is much longer as for e.g. passenger cars. It takes much longer before the effect of new vehicles, which pollute less, becomes effective. The other road transport vehicles had to comply already 10 years ago with relatively severe type approval thresholds. The benefit of this early adoption becomes obvious owing to the significant overall pollutant reduction of all other vehicles (refer to figure 3.1 to 3.5 of the LAT report, p59 - 61
Possible using the opportunities as identified in the LAT report ch. 3.3: - good environmental performance is a marketing asset for all products sold today. Improving emissions will also have a positive impact on PTWs' image - low CO2 vehicles are promoted and are increasingly desirable. Clean and efficient motorcycles are a very good candidate - emission standards from other vehicle categories become more stringent; this provides the ground to reduce emissions from PTWs as well	Emission reduction mandated for other means of road transport beyond 2020 may become marginal, if Mopeds and all other L-category vehicle type emissions not further reduced.	
Possible economy of scales expected for industrialised level of technology already applied today. Should theoretically result in only low vehicle price increase to consumer.	The weaknesses of introducing new emissions as identified in the LAT report (ch. 3.3): - costly measures with the cost transferred to the customers - generally, cost increases with increasing stringency of emission standards - the emission threshold should have appeared earlier to maximize benefit	
Additional possible impacts from SWOT analysis from LAT report (ch 3.3) - products (motorcycles, mopeds, three and four wheelers) of superior quality withstanding global competition. - possible generation of new jobs in suppliers of emission control systems	The threads as identified in the LAT report (ch. 3.3): - small motorcycles and mini-cars are mostly sold due to their low price, while large motorcycles and ATVs are mainly used as recreational and not prime transport vehicles; hence PTWs market is inherently more sensitive to price increases; large price increases may lead to loss of jobs including SMEs (- increasing cost may shift buyers to other vehicle classes (i.e. small cars); shift of the market to cars will increase congestion and greenhouse gas emissions. Shift to (small) diesel cars may also increase pollutant emissions - increasing cost may also lead to less frequent PTWs replacement, hence degrading the rate of reducing emissions - stringent emission standards may lead to loss of performance which is a marketing asset for motorcycles; hence increasing tampering practices	
	Sensitivity study presented in MCWG of 29 June 09 (EMISIA SA Report No: 09.RE.005.V2, Scenarios on the future regulation of Power Two Wheelers) showed that the threshold level has relatively little effect on total L-category vehicle emissions for the assessed timeframe until 2020. The speed of threshold introduction is the most important factor to reduce emissions. Option 4 is not supported by the industry (longer time anticipated to reach compromise, therefore negative effect on speed of implementation of new thresholds (speed of implementation is most critical factor)).	

Table 54: Analysis table policy options new emission limits, option 4

Option 5: New limits for all L-category vehicles equivalent in absolute terms to Euro5 M1 passenger cars (4th scenario from LAT report)		
Positive	**Negative**	**Neutral / Remarks**
Using the strength of new emission limit values for L-category vehicles as identified in the LAT report (ch. 3.3): - reduction of harmful atmospheric substances (HC, NOx, CO, PM) that directly affect a large fraction of the population - reduction of harmful species that contribute to the formation of photochemical pollution (HC, NOx) - minor reduction of greenhouse-gas (mainly CO2) emissions - reduction of visible smoke - products (motorcycles, mopeds, three and four wheelers) of superior quality withstanding global competition. - possible generation of new jobs in suppliers of emission control systems	Current high overall pollution level for new L-category vehicles maintained as this can only be very little influenced by type approval compliance with low thresholds. Adverse health and environmental effects by air pollution cannot be efficiently and effectively addressed.	Effect of Type Approval threshold reduction on the overall level of pollutants is marginal in comparison to the highly polluting L-category vehicle fleet. The average vehicle replacement timeframe is much longer as for e.g. passenger cars. It takes much longer before the effect of new vehicles, which pollute less, becomes effective. The other road transport vehicles had to comply already 10 years ago with relatively severe type approval thresholds. The benefit of this early adoption becomes obvious owing to the significant overall pollutant reduction of all other vehicles (refer to figure 3.1 to 3.5 of the LAT report, p59 - 61
Possible using the opportunities as identified in the LAT report ch. 3.3: - good environmental performance is a marketing asset for all products sold today. Improving emissions will also have a positive impact on PTWs' image - low CO2 vehicles are promoted and are increasingly desirable. Clean and efficient motorcycles are a very good candidate - emission standards from other vehicle categories become more stringent; this provides the ground to reduce emissions from PTWs as well	Emission reduction mandated for other means of road transport beyond 2020 may become marginal, if Mopeds and all other L-category vehicle type emissions not further reduced.	
Possible economy of scales expected for industrialised level of technology already applied today. Should theoretically result in only low vehicle price increase to consumer.	The weaknesses of introducing new emissions as identified in the LAT report (ch. 3.3): - costly measures with the cost transferred to the customers - generally, cost increases with increasing stringency of emission standards - the emission threshold should have appeared earlier to maximize benefit	
Best performing option in terms of emission reduction: achieves 19%, 28%, 40% and 37% reductions in CO, HC, PM and NOx, respectively.	The threads as identified in the LAT report (ch. 3.3): - small motorcycles and mini-cars are mostly sold due to their low price, while large motorcycles and ATVs are mainly used as recreational and not prime transport vehicles; hence PTWs market is inherently more sensitive to price increases; large price increases may lead to loss of jobs including SMEs (- increasing cost may shift buyers to other vehicle classes (i.e. small cars); shift of the market to cars will increase congestion and greenhouse gas emissions. Shift to (small) diesel cars may also increase pollutant emissions - increasing cost may also lead to less frequent PTWs replacement, hence degrading the rate of reducing emissions - stringent emission standards may lead to loss of performance which is a marketing asset for motorcycles; hence increasing tampering practices	
Additional possible impacts from SWOT analysis from LAT report (ch 3.3) - products (motorcycles, mopeds, three and four wheelers) of superior quality withstanding global competition. - possible generation of new jobs in suppliers of emission control systems	Sensitivity study presented in MCWG of 29 June 09 (EMISIA SA Report No: 09.RE.005.V2, Scenarios on the future regulation of Power Two Wheelers) showed that the threshold level has relatively little effect on total L-category vehicle emissions for the assessed timeframe until 2020. The speed of threshold introduction is the most important factor to reduce emissions. Option 4 is not supported by the industry (longer time anticipated to reach compromise, therefore negative effect on speed of implementation of new thresholds (speed of implementation is most critical factor)).	
	Worst in cost effectiveness and absolute cost to industry. A possible explanation is that the full benefits of this option cannot be obtained in the assessed timeframe, but a longer period (e.g. 2012 - 2030) should have been assessed. Unfortunately this was not feasible owing to timing, resources and simulation tool capability.	

Table 55: Analysis table policy options new emission limits, option 5

1.3. Revised lower emissions limits, summary of the cost effectiveness of the proposed emission limit options

Summary of the effectiveness of the emission limits scenarios proposed							Cost–effectiveness of different L-category vehicle emission standards [Euro/kg] or [Million Euro / kton]		
Pollutant	**Scenario**	**Total [tn] (2007-2020)**	**2009 [tn]**	**2020 [tn]**	**Percentage reduction over baseline in 2020**	**Percentage of total road transport in 2020**	**Low Estimate**	**Best Estimate**	**High Estimate**
CO	option 1 (no change)	18.400.000	1.630.000	1.010.000		35%	-	-	-
	option 2 (scenario 1)	18.400.000	1.630.000	995.000	1%	35%	-	-	-
	option 3 (scenario 2)	17.800.000	1.630.000	845.000	16%	31%	-	-	-
	option 4 (scenario 3)	17.600.000	1.630.000	859.000	15%	32%	-	-	-
	option 5 (scenario 4)	17.700.000	1.630.000	823.000	19%	31%	-	-	-
	Other road transport	56.600.000	6.070.000	1.870.000			-	-	-
HC	option 1 (no change)	4.910.000	429.000	262.000		61%	-	-	-
	option 2 (scenario 1)	4.810.000	429.000	245.000	6%	60%	36.2	42.3	48.4
	option 3 (scenario 2)	4.740.000	429.000	222.000	15%	57%	50.4	62.8	75.3
	option 4 (scenario 3)	4.870.000	429.000	256.000	2%	61%	86.6	109.7	132.8
	option 5 (scenario 4)	4.600.000	429.000	188.000	28%	53%	50.1	65.5	80.9
	Other road transport	5.370.000	614.000	166.000			-	-	-
NO_x	option 1 (no change)	480.000	29.200	42.000		3%	-	-	-
	option 2 (scenario 1)	481.000	29.200	42.100	0%	3%	-	-	-
	option 3 (scenario 2)	436.000	29.200	30.700	27%	3%	8.0	10.0	12.0
	option 4 (scenario 3)	426.000	29.200	32.800	22%	3%	3.8	4.8	5.8
	option 5 (scenario 4)	417.000	29.200	26.600	37%	2%	10.5	13.7	17.0
	Other road transport	32.500.000	3.220.000	1.190.000			-	-	-
PM	option 1 (no change)	37.600	3.450	1.970		6%	-	-	-
	option 2 (scenario 1)	34.100	3.450	1.430	28%	5%	93.9	109.8	125.6
	option 3 (scenario 2)	34.100	3.450	1.240	37%	4%	171.6	214.0	256.4
	option 4 (scenario 3)	37.600	3.450	1.970	0%	6%	-	-	-
	option 5 (scenario 4)	34.100	3.450	1.180	40%	4%	323.4	423.0	522.6
	Other road transport	933.000	101.000	28.800					

Worst performing scenario in terms of pollutant reduction
Best performing scenario in terms of pollutant reduction

Worst performing scenario in terms of cost
Best performing scenario in terms of cost

Scenario	Total cost (NPV) for the introduction of different emission thresholds [Million Euro]		
	Low Estimate	**Best Estimate**	**High Estimate**
Baseline	0	0	0
Scenario 1	4 996	5 838	6 681
Scenario 2	9 283	11 578	13 874
Scenario 3	6 023	7 626	9 229
Scenario 4[1]	17 358	22 705	28 051

Worst performing scenario in terms of cost
Best performing scenario in terms of cost

[1] Cost calculations are based on very rough estimates, with cost items expressed as multiplicands of the cost of technology required to meet the emission standards in Scenario 2. Details are given in section 3.2.4. of the LAT report

Table 56: Summary of the cost effectiveness of the proposed emission limits options

1.4. Use of a revised World-wide Motorcycle emissions Testing Cycle (WMTC) for all L-category vehicle categories

Type of impact:

(yellow)	Economical
(green)	Environmental
(orange)	Safety
(blue)	Societal

Option 1: No change							
Positive			Negative			Neutral / Remarks	
Minimised compliance cost for manufacturers			Mopeds (R47 test cycle), Tricycles (R40 test cycle) and Light and Heavy Quadricycles (R40 test cycle) cannot be type approved with WMTC global harmonised test cycle. WMTC introduction in 2006 for 2-wheel motorcycle very successful.				
			R47 and R40 test cycle not representative to simulate modern real-world traffic and driving conditions in which L-category vehicles participate, mainly owing to the absence of representative transient manœuvres in EDC and R47 cycle and non-representative low vehicle speed & low engine load collective in EDC test cycle.				
			Possible CO_2 / fuel consumption measurement is not representative for real world emission / performance. Especially fuel consumption measurement result may be a purchase criterion for a consumer, who will not be happy if tested fuel consumption and real-world fuel consumption largely differ. This deprives customer to compare different vehicles and to choose for the most fuel efficient and least polluting vehicle.				
			R40 & R47 test cycles easy to replicate with modern Engine Management Systems, induces engine tuning optimised for the specific emission cycle to obtain type approval. Real-world / off-cycle emission performance of vehicle may be compromised by the search for optimum drive-ability and engine performance (power & torque).				
Benefit			Cost			Other indicators	
Low	Best estimate	High	Low	Best estimate	High		
Not possible to quantify, no data available			Not possible to quantify, no data available			Not possible to quantify, no data available	

Option 2: Use of the phase 2 World Motorcycle Testing Cycle (WMTC) for all L-category vehicle categories						
Positive			Negative			Neutral / Remarks
All L-category vehicles could be type approved by using a World Harmonised test cycle (WMTC), which could open external markets, especially for countries that are acceded to the UN ECE agreements.			Initial additional compliance cost, cost neutral on the mid to long term.			
Economy of scales for manufacturers selling L-category vehicles globally. Possibly less cost transferred to consumers resulting in lower vehicle price.			No extra cost to manufacturer if WMTC phase replaced with phase 2 for L3&L4 vehicles. No emission impacts anticipated.			
More transparency for consumer to compare different vehicle types in terms of fuel consumption, CO2 emission and pollutant emissions. Also comparison with other vehicles than the ones from the L-category may be possible (pending large scale correlation exercises, as previously executed by JRC to establish correlation factors between EDC and WMTC)						
Better simulation of real world driving conditions						
Less easy (more expensive) to replicate test cycle conditions in ECU, more degrees of liberty to prevent "cycle beating", make this less attractive						
Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	
Not possible to quantify, no data available			Not possible to quantify, no data available			Not possible to quantify, no data available

Table 57: Analysis table policy options Use of a revised World-wide Motorcycle emissions Testing Cycle (WMTC) for all L-category vehicle categories

1.5. Type Approval requirements for CO_2 measurement and fuel consumption determination and reporting

Type of impact:

(yellow)	Economical
(green)	Environmental
(orange)	Safety
(blue)	Societal

Option 1: No change								
Positive			Negative			Neutral / Remarks		
			No uniform indication in EU for customer of L-category vehicles with respect to their energy consumption. This deprives consumer to compare different vehicles and to choose for the most fuel efficient vehicle.					
			Risk is that Member States will develop and impose own labelling system based on the internal structure market. This increases the risk of adding confusion to the customers and the manufacturers with respect to evaluation of their different products. A vehicle model could be differently scored in different countries. This is confusing and does not assist in the boundary-free market integration within EU.					
Benefit			Cost			Other indicators		
Low	Best estimate	High	Low	Best estimate	High			
Not possible to quantify, no data available			Not possible to quantify, no data available			Not possible to quantify, no data available		

Option 2: Type Approval requirements for CO2 measurement and fuel consumption determination and reporting								
Positive			Negative			Neutral / Remarks		
At a later stage when also a labelling scheme is introruced, direct comparison of fuel consumption with a passenger car may provide some good arguments in shifting some potential car buyers to the two-wheelers market. However, this requires common test cycles, or at least test cycles that correlate in terms of emissions, but also in terms of CO_2 emissions and fuel consumption.			Additional cost for manufacturer and further downstream at the dealer to label vehicles			Type approval CO_2 and fuel consumption measurement and demonstration cost compliance are cost neutral, as these are measured simultaneously during pollutant control emission Type Approval testing.		
Within different categories and sub-categories of L-category vehicles, consumer has additional information to his/her disposal to allow selection and purchase of the most energy efficient vehicle.								
Uniform EU-wide indication preventing confusion among stakeholders.								
Benefit			Cost			Other indicators		
Low	Best estimate	High	Low	Best estimate	High			
Not possible to quantify, no data available			Not possible to quantify, no data available			Not possible to quantify, no data available		

Table 58: Analysis table policy options Type-approval requirements for CO_2 measurement and fuel consumption determination and reporting

1.6. Evaporative emissions test and limit

Option 1: No change		
Positive	**Negative**	**Neutral / Remarks**
No additional compliance cost for the industry	Evaporative emissions are volatile HC emissions due to: • Breathing losses (directly from the fuel tank or through an activated carbon canister or through the open bowl of a carburettor) • Fuel permeation and/or leakage through the fuel lines and circuit As there is a generic concern with lowering L-category vehicle's share of HC from all road transport HC emissions, this source of HC should also be tackled.	
Both exhaust and evaporation emissions seem to drop until 2016. The reason for the drop in evaporation emissions is the gradual replacement of carburetted with fuel injection vehicles, also in the baseline scenario.	HC emissions from fuel evaporation via tank vents and engine openings may become a significant contributor of total HC emissions as exhaust concentrations decrease	

Benefit			Cost			Other indicators
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**	

Option 2: Replacement of all new carburetted models with fuel injected ones. Due to the closed circuit, fuel injection engines result in much lower evaporation emissions than carburetted ones		
Positive	**Negative**	**Neutral / Remarks**
Inherent advantage of EFI to lower evaporative emissions. Principle justification of moving from carburettor to EFI is more accurate fuel control, leading to better exhaust gas emissions, drive-ability and performance. Better performance of evaporative emission control is a welcome secondary effect.	Substantial investments required from industry to e.g. equip Mopeds with EFI, but this investment is to a high extend justified by possibly complying with revised exhaust emission limits. Only part of the investment can be attributed to better control of evaporative emissions, therefore is option 2 a purely academic assumption.	This option in which all the cost of the shift to move to electronic fuel injection (EFI) will be incurred only owing to improve evaporative emission control is a pure theoretic assumption. In practice the very first reason to equip a vehicle with EFI is to improve fuel metering accuracy to improve exhaust emissions. A secondary effect of moving from carburettor to EFI is the assumption under this option. The cost effectiveness of this option becomes much better if only part of the investment to move to EFI is attributed to evaporative emission control, but this can unfortunately not be quantified.
Increased revenue to supplier industry, including SMEs, potentially leading to higher employment	Availability of independent testing facilities (SHED chamber) for authorities, for manufacturers and in particular accessibility to these testing facilities for SMEs	
Significant additional decrease in evaporative HC emissions, approximately 600 ton until 2020 (refer to graph 3-29 in ch. 3.3.5.3 of the LAT report)	No guarantee that evaporative emissions remain controlled under different ambient conditions (hot climate, stop and go traffic) and/or over vehicle life. Type approved once when vehicle is new, no IUC or PTI testing foreseen to check compliance over vehicle life of vehicle fleet	

NB the quantitive data below was only available for category L3e vehicles

Benefit			Cost (million Euro)			Other indicators		
						Cost effectiveness [Euro/kg] or [Million Euro / kton]		
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**	**Low**	**Best estimate**	**High**
			792	1,189	1,585			
Not possible to quantify, no data available			NB assumption that investment in EFI will only be done to reduce evaporative emission is a theoretical assumption, therefore are the assumed cost and cost efficiency of this option estimated too high. No data available to quantify the level of magnitude of this too			171	257	342

Option 3: Evaporative emissions test and limit enforcing evaporative emission control for all L-category vehicles		
Positive	**Negative**	**Neutral / Remarks**
Inherent advantage of EFI to lower evaporative emissions. Principle justification of moving from carburettor to EFI is more accurate fuel control, leading to better exhaust gas emissions, drive-ability and performance. Better performance of evaporative emission control is a welcome secondary effect.	Substantial investments required from industry to e.g. equip vehicles with evaporative emission control, but this investment should more be attributed to the case of new exhaust emission limits. Only part of the investment can be attributed to better control of evaporative emissions.	Active evaporative emission control can only be effective if vehicle is equipped with EFI.
Increased revenue to supplier industry, including SMEs, potentially leading to higher employment	Availability of independent testing facilities (SHED chamber) for authorities, but also for SMEs	
Most cost effective solution found in LAT report, to address HC emissions from L-category vehicles	No guarantee that evaporative emissions remain controlled under different ambient conditions (hot climate, stop and go traffic) and/or over vehicle life. Type approved once when vehicle is new, no IUC or PTI testing foreseen to check compliance over vehicle life of vehicle fleet	
Significant additional decrease in evaporative HC emissions, approximately 2800 ton until 2020 (refer to graph 3-29 in ch. 3.3.5.3 of the LAT report)		

NB the quantitive data below was only available for category L3e vehicles

Benefit			Cost (million Euro)			Other indicators		
						Cost effectiveness [Euro/kg] or [Million Euro / kton]		
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**	**Low**	**Best estimate**	**High**
			171	513	855	9	47	28
Not possible to quantify, no data available								

Table 59: Analysis table policy options evaporative emissions test and limit

1.7. Durability requirements.

Option 1: (Scenario "Baseline" from the LAT report): This scenario assumes that there will be no further legislative step beyond 2006/72/EC i.e. no durability requirements for PTWs will be imposed. In this way, an arbitrary deterioration over the useful life is set to 20%.		
Positive	**Negative**	**Neutral / Remarks**
Low compliance cost for manufacturer	Uncontrolled degradation of exhaust emissions relevant engine components and systems is never verified on fleet vehicles, as there are no PTI, RSI or IUC tests. Once a type approval test conducted with a brand new vehicle, meeting the type approval limits does not guarantee that the emission performance over vehicle life in the real world remains within the acceptable boundary (e.g. maximum 10 - 15% emission performance deterioration after X km of mileage accumulation).	New Type Approval limits go hand-in-hand with durability requirements. Introduction of lower Type Approval limits is practically useless if the exhaust after treatment components and other emission relevant components do not have the quality and/or proper design to withstand thermal ageing and poisoning over vehicle life. One method to check this quality is to perform durability testing before start of production by e.g. letting development vehicles run a durability distance of X km (e.g. 50,000 km) and to test the emission performance of the vehicle every Y km (e.g. 10,000 km. After X km the emission performance must still be below the respective emission limits. Also accelerated durability tests exist.
Benefit	**Cost**	**Other indicators**
Low / Best estimate / High	**Low / Best estimate / High**	
Not possible to quantify, no data available	Not possible to quantify, no data available	Not possible to quantify, no data available
Option 2 (Scenario 2 from the LAT report): Deterioration reduced to 10% for the useful life and application of linear extrapolation for higher mileage		
Positive	**Negative**	**Neutral / Remarks**
Estimated emission benefit in EU15 (EU27 unknown) until 2020 owing to introduction of option 2: - HC: 12,500 tn - CO: 75,500 tn - NOx: 3,400 tn	Increased compliance cost for manufacturers possibly transferred into high consumer price	Once a durability regulation has been decided, the actual useful life is not a critical parameter. Increase of the durability by 60% led to additional reductions in emission levels in the order of 4 ktn of HC, 30 ktn of CO and 1.1 ktn of NOx. This corresponds to 1.6%, 3.0%, and 2.6% per pollutant respectively, of total PTW emissions in 2020
It is absolutely critical that a durability regulation is introduced for L-category vehicles, otherwise significant departures from the emission standard may occur at rather		
Increased quality and guarantee for customer that investment in cleaner vehicle gives better value for money over vehicle life in terms of steady environmental		
Reduced risk for customers to fail PTI tests in the Member States where this applies. Prevent early on exchange of expensive exhaust after treatment components.		
Benefit	**Cost**	**Other indicators**
Low / Best estimate / High	**Low / Best estimate / High**	
Not possible to quantify, no data available	Not possible to quantify, no data available	Not possible to quantify, no data available
Option 3 (Scenario 2 from the LAT report): useful life increased by 60%, i.e. equivalent to the increase incurred to passenger cars when shifting from Euro 3 (80k km) to Euro 5 (160k km)		
Positive	**Negative**	**Neutral / Remarks**
Estimated emission benefit in EU15 (EU27 unknown) until 2020 owing to introduction of option 3: - HC: 17,500 tn - CO: 105,000 tn - NOx: 4,600 tn	Increased compliance cost for manufacturers possibly transferred into high consumer price	Once a durability regulation has been decided, the actual useful life is not a critical parameter. Increase of the durability by 60% led to additional reductions in emission levels in the order of 4 ktn of HC, 30 ktn of CO and 1.1 ktn of NOx. This corresponds to 1.6%, 3.0%, and 2.6% per pollutant respectively, of total PTW emissions in 2020
It is absolutely critical that a durability regulation is introduced for L-category vehicles, otherwise significant departures from the emission standard may occur at rather		
Increased quality and guarantee for customer that investment in cleaner vehicle gives better value for money over vehicle life in terms of steady environmental		
Reduced risk for customers to fail PTI tests in the Member States where this applies. Prevent early on exchange of expensive exhaust after treatment components.		
Benefit	**Cost**	**Other indicators**
Low / Best estimate / High	**Low / Best estimate / High**	
Not possible to quantify, no data available	Not possible to quantify, no data available	Not possible to quantify, no data available

Table 60: Analysis table policy options durability requirements

2. NEW MEASURES TO CONTROL EMISSIONS DURING VEHICLE LIFE.

2.1. In-Use Conformity (IUC) testing and limits.

Under the scope of this policy option only IUC is regarded for the reasons as indicated in chapter 2.1, problem definition (not PTI, nor RSI, which will be subjects to a separate Impact Assessment executed by DG TREN on the revision of Directives 96/69/EC and 2000/40/EC).

Type of impact:
- Economical
- Environmental
- Safety
- Societal

Option 1: No change

Positive	Negative	Neutral / Remarks
Low compliance cost for manufacturer	Uncontrolled degradation of exhaust emissions relevant engine components and systems is never verified on fleet vehicles, as there are no PTI, RSI or IUC tests. Once a type approval test conducted with a brand new vehicle, meeting the type approval limits does not guarantee that the emission performance over vehicle life in the real world remains within the acceptable boundary (e.g. maximum 10 - 15% emission performance deterioration after X km of mileage accumulation).	In-Use compliance (IUC) regulations are established to make sure that the emission levels of a vehicle type in the real-world complies with its type-approval limits. IUC is a manufacturer's responsibility. IUC requires that a small sample of fleet vehicles is randomly selected and is tested according to the certification test conditions to check whether the vehicles comply with their corresponding emission standards.

Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	
Not possible to quantify, no data available			Not possible to quantify, no data available			Not possible to quantify, no data available

Option 2: (Scenario 1 from LAT report): IUC procedure mandatory to for all Euro 3 motorcycles. The IUC is considered to identify all not attainments which are consecutively corrected.

Positive	Negative	Neutral / Remarks
Depending on the results of the IUC procedure, the manufacturer may be forced to remedy the situation, if the vehicles selected do not comply with the emission standards. This should be considered as a direct environmental benefit of an IUC requirement. As an indirect benefit, the manufacturer takes all necessary steps to ensure that the long-term emission behaviour does not differentiate (at least much) from the type approval limits. It is obvious that it is not possible to simulate the indirect effect of IUC.	Increased compliance cost for manufacturers possibly transferred into high consumer price	main structural components of any IUC procedure • Manufacturers responsibility for durable and functioning emission controls in use, for a certain driving distance (durability period). • Test procedure: type-approval emission laboratory test or, for surveillance, some other in-use emission test data supplied by manufacturers or an authority. • Procedure for selection, procurement, and maintenance of vehicles to the test sample (audit procedure). • Procedure to examine test data and information, emission failure and technical faults. • Recall/remedial actions, how to perform and report, labels, etc
Estimated emission benefit in EU15 (EU27 unknown) until 2020 owing to introduction of option 2: - HC: 180 tn - CO: 1600 tn - NOx: 100 tn	Partial overlap with RSI, PTI and durability testing, low cost effectiveness of IUC compared to other related measures	
Increased quality and guarantee for customer that investment in cleaner vehicle gives better value for money over vehicle life in terms of steady environmental	Increased administrative and financial burden to national authorities	
Reduced risk for customers to fail PTI tests in the Member States where this applies. Prevent early on exchange of expensive exhaust after treatment components.	Difficult to select representative vehicles to test	
No additional cost for end-customer as burden carried by manufacturer and national authorities		

Benefit			Cost [Million Euro]			Other indicators		
						Cost effectiveness HC [Euro/kg] or [Million Euro / kton]		
Low	Best estimate	High	Low	Best estimate	High			
			6	7	8	Low	Best estimate	High
						3.6	4.2	4.8
						Cost effectiveness NOx [Euro/kg] or [Million Euro / kton]		
						Low	Best estimate	High
						0.3	0.3	0.4

Table 61: Analysis table policy options In-Use Conformity (IUC) testing and limits

2.2. On Board Diagnostic (OBD) systems and access to repair information

Type of impact:

(yellow)	Economical
(green)	Environmental
(orange)	Safety
(blue)	Societal

Option 1: No change (No introduction of OBD systems)						
Positive			Negative			Neutral / Remarks
No additional compliance cost for manufacturer.			Effect of malfunctions on emissions			
			Inefficient malfunction analysis with subsequent ineffective repair. (Independent) workshop is dependent on availability of proprietary manufacturer, non-standardised malfunction information.			
			Ineffective repair leads to high repair cost for customer and leads to customer dissatisfaction, high cost for repair shop and possibly high warranty cost for manufacturers.			
			Driver not directly informed if a capital system failure exists, that leads to high emissions			
			Driver not directly informed if a capital system failure exists, that leads to a possible safety impact.			
			Driver not directly informed if a capital system failure exists, that leads to a possible engine failure, leading to high subsequent repair cost for consumer.			
			In Member States in which L-category vehicles are subject to PTI testing, gaseous testing cannot be replaced by reading out OBD information as there is no standardised diagnostic information made available to a generic scan tool. This forces to maintain the worse cost efficient gaseous (CO) testing.			
Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	
Not possible to quantify, no data available			Not possible to quantify, no data available			Not possible to quantify, no data available

Table 62: Analysis table policy options On Board Diagnostic (OBD) systems and access to repair information, option 1

Option 2 (scenario 1 in LAT report): Application of OBD systems of similar technology to passenger cars (EOBD), including catalyst efficiency monitoring to all L-category vehicles. Introduction of free access to repair and maintenance provisions, similar as for passenger cars.		
Positive	**Negative**	**Neutral / Remarks**
If notified driver may visit repair shop soon and have malfunctions causing high emissions quickly repaired, leading to significant less negative environmental impact of malfunctions.	Substantial investments of the industry in technology (hard-ware and software). High compliance cost.	It is essential to find the optimum balance between correct, fast detection of failure and prevention of false detection. False detection will lead to loss of confidence of consumer and repairers and increased non value added cost to all stakeholders.
Standardised (ISO) malfunction information available to independent repairers, leading to less cost and time to diagnose malfunctions	Risk of ignoring the Malfunction Indicator Light by the driver.	
Driver directly informed if a capital system failure exists, that leads to a possible safety impact.	Special provisions required to accommodate retrofitting. Possible negative financial consequences for aftermarket	
Driver directly informed if a capital system failure exists, that leads to possible engine failure. Support to prevent high subsequent repair cost for consumer.	Increased complexity of legislation	
Engine component, sub system and complete system degradation monitoring. Fuel system drift, Misfire, Catalyst efficiency diagnostic, Front and Rear O2 sensor response diagnostic, EGR flow diagnostic, comprehensive components monitoring diagnostic among others guarantee that the most emission relevant components are monitored on their efficiency. In case of low efficiency leading to exceeding the OBD emission thresholds, the MIL will be illuminated and the driver will be notified so he/she is aware that a repair must be executed. The engine management system may trigger default actions in order to protect the engine and/or the catalytic converter. In Use Performance Ratio monitoring will increase the confidence level that all this monitoring will also happen under real world conditions and not only for demonstration purposes in the type approval test.	Missing enforcement in Periodical Technical Inspection / Road Side Inspection. No consequences if MIL on, voluntary decision of driver to continue driving with malfunction or to have vehicle repaired. In case of systematic malfunction owing to bad quality / design of components / systems there is no authority checking whether manufacturer should recall vehicles and improve vehicle.	
Less attractive (more complicated, more expensive) to tamper with manufacturer optimum found settings in order to just increase engine power / torque at the cost of the environmental / safety performance of the vehicle.	Access to technology by SME's (analogy to aspects as referred to under chapter on ***Antilock*** Brake systems).	
Additional employment and revenue for automotive suppliers to help manufacturers develop the OBD system and increased revenue related to additional engine hardware and software to be able to comply with OBD measures.		
Additional employment and revenue for Type Approval Authorities and testing laboratories to help manufacturers develop the OBD system and increased revenue related to additional engine hardware and software to be able to comply with OBD measures.		
Increased innovation in other areas of development than only in engine performance (power / torque) increase		
Use OBD as alternative to gaseous test in PTI, similar as on passenger cars. Enhanced efficient method to check whether engine is in acceptable condition. Reduced cost and PTI for customer.		
Standardised (ISO) malfunction and other diagnostic information is indispensible for independent repairers to efficiently and effectively repair a failure. The introduction of OBD and free access to repair and maintenance information to address the competition concern in the EU internal market must be assessed as one combined policy option. For this reason are the cost and cost-effectiveness calculations only indicative and too estimated very conservatively		

Benefit			**Cost (NPV in Million Euro)**			**Other indicators**		
						Cost effectiveness [Euro/kg] or [Million Euro / kton]		
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**	**Low**	**Best estimate**	**High**
Not possible to quantify, no data available			1227	1588	1949			
					HC	22.5	29.1	35.8
					NOx	1.5	2.4	1.9

Table 63: Analysis table policy options On Board Diagnostic (OBD) systems and access to repair information, option 2

Option 3 (scenario 2 in LAT report): use of Best Available Technology (BAT): minor malfunction monitoring (e.g. circuit integrity check) (OBD phase 1) to all L-category vehicles, no catalyst efficiency monitoring. Introduction of free access to repair and maintenance provisions, similar as for passenger cars.		
Positive	**Negative**	**Neutral / Remarks**
If notified driver may visit repair shop soon and have malfunctions causing high emissions quickly repaired, leading to significant less negative environmental impact of malfunctions.	Low investments of the industry in technology (hardware and software) as OBD phase one features are industry wide available, only as manufacturer proprietary systems (not standardised) and hardly not available on request of generic scan tool. Low estimated compliance cost. OBD phase 1 is ´commodity product´ of automotive suppliers and a ´no brainer´ to manufacturers.	It is essential to find the optimum balance between correct, fast detection of failure and prevention of false detection. False detection will lead to loss of confidence of consumer and repairers and increased non value added cost to all stakeholders.
Standardised (ISO) malfunction information available to independent repairers, leading to less cost and time to diagnose malfunctions	Risk of ignoring the Malfunction Indicator Light by the driver.	
Driver directly informed if a capital system failure exists, that leads to a possible safety impact.	Special provisions required to accommodate retrofitting. Possible negative financial consequences for aftermarket industry.	
Driver directly informed if a capital system failure exists, that leads to possible engine failure. Support to prevent high subsequent repair cost for consumer.	Increased complexity of legislation	
Degradation of components / systems not included. Only fast developing failures detected, slow over time developing failures will not be detected.	Missing enforcement in Periodical Technical Inspection / Road Side Inspection. No consequences if MIL on, voluntary decision of driver to continue driving with malfunction or to have vehicle repaired. In case of systematic malfunction owing to bad quality / design of components / systems there is no authority checking whether manufacturer should recall vehicles and improve vehicle.	
Less attractive (more complicated, more expensive) to tamper with manufacturer optimum found settings in order to just increase engine power / torque at the cost of the environmental / safety performance of the vehicle.		
Additional employment and revenue for automotive suppliers to help manufacturers develop the OBD system and increased revenue related to additional engine hardware and software to be able to comply with OBD measures		
Additional employment and revenue for Type Approval Authorities and testing laboratories to help manufacturers develop the OBD system and increased revenue related to additional engine hardware and software to be able to comply with OBD measures.		
Increased innovation in other areas of development than only in engine performance (power / torque) increase.		
Use OBD as alternative to gaseous test in PTI, similar as on passenger cars. Enhanced efficient method to check whether engine is in acceptable condition. Reduced cost and PTI for customer.		
One time investment for OEM can be well amortised, owing to high level of re-use of hardware and software functionality for current and future generations of Engine Control Modules.		
Standardised (ISO) malfunction and other diagnostic information is indispensible for independent repairers to efficiently and effectively repair a failure. The introduction of OBD and free access to repair and maintenance information to address the competition concern in the EU internal market must be assessed as one combined policy option.This was an additional reason to discard the cost and cost-effectiveness calculations provided by the consultant's report as this was aspect was not included in the initial assumptions.		

Benefit			Cost (NPV in Million Euro)			Other indicators
Low	Best estimate	High	Low	Best estimate	High	Cost effectiveness
Not possible to quantify, no data available			The numbers from the LAT report were considered much too high and were therefore discarded by the Commission Services.			The numbers from the LAT report were considered much too high and were therefore discarded by the Commission Services.

Table 64: Analysis table policy options On Board Diagnostic (OBD) systems and access to repair information, option 3

ANNEX XII: DETAILS CHAPTER 5 — IMPACT ANALYSIS NEW VEHICLE TYPE APPROVAL SAFETY MEASURES

1. OBLIGATORY FITTING OF ADVANCED BRAKE SYSTEMS

In the discussions about this topic there is a lot of confusion about the expression 'Advanced' Brake Systems and '***Anti-lock'*** Brake Systems[49], generally abbreviated as ABS. However, Advanced Brake Systems are also abbreviated as ABS. In this Impact Assessment report ABS means ***Anti-lock*** Brake System exclusively. Advanced Brake Systems in this report is defined as: ***Anti-lock*** Brake System and/or Combined Brake Systems[50].

Controversial in the discussions is the technical effectiveness of ***Anti-lock*** Brake Systems to prevent accidents or mitigation of injuries and associated cost-benefit ratios, especially for the scenarios in which this system would be assumed to be mandatory. One of the most critical variables in the discussion is the best estimated cost price of ***Anti-lock*** Brake System and the impact this potentially has on vehicle sales and the estimations of the cost benefit ratios. For every scenario the assumed best estimate, including low and high range prices will be listed. In the policy report the short, mid- and long-term economic impacts were assessed. In the Impact Assessment report only the long term effects will be used as final comparison criteria, as the objectives for the measures in the new regulation are also defined as long term goals. In case of any short term side-effect of a measure, this will be specifically reported.

1.1. No change

Type of impact:

(yellow)	Economical
(green)	Environmental
(orange)	Safety
(blue)	Societal

Option 1: No change		
Positive	**Negative**	**Neutral / Remarks**
Low consumer price of PTW	Unchanged level of fatalities and injured riders in PTW involved road accidents.	
	Level of cost to society owing to cost of health care, lost working days etc.	
	High insurance cost for consumer	
	Potential customers not purchasing PTWs owing to being victim of road accident	
	Grief of family, friends, colleagues.	

Benefit (million Euro), 2011 - 2021			Cost (million Euro), 2011 - 2021			Other indicators
Low	Best estimate	High	Low	Best estimate	High	

Table 65: Analysis table policy options obligatory fitting of advanced brake systems, option 1

49 Definition from TRL report: ***Anti-lock*** braking systems (ABS) monitor the speed at which the wheels are rotating and rapidly modulate the brake pressure when imminent wheel lock is detected in order to increase effective braking and prevent the deceleration being dictated by the sliding friction between tyre and road. ABS is the **only technical solution** which directly monitors and prevents wheel locking and has been shown in test conditions to result in generally higher braking decelerations by maintaining the wheel slip such that friction is above the level provided by locked wheels. Preventing wheel lock under emergency braking provides the rider with increased confidence to apply higher brake forces.

50 Definition from TRL report: Combined braking systems (CBS) are used to ensure that the correct braking distribution is applied regardless of which brake is activated; currently the rider must use two separate mechanisms to operate the front and rear brakes. The use of CBS allows one mechanism to operate both brakes (in a similar way to that of a passenger car). The primary aim of this system is to appropriately distribute the braking effort between the front and rear wheels. Compared with rider-controlled distribution of braking between the front and the rear, CBS reduces the chances of wheel lock and instability occurring at less than the maximum level of deceleration. For example, if a rider applied the rear brake very hard, without using the front brake, the rear wheel could lock and cause instability at a level of deceleration considerably less than half the maximum achievable. CBS can prevent such a situation but cannot prevent wheel lock when the rider applies the single brake control harder than required to produce maximum deceleration.

1.2. Anti-lock Brake Systems on all Powered Two Wheelers (PTW)

Option 2: *Anti-lock* Brake Systems on all Powered Two Wheelers (PTW)		
Positive	**Negative**	**Neutral / Remarks**
Anti-lock Brake System is the **only** technical solution which directly monitors and prevents wheel locking.	Rider becoming "over" confident if PTW equipped with advanced brake system, trusts too much on technology. Higher speed	Rider training is required in order to achieve the maximum advantages of ***Anti-lock*** brake system
With ***Anti-lock*** Brake System higher braking decelerations achieved (resulting in less braking distance) than with conventional brakes only. Potential reduction in impact speed in case of collision	Perception that CBS is full alternative to ***Anti-lock*** brake system, technical equivalence	Innovation in ***Anti-lock*** Brake System and braking technology
Preventing wheel lock under emergency braking provides the rider with increased confidence to apply higher brake forces. More efficient braking with ***Anti-lock*** brake system, rider brakes earlier during brake manœuvre	Possible bad braking performance (adverse effects off-road) if ***Anti-lock*** Brake System fitted on off-road PTW	
Inexperienced riders on PTW with ***Anti-lock*** Brake System able to achieve decelerations closer to that of experienced riders, after relatively short training / adaptation time	Manufacturing and development cost of PTWs equipped with ***Anti-lock*** Brake Systems, possibly passed on to consumer (possible price increase)	
Vehicles fitted with ***Anti-lock*** Brake System are able to make use of the adhesion available when on low and high friction surfaces. (e.g. changing conditions from dry to wet road)	Availability of ***Anti-lock*** Brake System technology to SME's (not meeting entrance criteria to be supplied by bigger automotive suppliers or confronted with high development cost as supplier cannot amortise investments owing to low series production)	
Anti-lock brake systems prevents dangerous downfalls whilst braking. In case of critical wheel-lock of front wheel PTW rider falls and slides uncontrolled over the road	Risk of short - mid term price increase owing to manufacturers forced to buy systems and components from suppliers.	
Cost effectiveness obligatory ***Anti-lock*** brake system. Majority of in total 11 predictive and retrospective literature study results are positive.	Additional rules for design of brake system to industry making legislation more complex.	
Chance of increased level of accident result mitigation in case of ***Anti-lock*** brake system	Legislation not technology neutral, mandating a specific technology. Normally legislation just defines the performance criteria.	
Long term societal and economic benefits owing to casualty mitigation . There are estimated to be between 5.5 and 13 times (approximately between 30,000 and 72,000 riders) more heavily injured people than fatalities per year in the EU. Slight motorcycle casualties are lying within a range of 12 and 28 times the numbers of fatalities (approximately between 66,000 and 155,000 riders) per annum in the EU. Based on the current available data it is not possible to forecast the level of mitigation in case of mandatory use of advanced brake system.	Level of technical complexity of vehicle	
In some Member States, discount on rider's insurance. Less cost insurance companies.		
Economy of scales for Anti-lock Braking System production, mid to long term drop of development and production cost		
Revenue and employment supplier industry		
Level of market penetration: 91% of PTWs estimated to be equipped with a ***Anti-lock*** Brake System in 2021		

FATALITY REDUCTION Long term life saving (2011-2021)		
Min.	**Best Estimate**	**Max.**
2,799	5,999	11,997

Benefit (million Euro), 2011 - 2021			Cost (million Euro), 2011 - 2021			Remarks / Other indicators		
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**			
€ 2,553	€ 5,107	€ 10,214	€ 1,732	€ 3,463	€ 2,597	Benefit: fatality avoidance		
€ 792	€1,583 - €3,677	€ 7,354				Benefit: mitigation heavy injuries		
€ 102	€204 - €460	€ 919				Benefit: mitigation slight injuries		
						Benefit to cost ratio, 2011 - 2021		
						Low	**Best estimate**	**High**
					accident avoidance 2011 - 2021	1.3	2.7 – 3.6	7.1
					casualty mitigation 2011 - 2021	1.1	2.3 – 3.0	5.9

Table 66: Analysis table policy options obligatory fitting of advanced brake systems, option 2

1.3. ANTI-LOCK BRAKE SYSTEMS ON PTWS WITH CYLINDER CAPACITY[51] > 125 CM^3 AND ADVANCED BRAKE SYSTEMS (COMBINED BRAKE SYSTEM (CBS) OR ANTI-LOCK BRAKE SYSTEMS (ABS)) ON MOTORCYCLES WITH 50 CM^3 < CYLINDER CAPACITY[51] ≤ 125 CM^3

Option 3: Anti-lock Brake Systems on PTWs with cylinder capacity > 125 cm^3 and Advanced Brake Systems (Combined Brake System (CBS) and/or Anti-lock Brake Systems (Anti-lock Brake System)) on motorcycles with cylinder capacity >50cm^3 and <= 125cm^3		
Positive	**Negative**	**Neutral / Remarks**
Anti-lock Brake System is the <u>only</u> technical solution which directly monitors and prevents wheel locking.	Rider becoming "over" confident if PTW equipped with advanced brake system, trusts too much on technology.	Rider training is required in order to achieve the maximum advantages of ***Anti-lock*** brake system
With ***Anti-lock*** Brake System higher braking decelerations achieved (resulting in less braking distance) than with conventional brakes only. Potential reduction in impact speed in case of collision	Perception that CBS is full alternative to ***Anti-lock*** brake system, technical equivalence	Innovation in ***Anti-lock*** Brake System and braking technology
Preventing wheel lock under emergency braking provides the rider with increased confidence to apply higher brake forces. More efficient braking with ***Anti-lock*** brake system, rider brakes earlier during brake manœuvre	Possible bad braking performance (adverse effects off-road) if ***Anti-lock*** Brake System fitted on Off-road PTW	
Inexperienced riders on PTW with ***Anti-lock*** Brake System able to achieve decelerations closer to that of experienced riders, after relatively short training / adaptation time	Manufacturing and development cost of PTWs equipped with ***Anti-lock*** Brake Systems, possibly passed on to consumer (possible price increase)	
Vehicles fitted with ***Anti-lock*** Brake System are able to make use of the adhesion available when on low and high friction surfaces. (e.g. changing conditions from dry to wet road)	Availability of ***Anti-lock*** Brake System technology to SME's (not meeting entrance criteria to be supplied by bigger automotive suppliers or confronted with high development cost as supplier cannot amortise investments owing to low series production)	
Anti-lock brake systems prevents dangerous downfalls whilst braking. In case of critical wheel-lock of front wheel PTW rider falls and slides uncontrolled over the road	Risk of short term price increase owing to manufacturers forced to buy systems and components from suppliers.	
Cost effectiveness obligatory ***Anti-lock*** brake system. Majority of in total 11 predictive and retrospective literature study results are positive.	Additional rules for design of brake system to industry making legislation more complex.	
Chance of increased level of accident result mitigation in case of ***Anti-lock*** brake system	Legislation not technology neutral, mandating a specific technology. Normally legislation just defines the performance criteria.	
Long term societal and economic benefits.	Level of technical complexity of vehicle	
In some Member States, discount on rider's insurance. Less cost insurance companies.		
Economy of scales for Anti-lock Braking System production, mid to long term drop of development and production cost		
Revenue and employment supplier industry		
Level of market penetration: 64% of PTWs estimated to be equipped with a ***Anti-lock*** Brake System in 2021, 27% with		
Long term societal and economic benefits owing to casualty mitigation . There are estimated to be between 5.5 and 13 times (approximately between 30,000 and 72,000 riders) more heavily injured people than fatalities per year in the EU. Slight motorcycle casualties are lying within a range of 12 and 28 times the numbers of fatalities (approximately between 66,000 and 155,000 riders) per annum in the EU. Based on the current available data it is difficult to forecast the level of mitigation in case of mandatory use of advanced brake system.		
Performance criteria of option 3 aligned with vehicle performance criteria as defined in the new driving licence Directive 2006/126/EC for category A2. Benefit: type approval and driving licence vehicle classification criteria harmonised (coherence)		
Sensible definition of performance thresholds to differentiate between a low and a high performing motorcycle. To improve the match between the performance (acceleration and braking) criteria used for type approval and for driving licence (category A2). Rationale: the higher the power and torque characteristics of a motorcycle, leading to a high max. vehicle speed and fast acceleration respectively, the better the braking performance must be. Especially the Power to mass criteria defined in Directive 2006/126/EC provide an international accepted limitation for this criterion.		
FATALITY REDUCTION Long term life saving (2011-2021) **Min.** 2,799 / **Best Estimate** 5,332 / **Max.** 11,331		

Benefit (million Euro), 2011 - 2021			Cost (million Euro), 2011 - 2021			Remarks / Other indicators		
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**			
€ 2,383	€ 4,539	€ 9,646	€ 1,602	€ 3,463	€ 2,597	Benefit: fatality avoidance		
€ 739	€1,407 - €3,268	€ 6,945				Benefit: mitigation heavy injuries		
€ 95	€182 - €409	€ 868				Benefit: mitigation slight injuries		
						Benefit to cost ratio, 2011 - 2021		
						Low	**Best estimate**	**High**
					accident avoidance 2011 - 2021	1.2	2.4 – 3.2	6.7
					casualty mitigation 2011 - 2021	1.1	2.0 – 2.6	5.6

Table 67: Analysis table policy options obligatory fitting of advanced brake systems, option 3

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[51] The 125 cm^3 takes reference to the thresholds in Directive 2006/126/EC (recasted driving licence directive) related to class A1: motorcycles with a cylinder capacity not exceeding 125 cm^3, of a power not exceeding 11kW and with a power/weight ratio not exceeding 0.1 kW/kg.

1.4. To make mandatory the fitting of Advanced Brake Systems (Combined Brake System (CBS) and/or Anti-lock Braking Systems) on those motorcycles which conform to the performance criteria defined by the A2 driving licence. Obligatory fitting of Anti-lock Brake Systems on all other L3e class motorcycles;

Option 4: To make mandatory the fitting of Advanced Brake Systems (Combined Brake System (CBS) and/or Anti-lock Braking Systems) on those motorcycles which conform to the performance criteria defined by the A2 driving licence . Obligatory fitting of Anti-lock Brake Systems on all other L3 class motorcycles;		
Positive	**Negative**	**Neutral / Remarks**
Anti-lock Brake System is the **only** technical solution which directly monitors and prevents wheel locking.	Rider becoming "over" confident if PTW equipped with advanced brake system, trusts too much on technology.	Rider training is required in order to achieve the maximum advantages of ***Anti-lock*** brake system
With ***Anti-lock*** Brake System higher braking decelerations (resulting in less braking distance) than with conventional brakes only. Potential reduction in impact speed in case of collision	Perception that CBS is full alternative to ***Anti-lock*** brake system, technical equivalence	Innovation in ***Anti-lock*** Brake System and braking technology
Preventing wheel lock under emergency braking provides the rider with increased confidence to apply higher brake forces. More efficient braking with ***Anti-lock*** brake system, rider brakes earlier during brake manœuvre	Possible bad braking performance (adverse effects off-road) if ***Anti-lock*** Brake System fitted on Off-road PTW	
Inexperienced riders on PTW with ***Anti-lock*** Brake System able to achieve decelerations closer to that of experienced riders, after relatively short training / adaptation time	Manufacturing and development cost of PTWs equipped with ***Anti-lock*** Brake Systems, possibly passed on to consumer (possible price increase)	
Vehicles fitted with ***Anti-lock*** Brake System are able to make use of the adhesion available when on low and high friction surfaces. (e.g. changing conditions from dry to wet road)	Availability o***f Anti-lock*** Brake System technology to SME's (not meeting entrance criteria to be supplied by bigger automotive suppliers or confronted with high development cost as supplier cannot amortise investments owing to low series production)	
Anti-lock brake systems prevents dangerous downfalls whilst braking. In case of critical wheel-lock of front wheel PTW rider falls and slides uncontrolled over the road	Risk of short term price increase owing to manufacturers forced to buy systems and components from suppliers.	
Cost effectiveness obligatory ***Anti-lock*** brake system. Majority of in total 11 predictive and retrospective literature study results are positive.	Additional rules for design of brake system to industry making legislation more complex.	
Chance of increased level of accident result mitigation in case of ***Anti-lock*** brake system	Legislation not technology neutral, mandating a specific technology. Normally legislation just defines the performance criteria.	
In some Member States, discount on rider's insurance. Less cost insurance companies.	Level of technical complexity of vehicle	
Economy of scales for Anti-lock Braking System production, mid to long term drop of development and production cost	Less vehicles in the scope of mandatory equipping vehicles with an ***Anti-lock*** Brake System from the braking performance perspective	
Revenue and employment supplier industry	Significant higher level of uncertainty regarding the benefit to cost ratio as scenario did not make part of the TRL report. The financial data were copied from option 3. The assumption is that the cost to the manufacturer is significantly lower, but the benefit as well, resulting in lower benefit to cost ratios.	
Higher fleet penetration rate of ***Anti-lock*** Brake System than if left to market		
Long term societal and economic benefits owing to casualty mitigation . There are estimated to be between 5.5 and 13 times (approximately between 30,000 and 72,000 riders) more heavily injured people than fatalities per year in the EU. Slight motorcycle casualties are lying within a range of 12 and 28 times the numbers of fatalities (approximately between 66,000 and 155,000 riders) per annum in the EU. Based on the current available data it is difficult to forecast the level of mitigation in case of mandatory use of advanced brake system		
Performance criteria of option 4 aligned with vehicle performance criteria as defined in the new driving licence Directive 2006/126/EC for category A2. Benefit: type approval and driving licence vehicle classification criteria harmonised (coherence)		
Sensible definition of performance thresholds to differentiate between a low and a high performing motorcycle. To improve the match between the performance (acceleration and braking) criteria used for type approval and for driving licence (category A2). Rationale: the higher the power and torque characteristics of a motorcycle, leading to a high max. vehicle speed and fast acceleration respectively, the better the braking performance must be. Especially the Power to mass criteria defined in Directive 2006/126/EC provide an international accepted limitation for this criterion.		

FATALITY REDUCTION Long term life saving (2011-2021)		
Min.	**Best Estimate**	**Max.**
754 - 2799 mean: 1777	1437 - 5332 mean:3385	3054 - 11331 mean:7193

Approximated Benefit (million Euro), 2011 - 2021			**Approximated Cost (million Euro), 2011 - 2021**			**Remarks / Other indicators**		
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**			
Benefit (million Euro), 2011 - 2021			**Cost (million Euro), 2011 - 2021**			**Remarks / Other indicators**		
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**			
€ 2,383	€ 4,539	€ 9,646	€ 1,602	€ 3,463	€ 2,597	Benefit: fatality avoidance		
€ 739	€1,407 - €3,268	€ 6,945				Benefit: mitigation heavy injuries		
€ 95	€182 - €409	€ 868				Benefit: mitigation slight injuries		
						Benefit to cost ratio, 2011 - 2021		
						Low	**Best estimate**	**High**
					accident avoidance 2011 - 2021	1.2	2.4 – 3.2	6.7
					casualty mitigation 2011 - 2021	1.1	2.0 – 2.6	5.6

Table 68: Analysis table policy options obligatory fitting of advanced brake systems, option 4

1.5. Industry self obligation

Option 5: Industry self-obligation		
Positive	**Negative**	**Neutral / Remarks**
Preventing wheel lock under emergency braking provides the rider with increased confidence to apply higher brake forces. More efficient braking with Advanced Brake System, rider brakes earlier during brake manœuvre	Rider becoming "over" confident if PTW equipped with advanced brake system, trusts too much on technology. Higher speeds	***Anti-lock*** Brake System is the **only** technical solution which directly monitors and prevents wheel locking.
Cost effectiveness Advanced Brake Systems according to industry self-obligation scheme (either ***Anti-lock*** Brake System and/or CBS)	Cost effectiveness obligatory ***Anti-lock*** brake system.	With ***Anti-lock*** Brake System higher braking decelerations achieved in the majority of cases (resulting in less braking distance) than with conventional brakes only.
CBS is full alternative to ***Anti-lock*** brake system, technical equivalence assumed between both systems from the perspective of accident avoidance.	Possible bad braking performance (adverse effects off-road) if ***Anti-lock*** Brake System fitted on Off-road PTW	Inexperienced riders on PTW with ***Anti-lock*** Brake System able to achieve decelerations closer to that of experienced riders, after relatively short training / adaptation time
Less burden (impact of legislation on vehicle design) in industry (mainly for big players, small manufacturers may still struggle to fulfil self regulation quota if above small series threshold)	SME's under "normal" market pressure to equip produced vehicles with advanced brake systems. Concern related to access to technology postponed / only mitigated, not eliminated	***Anti-lock*** brake systems prevents dangerous downfalls in many cases whilst braking (panic stop).
In some Member States, discount on rider's insurance in case consumer opted for advanced brake system. Less cost insurance companies for these cases.	Estimated Percentage of fleet fitted with ***Anti-lock*** Brake System only estimated 16%, CBS: 7% in 2021	Rider training is required in order to achieve the maximum advantages of ***Anti-lock*** brake system
Conventional consumer price development owing to supply and demand. No guarantee in the self regulation is provided that the cost of advanced brake systems will not be transferred to the end customer. Anti-lock Brake System might be available as an option only.	Consumer opting for ***Anti-lock*** Brake System and/or CBS can only partly benefit from pressure on advanced brake system price (lower level of economy of scales for manufacturer)	Chance of increased level of accident result mitigation in case of ***Anti-lock*** brake system
Advanced brake system type chosen by consumer	Level of technical complexity of vehicle	Economy of scales for ***Anti-lock*** Braking System production, mid to long term drop of development and production cost
Less complex legislation, remains technology neutral to the full extend by just defining brake performance criteria	Despite of voluntary self-regulation already applicable since 2004 and on schedule (35% of all PTWs equipped with advanced brake systems) the fatality statistics have not significantly decreased and remain to be static or slightly increasing.	Revenue and employment supplier industry
Higher fleet penetration rate of ***Anti-lock*** Brake System than if completely left to market demand		Innovation in ***Anti-lock*** Brake System and braking technology
Long term societal and economic benefits owing to casualty mitigation . There are estimated to be between 5.5 and 13 times (approximately between 30,000 and 72,000 riders) more heavily injured people than fatalities per year in the EU. Slight motorcycle casualties are lying within a range of 12 and 28 times the numbers of fatalities (approximately between 66,000 and 155,000 riders) per annum in the EU. Based on the current available data it is not possible to forecast the level of mitigation in case of mandatory use of advanced brake system.		

FATALITY REDUCTION Long term life saving (2011-2021)		
Min.	**Best Estimate**	**Max.**
754	1,437	3,054

Benefit (million Euro), 2011 - 2021			Cost (million Euro), 2011 - 2021			Remarks / Other indicators
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**	
€ 648	€ 1,234	€ 2,621	€ 404	€ 1,338	€ 2,203	Benefit: fatality avoidance
€ 201	€382 - €888	€ 1,887				Benefit: mitigation heavy injuries
€ 26	€49 - €111	€ 236				Benefit: mitigation slight injuries

Benefit to cost ratio, 2011 - 2021	Low	Best estimate	High
accident avoidance 2011 - 2021	0.7	1.2 - 1.7	3.5
casualty mitigation 2011 - 2021	0.6	1.1 - 1.4	3.0

Table 69: Analysis table policy options obligatory fitting of advanced brake systems, option 5

2. ANTI-TAMPERING MEASURES

Type of impact:

(yellow)	Economical
(green)	Environmental
(orange)	Safety
(blue)	Societal

2.1. No change;

Option 1: No change		
Positive	**Negative**	**Neutral / Remarks**
General interest in customising and modification, good for technical education	By-passing driver licensing restrictions	Tampering only limited to Mopeds and lower displacement motorcycles ? What will be effect of possible lower emission limits which may effect maximum performance on motorcycles with higher displacement ?
Large after-market industry that supplies equipment/services for the modification of vehicles. Some of these modifications can be used to by-pass the existing anti-tampering measures, therefore repealing these measures could have an economic impact on this market, which is likely to contain a number of SMEs. (not possible to quantify this impact)	Saving on road tax	No additional manufacturer cost added if current anti-tampering measures for Mopeds and Light Motorcycles would be maintained.
	Saving on insurance premium	Theft of vehicles
	By-passing recurring technical inspections for special categories of vehicle	
	Emission of noise, exhaust emission levels, fuel consumption and CO_2. In some cases application of after-market components that do not increase power or maximum speed but do increase the noise levels substantially.	
	Higher maximum vehicle speed for e.g. Mopeds, which are designed for max. only 45 km/h.	
	Vehicles move more towards electronic manipulation, there is likely to be a negative safety impact as the existing anti-tampering measures become less effective (not possible to quantify) or become obsolete	
	Vehicles that have been tampered with are more likely to become involved in an accident.	
	Enforcement: vehicle compliance with chapter 7 not checked with the same intensity and frequency in all the EU27 Member States	
	Effectiveness of chapter 7, seven years after introduction largely unknown	
	Adverse economic impact on the suppliers of the parts which are no longer required (information stickers, frangible bolts etc.). Some may be SMEs.	
	Likely to have a negative effect on safety and would represent a backwards step from the current situation (MAIDS study indicated in 1999-2000, before introduction of chapter 7, 12.3% of mopeds had some form of engine or driveline tampering, which may be a very conservative estimate)	
	Enforcement: vehicle compliance with chapter 7 not checked with the same intensity and frequency in all the EU27 Member States (spot checks in Road Side Inspection or reoccurring in Periodical Technical Inspection)	
	Effectiveness of chapter 7, ten years after introduction largely unknown	
	Level of innovation	
	Most frequent tampering of original exhaust system, which possible contains exhaust after treatment technology to reduce emissions. Possible other tampering candidate: Engine Management System	

Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	
Not possible to quantify, no data available			Not possible to quantify, no data available			Not possible to quantify, no data available

Table 70: Analysis table policy options anti tampering measures, option 1

2.2. Repeal Chapter 7 of Directive 97/24/EEC, current superseded anti-tampering measures;

Option 2: Repeal Chapter 7 of Directive 97/24/EEC, current superseded anti-tampering measures		
Positive	**Negative**	**Neutral / Remarks**
General interest in customising and modification, good for technical education	By-passing driver licensing restrictions	Tampering only limited to Mopeds and lower displacement motorcycles ? What will be effect of possible lower emission limits which may effect maximum performance on motorcycles with higher displacement ?
Slightly less burden on OEM because one less approval to be obtained.	Saving on road tax	
	Saving on insurance premium	
	By-passing recurring technical inspections for special	
	Emission of noise, exhaust emission levels, fuel consumption and CO_2. In some cases application of after market components that do not increase power or maximum speed but do increase the noise levels substantially.	
	Higher maximum vehicle speed for e.g. Mopeds, which are designed for max. only 45 km/h.	
	Vehicles move more towards electronic manipulation, there is likely to be a negative safety impact as the existing anti-tampering measures become less effective (not possible to quantify) or obsolete	
	Vehicles that have been tampered with are more likely to become involved in an accident.	
	Enforcement: vehicle compliance with chapter 7 not checked with the same intensity and frequency in all the EU27 Member States	
	Effectiveness of chapter 7, seven years after introduction largely unknown	
	Adverse economic impact on the suppliers of the parts which are no longer required (information stickers, frangible bolts etc.). Some may be SMEs.	
	Large after-market industry that supplies equipment/services for the modification of vehicles. Some of these modifications can be used to by-pass the existing anti-tampering measures, therefore repealing these measures could have an economic impact on this market, which is likely to contain a number of SMEs. (not possible to quantify this impact)	
	Likely to have a negative effect on safety and would represent a backwards step from the current situation (MAIDS study indicated in 1999-2000, before introduction of chapter 7, 12.3% of mopeds had some form of engine or driveline tampering, which may be a very conservative estimate)	
	Enforcement: vehicle compliance with chapter 7 not checked with the same intensity and frequency in all the EU27 Member States (spot checks in Road Side Inspection or reoccurring in Periodical Technical Inspection)	
	Effectiveness of chapter 7, ten years after introduction largely unknown	
	Most frequent tampering of original exhaust system, which possible contains exhaust after treatment technology to reduce emissions. Possible other tampering candidate: Engine Management System	
	Level of innovation	
	Theft of vehicles	

Benefit			Cost			Other indicators
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**	
Not possible to quantify, no data available			Not possible to quantify, no data available			Not possible to quantify, no data available

Table 71: Analysis table policy options anti tampering measures, option 2

2.3. New measures on anti-tampering

Option 3 New measures on anti-tampering						
Positive			Negative			Neutral / Remarks
General interest in customising and modification, good for technical education			By-passing driver licensing restrictions			Minimum economic impact on manufacturers if the new measures can be designed into the vehicles in a similar way to the current measures
Updated legal requirements to align with progress in technology			Saving on road tax			Additional cost owing to design/development of new parts that are not currently used for the existing measures, especially for SMEs. Positive impact on other suppliers (which could also be SMEs), who develop and sell solutions to cope with new requirements.
Theft of vehicles			Saving on insurance premium			Economic impact on the after-market vehicle
Level of innovation			By-passing recurring technical inspections for special categories of vehicle			Tampering only limited to Mopeds and lower displacement motorcycles ? What will be effect of possible lower emission limits which may effect maximum performance on motorcycles with higher displacement ?
Improvements in emission of noise, exhaust emission levels, fuel consumption and CO_2 owing to tampering prevention.			Adverse economic impact on the suppliers of the parts which are no longer required or modified (information stickers, frangible bolts etc.). Some may be SMEs.			
More difficult (expensive) to obtain a maximum vehicle speed for e.g. Mopeds over the legal limit of 45 km/h.						
More appropriate anti-tampering measures, matching with technology, prevention of obsolete measures.						
(more expensive) to tamper with become less involved in a road accident.						
Enforcement: better vehicle compliance checking indications						
Number of additional products for large after-market industry that supplies equipment/services for the modification of vehicles. Modifying / adding measures could have a positive economic impact on this market.						
Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	
Not possible to quantify, no data available			Not possible to quantify, no data available			Not possible to quantify, no data available

Table 72: Analysis table policy options anti tampering measures, option 3

3. 74 kW POWER LIMITATION FOR MOTORCYCLES

Type of impact:

(light yellow)	Economical
(green)	Environmental
(orange)	Safety
(light blue)	Societal

Option 1: No change						
Positive			Negative			Neutral / Remarks
Minimum Economic impact			Cost to the manufacturers to produce the restricted motorcycles			Number of Member States that apply the 74kW power limit through national legislation could increase
						Potential that, in the future, the number of Member States that apply the 74kW power limit through national legislation could increase
						Sales within the markets affected that are currently not restricted ? Will there be an increase or decrease in sales ?
						No clear evidence to suggest that limiting the power of a motorcycle to 74kW has a positive impact on the number of road accidents involving motorcycles. Other factors such as rider attitude and experience have a greater influence on accident risk
						Effect on the noise generation, emissions and fuel consumption
Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	

Option 2: Repeal the option given to Member States to limit the power to 74kW.						
Positive			Negative			Neutral / Remarks
Any motorcycle that has a European approval can be registered in any Member State.						Effect on the noise generation neutral, impact on emissions and fuel consumption may be negative
Member States that currently apply the 74kW power limit (currently thought to be only France) may rescind the National Legislation. This is likely to have a moderate positive economic impact						No clear evidence to suggest that limiting the power of a motorcycle to 74kW has a positive impact on the number of road accidents involving motorcycles. Other factors such as rider attitude and experience have a greater influence on accident risk
OEMs will not be required to add specific measures to vehicles for specific markets therefore this should result in a positive economic impact for the OEMs with respect to reduced technical and administrative costs						
Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	
Not possible to quantify, no data available			Not possible to quantify, no data available			

Option 3: Set a harmonized limit of 74kW.						
Positive			Negative			Neutral / Remarks
			Impact on some specialist manufacturers that concentrate on the production of high powered motorcycles, where maximum power is essential for their brand			No clear evidence to suggest that limiting the power of a motorcycle to 74kW has a positive impact on the number of road accidents involving motorcycles. Other factors such as rider attitude and experience have a greater influence on accident risk
			Potential significant revenue loss to industry owing to some customers loosing interest in motorcycles			Effect on the noise generation, emissions and fuel consumption
Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	
Not possible to quantify, no data available			Not possible to quantify, no data available			

Option 4: Use an alternative limitation.						
Positive			Negative			Neutral / Remarks
If e.g. power to mass ratio would be considered as limitation criterion this may be more effective. No data available to substantiate assumption.			Risk of impact on the sales of new motorcycles if the new method of limitation is inconsistent with the requirements of the target market			No clear evidence to suggest that limiting the power of a motorcycle to 74kW has a positive impact on the number of road accidents involving motorcycles. Other factors such as rider attitude and experience have a greater influence on accident risk
			Potential significant revenue loss to industry owing to some customers loosing interest in motorcycles			Economic impact of this option will be dependent on the method of limitation that is selected
						Effect on the noise generation, emissions and fuel consumption
Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	

Table 73: Analysis table policy options 74 kW limitation, options 1 to 4

ANNEX XIII: DETAILS CHAPTER 5 — IMPACT ANALYSIS IMPROVED CATEGORISATION OF L-CATEGORY VEHICLES

1. ELECTRICAL CYCLES (OUTSIDE SCOPE OF FRAMEWORK DIRECTIVE CURRENTLY), TRICYCLES (L5E) AND QUADRICYCLES (CATEGORY L6E AND L7E)

Option 1: No change

Positive	Negative	Neutral / Remarks
	Regulatory system costs unchanged, not possible to quantify more as the general statement that type approval cost per application is €10,000;	In the EU approximately 320.000 minicars, 800.000 ATVs (in 2007, sales 158.000 vehicles per year), relatively small fleet in comparison to motorcycles or passenger cars, but 2,500,000 electric bicycles anticipated to be on the market by 2011
	Technical standards meeting effort; current costs unchanged	
	Level of safety	
	Noise, emissions and fuel consumption; low negative impact. Not quantified; no data	

Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	

Option 2: Exclude quadricycles and electrical bi- and tri-cycles from the Framework Regulation;

Positive	Negative	Neutral / Remarks
	Significant cost increase if technical requirements vary between countries. Cost impact particularly high for SMEs	In the EU approximately 320.000 minicars, 800.000 ATVs (in 2007, sales 158.000 vehicles per year), relatively small fleet in comparison to motorcycles or passenger cars, but 2,500,000 electric bicycles anticipated to be on the market by 2011
	Transparency regulatory system	Technical standards meeting effort; current costs unchanged
	Level of safety	
	Noise, emissions and fuel consumption; low negative impact. Not quantified; no data	

Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	
Not possible to quantify, no data available			Not possible to quantify, no data available			

Option 3: Return to the original spirit of the legislation for mini cars;

Positive	Negative	Neutral / Remarks
Transparency regulatory system	Level of safety	In the EU approximately 320.000 minicars, 800.000 ATVs (in 2007, sales 158.000 vehicles per year), relatively small fleet in comparison to motorcycles or passenger cars, but 2,500,000 electric bicycles anticipated to be on the market by 2011
	Noise, emissions and fuel consumption; low negative impact. Not quantified; no data	Regulatory system costs
	Possible additional compliance cost to manufacturer with revised criteria to re-categorise L-category vehicles	Technical standards meeting effort unchanged

Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	
Not possible to quantify, no data available			Not possible to quantify, no data available			

Option 4: Improving the legislation by adding new requirements based on car requirements for mini cars.

Positive	Negative	Neutral / Remarks
Transparency regulatory system	Align requirements as far as possible with M1 requirements. Increase in scope for testing to match passenger cars would impose very significant additional cost on industry	In the EU approximately 320.000 minicars, 800.000 ATVs (in 2007, sales 158.000 vehicles per year), relatively small fleet in comparison to motorcycles or passenger cars
Technical requirements improved to M1 passenger car equivalent; improved safety		Technical standards meeting effort unchanged
Noise, emissions and fuel consumption; Not quantified; no data		

Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	
Not possible to quantify, no data available			Not possible to quantify, no data available			

Option 5: Improving the proliferation of vehicle categories by the introduction of dedicated sub categories in L1e, L5e, L6e and L7e. Add new / revised appropriate dedicated requirements for these sub categories.

Positive	Negative	Neutral / Remarks
Transparency regulatory system	Possible additional compliance cost to manufacturer with revised criteria to re-categorise L-category vehicles	In the EU approximately 320.000 minicars, 800.000 ATVs (in 2007, sales 158.000 vehicles per year), relatively small fleet in comparison to motorcycles or passenger cars
Level of safety		Technical standards meeting effort unchanged

Table 74: Analysis table policy options re-categorisation L1e, L5e, L6E & L7e, options 1 to 5.

2. Specific requirements for category L7e vehicles

Option 1: No change		
Positive	**Negative**	**Neutral / Remarks**
	Type approval costs unchanged	
	Casualty rates remain unchanged; current casualty rates appear high in relation to cars and PTWs. Not quantified; data insufficient to draw robust conclusions	
	Inappropriate / non-present safety measures	
	Inappropriate / non-present environmental measures	

Benefit			Cost			Other indicators
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**	

Option 2: Exclude off-road quads from the Framework Directive.		
Positive	**Negative**	**Neutral / Remarks**
	ATVs approved at national level. Increase in cost to manufacturers over current situation, potentially requiring €10,000 per vehicle for approval in each member state	
	Different national approval requirements. Not quantified; risk of divergent requirements leading to trade barriers	
	Approved as machines or other alternative. Not quantified; effect on casualties not clear	
	Inappropriate / non-present safety measures	
	Inappropriate / non-present environmental measures	

Benefit			Cost			Other indicators
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**	
Not possible to quantify, no data available			Not possible to quantify, no data available			

Option 3: Keep the existing category and add new requirements on safety for all quads.		
Positive	**Negative**	**Neutral / Remarks**
Appropriate safety measures. Possibility to include international standards (CEN / ISO / UN ECE)	Add new requirements for all quadricycles (Quads and mini cars) in terms of cost. Risk that requirements for one vehicle type are not applicable for the other and vice versa. Not quantified; insufficient data but cost increase if additional tests added. Likely to also result in increased cost to consumers	Add new requirements for all quadricycles. Not quantified ; effect on casualties not clear
Appropriate environmental measures. Possibility to include international standards (CEN / ISO / UN ECE)	Emissions resulting from travel to/from technical standards meetings	
	Still complex, difficult to interpret and to differentiate between different vehicle types	

Benefit			Cost			Other indicators
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**	
Not possible to quantify, no data available			Not possible to quantify, no data available			

Option 4: Create a new category for off-road quadricycles with specific requirements.		
Positive	**Negative**	**Neutral / Remarks**
Simplification. Clearer, more appropriate measures. Reduction of obsolete or redundant requirements	Emissions resulting from travel to/from technical standards meetings	Add new Quadricycle category and specific requirements. Not quantified; cost increase over current situation if additional to current requirements but reduction possible if specific requirements mean reduced cost
Add new Quadricycle category and specific requirements. Not quantified; effect on casualties not clear. Targeted measures may be more effective at reducing casualties than Option C.	No clear separation between on-road and off-road quad classification possible, based on design criteria only . High risk of easy circumnavigating strict safety and environmental type-approval requirements for on-road quads by simple and inexpensive modification of off-road quads	
Reduced compliance cost for manufacturers, better cost effectiveness of measures, lower consumer prices.		
Appropriate safety measures. Possibility to include international standards (CEN / ISO / UN ECE)		
Appropriate environmental measures. Possibility to include international standards (CEN / ISO / UN ECE)		

Benefit			Cost			Other indicators
Low	**Best estimate**	**High**	**Low**	**Best estimate**	**High**	
Not possible to quantify, no data available			Not possible to quantify, no data available			

Table 75: Analysis table policy options specific requirements for Category L7e vehicles, options 1 to 4.

3. Dedicated requirements for gaseous alternative fuels and other non-traditional propulsions.

Option 1: No change (legislation at National level)						
Positive			Negative			Neutral / Remarks
			Type approval costs unchanged. Potentially high costs for approval in multiple countries and this may be inhibiting investment in market. Not quantified; no available data			
			Different national approval requirements. Not quantified; risk of divergent requirements leading to trade barriers			
			In appropriate / non present safety measures			
			In appropriate / non present environmental measures			
Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	

Option 2: Legislation at European Union level through a tighter grid of vehicle type categorisation with dedicated measures for the different vehicles and propulsion technologies.						
Positive			Negative			Neutral / Remarks
Appropriate safety measures. Possibility to include international standards (CEN / ISO / UN ECE)			Type approval costs unchanged or estimated higher. Also conflicting stakeholder responses that would a) promote investment through a clearer market or b) inhibit innovation by more test and cost requirements			Global Technical Regulation on Hydrogen technology is being developed. L-category vehicles propelled on hydrogen are excluded as the technology is not considered mature yet.
Appropriate environmental measures. Possibility to include international standards (CEN / ISO / UN ECE)			Not sufficient technical experience with and impacts of e.g. large scale industrial hydrogen L-category vehicle technology.			
Environmental benefit: lower particulate matter emissions, lower non-methane hydrocarbon emissions, lower CO emissions, similar NOx emissions. In case of CNG / Biogas: significant lower CO_2 emissions.						
Simplification. Clearer, more appropriate measures. Reduction of obsolete or redundant requirements						
Add new fuel specific requirements. Not quantified; effect on casualties not clear. Targeted measures may be more effective at reducing casualties than option 1.						
Level of innovation in safety and environmental technology may increase, with potential opportunities for SMEs.						
Benefit			Cost			Other indicators
Low	Best estimate	High	Low	Best estimate	High	
Not possible to quantify, no data available			Not possible to quantify, no data available			

Table 76: Analysis table policy options dedicated requirements for gaseous alternative fuels and other non-traditional propulsions.

ANNEX XIV: DETAILS CHAPTER 6 — OPTIONS COMPARISON AND CONCLUSIONS SIMPLIFICATION OF THE LEGISLATION

The positive point in option 1,'no policy change' is that no risk of loss in quality of requirements would be introduced by replacing provisions of EU Directives by references to international standards. A negative side of option 1 is that the concerns for manufacturers and administrations will remain, which is not in line with the Better Regulation objective. Continuing this approach would thus add unnecessary administrative burden on stakeholders. To reply to the concerns about a weakening of requirements, it is intended that references will only be proposed in cases where the international standards are at least equal to the relevant EU Directives.

By moving from directives to the legislative instrument of regulations, option 2 would do away with the need for transposition on the side of Member States and the need for transposition control on the side of the Commission, as this continues to be the case for options 1 and 3. Hence, all discrepancies between national transposition acts would be avoided. In addition, today the Commission services work on their own documents and on those from UNECE, etc. It would be much more efficient and more cost-effective for the representatives of Member States and also for the Commission services if the technical details were no longer duplicated in different set of legislations.

With the introduction of the split-level approach, the Council and Parliament can concentrate on the most important and perhaps controversial issues that require political debate and agreement, while delegating technical and administrative details to the Commission without losing control. The regulatory procedure with scrutiny would be the applicable comitology procedure, which ensures final control of the co-legislators also for comitology acts. Additional advantages of options 2 and 3 compared to option 1 are that the legislation will be simplified by suppressing useless duplications and that the fast developments in technical progress, possible new or revised environmental and safety measures can be smoothly integrated, while executing the simplification exercise. In terms of cost benefit is option 2 superior to option 3, as the cost for national transposition and surveillance of compliance cost will not apply.

In conclusion the advantages of option 2 outweigh by far its disadvantages and are more beneficial than choosing for options 1 or 3. Therefore the preferred option would be to simplify the legislation by introducing a co-decision Regulation with a limited number of implementing Regulations through Comitology, using as much as possible the standards available from UNECE, CEN/CENELEC and ISO.

Explanation:	
— —	much worse
—	worse
0	neutral (no change)
+	better
++	much better

Option 1: No policy change

Objective	Policy options	Criteria						Conclusion
		Effectiveness		Efficiency		Coherence		Conclusion
	1: No policy change		0		0		0	0

Option 2: Repeal current directives and replace with a minimum number of regulations

Objective	Policy options	Effectiveness		Efficiency		Coherence		Conclusion
Simplification	2: Repeal current directives and replace with a minimum number of regulations	simplification of the regulatory framework	++	initial cost	—	better coherence than option 1, in the long run also better than option 3	++	++
		Improved global harmonization	++	reduced annual implementation cost of regulatory system	+	increased clarity for industry and other stakeholders	++	
		better and clearer structure of legal text	++	translation cost eliminated	+			
		technical standards meeting effort reduced for Industry & EU-27	0	risk of delaying urgent matters	0			
		emissions resulting from travel to/from technical standards meetings reduced for Industry/EU-27	0	cost reduction on the long term	++			
		loss in safety and environmental protection	0	quick process of adaptation to technical evolution in the future	0			
				benefits of new measures can be accrued more rapidly	+			
				transparent regulatory system / democratic gap	0			
				length of processing: agreeing on one text including all requirements	—			

Option 3: Repeal current directives and replace with a minimum number of regulations

Objective	Policy options	Effectiveness		Efficiency		Coherence		Conclusion
Simplification	3: Repeal current directives and replace with a minimum number of regulations	simplification of the regulatory framework	++	initial cost	—	better coherence than option 1, in the long run also better than option 3	++	+
		Improved global harmonization	++	reduced annual implementation cost of regulatory system	0	increased clarity for industry and other stakeholders	++	
		better and clearer structure of legal text	++	translation cost eliminated if direct reference to technical standard	0			
		technical standards meeting effort reduced for Industry & EU-27	0	risk of delaying urgent matters	—			
		emissions resulting from travel to/from technical standards meetings reduced for Industry/EU-27	0	cost reduction on the long term	+			
		loss in safety and environmental protection	0	quick process of adaptation to technical evolution in the future	–			
				benefits of new measures can be accrued more rapidly	0			
				transparent regulatory system / democratic gap	0			
				length of processing: agreeing on one text including all requirements	—			

Table 77: option comparison and conclusion table — simplification

ANNEX XV: DETAILS CHAPTER 6 — OPTIONS COMPARISON AND CONCLUSIONS VEHICLE TYPE APPROVAL ENVIRONMENTAL MEASURES

1. New or revised environmental measures for the type approval of new vehicles

1.1. Revised lower emissions limits.

Explanation:	
— —	much worse
—	worse
0	neutral (no change)
+	better
++	much better

Option 1: No change

Objective	Policy options	Criteria						Conclusion
		Effectiveness		Efficiency		Coherence		
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Level of reduction of all air pollutants emitted by L-category vehicles but in particular: Hydrocarbon, Carbon Monoxide and Particulate Matter emissions as share of total road transport emissions.	0	Estimated speed of implementation (short implementation time)	0	Better coherence than options 2,3,4,5 ?	0	0
		Impact of L-category vehicle high level of emissions on capability of reducing emissions from other means of road transport	0	Compliance cost	0	Increased clarity for industry and other stakeholders	0	
		Only one or limited amount of L-category vehicles comply with revised thresholds, so distribution of burden to reduce emissions for part or all of L-category vehicle industry	0	Risk of cost transferred to consumer	0	Appropriate environmental measures for complete different vehicles	0	
		Products of superior quality withstanding global competition.	0			Level of simplification	0	
		Possible generation of new jobs in suppliers of emission control systems	0			Transparency with emission performance of other, alternative means of road transport	0	
		Risk of large price increases might lead to loss of jobs in manufacturing including SMEs	0					
		Risk of less frequent vehicle replacement, leading to longer time before new measures become effective	0					
		Increasing tampering practices	0					

Table 78: option comparison and conclusion table, revised emission limits, option 1

Option 2: : New emission limits for L1 mopeds: a cold-start r47 test cycle and a 30% weighing factor for the cold start are proposed to be applied. (Scenario 1 from LAT report). No change in limits for other L-category vehicles.

Objective	Policy options	Criteria						Conclusion
		Effectiveness		Efficiency		Coherence		
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Level of reduction of all air pollutants emitted by L-category vehicles but in particular: Hydrocarbon, Carbon Monoxide and Particulate Matter emissions as share of total road transport emissions.	—	Estimated speed of implementation (short implementation time)	++	Better coherence than options 2,3,4,5 ?	— —	—
		Impact of L-category vehicle high level of emissions on capability of reducing emissions from other means of road transport	— —	Compliance cost	0	Increased clarity for industry and other stakeholders	— —	
		Only one or limited amount of L-category vehicles comply with revised thresholds, so distribution of burden to reduce emissions for part or all of L-category vehicle industry	— —	Risk of cost transferred to consumer	0	Appropriate environmental measures for complete different vehicles	— —	
		Products of superior quality withstanding global competition.	—			Level of simplification	— —	
		Possible generation of new jobs in suppliers of emission control systems	—			Transparency with emission performance of other, alternative means of road transport	— —	
		Risk of large price increases might lead to loss of jobs in manufacturing including SMEs	0					
		Risk of less frequent vehicle replacement, leading to longer time before new measures become effective	0					
		Increasing tampering practices	0					

Table 79: option comparison and conclusion table, revised emission limits, option 2

Option 3: Motorcycle industry proposal (Scenario 2 from LAT report)								
Objective	Policy options	Criteria						
		Effectiveness		Efficiency		Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Level of reduction of all air pollutants emitted by L-category vehicles but in particular: Hydrocarbon, Carbon Monoxide and Particulate Matter emissions as share of total road transport emissions.	+	Estimated speed of implementation (short implementation time)	++	Better coherence than options 1,2,4,5 ?	— —	++
		Impact of L-category vehicle high level of emissions on capability of reducing emissions from other means of road transport	0	Compliance cost	0	Increased clarity for industry and other stakeholders	+	
		Only one or limited amount of L-category vehicles comply with revised thresholds, so distribution of burden to reduce emissions for part or all of L-category vehicle industry	++	Risk of cost transferred to consumer	0	Appropriate environmental measures for complete different vehicles	+	
		Products of superior quality withstanding global competition.	+			Level of simplification	0	
		Possible generation of new jobs in suppliers of emission control systems	+			Transparency with emission performance of other, alternative means of road transport	—	
		Risk of large price increases might lead to loss of jobs in manufacturing including SMEs	0					
		Risk of less frequent vehicle replacement, leading to longer time before new measures become effective	0					
		Increasing tampering practices	0					

Table 80: option comparison and conclusion table, revised emission limits, option 3

Option 4: New measures based on the Best Available Technology applied on L-category vehicles sold today in the market (Scenario 3 from LAT report)								
Objective	Policy options	Criteria						
		Effectiveness		Efficiency		Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Level of reduction of all air pollutants emitted by L-category vehicles but in particular: Hydrocarbon, Carbon Monoxide and Particulate Matter emissions as share of total road transport emissions.	+	Estimated speed of implementation (short implementation time)	— —	Better coherence than options 1, 2, 3 and 5 ?	—	+
		Impact of L-category vehicle high level of emissions on capability of reducing emissions from other means of road transport	0	Compliance cost	—	Increased clarity for industry and other stakeholders	+	
		Only one or limited amount of L-category vehicles comply with revised thresholds, so distribution of burden to reduce emissions for part or all of L-category vehicle industry	++	Risk of cost transferred to consumer	—	Appropriate environmental measures for complete different vehicles	+	
		Products of superior quality withstanding global competition.	+			Level of simplification	0	
		Possible generation of new jobs in suppliers of emission control systems	+			Transparency with emission performance of other, alternative means of road transport	—	
		Risk of large price increases might lead to loss of jobs in manufacturing including SMEs	0					
		Risk of less frequent vehicle replacement, leading to longer time before new measures become effective	0					
		Increasing tampering practices	0					

Table 81: comparison and conclusion table, revised emission limits, option 4

Option 5: New limits for all L-category vehicles equivalent in absolute terms to Euro5 M1 light-duty vehicles (4th scenario from LAT report)								
Objective	Policy options	Criteria						
		Effectiveness		Efficiency		Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Level of reduction of all air pollutants emitted by L-category vehicles but in particular: Hydrocarbon, Carbon Monoxide and Particulate Matter emissions as share of total road transport emissions.	++	Estimated speed of implementation (short implementation time)	— —	Better coherence than options 1, 2, 3 and 5 ?	+	++
		Impact of L-category vehicle high level of emissions on capability of reducing emissions from other means of road transport	+	Compliance cost	—	Increased clarity for industry and other stakeholders	+	
		Only one or limited amount of L-category vehicles comply with revised thresholds, so distribution of burden to reduce emissions for part or all of L-category vehicle industry	++	Risk of cost transferred to consumer	— —	Appropriate environmental measures for complete different vehicles	++	
		Products of superior quality withstanding global competition.	++			Level of simplification	+	
		Possible generation of new jobs in suppliers of emission control systems	++			Transparency with emission performance of other, alternative means of road transport	+	
		Risk of large price increases might lead to loss of jobs in manufacturing including SMEs	—					
		Risk of less frequent vehicle replacement, leading to longer time before new measures become effective	—					
		Increasing tampering practices	—					

Table 82: comparison and conclusion table, revised emission limits, option 5

1.2. Use of a revised World-wide Motorcycle emissions Testing Cycle (WMTC) for all L-category vehicle categories.

Explanation:	
– –	much worse
–	worse
0	neutral (no change)
+	better
++	much better

Option 1: No change								
Objective	Policy options	Criteria						
		Effectiveness		Efficiency		Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Representation of off-cycle, real world emissions and fuel consumption	0	Compliance cost short term	0	Amount of test cycles developed from historic reasons that may obsolete	0	0
		Increase cost of tampering / "cycle beating", therefore make it less attractive	0	Compliance cost mid to long term	0	Transparency of vehicle emission performance and fuel economy between the different vehicles of the L-category.	0	
				Economy of scale for manufacturers that globally market L-category vehicles	0	Transparency of vehicle emission performance and fuel economy between L-category vehicle and alternative means of transport (e.g. passenger cars or other).	0	

Option 2: Use of the phase 2 World Motorcycle Testing Cycle (WMTC) for all L-category vehicle classes								
Objective	Policy options	Criteria						
		Effectiveness		Efficiency		Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Representation of off-cycle, real world emissions and fuel consumption	+	Compliance cost short term	–	Amount of test cycles developed from historic reasons that may obsolete	+	++
		Increase cost of tampering / "cycle beating", therefore make it less attractive	+	Compliance cost mid to long term	0	Transparency of vehicle emission performance and fuel economy between the different vehicles of the L-category.	++	
				Economy of scale for manufacturers that globally market L-category vehicles	+	Transparency of vehicle emission performance and fuel economy between L-category vehicle and alternative means of transport (e.g. passenger cars or other).	+	
						Transparent change (cost and/or emission impact) if phase 2 WMTC would replace phase 1	++	

Table 83: comparison and conclusion table Use of a revised World-wide Motorcycle emissions Testing Cycle (WMTC) for all L-category vehicle categories

Current test cycle			Proposal for future test cycles					
L-category vehicle type	Emission step	Test cycle	L-category vehicle type	Emission step	Test cycle	Emission step	Test cycle	Remark
L1	Euro 2	R47	**L1A**	N.A.	N.A.			N.A. is not applicable, full electrical vehicles only
			L1B	Euro 3 & 4	R47	Euro 5	WMTC	To be developped in UN ECE
L2	Euro 2	R47	**L2**	Euro 3 & 4	R47	Euro 5	WMTC	Same as for L1B
L3	Euro 3	EDC / WMTC	**L3**	Euro 4 & 5	WMTC	Euro 6	WMTC	
L4	Euro 3	EDC / WMTC	**L4**	Euro 4 & 5	WMTC	Euro 6	WMTC	
L5	Euro 2	R40	**L5A**	Euro 3 & 4	WMTC	Euro 5	WMTC	
			L5B	Euro 3 & 4	R40	Euro 5	WMTC	
L6	Euro 2	R47	**L6A**	Euro 3 & 4	R47	Euro 5	WMTC	Same as for L1B
			L6B	Euro 3 & 4	R47	Euro 5	WMTC	Same as for L1B
L7	Euro 2	R40	**L7A**	Euro 3 & 4	WMTC	Euro 5	WMTC	
			L7B	Euro 3 & 4	R40	Euro 5	WMTC	

Table 84: Summary table containing proposal to transition to preferred option 2 (use of WMTC for all L-category vehicles)

NB Also please notes that for certain L-category vehicles (L1e, L2e, L6E and L7e) the scope of the WMTC under UNECE Global Technical Regulation 2 must be widened.

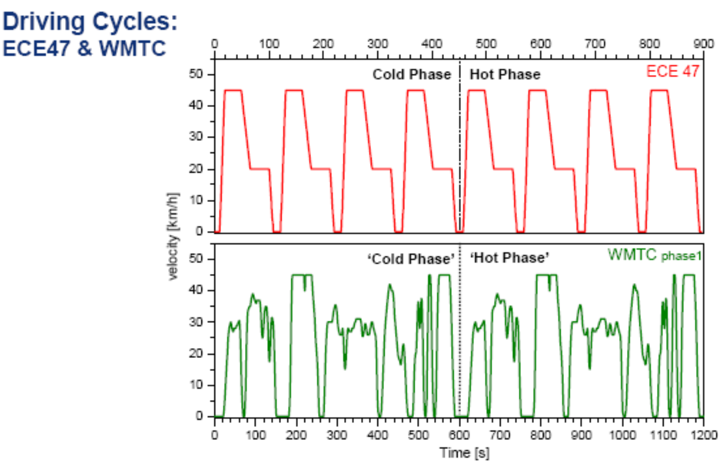

Figure 22: Example of how the existing Moped test cycle R47 can be replaced by a WMTC based test cycle.

1.3. Type-approval requirements for CO_2 measurement and fuel consumption determination and reporting

Option 1: No change

Objective	Policy options	Criteria						Conclusion
		Effectiveness		**Efficiency**		**Coherence**		**Conclusion**
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Paving the ground for the introduction of an energy efficiency labelling schem. Allowing then the consumer to select optimum fuel efficient vehicle: - between different alternative L-category vehicles - between L-category vehicles and alternative means of road transport	0	Cost of development to Member State to develop proprietary labelling system, if not EU wide available	0	Uniform EU-wide indication of CO2 emission and fuel consumption	0	0
				Compliance cost of manufacturers and further downstream	0	Stakeholders less confused, level of awareness	0	

Option 2: Type Approval for CO_2 and fuel consumption, vehicle labelling

Objective	Policy options	Criteria						Conclusion
		Effectiveness		**Efficiency**		**Coherence**		**Conclusion**
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Paving the ground for the introduction of an energy efficiency labelling schem. Allowing then the consumer to select optimum fuel efficient vehicle: - between different alternative L-category vehicles - between L-category vehicles and alternative means of road transport	++	Cost of development to Member State to develop proprietary labelling system, if not EU wide available	+	Uniform EU-wide indication of CO2 emission and fuel consumption	++	++
				Compliance cost of manufacturers and further downstream	—	Stakeholders less confused, level of awareness	++	

Table 85: comparison and conclusion table Type-approval requirements for CO_2 measurement and fuel consumption determination and reporting

1.4. Evaporative emissions test and limit

Option 1: No change

Objective	Policy options	Criteria: Effectiveness		Criteria: Efficiency		Criteria: Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Evaporative hydrocarbon emission level	0	Additional compliance cost	0	Better coherence than options 2 and 3 ?	0	0
		Reducing exhaust and evaporative emissions	0	Investment in evaporative emission control technology development of hardware and software. Additional cost may be passed on to customers	0	Increased clarity for industry and other stakeholders	0	
		Level of cost effectiveness compared to other methods to reduce hydrocarbon emissions	0	Revenue to supplier industry, including SMEs, potentially leading to effects on employment	0	Appropriate environmental measures for complete different vehicles	0	
		Availability of independent testing facilities (SHED chamber) for authorities, but also for	0			Level of simplification	0	
		Evaporative emissions controlled under different ambient conditions (hot climate, stop and go traffic) and/or over vehicle life.	0			Transparency with emission performance of other, alternative means of road transport	0	

Option 2: Replacement of all new carburetted models with fuel injected ones. Due to the closed circuit, fuel injection engines result in much lower evaporation emissions than carburetted ones

Objective	Policy options	Criteria: Effectiveness		Criteria: Efficiency		Criteria: Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Evaporative hydrocarbon emission level	+	Additional compliance cost	—	Better coherence than options 2 and 3 ?	+	+
		Reducing exhaust and evaporative emissions	++	Investment in evaporative emission control technology development of hardware and software. Additional cost may be passed on to customers	—	Increased clarity for industry and other stakeholders	+	
		Level of cost effectiveness compared to other methods to reduce hydrocarbon emissions. NB assumption that investment in EFI will only be done to reduce evaporative emission is a theoretical assumption, therefore are the assumed cost and cost efficiency of this option estimated too high. No data available to quantify the level of magnitude of this too high estimate.	0	Revenue to supplier industry, including SMEs, potentially leading to effects on employment	++	Appropriate environmental measures for complete different vehicles	++	
		Availability of independent testing facilities (SHED chamber) for authorities, but also for SMEs	—			Level of simplification	—	
		Evaporative emissions controlled under different ambient conditions (hot climate, stop and go traffic) and/or over vehicle life.	—			Transparency with emission performance of other, alternative means of road transport	+	

Option 3: Evaporative emissions test and limit enforcing evaporative emission control for all L-category vehicles

Objective	Policy options	Criteria: Effectiveness		Criteria: Efficiency		Criteria: Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L category emissions proportionate to their actual use (3% of total road mileage)		Evaporative hydrocarbon emission level	++	Additional compliance cost	—	Better coherence than options 1 and 2 ?	+	++
		Reducing exhaust and evaporative emissions	0	Investment in evaporative emission control technology development of hardware and software. Additional cost may be passed on to customers	—	Increased clarity for industry and other stakeholders	+	
		Level of cost effectiveness compared to other methods to reduce hydrocarbon emissions. NB assumption that investment in EFI will only be done to reduce evaporative emission is a theoretical assumption, therefore are the assumed cost and cost efficiency of this option estimated too high. No data available to quantify the level of magnitude of this too high estimate.	++	Revenue to supplier industry, including SMEs, potentially leading to effects on employment	++	Appropriate environmental measures for complete different vehicles	++	
		Availability of independent testing facilities (SHED chamber) for authorities, but also for	—			Level of simplification	—	
		Evaporative emissions controlled under different ambient conditions (hot climate, stop and go traffic) and/or over vehicle life.	—			Transparency with emission performance of other, alternative means of road transport	+	

Table 86: comparison and conclusion table evaporative emissions test and limit

1.5. Durability requirements

Option 1: No change

Objective	Policy options	Criteria: Effectiveness		Criteria: Efficiency		Criteria: Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Controlled degradation of exhaust emissions relevant engine components and systems	0	Compliance cost for manufacturers possibly transferred into high consumer price	0	Better coherence than options 2 and 3 ?	0	0
		Effect of actual defined vehicle mileage once opted to introduce durability requirements	0	Increased quality and guarantee for customer that investment in cleaner vehicle gives better value for money over vehicle life in terms of steady environmental performance over vehicle life.	0	Increased clarity for industry and other stakeholders	0	
		Combined measure together with revised Type Approval emission limits	0	Reduced risk for customers to fail PTI tests in the Member States where this applies. Prevent early on exchange of expensive exhaust after treatment components.	0	Appropriate environmental measures for complete different vehicles	0	
		Possible emission reduction level	0			Level of simplification	0	
						Transparency with emission performance of other, alternative means of road transport	0	

Option 2 (Scenario 2 from the LAT report): Deterioration reduced to 10% for the useful life and application of linear extrapolation for higher mileage

Objective	Policy options	Criteria: Effectiveness		Criteria: Efficiency		Criteria: Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Controlled degradation of exhaust emissions relevant engine components and systems	++	Compliance cost for manufacturers possibly transferred into high consumer price	—	Better coherence than options 1 and 2 ?	0	++
		Effect of actual defined vehicle mileage once opted to introduce durability requirements	0	Increased quality and guarantee for customer that investment in cleaner vehicle gives better value for money over vehicle life in terms of steady environmental performance over vehicle life.	++	Increased clarity for industry and other stakeholders	+	
		Combined measure together with revised Type Approval emission limits	++	Reduced risk for customers to fail PTI tests in the Member States where this applies. Prevent early on exchange of expensive exhaust after treatment components.	+	Appropriate environmental measures for complete different vehicles	+	
		Possible emission reduction level	+			Level of simplification	—	
						Transparency with emission performance of other, alternative means of road transport	+	

Option 3 (Scenario 2 from the LAT report): useful life increased by 60%, i.e. equivalent to the increase incurred to passenger cars when shifting from Euro 3 (80k km) to Euro 5 (160k km)

Objective	Policy options	Criteria: Effectiveness		Criteria: Efficiency		Criteria: Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Controlled degradation of exhaust emissions relevant engine components and systems	++	Compliance cost for manufacturers possibly transferred into high consumer price	— —	Better coherence than options 1 and 2 ?	0	+
		Effect of actual defined vehicle mileage once opted to introduce durability requirements	0	Increased quality and guarantee for customer that investment in cleaner vehicle gives better value for money over vehicle life in terms of steady environmental performance over vehicle life.	++	Increased clarity for industry and other stakeholders	+	
		Combined measure together with revised Type Approval emission limits	++	Reduced risk for customers to fail PTI tests in the Member States where this applies. Prevent early on exchange of expensive exhaust after treatment components.	+	Appropriate environmental measures for complete different vehicles	+	
		Possible emission reduction level	++			Level of simplification	—	
						Transparency with emission performance of other, alternative means of road transport	++	

Table 87: comparison and conclusion table durability requirements

2. NEW MEASURES TO CONTROL EMISSIONS DURING VEHICLE LIFE.

2.1. In-Use Conformity (IUC) testing and limits.

Option 1: No change								
Objective	Policy options	Criteria						
		Effectiveness		Efficiency		Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Controlled degradation of exhaust emissions relevant engine components and systems	0	Compliance cost for manufacturers possibly transferred into high consumer price	0	Better coherence than option 1 ?	0	0
		Combined measure together with revised Type Approval emission limits	0	Increased quality and guarantee for customer that investment in cleaner vehicle gives better value for money over vehicle life in terms of steady environmental performance over vehicle life.	0	Increased clarity for industry and other stakeholders	0	
		Possible emission reduction level	0	Reduced risk for customers to fail PTI tests in the Member States where this applies. Prevent early on exchange of expensive exhaust after treatment components.	0	Appropriate environmental measures for complete different vehicles	0	
		Cost effectiveness	0			Level of simplification	0	
						Transparency with emission performance of other, alternative means of road transport	0	

Option 2: (Scenario 1 from LAT report): IUC procedure mandatory to for all Euro 3 motorcycles. The IUC is considered to identify all not attainments which are consecutively corrected.								
Objective	Policy options	Criteria						
		Effectiveness		Efficiency		Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Controlled degradation of exhaust emissions relevant engine components and systems	+	Compliance cost for manufacturers possibly transferred into high consumer price	— —	Better coherence than option 0 ?	0	—
		Combined measure together with PTI and RSI, overlap	—	Increased quality and guarantee for customer that investment in cleaner vehicle gives better value for money over vehicle life in terms of steady environmental performance over vehicle life.	+	Increased clarity for industry and other stakeholders	0	
		Possible emission reduction level	— —	Reduced risk for customers to fail PTI tests in the Member States where this applies. Prevent early on exchange of expensive exhaust after treatment components.	0	Appropriate environmental measures for complete different vehicles	+	
		Cost effectiveness	—			Level of simplification	—	
		Selection of representative vehicles	— —			Transparency with emission performance of other, alternative means of road transport	+	

Table 88: comparison and conclusion table possible introduction of In-Use Conformity (IUC) testing and limits

2.2. On Board Diagnostic (OBD) systems and access to repair information

Option 1: No change (No introduction of OBD systems)

Objective	Policy options	Criteria: Effectiveness		Criteria: Efficiency		Criteria: Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Environmental impact	0	Compliance cost manufacturers	0	Better coherence than options 2 and 3 ?	0	0
		Ignoring Malfunction Indicator Light by customer	0	Employment at manufacturers	0	Increased clarity for industry and other stakeholders	0	
		Functional safety impact	0	Initial investment cost for manufacturer	0	Appropriate environmental measures for complete different vehicles	0	
		Standardised diagnostic information, available on request of generic scan tool	0	Effectiveness of repair (perspective independent repairer)	0	Level of simplification	0	
		Anti-tampering measure	0	Repair cost for customer (if repaired by independent repairer)	0	Transparency with emission performance of other, alternative means of road transport	0	
		Level of innovation in engine technology other than to increase engine performance (power	0	Employment and revenue suppliers, type approval authorities, test	0			
		Complexity of legislation	0	Cost of PTI in Member States that conduct this for L-category vehicles	0			
		Enforcement (recall)	0					
		Access to technology by SME's	0					
		Paramount for the repair cycle (diagnose, access to repair and maintenance information,	0					
		Level of re-use of technology by manufacturer	0					

Option 2 (scenario 1 in LAT report): Application of OBD systems of similar technology to passenger cars (EOBD), including catalyst efficiency monitoring to all L-category vehicles. Introduction of free access to repair and maintenance provisions, similar as for passenger cars.

Objective	Policy options	Criteria: Effectiveness		Criteria: Efficiency		Criteria: Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Environmental impact	++	Compliance cost manufacturers	— —	Better coherence than options 1 and 3 ?	0	+
		Ignoring Malfunction Indicator Light by customer	—	Employment at manufacturers	++	Increased clarity for industry and other stakeholders	+	
		Functional safety impact	+	Initial investment cost for manufacturer	— —	Appropriate environmental measures for complete different vehicles	++	
		Standardised diagnostic information, available on request of generic scan tool	++	Effectiveness of repair (perspective independent repairer)	++	Level of simplification	—	
		Anti-tampering measure	++	Repair cost for customer (if repaired by independent repairer)	+	Transparency with emission performance of other, alternative means of road transport	++	
		Level of innovation in engine technology other than to increase engine performance (power and torque)	++	Employment and revenue suppliers, type approval authorities, test laboratories	++			
		Complexity of legislation	— —	Cost of PTI in Member States that conduct this for L-category vehicles	+			
		Enforcement (recall)	0					
		Access to technology by SME's	—					
		Paramount for the repair cycle (diagnose, access to repair and maintenance information, repair). Importance to free access to repair and maintenance information policy option to repair competition failure in internal market.	+					
		Level of re-use of technology by manufacturer	+					

Option 3 (scenario 1 in LAT report): Application of OBD systems of similar technology to passenger cars (EOBD), including catalyst efficiency monitoring to all L-category vehicles. Introduction of free access to repair and maintenance provisions, similar as for passenger cars.

Objective	Policy options	Criteria: Effectiveness		Criteria: Efficiency		Criteria: Coherence		Conclusion
Environmental objective: reduce air pollution from operation and reduce evaporative emissions until L-category emissions proportionate to their actual use (3% of total road mileage)		Environmental impact	+	Compliance cost manufacturers	—	Better coherence than options 1 and 2 ?	0	++
		Ignoring Malfunction Indicator Light by customer	—	Employment at manufacturers	++	Increased clarity for industry and other stakeholders	+	
		Functional safety impact	+	Initial investment cost for manufacturer	—	Appropriate environmental measures for complete different vehicles	+	
		Standardised diagnostic information, available on request of generic scan tool	++	Effectiveness of repair (perspective independent repairer)	+	Level of simplification	—	
		Anti-tampering measure	+	Repair cost for customer (if repaired by independent repairer)	+	Transparency with emission performance of other, alternative means of road transport	++	
		Level of innovation in engine technology other than to increase engine performance (power and torque)	0	Employment and revenue suppliers, type approval authorities, test laboratories	+			
		Complexity of legislation	—	Cost of PTI in Member States that conduct this for L-category vehicles	+			
		Enforcement (recall)	0					
		Access to technology by SME's	+					
		Paramount for the repair cycle (diagnose, access to repair and maintenance information, repair). Importance to free access to repair and maintenance information policy option to repair competition failure in internal market.	++					
		Level of re-use of technology by manufacturer	++					

Table 89: comparison and conclusion table possible introduction On Board Diagnostic (OBD) systems and access to repair information

3. PROPOSAL FOR REVISED EMISSION LIMITS

3.1. Proposal to revise tailpipe emission limits for the short term (2014)

Vehicle category	Vehicle category name	Propulsion class	Euro level	Mass of carbon monoxide (CO)	Mass of total hydrocarbons (THC)	Mass of oxides of nitrogen (NOx)	Mass of particulate Matter (PM)	Sum mass of total hydrocarbons and oxides of nitrogen (THC + NOx)	Test cycle
				L_1 (mg /	L_2 (mg / km)	L_3 (mg / km)	L_4 (mg / km)	L_5 (mg / km)	
L1Ae	Powered cycle	PI / Hybrid	Euro 3	560	100	130	-	-	UNECE regulation No 47
L1Be	Two-wheel moped	PI / Hybrid	Euro 3	1000	-	-	-	1200	UNECE regulation No 47
L2e	Three-wheel moped	PI /Hybrid	Euro 3	3500	-	-	-	1200	UNECE regulation No 47
L3e L4e L5Ae L7Ae	-Two-wheel motorcycle with and without side-car - Tricycle - Heavy on-road quad	PI, $v_{max} <$ 130 km/h	Euro 4	1970	560	130	-	-	Revised WMTC, phase 2
		PI, $v_{max} \geq$ 130 km/h	Euro 4	1970	250	170	-	-	Revised WMTC, phase 2
		CI / Hybrid	Euro 4	1000	100	570	100[52]	-	Revised WMTC, phase 2
L5Be	Commercial tricycle	PI	Euro 3	4000	1000	250	-	-	UNECE regulation No 40
		CI / Hybrid	Euro 3	1000	150	650	100	-	UNECE regulation No 40
L6Ae	Light on-road quad	PI / Hybrid	Euro 3	3500				1200	UNECE regulation No 47
L6Be	Light mini-car	PI	Euro 3	3500				1200	UNECE regulation No 47
		CI / Hybrid	Euro 3	1000	150	650	100		UNECE regulation No 47
L7Be	Heavy mini-car	PI	Euro 3	4000	1000	250	-	-	UNECE regulation No 40
		CI / Hybrid	Euro 3	1000	150	650	100		UNECE regulation No 40

Table 90: Proposed revised tailpipe emission limits[53], Euro 3

52 CI only, also if e.g. a hybrid concept includes a CI engine.

53 Category L3e vehicles: Euro 4

3.2. Proposal to revise tailpipe emission limits for the mid term (2017)

Vehicle category	Vehicle category name	Propulsion class	Euro level	Mass of carbon monoxide (CO)	Mass of total hydrocarbons (THC)	Mass of oxides of nitrogen (NOx)	Mass of particulate matter (PM)	Test cycle
				L_1 (mg / km)	L_2 (mg / km)	L_3 (mg / km)	L_4 (mg / km)	
L1Ae	Powered cycle	PI / Hybrid	Euro 4	560	100	70		UNECE regulation No 47
L1Be	Two-wheel moped	PI / Hybrid	Euro 4	1000	640	170	-	UNECE regulation No 47
L2e	Three-wheel moped	PI /Hybrid	Euro 4	1900	740	170	-	UNECE regulation No 47
L3e L4e Error! Bookmark not defined. L5Ae L7Ae	-Two-wheel motorcycles with and without side-car - Tricycle - Heavy on-road quad	PI, v_{max} < 130 km/h	Euro 5	1140	380	70	-	Revised WMTC, phase 2
		PI, v_{max} ≥ 130 km/h	Euro 5	1140	170	90	-	Revised WMTC, phase 2
		CI / Hybrid	Euro 5	1000	100	300	80[52]	Revised WMTC, phase 2
L5Be	Commercial tricycle	PI	Euro 4	2000	550	250	-	UNECE regulation No 40
		CI / Hybrid	Euro 4	1000	100	550	80[52]	UNECE regulation No 40
L6Ae	Light on-road quad	PI / Hybrid	Euro 4	1900	740	170	-	UNECE regulation No 47
L6Be	Light mini-car	PI	Euro 4	1900	740	170		UNECE regulation No 47
		CI / Hybrid	Euro 4	1000	100	550	80[52]	UNECE regulation No 47
L7Be	Heavy mini-car	PI	Euro 4	2000	550	250	-	UNECE regulation No 40
		CI / Hybrid	Euro 4	1000	100	550	80[52]	UNECE regulation No 40

Table 91: Proposed revised tailpipe emission limits[54], Euro 4

54 Category L3e vehicles: Euro 5.

3.3. Proposal[55] to revise tailpipe emission limits for the long term (2020)

Vehicle category	Vehicle category name	Propulsion class	Euro level	Mass of carbon monoxide (CO)	Mass of total hydrocarbons (THC)	Mass of Non methane hydrocarbons (NMHC)	Mass of oxides of nitrogen (NOx)	Mass of particulate matter (PM)	Test cycle
				L_1 (mg / km)	L_{2A} (mg / km)	L_{2B} (mg / km)	L_3 (mg / km)	L_4 (mg / km)	
L1Ae	Powered cycle	PI / Hybrid	Euro 5	{500}	{100}	{68}	{60}	{4.5}	{Revised WMTC}
L1Be — L7e	All other L-category vehicles	PI	Euro 5	{1000}	{100}	{68}	{60}	{4.5}	{Revised WMTC}
		CI / Hybrid		{500}	{100}	{68}[56]	{90}	{4.5}	{Revised WMTC}

Table 92: Proposed revised tailpipe emission limits[57], Euro 5

55 The braces around the limit values indicate that these have to be finally confirmed by an environmental effect study conducted for the Commission.

56 NMHC limit only applicable to a hybrid vehicle equipped with a PI engine.

57 Category L3e vehicles: Euro 6.

3.4. Proposal for the introduction of On-board diagnostics emission thresholds for the mid term (2017)

Vehicle category	Vehicle category name	Propulsion class	Euro level	Mass of carbon monoxide (CO)	Mass of total hydrocarbons (THC)	Mass of oxides of nitrogen (NOx)	Test cycle
				OT_1 (mg / km)	**OT_2** (mg / km)	**OT_3** (mg / km)	
L1Be L2e L6Ae	- Two-wheel moped - Three-wheel moped -On-road light quad	PI or Hybrid	Euro 4	3610	2720	850	UNECE regulation No 47
L3e L4e[Error! Bookmark not defined.] L5Ae L7Ae	-Two-wheel motorcycle with and without side-car - Tricycle - Heavy on-road quad	PI $v_{max} < 130$ km/h	Euro 4	3740	2060	650	Revised WMTC, phase 2
		PI $v_{max} \geq 130$ km/h		3740	920	850	Revised WMTC, phase 2
		CI or Hybrid		1900	640	1710	Revised WMTC, phase 2

Table 93: Proposed Euro 4 OBD emission thresholds[54], OBD stage I

3.5. Proposal[55] to revise the On-board diagnostics emission thresholds for the long term (2020)

Vehicle category	Vehicle category name	Propulsion class	Euro level	Mass of carbon monoxide (CO)	Mass of Non methane hydrocarbons (NMHC)	Mass of oxides of nitrogen (NOx)	Mass of particulate matter (PM)	Test cycle
				OT_1 (mg / km)	**OT_2** (mg / km)	**OT_3** (mg / km)	**OT_4** (mg / km)	
{L1Be — L7e}	All L category vehicles except category	PI	Euro 5	{1900}	{250}	{300}	{50}	{Revised WMTC}
		CI or Hybrid	Euro 5	{1900}	{320}	{375}	{50}	{Revised WMTC}

Table 94: Proposed Euro 5 OBD emission thresholds[57] {OBD stage I, and OBD stage II}[55]

3.6 Proposal for the introduction of evaporative emission threshold (2017)

Vehicle category	Vehicle category name	Propulsion class	Euro level	Mass of total hydrocarbons (THC) (mg / test)	Test cycle
L3e L4e	Two-wheel motorcycle with and without side-car	PI[58] $v_{max} \geq 130$ km/h	Euro 5	2000	SHED
L6A	Light on-road quad	PI	Euro 4		
L7Ae	Heavy on-road quad	PI	Euro 4		

Table 95: Proposed revised evaporative emission limit, Euro 4[54]

3.7 Proposal[55] to revise the evaporative emission threshold (2020)

Vehicle Class	Vehicle class name	Propulsion Class	Euro level	Mass of total hydrocarbons (THC) (mg / test)	Test cycle
{L1Ae}	{Powered cycle}	PI	{Euro 5}	{2000} / {TBD}	SHED / {SHED} or {Fuel Tank and Fuel tubing permeation test}[59]
{L1B}	{Two-wheel moped}		{Euro 5}		
{L2}	{Three-wheel moped}		{Euro 5}		
L3e L4	Two-wheel motorcycle with and without side-car		Euro 6		
{L5A}	{Tricycle}		{Euro 5}		
{L5B}	{Commercial tricycle}		{Euro 5}		
L6A	Light on-road quad		Euro 5		
{L6B}	{Light mini-car}		{Euro 5}		
L7A	Heavy on-road quad		Euro 5		
{L7B}	{Heavy mini-car}		{Euro 5}		

Table 96: Proposed revised evaporative emission limit, Euro 5[57]

58 PI engines running on gasoline, gasoline blends or ethanol.

59 The cost-effectiveness of evaporative emission control will among others be assessed in the environmental effect study to be carried out for the Commission. Other cost-effective evaporative testing methods like fuel tank and fuel supply permeation testing will be assessed in this study as an alternative to the SHED test for vehicle categories other than L3e, L6Ae and L7Ae.

ANNEX XVI: DETAILS CHAPTER 6 — OPTIONS COMPARISON AND CONCLUSIONS — ANALYSIS NEW VEHICLE TYPE APPROVAL SAFETY MEASURES

1. FITTING OF ADVANCED BRAKE SYSTEMS

Explanation:	
— —	much worse
—	worse
0	neutral (no change)
+	better
++	much better

1.1. No change

Option 1: No change								
Objective	Policy options	Criteria						
		Effectiveness		Efficiency		Coherence		Conclusion
	1: No policy change		0		0		0	0

Table 97: option comparison and conclusion table — fitting of Advanced Brake systems — option 1

1.2. Anti-lock Brake Systems on all Powered Two Wheelers (PTW)

Option 2: Anti-lock Brake Systems on all Powered Two Wheelers (PTW)								
Objective	**Policy options**	**Criteria**						**Conclusion**
		Effectiveness		**Efficiency**		**Coherence**		
Increased Safety	Anti-lock Brake Systems on all Powered Two Wheelers (PTW)	Level of fatalities and injured riders in PTW involved road accidents	++	Low consumer price of PTW	— —	better coherence than options 3,4 and 5	0	+
		Anti-lock Brake System is the only technical solution which directly monitors and prevents wheel locking.	++	Level of cost to society owing to cost of health care, lost working days etc	++	increased clarity for industry and other stakeholders	+	
		With ***Anti-lock*** Brake System higher braking decelerations achieved (resulting in less braking distance) than with conventional brakes only. Potential reduction in impact speed in case of collision	++	Insurance cost for consumer	+			
		Preventing wheel lock under emergency braking provides the rider with increased confidence to apply higher brake forces. More efficient braking with ***Anti-lock*** brake system, rider brakes earlier during brake manœuvre	++	Potential customers not purchasing PTWs owing to being victim of road accident	+			
		Inexperienced riders on PTW with ***Anti-lock*** Brake System able to achieve decelerations closer to that of experienced riders, after relatively short training / adaptation time	++	Cost effectiveness obligatory ***Anti-lock*** brake system. Majority of in total 11 predictive and retrospective literature study results are positive.	++			
		Vehicles fitted with ***Anti-lock*** Brake System are able to make use of the adhesion available when on low and high friction surfaces. (e.g. changing conditions from dry to wet road)	++	Economy of scales for ***Anti-lock*** Braking System production, mid to long term drop of development and production cost	++			
		Anti-lock brake systems prevents dangerous downfalls whilst braking. In case of critical wheel lock of front wheel PTW rider falls and slides uncontrolled over the road	++	Revenue and employment supplier industry	++			
		Chance of increased level of accident result mitigation in case of ***Anti-lock*** brake system fitted. Long term societal and economic benefits	++	Market penetration of Anti-lock brake system	++			
		Estimated fatality and heavily injured rider reduction	++	Manufacturing and development cost of PTWs equipped with ***Anti-lock*** Brake Systems, possibly passed on to consumer (possible price increase)	— —			
		Risk of rider becoming "over" confident if PTW equipped with advanced brake system, trusts too much on technology. Higher speed	–	Risk of unavailability of ***Anti-lock*** Brake System technology to SME's (not meeting entrance criteria to be supplied by bigger automotive suppliers or confronted with high development cost as supplier cannot amortise investments owing to low series production)	— —			
		Possible bad braking performance (adverse effects off-road) if Anti-lock Brake System fitted on Off-road PTW	–	Risk of short term price increase owing to manufacturers forced to buy systems and components from suppliers.	–			
		Additional rules for design of brake system to industry making legislation more complex.	–	Level of legislation complexity	–			
		Legislation not technology neutral, mandating a specific technology. Normally legislation just defines the performance criteria.	— —					
		Level of technical complexity of vehicle	0					
		Level of brake technology innovation	0					
		Riding training required for system to be effectively	0					

Table 98: option comparison and conclusion table — fitting of Advanced Brake systems — option 2

1.3. Anti-lock Brake Systems on PTWs with cylinder capacity[60] > 125 cm^3 and Advanced Brake Systems (Combined Brake System (CBS) or Anti-lock Brake Systems (ABS) on motorcycles with 50 cm^3 < cylinder capacity[61] ≤ 125 cm^3

Option 3: Anti-lock Brake Systems on PTWs with cylinder capacity >125cm^3 and Advanced Brake Systems (Combined Brake System (CBS) and/or Anti-lock Brake Systems (ABS)) on motorcycles with 50cm3 < cylinder capacity <= 125cm^3

Objective	Policy options	Criteria						Conclusion
		Effectiveness		Efficiency		Coherence		
Increased Safety	Anti-lock Brake Systems on PTWs with cylinder capacity >125cm3 and Advanced Brake Systems (Combined Brake System (CBS) and/or Anti-lock Brake Systems (ABS)) on motorcycles with 50cm3 < cylinder capacity <= 125cm3	Level of fatalities and injured riders in PTW involved road accidents	++	Low consumer price of PTW	— —	better coherence than options 3,4 and 5	0	++
		Anti-lock Brake System is the only technical solution which directly monitors and prevents wheel locking.	++	Level of cost to society owing to cost of health care, lost working days etc	++	increased clarity for industry and other stakeholders	+	
		With ***Anti-lock*** Brake System higher braking decelerations achieved (resulting in less braking distance) than with conventional brakes only. Potential reduction in impact speed in case of collision	++	Insurance cost for consumer	+			
		Preventing wheel lock under emergency braking provides the rider with increased confidence to apply higher brake forces. More efficient braking with ***Anti-lock*** brake system, rider brakes earlier during brake manœuvre	++	Potential customers not purchasing PTWs owing to being victim of road accident	+			
		Inexperienced riders on PTW with ***Anti-lock*** Brake System able to achieve decelerations closer to that of experienced riders, after relatively short training / adaptation time	++	Cost effectiveness obligatory ***Anti-lock*** brake system. Majority of in total 11 predictive and retrospective literature study results are positive.	++			
		Vehicles fitted with ***Anti-lock*** Brake System are able to make use of the adhesion available when on low and high friction surfaces. (e.g. changing conditions from dry to wet road)	++	Economy of scales for ***Anti-lock*** Braking System production, mid to long term drop of development and production cost	++			
		Anti-lock brake systems prevents dangerous downfalls whilst braking. In case of critical wheel lock of front wheel PTW rider falls and slides uncontrolled over the road	++	Revenue and employment supplier industry	++			
		Chance of increased level of accident result mitigation in case of ***Anti-lock*** brake system fitted. Long term societal and economic benefits	+	Market penetration of ***Anti-lock*** brake system	++			
		Estimated fatality and heavily injured rider reduction	+	Manufacturing and development cost of PTWs equipped with ***Anti-lock*** Brake Systems, possibly passed on to consumer (possible price increase)	— —			
		Risk of rider becoming "over" confident if PTW equipped with advanced brake system, trusts too much on technology. Higher speed	–	Risk of unavailability of ***Anti-lock*** Brake System technology to SME's (not meeting entrance criteria to be supplied by bigger automotive suppliers or confronted with high development cost as supplier cannot amortise investments owing to low series production)	— —			
		Possible bad braking performance (adverse effects off-road) if Anti-lock Brake System fitted on Off-road PTW	–	Risk of short term price increase owing to manufacturers forced to buy systems and components from suppliers.	–			
		Additional rules for design of brake system to industry making legislation more complex.	–	Level of legislation complexity	–			
		Legislation not technology neutral, mandating a specific technology. Normally legislation just defines the performance criteria.	— —					
		Level of technical complexity of vehicle	0					
		Freedom of choice regarding product and product characteristics	0					
		Level of brake technology innovation	0					

Table 99: option comparison and conclusion table — fitting of Advanced Brake systems -option 3

60 The 125 cm^3 takes reference to the thresholds in Directive 2006/126/EC (recasted driving licence directive) related to class A1: motorcycles with a cylinder capacity not exceeding 125 cm^3, of a power not exceeding 11kW and with a power/weight ratio not exceeding 0.1 kW/kg.

61 The 125 cm^3 takes reference to the thresholds in Directive 2006/126/EC (recasted driving licence directive) related to class A1: motorcycles with a cylinder capacity not exceeding 125 cm^3, of a power not exceeding 11kW and with a power/weight ratio not exceeding 0.1 kW/kg.

1.4. Obligatory fitting of Advanced Brake Systems (Combined Brake System (CBS) and/or Anti-lock Brake Systems (ABS)) on motorcycles fulfilling the maximum performance criteria related to the A2 driving licence[62]. Obligatory fitting of Anti-lock Brake Systems on all other L3e class motorcycles.

Option 4: To make mandatory the fitting of Advanced Brake Systems (Combined Brake System (CBS) and/or Anti-lock Braking Systems) on those motorcycles which conform to the performance criteria defined by the A2 driving licence . Obligatory fitting of Anti-lock Brake Systems on all other L3 class motorcycles

Objective	Policy options	Criteria						Conclusion
		Effectiveness		Efficiency		Coherence		
Increased Safety	To make mandatory the fitting of Advanced Brake Systems (Combined Brake System (CBS) and/or Anti-lock Braking Systems) on those motorcycles which conform to the performance criteria defined by the A2 driving licence . Obligatory fitting of Anti-lock Brake Systems on all other L3 class motorcycles	Level of fatalities and injured riders in PTW involved road accidents	+	Low consumer price of PTW		better coherence than options 3,4 and 5		++
		Anti-lock Brake System is the only technical solution which directly monitors and prevents wheel locking.	++	Level of cost to society owing to cost of health care, lost working days etc		increased clarity for industry and other stakeholders		
		With ***Anti-lock*** Brake System higher braking decelerations achieved (resulting in less braking distance) than with conventional brakes only. Potential reduction in impact speed in case of collision	++	Insurance cost for consumer				
		Preventing wheel lock under emergency braking provides the rider with increased confidence to apply higher brake forces. More efficient braking with ***Anti-lock*** brake system, rider brakes earlier during brake manœuvre	++	Potential customers not purchasing PTWs owing to being victim of road accident				
		Inexperienced riders on PTW with ***Anti-lock*** Brake System able to achieve decelerations closer to that of experienced riders, after relatively short training / adaptation time	++	Cost effectiveness obligatory ***Anti-lock*** brake system. Majority of in total 11 predictive and retrospective literature study results are positive.				
		Vehicles fitted with ***Anti-lock*** Brake System are able to make use of the adhesion available when on low and high friction surfaces. (e.g. changing conditions from dry to wet road)	++	Economy of scales for ***Anti-lock*** Braking System production, mid to long term drop of development and production cost				
		Anti-lock brake systems prevents dangerous downfalls whilst braking. In case of critical wheel lock of front wheel PTW rider falls and slides uncontrolled over the road	++	Revenue and employment supplier industry				
		Chance of increased level of accident result mitigation in case of ***Anti-lock*** brake system fitted. Long term societal and economic benefits	++	Market penetration of ***Anti-lock*** brake system				
		Estimated fatality and heavily injured rider reduction	+	Manufacturing and development cost of PTWs equipped with Anti-lock Brake Systems, possibly passed on to consumer (possible price increase)				
		Risk of rider becoming "over" confident if PTW equipped with advanced brake system, trusts too much on technology. Higher speed	–	Risk of unavailability of ***Anti-lock*** Brake System technology to SME's (not meeting entrance criteria to be supplied by bigger automotive suppliers or confronted with high development cost as supplier cannot amortise investments owing to low series production)				
		Possible bad braking performance (adverse effects off-road) if ***Anti-lock*** Brake System fitted on Off-road PTW	–	Risk of short term price increase owing to manufacturers forced to buy systems and components from suppliers.				
		Additional rules for design of brake system to industry making legislation more complex.	–	Level of legislation complexity				
		Legislation not technology neutral, mandating a specific technology. Normally legislation just defines the performance criteria.	——					
		Level of technical complexity of vehicle	0					
		Freedom of choice regarding product and product characteristics	0					
		Level of brake technology innovation	0					
		Horizontal harmonisation of vehicle performance criteria between type approval and driving licence legislation (simplification)	+					

Table 100: option comparison and conclusion table — fitting of Advanced Brake systems — option 4

62 Thresholds obtained from Directive 2006/126/EC (recasted driving licence directive) class A2: 1) power not exceeding 35 kW, with 2) a power/weight ratio not exceeding 0.2 kW/kg, and 3) not derived from a vehicle of more than double its power. These are EU wide accepted criteria to separate less powerful PTWs that beginning riders only may ride during the two subsequent years of getting their driving licence on one hand from powerful motorcycles that may only driven by more experienced motorcycle riders on the other hand.

1.5. Industry self obligation

Option 5: Industry self regulation proposal								
Objective	**Policy options**	**Criteria**						**Conclusion**
		Effectiveness		**Efficiency**		**Coherence**		
Increased Safety	Option 5: Industry self regulation proposal	Level of fatalities and injured riders in PTW involved road accidents	–	Low consumer price of PTW	+	better coherence than options 3,4 and 5	0	—
		CBS is full alternative to ***Anti-lock*** brake system, technical equivalence assumed between both systems	0	Level of cost to society owing to cost of health care, lost working days etc	0	increased clarity for industry and other stakeholders	+	
		With ***Anti-lock*** Brake System higher braking decelerations achieved (resulting in less braking distance) than with conventional brakes only. Potential reduction in impact speed in case of collision	+	Insurance cost for consumer	++			
		Preventing wheel lock under emergency braking provides the rider with increased confidence to apply higher brake forces. More efficient braking with Advanced Brake System, rider brakes earlier during brake manœuvre	+	Potential customers not purchasing PTWs owing to being victim of road accident	+			
		Inexperienced riders on PTW with ***Anti-lock*** Brake System able to achieve decelerations closer to that of experienced riders, after relatively short training / adaptation time	+	Cost effectiveness Advanced Brake Systems according to industry self-obligation scheme (either Anti-lock Brake System and/or CBS)	+			
		Vehicles fitted with ***Anti-lock*** Brake System are able to make use of the adhesion available when on low and high friction surfaces. (e.g. changing conditions from dry to wet road)	+	Economy of scales for Advanced Braking System production, mid to long term drop of development and production cost	+			
		Anti-lock brake systems prevents dangerous downfalls whilst braking. In case of critical wheel lock of front wheel PTW rider falls and slides uncontrolled over the road	0	Revenue and employment supplier industry	—			
		Chance of increased level of accident result mitigation in case of ***Anti-lock*** brake system fitted. Long term societal and economic benefits	+	Market penetration of ***Anti-lock*** brake system	—			
		Estimated fatality and heavily injured rider reduction	—	Manufacturing and development cost of PTWs equipped with Anti-lock Brake Systems, possibly passed on to consumer (possible price increase)	+			
		Risk of rider becoming "over" confident if PTW equipped with advanced brake system, trusts too much on technology. Higher speed	— —	Risk of unavailability of ***Anti-lock*** Brake System technology to SME's (not meeting entrance criteria to be supplied by bigger automotive suppliers or confronted with high development cost as supplier cannot amortise investments owing to low series production)	+			
		Possible bad braking performance (adverse effects off-road) if ***Anti-lock*** Brake System fitted on Off-road PTW	— —	Risk of short term price increase owing to manufacturers forced to buy systems and components from suppliers.	+			
		Additional rules for design of brake system to industry making legislation more complex.	— —	Less burden (impact of legislation on vehicle design) in industry (mainly for big players, small manufacturers may still struggle to fulfil self regulation quota if above small series threshold)	+			
		Legislation not technology neutral, mandating a specific technology. Normally legislation just defines the performance criteria.	0	Level of intervention: Conventional consumer price development owing to supply and demand	0			
		Level of technical complexity of vehicle	0	Level of legislation complexity	0			
		Freedom of choice regarding product and product characteristics	++	SME's under normal market pressure to equip produced vehicles with advanced brake systems. Concern related to access to technology postponed / only mitigated, not eliminated	—			
		Level of brake technology innovation	0	Consumer price of Advanced Brake System determined by normal market mechanism of supply and demand. Consumer opting for ***Anti-lock*** Brake System and/or CBS can only partly benefit from pressure on advanced brake system price (lower level of economy of scales for manufacturer)	—			

Table 101: option comparison and conclusion table — fitting of Advanced Brake systems -option 5

1.6. Impact Assessment of Anti-lock Brake System technology fitted on vehicles, manufactured and type approved by SMEs

1.6.1. Introduction

As part of the impact assessment of the proposed Regulation for the type approval of L-category vehicles, an analysis of possible effects on SMEs in the relevant business sectors must be conducted. In accordance with the definitions laid down in Recommendation 2003/361/EC, a medium sized enterprise employs between 50-249 workers. A small enterprise has 10-49 employees whereas micro enterprises employ up to nine persons. It is important to keep these distinctions in mind given that precise employment numbers in SMEs in the PTW industry are difficult to obtain, but recent data collected by EuroStat suggests that within the EU micro companies account for the biggest share of SMEs manufacturing cycles as well as motorcycles. Unfortunately the data for each type of manufacturer cannot be disaggregated. In addition this data should be referenced with caution owing to 2 constraints.

For the sake of clarity and completeness, it is important to point out that the data provided by EuroStat can only be used to gain a generic picture of the Cycle and L-category vehicle market since it lacks precision in two important ways. First, the data includes the manufacture of cycles which is problematic in the sense that the cycle market strongly varies from the PTWs market. The cycle market is very diversified and heterogeneous in terms of producers which often constitute of micro companies. This strongly contrasts with the motorcycle market which is far more concentrated. Second, the data does not specify the term 'manufacturer' which is paramount for the underlying assessment since the proposed Regulation will only cover OEMs that market their products complying with requirements for Whole Vehicle Type Approval (WVTA). Accordingly, all SMEs that might fall under the definition of manufacturer in the EuroStat database but which are only active in the business of vehicle modifications are not of primary concern in this impact assessment since their end products may be subject to national type approvals.

1.6.2. Regulatory Impacts on SMEs

In respect of the assessment of regulatory impacts on SMEs, there are some general points worth to be kept in mind. Hence, the introduction of new regulations can be a disproportionately bigger burden for SME manufacturers because of scarcer resources. Any additional costs caused by a new regulatory framework can have a substantial negative impact on the commercial viability of SME OEMs because of compliance costs and a lack of information or expertise which in many cases has to be bought from specialists outside the company. Furthermore, SME manufacturers have only a limited scope for benefiting from economies of scale and face severe constraints in passing on increases in costs to their customers because they generally act as price takers on the market. Moreover, especially in the context of the current crisis it is important to remember that the access to capital is restricted for SMEs which makes major investments difficult if often not impossible. On the other hand, SMEs are characterised by their high flexibility and their ability to adapt to new market conditions quickly. As such they are therefore quicker to meet new market demands than their larger counterparts. There may also be components and systems (hardware) and software required by manufacturers to be able to comply with new or revised legal requirements. This demand for certain niche products, not interesting to be mass produced by the major automotive suppliers, or highly specialised products or software solutions may be the high added value that specialised SME suppliers can provide.

1.6.3. Economic Advantages

There are a number of economic advantages in case of introduction of mandatory *Anti-lock* Brake Systems on PTWs. Hence, positive impact on society as a whole by fatality prevention and possible injury mitigation in road accidents of PTW riders positively correlate with the industry's economic interests since it will retain first-line potential clients. Related to this is the increase in consumer confidence. This argument has essentially two aspects. First, on a more general level making the use of motorcycles safer will remove some of the safety concerns which are beneficial for acquiring new customers as well as for winning back old customers. Given some customers' tendency to be up to date with the newest technological developments, the legislative proposal could have a positive impact on sale numbers since it encourages customers to upgrade their vehicle. Second, it will improve the individual brand image of motorcycle producers since they do not have an interest in being perceived as marketing second-class quality products. There is clearly no interest in being considered as lagging behind in terms of safety standards in an industry where safety issues play an increasingly greater role. Thus, due to the technological advancement brought by ***Anti-lock*** Brake System the product becomes more attractive. In addition, the attractiveness could also be raised by lower insurance premiums offered for PTWs with ***Anti-lock*** Brake Systems. With regard to new distribution channels, the downstream market that practically consists of SMEs could also profit from the measure envisaged. Hence, requiring the fitting of ***Anti-lock*** Brake System could encourage the emergence of a new niche distribution channel, e.g. outlets specialising in the safest motorbikes only.

1.6.4. Possible Disadvantages

As regards the disadvantages of the mandatory fitting of ***Anti-lock*** Brake System, it is obvious that there is a probability that the additional costs of fitting this braking system will be added up to the market price of the vehicle with an adverse effect on the vehicle's competitiveness. However, it needs to be remembered that safer motorcycles could attract additional customers and, furthermore, economy of scales and market pressure may soon lead to a new equilibrium. In this context, it remains to be seen in how far SMEs manufacturing motorcycles in relatively low volumes will be able to cope with the competitive pressure to lower prices given that they do not profit from large economies of scale. In this context, however, it needs to be remembered that through an appropriate marketing strategy, SMEs could also have the possibility to get an extra margin on their products since new advancements in safety matters could justify higher prices. From the perspective of the ***Anti-lock*** Brake System supplier, it is worthwhile to state that in the short term the prices for ***Anti-lock*** Brake System systems could rise given the sudden increase in demand which could translate into higher vehicle prices.

1.6.5. Potential Opportunities

Despite the potential disadvantages, the mandatory fitting of ***Anti-lock*** Brake System also brings opportunities for SMEs. Alongside the advantages mentioned above, SME suppliers would have the chance to specialise in the production of ***Anti-lock*** Brake System braking systems since the demand for this system will significantly increase. In this context, there is even the possibility of the development of certain synergy effects between two SMEs where one focuses on the production of motorbikes whereas the other specialises on the supply of corresponding braking systems that are tailor-made for a specific brand. In this sense, both could profit from the conclusion of exclusive supply agreements and an improved brand image.

1.6.6. Potential Risks

In respect of potential risks of the compulsory fitting of ***Anti-lock*** Brake System, there is a danger that certain SMEs manufacturing PTWs will not have access to ***Anti-lock*** Brake System technology. There are two reasons for this observation. First, the R&D expenses for this technology are prohibitive and, thus, only the SME manufacturers producing high end PTWs may invest to develop the technology on its own. That is particularly true for SME manufacturers with low production volumes where economies of scale are very small. Second, in order to get the required technology, SME OEMs will have to rely on automotive technology suppliers and buy the technology from them. The problem with this scenario is that their purchase order might be too small and, hence, suppliers may refuse to deal with them since the profit margins are not high enough or the supplier may not even reach its break even point with these customised ***Anti-lock*** Brake System. In the worst case scenario a SME OEM might not find a supplier willing to supply ***Anti-lock*** Brake System technology which would basically amount to an inability to sell its products if the fitting of ***Anti-lock*** Brake System was to be made mandatory. With the purpose to address this problem, various solutions may be considered. One solution could be to set a sale number threshold for a product below which a SME producer does not have to comply with the ***Anti-lock*** Brake System requirement (small series requirements). Another possibility is to ensure that every SME manufacturer will get access to ***Anti-lock*** Brake System technology at an affordable price. In this regard, the idea of a voluntary commitment on the part of ***Anti-lock*** Brake System suppliers to supply SMEs could be another possibility to ease the fears expressed above.

2. Anti-tampering measures

Explanation:	
– –	much worse
–	worse
0	neutral (no change)
+	better
++	much better

2.1. No change;

Option 1: No change

Objective	Policy options	Criteria						Conclusion
		Effectiveness		Efficiency		Coherence		**Conclusion**
	1: No policy change	General interest in customising and modification, good for technical education	0	Road tax contribution	0	better coherence than options 2, & 3 ?	0	0
		Driver licensing restrictions	0	Insurance premium	0	increased clarity for industry and other stakeholders	0	
		By-passing recurring technical inspections	0	Economic impact on the suppliers of the parts which are no longer required (information stickers, frangible bolts	0			
		Emission of noise, exhaust emission levels, fuel consumption and CO2.	0	Economic effect on tampering industry	0			
		Prevent to exceed maximum vehicle speed for e	0					
		Electronic manipulation: effectiveness of existing anti-tampering measures	0					
		Risk to be involved in accident	0					
		Enforcement results successful ?	0					
		Level of innovation	0					
		Effectiveness of chapter 7, ten years after introduction largely unknown	0					
		Level of obsolete measures	0					
		Theft of vehicles	0					

Table 102: option comparison and conclusion table, anti-tampering measures, option 1

2.2. Repeal Chapter 7 of Directive 97/24/EEC, current superseded anti-tampering measures;

Option 2: Repeal Chapter 7 of Directive 97/24/EEC, current superseded anti-tampering measures

Objective	**Policy options**	**Criteria**						**Conclusion**
		Effectiveness		**Efficiency**		**Coherence**		
Increased Safety		General interest in customising and modification, good for technical education	++	Road tax contribution	– –	better coherence than options 1, & 3 ?	– –	– –
		Driver licensing restrictions	– –	Insurance premium	– –	increased clarity for industry and other stakeholders	– –	
		By-passing recurring technical inspections	– –	Economic impact on the suppliers of the parts which are no longer required (information stickers, frangible bolts etc.)	– –			
		Emission of noise, exhaust emission levels, fuel consumption and CO2.	– –	Economic effect on tampering industry	– –			
		Prevent to exceed maximum vehicle speed for e	– –					
		Electronic manipulation: effectiveness of existing anti-tampering measures	– –					
		Risk to be involved in accident	– –					
		Enforcement results successful ?	– –					
		Level of innovation	–					
		Effectiveness of chapter 7, ten years after introduction largely unknown	0					
		Level of obsolete measures	– –					
		Theft of vehicles	– –					

Table 103: option comparison and conclusion table, anti-tampering measures, option 2

2.3. New measures on anti-tampering.

Option 3 New measures on anti-tampering								
Objective	Policy options	Criteria						Conclusion
		Effectiveness		Efficiency		Coherence		
Increased Safety		General interest in customising and modification, good for technical education	++	Road tax contribution	0	better coherence than options 1, & 2 ?	+	+
		Driver licensing restrictions	0	Insurance premium	+	increased clarity for industry and other stakeholders	+	
		By-passing recurring technical inspections	0	Economic impact on the suppliers of the parts which are no longer required (information stickers, frangible bolts etc.)	—			
		Emission of noise, exhaust emission levels, fuel consumption and CO2.	++	Economic effect on tampering industry	0			
		Prevent to exceed maximum vehicle speed for e.g. Mopeds	+					
		Electronic manipulation: effectiveness of existing anti-tampering measures	++					
		Risk to be involved in accident	+					
		Enforcement results successful ?	+					
		Level of innovation	+					
		Effectiveness of chapter 7, ten years after introduction largely unknown	0					
		Level of obsolete measures	+					
		Theft of vehicles	+					

Table 104: option comparison and conclusion table, anti-tampering measures, option 3

3. 74 kW power limitation for motorcycle

Explanation:	
— —	much worse
—	worse
0	neutral (no change)
+	better
++	much better

Option 1: No change

Objective	Policy options	Criteria: Effectiveness		Criteria: Efficiency		Criteria: Coherence		Conclusion
Increased Safety		Number of Member States that apply the 74kW power limit through national legislation could increase	0	Minimum Economic impact	0	better coherence than options 2,3,4 ?	0	0
		No clear evidence to suggest that limiting the power of a motorcycle to 74kW has a positive impact on the number of road accidents involving motorcycles. Other factors such as rider attitude and experience have a greater influence on accident risk	0	Cost to the manufacturers to produce the restricted motorcycles	0	increased clarity for industry and other stakeholders	0	
		Effect on the noise generation, emissions and fuel consumption	0	Impact on some specialist (SME) manufacturer's revenue and cost that concentrate on the production of high powered motorcycles	0			
				Member State may save cost by rescinding National Legislation	0			
				Internal market with less barriers, reduced technical and administration burden on manufacturers. Lower price	0			

Option 2: Repeal the option given to Member States to limit the power to 74kW.

Objective	Policy options	Criteria: Effectiveness		Criteria: Efficiency		Criteria: Coherence		Conclusion
Increased Safety		Number of Member States that apply the 74kW power limit through national legislation could increase	0	Minimum Economic impact	+	better coherence than options 3 &4 ?	+	+
		No clear evidence to suggest that limiting the power of a motorcycle to 74kW has a positive impact on the number of road accidents involving motorcycles. Other factors such as rider attitude and experience have a greater influence on accident risk	+	Cost to the manufacturers to produce the restricted motorcycles	++	increased clarity for industry and other stakeholders	+	
		Effect on the noise generation, emissions and fuel consumption	0	Impact on some specialist (SME) manufacturer's revenue and cost that concentrate on the production of high powered motorcycles	+			
				Member State may save cost by rescinding National Legislation	+			
				Internal market with less barriers, reduced technical and administration burden on manufacturers. Lower price to consumer	++			

Option 3: Set a harmonized limit of 74kW.

Objective	Policy options	Criteria: Effectiveness		Criteria: Efficiency		Criteria: Coherence		Conclusion
Increased Safety		Number of Member States that apply the 74kW power limit through national legislation could increase	0	Minimum Economic impact	— —	better coherence than options 2&4 ?	+	—
		No clear evidence to suggest that limiting the power of a motorcycle to 74kW has a positive impact on the number of road accidents involving motorcycles. Other factors such as rider attitude and experience have a greater influence on accident risk	+	Cost to the manufacturers to produce the restricted motorcycles	—	increased clarity for industry and other stakeholders	+	
		Effect on the noise generation, emissions and fuel consumption	0	Impact on some specialist (SME) manufacturer's revenue and cost that concentrate on the production of high powered motorcycles	— —			
				Member State may save cost by rescinding National Legislation	+			
				Internal market with less barriers, reduced technical and administration burden on manufacturers. Lower price	+			

Table 105: option comparison and conclusion table, 74 kW power limitations for motorcycles, options 1 to 4

ANNEX XVII: DETAILS CHAPTER 6 — OPTIONS COMPARISON AND CONCLUSIONS — IMPROVED CATEGORISATION OF L-CATEGORY VEHICLES

Explanation:	
— —	much worse
—	worse
0	neutral (no change)
+	better
++	much better

1. RECATEGORISATION ELECTRICAL CYCLES (OUTSIDE SCOPE OF FRAMEWORK DIRECTIVE CURRENTLY), TRICYCLES (L5E) AND QUADRICYCLES (CATEGORIES L6E AND L7E)

Option 1: No change

Objective	Policy options	Criteria: Effectiveness		Efficiency		Coherence		Conclusion
Improved categorisation of L-category vehicles		Technical standards meeting effort	0	Compliance costs	0	Better coherence than options 2,3,4,5 ?	0	0
		Noise, emissions and fuel consumption	0			Increased clarity for industry and other stakeholders	0	
		Level and appropriateness of current safety measures	0					

Option 2: Exclude quadricycles and electrical bi- and tri-cycles from the Framework Regulation;

Objective	Policy options	Criteria: Effectiveness		Efficiency		Coherence		Conclusion
Improved categorisation of L-category vehicles		Technical standards meeting effort	0	Compliance costs	+	Better coherence than options 3,4,5 ?	— —	— —
		Noise, emissions and fuel consumption	— —			Increased clarity for industry and other stakeholders	— —	
		Level and appropriateness of current safety measures	— —					

Option 3: Return to the original spirit of the legislation for mini cars;

Objective	Policy options	Criteria: Effectiveness		Efficiency		Coherence		Conclusion
Improved categorisation of L-category vehicles		Technical standards meeting effort	0	Compliance costs	0	Better coherence than options 2,4,5 ?	— —	—
		Noise, emissions and fuel consumption	— —			Increased clarity for industry and other stakeholders	— —	
		Level and appropriateness of current safety measures	— —					

Option 4: Improving the legislation by adding new requirements based on car requirements for mini cars.

Objective	Policy options	Criteria: Effectiveness		Efficiency		Coherence		Conclusion
Improved categorisation of L-category vehicles		Technical standards meeting effort	0	Compliance costs	— —	Better coherence than options 2, 3, 5 ?	— —	0
		Noise, emissions and fuel consumption	— —			Increased clarity for industry and other stakeholders	— —	
		Level and appropriateness of current safety measures	— —					

Option 5: Improving the proliferation of vehicle categories by the introduction of dedicated sub categories inL1 and L6&L7. Add new / revised appropriate dedicated requirements for these sub categories.

Objective	Policy options	Criteria: Effectiveness		Efficiency		Coherence		Conclusion
Improved categorisation of L-category vehicles		Technical standards meeting effort	0	Compliance costs	—	Better coherence than options 2, 3, 5 ?	++	+
		Noise, emissions and fuel consumption	+			Increased clarity for industry and other stakeholders	++	
		Level and appropriateness of current safety measures	+					

Table 106: option comparison and conclusion table, re-categorisation, options 1 to 5

2. SPECIFIC REQUIREMENTS FOR CATEGORY L7E VEHICLES

Option 1: No change

Objective	Policy options	Criteria						Conclusion
		Effectiveness		**Efficiency**		**Coherence**		
Improved categorisation of L-category vehicles		Casualty rates	0	Type approval costs	0	Appropriate safety measures for complete different vehicles	0	0
		Trade barriers owing to divergent requirements when type approved (national or EU)	0			Appropriate environmental measures for complete different vehicles	0	
		Separation on-road and off-road quads based on design criteria in order to develop designated safety and environmental measures	0			Level of simplification	0	

Option 2: Exclude off-road quads from the Framework Directive.

Objective	Policy options	Criteria						Conclusion
		Effectiveness		**Efficiency**		**Coherence**		
Improved categorisation of L-category vehicles		Casualty rates	0	Type approval costs	+	Appropriate safety measures for complete different vehicles	—	+
		Trade barriers owing to divergent requirements when type approving off-road quads (national or	—			Appropriate environmental measures for complete different vehicles	—	
		Separation on-road and off-road quads based on design criteria in order to develop designated safety and environmental measures	+			Level of simplification	+	

Option 3: Keep the existing category and add new requirements for all quads.

Objective	Policy options	Criteria						Conclusion
		Effectiveness		**Efficiency**		**Coherence**		
Improved categorisation of L-category vehicles		Casualty rates	+	Type approval costs	—	Appropriate safety measures for complete different vehicles	+	+
		Trade barriers owing to divergent requirements when type approved (national or EU)	0			Appropriate environmental measures for complete different vehicles	+	
		Separation on-road and off-road quads based on design criteria in order to develop designated safety and environmental measures	—			Level of simplification	—	

Option 4: Create a new category for off-road quads with specific requirements.

Objective	Policy options	Criteria						Conclusion
		Effectiveness		**Efficiency**		**Coherence**		
Improved categorisation of L-category vehicles		Casualty rates	+	Type approval costs	0	Appropriate safety measures for	+	+
		Trade barriers owing to divergent requirements when type approved (national or EU)	0			Appropriate environmental measures for complete different vehicles	+	
		Separation on-road and off-road quads based on design criteria in order to develop designated safety and environmental measures	—			Level of simplification	— —	

Table 107: option comparison and conclusion table specific requirements Category L7e vehicles

3. SPECIFIC REQUIREMENTS FOR GASEOUS ALTERNATIVE FUELS AND OTHER NON-TRADITIONAL PROPULSIONS.

Option 1: No change

Objective	Policy options	Criteria						Conclusion
		Effectiveness		**Efficiency**		**Coherence**		
Improved categorisation of L category vehicles		Casualty reduction	0	Type Approval Cost	0	Appropriate safety measures for complete different vehicles	0	0
		Environmental performance	0			Appropriate environmental measures for complete different vehicles	0	
		Level of innovation in environmental and safety technology	0			Level of simplification	0	

Option 2: Legislation at European Union level through a tighter grid of vehicle type categorisation with dedicated measures for the different vehicles and propulsion technologies.

Objective	Policy options	Criteria						Conclusion
		Effectiveness		**Efficiency**		**Coherence**		
Improved categorisation of L-category vehicles		Casualty reduction	+	Type Approval Cost (initially higher, on the long run neutral)	—	Appropriate safety measures for complete different vehicles	++	+
		Environmental performance	++			Appropriate environmental measures for complete different vehicles	++	
		Level of innovation in environmental and safety technology	++			Level of simplification	0	

Table 108: option comparison and conclusion table: dedicated requirements for gaseous alternative fuels and other non-traditional propulsions

4. PROPOSAL TO RE-CATEGORISE L-CATEGORY VEHICLES

Category & Category Name	Sub category & Sub category name	Example	Number of wheels	Propulsion					Max. vehicle Speed	Internal Combustion Engine (ICE) max. displ. (cm3)	ICE Max. Power (kW)	Hybrid Max. Power (kW)	Electric Motor Max. Power (kW)	Max mass (kg)
				Internal Combustion Engine (ICE)			Hybrid Engine	Electric Engine						
				Gasoline & Gasoline blends	Diesel & Diesel blends	Gaseous (CNG / LPG)								
L1e, light two-wheel vehicle	L1Ae powered cycles		2	x	x	x	x	x	25	50 (PI)		max. 1		
	L1Be Moped		2	x	x	x	x	x	45	50 (PI)		max. 4		
L2e Three-wheel moped			3	x	x	x	x	x	45	50 (PI)		max. 4		
L3e, motorcycle	-		2	x	x	x	x	x						
L4e, motorcycle with side car	-		3	x	x	x	x	x						
L5e, tricycles	L5Ae Tricycles		3	x	x	x	x	x						
	L5Be Commercial tricycles		3	x	x	x	x	x						
L6e, Light quadricycle	L6Ae Light quad		4	x	x	x	x	x	45	50 (PI)		max. 4		350
	L6Be Light mini car		4	x	x	x	x	x	45	50 (PI)		max. 6		350
L7e, Heavy quadricycle	L7Ae On-road quad		4	x	x	x	x	x				max.15 kW		400
	L7Be Heavy mini car		4	x	x	x	x	x				max.15 kW		400 (passengers) 550 (goods)

PI: Positive Ignition engine

Table 109: Proposal to re-categorise L-category vehicles

ANNEX XVIII: DETAILS CHAPTER 7 — – MONITORING & EVALUATION ANALYSIS NEW VEHICLE TYPE APPROVAL SIMPLIFICATION AND SAFETY MEASURES

The following recommendations to monitor and control safety measures were obtained from the TRL report:

1. SIMPLIFICATION

The following issues were proposed by TRL to be monitored and evaluated in order to ensure the effectiveness of the proposed change:
- Monitor the key cost parameters used as a basis for the analysis;
- Number of amendments required to relevant Directives per annum
- Ongoing costs to member states of implementing current system
- Monitor numbers of type approvals per annum
- Time taken for implementation of regulatory changes
- Monitoring and standardisation of vehicle design
- Number of technical standard group meetings, travel mode, distance and number of attendees
- Evaluation of the proposed change should also monitor key costs to allow the accuracy of the cost saving (benefit) estimate of option 2 to be assessed.

2. OBLIGATORY FITTING OF ADVANCED BRAKE SYSTEMS

In order to monitor the effect of any change in legislation, the number of motorcycle casualties should be monitored, preferably in relation to the engine capacity of the motorcycle, the equipment fitted and in which driving licence category the rider can be attributed to. The quality of this impact assessment was influenced by a lack of reliable non-fatal casualty data, requiring some broad assumptions to be made. Collection/reporting of reliable non-fatal data would enable these assumptions to be verified and would a more accurate evaluation of the effect of any changes. There was minimal information available regarding the costs and effectiveness of combined Brake systems. Data from research studies similar to those identified for ***Anti-lock*** Brake System would enable a higher confidence in the estimated societal impact for casualty prevention. Minimal information was also available regarding future ***Anti-lock*** Brake System costs and the effect of large scale fitment of systems on the market price. In particular, information on CBS costs was lacking and these were estimated.

3. ANTI-TAMPERING MEASURES

In order to monitor the effect of the selected option it is recommended that the following actions be taken: Identify baseline data, especially relating to the current levels of tampering, and the magnitude of the effect that the tampering has on noise, tailpipe emissions and the involvement of relevant vehicle types in accidents. Monitor the in-use condition of vehicles, undertaking a survey at a representative sample of periodic/roadside inspections.

It was recommended to provide more definitive guidance on the effect of future policy options, the impact of tampering on safety and the environment should be reviewed in order that the effects can be quantified. If effects are identified which cause concern, then a survey should be conducted to monitor the current rates and types of tampering present in the current fleet. This could be carried out at periodic inspections, or by roadside checks, as used by previous studies.

4. 74KW POWER LIMITATION FOR MOTORCYCLES

Determine baseline data, including:

- Sales data with respect to engine power/acceleration potential or whatever measure is used as the limitation.
- Accident rates with respect to engine power/acceleration potential or whatever measure is used as the limitation.
- Emissions/noise data with respect to engine power/acceleration potential or whatever measure is used as the limitation. Monitor these data in relation to any other changes that could influence the number of accidents, emissions or noise, for example anti-tampering measures, approval of hydrogen powered vehicles etc.

These actions should allow the effect of the proposal to be identified after implementation, or before if the implementation is delayed to quantify the possible impacts further.

ANNEX XIX: DETAILS CHAPTER 7 — MONITORING & EVALUATION IMPROVED CATEGORISATION OF L-CATEGORY VEHICLES

1. RE-CATEGORISATION ELECTRIC ASSISTED CYCLES (OUTSIDE SCOPE OF LEGAL FRAMEWORK CURRENTLY), TRICYCLES (L5E) AND QUADRICYCLES (CATEGORIES L6E AND L7E)

The following recommendations are relevant for the re-categorisation of L1e, L6E & L7e vehicles:
Significant uncertainties remain regarding key costs in the approvals process and in the casualty and environmental impacts of the proposed options. These should be monitored and further data obtained to refine the assessments of potential impacts. More detailed accident data is required to provide information on the safety of quadricycles and to allow the impact of any measures to be assessed. A more specific categorisation of L1e, L6E & L7e vehicles would allow the safety impact of future measures to be monitored.

2. SPECIFIC REQUIREMENTS FOR OFF-ROAD QUADS (ALL TERRAIN VEHICLES, ATVS)

Data required to perform a full cost benefit analysis for these options was not obtained from the consultation process. Evaluation of the costs of the proposed options could be gathered by monitoring type approval costs prior to 2011 (the proposed earliest implementation of any change) and further investigation of costs for national approval. This would allow costs involved with the approval processes of all proposed options to be more accurately quantified. For all options it is important that a means of collecting European accident data for quadricycles is implemented and that this accident data is disaggregated for different quadricycle types and accident locations (on-road and off-road). This would allow clearer assessment of the societal benefits of future safety improvement measures. Monitoring of accident data would allow future safety related changes to be identified and evaluated.

3. DEDICATED REQUIREMENTS FOR GASEOUS ALTERNATIVE FUELS AND OTHER NON-TRADITIONAL ALTERNATIVE PROPULSIONS.

The following should be monitored and evaluated: Some hydrogen-powered category L vehicles are likely to be produced in very low numbers only. For these vehicles, it might be acceptable to pursue a policy that results in individual vehicle approval schemes at Member State level. Possible uncertainties include: the proportion of road miles likely to be driven by each category of hydrogen-powered, other gaseous fuel-powered or non-traditionally propelled category L vehicles; the environmental effects of new petrol and diesel engines; the effects of any Government incentives.

ANNEX XX: ABBREVIATION LIST AND GLOSSARY

2S	Two Stroke engine
4S	Four Stroke engine
ABS	***Anti-lock*** Brake System. The Antilock Brake System is a closed loop controlled brake system which prevents the wheels from locking while braking. The purpose of this is on the one hand to avoid a possible fall of the motorcycle rider and on the other hand to shorten braking distances. A more detailed technical explanation can be found on: http://en.wikipedia.org/wiki/Anti-lock_braking_system#Motorcycles
ABS	**Advanced** Braking Systems. NB 1) In the TRL report this is a summary expression of Combined Brake System (CBS) ***or*** ***Anti-lock*** Brake Systems (ABS). 2) ACEM considers under **Advanced** Brake System: a brake system in which either an ***Antilock Brake*** System ***and/or*** a Combined Brake System is present.
ACEM	Association des Constructeurs Européens de Motocycles www.acembike.org
AECC	Association for Emissions Control by Catalyst www.aecc.eu
AFQUAD	Association européenne des fabricants et importateurs de quadricycles
ATV	All Terrain Vehicle
ATVEA	All Terrain Vehicle Industry European Association www.atvea.org
BASt	Federal Highway Research Institute (Germany)
BAT	Best Available Technology
CAN	Controller Area Network, referred to as communication protocol (language) between ECU and generic scan tool
CARS 21	Competitive Automotive Regulatory System for the 21st century
CB	Carburettor
CBS	Combined Brake System
Ch.	Chapter
CLEPA	European Association of Automotive Suppliers www.clepa.com
CLWP	Commission Legislative and Work Programme
CNG	Compressed Natural Gas (mainly methane)
CO	Carbon monoxide
CO_2	Carbon dioxide
CoC	Certificate of Conformity
COM	The European Commission
CoP	Conformity of Production
COP	Conformity of Production
DeNOx	NOx emission control devices
DI	Direct Injection

DPF	Diesel Particle Filter
DTC	Diagnostic Trouble Code
EBD	Electronic Brake Distribution
EU	European Union
ECE-R40	United Nations Economic Commission for Europe Regulation 40 driving cycle
ECE-R47	United Nations Economic Commission for Europe Regulation 47 driving cycle
ECU	Engine Control Unit
EDC	European Driving Cycle for L-category vehicles (6 super cycles & EUDC)
EEA	European Environmental Agency
EEA	EU Legal provisions will also apply to Iceland, Norway, and Liechtenstein.
EFI	Electronic Fuel Injection
EMPA	Federal Laboratories for Materials Testing and Research (Switzerland)
EOBD	European On Board Diagnostics
EoS	End-of-Series (vehicle)
EUDC	Extra Urban Driving Cycle (high vehicle speed part of the laboratory test cycle)
Euro 3, Euro 4, Euro 5,	Emission standards for air pollutants HC, CO, NOx and PM
EuroStat	European Institute to gather, process and publish statistical data
FC	Fuel Consumption [l./100 km]
FE	Fuel Economy [km per litre]
FEMA	Federation of European Motorcyclists' Associations
FF	Freeze Frame information. These are generic engine parameters listed on the moment while a failure was detected and a DTC was stored in the Engine Control Unit memory. This information helps a service technician to diagnose and pinpoint a failure of the system. Best case it helps to determine finding the smallest exchangeable / repairable unit in the
FI	Fuel Injection
GDi	Gasoline Direct Injection
GHG	GreenHouse Gas
GSR	General Safety Regulation
HC	HydroCarbons
IA	Impact Assessment
IASG	Impact Assessment Steering Group
ICE	Internal Combustion Engine
IES	Institute for Environment and Sustainability (European Commission)
IMMA	International Motorcycle Manufacturers Association
IUC	In-Use Compliance / In-Use Conformity testing
IUPR	In Use Performance Ratio

JRC	Joint Research Centre (European Commission)
LAT	Laboratory of Applied Thermodynamics (Aristotle University, Greece). Institute that assessed the environmental policy options.
L-category	Light vehicles e.g. 2&3 wheel Mopeds, 2& 3 wheel motorcycles, quads, all terrain vehicles and mini cars. All these different vehicle types are categorised in 7 different classes currently. Refer to Annex I X for the details on the classification.
LPG	Liquefied Petroleum Gas (mix of propane and butane)
M.V.E.G.	Motor Vehicle Emissions Group
M.V.W.G.	Motor Vehicles Working Group
MC	Motorcycle
MCWG	Motor Cycle Working Group
MIL	Malfunction Indicator Lamp
MY	Model Year
NEDC	New European Driving Cycle
NG	Natural Gas (mainly methane)
NOx	Nitrogen Oxides
NPV	Net Present Value
OBD	On-Board Diagnostics
OCE	Off Cycle Emissions
OEM	Original Equipment Manufacturer
OxiCat	Oxidation Catalyst
PM	Particulate Matter
PTI	Periodical Technical Inspection
PTW	Powered Two Wheelers
R40 test cycle	Moped test cycle as specified in UNECE regulation 40 (4 ECE super cycles)
R47 test cycle	Moped test cycle as specified in UNECE regulation 47
R&D	Research and Development
RESS	1) Replacement Exhaust Silencer System 2) Rechargeable Energy Storage System
RLP	Rear wheel Lift-off Protection
RMI	Retail Motor Industry Federation www.rmif.co.uk
RSI	Road Side Inspection
RSI	Road Side Inspection
RW	Road Worthiness
SD	Separate Directives in relation to framework directive or mother regulation.
SHED	Sealed Housing Evaporative Determination

SME	Small Medium Enterprise
TA	Type-Approval
TAAM	Type-Approval Authorities Meetings
TAR	Type-Approval Regulation
TCMV	Technical Committee Motor Vehicles
THC	Total HydroCarbons measured in the appropriate emission laboratory test cycle or if it is used in the context of air quality: all hydrocarbon emissions when adding up evaporative and tail pipe emissions from vehicles
TNO	Netherlands Organisation for Applied Scientific Research
TRL	Transport Research Laboratory. Institute that assessed the safety policy options.
TÜV	Technical Inspection Agency (Germany)
TWC	Three Way Catalyst
UDC	Urban driving Cycle
UNECE	United Nations Economic Committee for Europe — World Forum for Harmonisation of Vehicle Regulations (WP.29)[63]
VOC	Volatile Organic Compound
VOC	Volatile organic compounds
WMTC	World-wide Motorcycle emissions Test Cycle
WP29	Working Party of the UNECE, which is the World Forum for Harmonisation of Vehicle Regulations

Table 110: Abbreviation List and Glossary

63 www.unece.org/trans/main/welcwp29.htm