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#### World Forum for Harmonization of Vehicle Regulations

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**Other Business – Follow-up of the round table on climate change and transport**

### Conclusion document of the WP.29 Round Table on Climate Change and Transport

#### Note by the secretariat\*

The text reproduced below was prepared by the secretariat to summarize the outcome of the Round Table on Climate Change and Transport which took place in Geneva on 24 June 2010, during the 151<sup>st</sup> session of the World Forum for Harmonization of Vehicle Regulations (WP.29). The World Forum agreed to consider the conclusions of the Round Table at November 2010 session (ECE/TRANS/WP.29/1085, para. 64).

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\* In accordance with the programme of work of the Inland Transport Committee for 2006–2010 (ECE/TRANS/166/Add.1, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

## Conclusion document of the WP.29 Round Table on Climate Change and Transport

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## I. Introduction

1. The mandate of the United Nations Economic Commission for Europe (UNECE) is to promote and facilitate economic development in the region and transport is one of the key sectors. It provides mobility and access to basic services, such as health and education for all. It is also vital to the well functioning of economies, to the production and distribution of goods as well as to trade and tourism. Transport is indispensable to open up and integrate countries and regions, particularly those that are peripheral or landlocked. The transport sector, including the vehicle manufacturing industry and their suppliers, accounts for a large share of the gross domestic product (GDP) in many countries.

2. However, transport has also negative externalities that need to be dealt with: impact on climate change, environmental pollution, noise, accidents and extensive use of resources (i.e. fossil fuels). There is now a shift from pure mobility objectives towards sustainable transport objectives. We must ensure that future transport systems provide sustainable mobility and economic development without reducing the ability of future generations to meet their own needs.

3. Following a policy debate on global warming and transport during its November 2008 session, the World Forum for the Harmonization of Vehicle Regulations (WP.29) considered the possibility to organize a substantive round table on this subject, back-to-back with one of its forthcoming sessions. In February 2009, the Inland Transport Committee (ITC) endorsed the activities of WP.29 on market fuel quality standards and the organization of such a Round Table (ECE/TRANS/206, para. 29).

4. In this respect, the World Forum agreed to organize the Round Table on Climate Change and Transport, in conjunction with its June 2010 session, aiming at identifying potential scenarios and the most needed actions and measures to which the World Forum WP.29 could contribute, in its future work on climate change mitigation and adaptation.

5. During the Round Table, the World Forum addressed not only new fuel/energy efficient and innovative vehicle technologies, but also Intelligent Transport Systems, inter-modal transport links and intersectoral links. In particular, the Round Table tackled the necessity of considerable changes in the energy sector needed for shifting the road vehicle fleet from using fossil fuels to the use of electricity.

6. Further sustainable transport solutions and more energy efficient transport means are also promoted by the UNECE through the activities and partnerships in 'the Transport, Health and Environment Pan - European Programme' (THE-PEP), for example by promoting human-powered mobility like cycling and walking as environmentally friendly modes of transport which reduce urban congestion and contribute to public health. THE-PEP also launched projects to foster the introduction of eco-driving into professional driver training.

7. All background documents, presentations and this conclusion paper on the WP.29 Round Table on Climate Change and transport are available on the UNECE website at [http://www.unece.org/trans/events/ClimateChange\\_Transport.html](http://www.unece.org/trans/events/ClimateChange_Transport.html).

## II. Scenarios on climate change and transport

### A. The facts

8. The inland transport sector is the fastest growing source of global greenhouse gas (GHG) emissions and road transport is responsible for about 80 per cent of all transport related energy consumption (Organisation for Economic Co-operation and Development 2008). Fossil fuel combustion is the main contributor to air pollution and GHG emissions, especially carbon dioxide (CO<sub>2</sub>). Especially in emerging economies, vehicle ownership is expected to increase largely within the next decades and technological advances are unlikely to offset that increase in CO<sub>2</sub> emissions in the transport sector.

9. The first assessment report of the Intergovernmental Panel on Climate Change (IPCC) was completed in 1990, and served as the basis of the United Nations Framework Convention on Climate Change (UNFCCC). The report mentioned that emissions resulting from human activities are substantially increasing the atmospheric concentrations of greenhouse gases, resulting on average in an additional warming of the Earth's surface and that CO<sub>2</sub> has been responsible for over half the enhanced greenhouse effect. The panel predicted that under a "business as usual" (BAU) scenario, global mean temperature will increase by about 0.3 °C per decade during the twenty-first century. The objective of UNFCCC is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (man-made) interference with the climate system.

### B. The scenarios to mitigate climate change

10. The Foundation for the Automobile and Society (FIA Foundation), International Energy Agency (IEA), International Transport Forum (ITF) and United Nations Environment Programme (UNEP) had launched in early 2009 the "Global Fuel Economy Initiative" within the "50by50 campaign".<sup>1</sup> Improving the efficiency of new vehicles would make possible at least a 50 per cent improvement in the average fuel economy of all vehicle fleets on the road worldwide by 2050. The technologies required to improve the efficiency of new vehicles about 30 per cent by 2020 and 50 per cent by 2030 (i.e. the efficiency of the global vehicle fleet in use about 50 per cent by 2050) mainly involve as a first step changes to conventional internal combustion engines and powertrain systems, along with weight reduction and better aerodynamics. To achieve as a further step a 50 per cent improvement by 2030, the main additional measures would be full hybridization of a much wider range of vehicles. Vehicle technology is changing rapidly and more cost-effective technologies are likely to emerge in coming years, increasing the potential and/or lowering further costs of these new technologies.

11. Another similar approach, the so-called "30by30 resolution"<sup>2</sup>, has been initiated by the International Road Union (IRU) that represents truck, bus, coach and taxi operators worldwide. It is a voluntary commitment of its members (mostly professional drivers) to reduce CO<sub>2</sub> emissions by 30 per cent by 2030 on the basis of new technologies and

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<sup>1</sup> For more detailed information, see:

[http://www.50by50campaign.org/Documents/Publications/50BY50\\_report.pdf](http://www.50by50campaign.org/Documents/Publications/50BY50_report.pdf)

<sup>2</sup> For more detailed information, see: [http://www.iru.org/index/cms-filessystem-action?file=en\\_Resolutions\\_General%20transport%20policy/09\\_30-30.E.pdf](http://www.iru.org/index/cms-filessystem-action?file=en_Resolutions_General%20transport%20policy/09_30-30.E.pdf)

practices, through means such as driver training, application of innovative logistic concepts and investments in innovative engine and vehicle technologies.

12. Some governments and intergovernmental organizations also announced national and regional programmes to cut the national CO<sub>2</sub> emissions by 20 per cent by 2020.

### **C. A possible strategy to reduce CO<sub>2</sub> emissions**

13. At its session in June 2008, WP.29 had already noted the key messages of the ITF as well as the results of the International Symposium on a global approach to automotive fuel economy, which was held in Paris on 15 and 16 May 2008 and had been organized by IEA in cooperation with ITF, the FIA Foundation and UNEP. At its November 2008 session, WP.29 outlined that, with regard to the abatement of global warming and the reduction of CO<sub>2</sub> emissions, a possible strategy for the inland transport sector could be:

(a) a short-term objective through improved energy efficiency and the use of sustainable biofuels (2015);

(b) a midterm objective with the development and introduction into the market of plug-in hybrid vehicles (2020–2025), and;

(c) a long-term objective with development and introduction into the market of electric, hydrogen and fuel cell vehicles (2030–2040).

14. This strategy would shift the automotive sector from the use of fossil energy to the use of hydrogen and electric energy. The effectiveness of this integrated strategy depends on the energy sector ensuring the sustainable and cost-effective generation of electricity and production of hydrogen.

15. The development of worldwide harmonized technical provisions are aimed at reducing trade barriers and quickly introducing innovative engine technologies and efficient powertrains for greener vehicles into the global market.

16. In this respect, the World Forum and its subsidiary Working Parties had already considered a large number of issues regarding the energy efficiency of the vehicle fleet, such as:

(a) innovative vehicle technologies, i.e. provisions for Environmentally Friendly Vehicles (EFV) such as Hybrid Electric Vehicles (HEV), Plug-in Hybrid Electric Vehicles (PHEV), Hydrogen and Fuel Cell Vehicles (HFCV), Electric Vehicles (EV), etc.;

(b) advanced engine management systems (e.g. stop and go function, gearshift and eco-drive indicators) and engine emission control devices (e.g. on-board diagnostic systems);

(c) efficient vehicle powertrains (e.g. low friction components, tyres with low rolling resistance, tyre pressure monitoring systems, brake energy regeneration);

(d) use of other alternative fuels such as liquefied petroleum gas (LPG), compressed natural gas (CNG) and biofuels (liquid and gaseous);

(e) development of quality specifications for market fuels in relation with the vehicle emission levels and engine technology type;

(f) installation of electric devices with a low energy consumption on vehicles to reduce energy consumption (e.g. headlamps with Light Emitting Diode (LED) technologies);

(g) development of driver assisting features, such as Intelligent Transport Systems (ITS), intelligent Information and Communication Technologies (ICT) to prevent traffic congestion.

17. The most important achievements of the World Forum WP.29 with regard to the abatement of CO<sub>2</sub> emissions are listed in the annex to this conclusion document.

18. With regard to the ongoing activities of the World Forum, the following of its Working Groups consider subjects related to the reduction of CO<sub>2</sub> emissions:

(a) Worldwide harmonized Light vehicles emissions Test procedure (WLTP): following detailed consideration in 2010 of a roadmap for the development of WLTP, the World Forum mandated an informal group to start work on the elaboration of new emissions test cycles and procedures for light vehicles with regard to fuel and energy consumption, the emissions of gaseous pollutants (NO<sub>x</sub>, CO, HC) and particles. This new test procedure will better reflect the real world conditions of vehicle operation.

(b) Mobile Air Conditioner Test Procedure (MACTP): in 2010, the World Forum set up an informal working group to develop, in parallel with the ongoing work on the WLTP, a new test procedure to evaluate the energy efficiency of Mobile Air Conditioner (MAC) systems for motor vehicles.

(c) Heavy Duty Hybrids: in 2010, the World Forum set up a working group to develop new test procedures for the emissions of pollutants and CO<sub>2</sub> from engines used for the propulsion of commercial vehicles equipped with a hybrid electric powertrain.

(d) Hydrogen and Fuel Cell Vehicles (HFCV): in 2005, the World Forum set up an informal working group to develop and establish a global technical regulation (gtr) on (HFCV) that attains equivalent levels of safety as those for conventional gasoline powered vehicles, without any restrictions for future innovative technologies.

(e) Electric Safety (ELSA): in 2007, the World Forum set up a working group to prepare, in a first phase, an amendment to existing Regulation No. 100 adopted by WP.29 in March 2010. This amendment applies to all categories of vehicles with an electric power train and supplements the Regulation with additional provisions regarding protection against electric shocks (high voltage) during the normal use of such vehicle. The working group continued to develop, in a second phase, specifications to protect the occupants of vehicles with an electric powertrain against electric shocks in case of frontal or lateral collisions (i.e. amendments to Regulations Nos. 12, 94 and 95 for consideration and adoption by WP.29 at its November 2010 session).

(f) Fuel Quality: in 2007, the World Forum showed the close link between market fuel quality and emissions of pollutants from motor vehicles. It recognized that further reduction of emissions required that cleaner fuel be available to consumers. The lack of harmonized fuel quality requirements was seen to hamper the development of new vehicle technologies (e.g. aftertreatment systems, catalytic converter, particle filter). For that reason, the World Forum was urged to develop such uniform provisions for cleaner market fuels and, therefore, set up a specific expert group to develop recommendations for market fuel quality. A first set of specifications is expected to be finalized by mid-2011.

(g) Environmentally Friendly Vehicles (EFV): at the third EFV conference held in Dresden (2007), the World Forum WP.29 agreed to establish a new informal group on EFV to ensure close cooperation with the organizers of future EFV conferences aimed at the following achievements:

- (i) Status report regarding the set goals;
- (ii) Exchange of experiences regarding ongoing measures for promoting and facilitating the introduction into the market of EFVs;
- (iii) Exchange of experiences and analysis regarding the legal and economic framework;

Following the fourth EFV Conference in New Delhi (2009), the EFV informal group considered, under the chairmanship of India, a holistic approach for the evaluation of EFVs, based on parameters such as CO<sub>2</sub> emissions, noise level, gaseous pollutants, the recyclability and type of fuels. According to the integrated well-to-wheel approach as considered in the feasibility study prior to the conference in New Delhi, further investigation is needed concerning the purpose and target group of the future EFV concept. Detailed information on these parameters is available at: <http://www.unece.org/trans/main/wp29/wp29wgs/wp29grpe/efv07.html>.

19. With its strong commitment to contribute to climate change mitigation, the World Forum agreed to resume its efforts to improve the energy efficiency of new motor vehicles and to review the priorities, whenever necessary. However, it is clear that the construction of vehicles cannot be the only solution to reduce CO<sub>2</sub> emissions in the transport sector.

### III. Conclusions of the WP.29 Round Table

20. There is clear consensus among scientists, policy-makers, engineers and business leaders from the automotive industry that concerted action is needed to address climate change through the reduction of greenhouse gas emissions, especially those of CO<sub>2</sub>.

21. In the short-term, all stakeholders involved in inland transport should focus on:

- (a) improved energy efficiency of all inland transport modes;
- (b) a broader use of sustainable biofuels and hydrogen, as well as a sustainable generation of electricity;
- (c) a better traffic flow and transport infrastructure, including intermodal transport, to avoid congestion;
- (d) a broader information campaign and in-depth education on measures to reduce the CO<sub>2</sub> emissions.

22. In the long-term, there should be a shift in the automotive sector from the use of fossil energy to the use of hydrogen and electric energy. It is obvious that this shift will not solve the problem, if the production of hydrogen and the generation of electricity wouldn't be sustainable. Therefore, it was agreed to consider the future environmentally friendly vehicles in an integrated approach, i.e. on the basis of a well-to-tank (energy) and tank-to-wheel (vehicle) approach.

23. The effectiveness of that integrated approach for green vehicles depends on the energy sector ensuring the sustainable and cost-effective generation of electricity and production of hydrogen. The distributors of electricity have to set up smart grids for the distribution of sustainable electricity offering the possibility of slow and fast recharging of electric vehicles. For a faster market penetration of electric, hydrogen and fuel cell vehicles,

it is important to set up an infrastructure for instant recharging packs (exchange of electric batteries) for electric vehicles and for safe refuelling of vehicles with fluid and compressed hydrogen.

24. It was agreed that the World Forum should continue with its work programme on the worldwide harmonization of vehicle regulations, taking into account the need to continuously adapt to technical progress and to include new performance requirements for innovative technologies.

25. The main objectives of all above mentioned scenarios are similar and result in a considerable improvement of the energy efficiency in the inland transport sector and a reduction of its CO<sub>2</sub> emissions worldwide. It was agreed that this goal could be reached, under the condition that all stakeholders have to contribute: international organizations, governments, road users, consumers, vehicle manufacturers and their suppliers, electricity producer, researchers and engineers, journalists and teachers, i.e. all of us.

26. There are many measures possible in our daily life to save energy in general, thus save money and reduce CO<sub>2</sub> emissions. It should become a habit for all of us to link each of our daily actions and future plans to the goal of saving energy and resources. In this respect, education and information should focus on this important and sometimes complex subject. These measures to improve the use of energy and to mitigate climate change are numerous. Some of them are listed below.

#### **IV. Measures to be taken by the different stakeholders**

27. The WP.29 Round Table agreed on the need to consider the greening of inland transport on the basis of an integrated approach. For the effectiveness of that integrated approach, all stakeholders involved, i.e. the automotive industry, the energy supplier, the consumer as well as the urban infrastructure planners, have to contribute. Delegates considered a large number of possible measures that should be taken by the stakeholder concerned to contribute to the mitigation of climate change. The measures listed below are only an excerpt of possible contributions.

##### **A. International and intergovernmental organizations**

28. International organizations and intergovernmental organization should:

(a) establish and foster international legal instruments on sustainable development including green mobility and sustainable energy. The existing legal instruments should be promoted worldwide and the accession of countries to these legal instruments should be facilitated. The global harmonization of regulations and standards as well as their continuous adaptation to technical progress play a key role in reducing trade barriers worldwide. Such regulations and standards should be technology neutral and performance oriented especially with regard to their level of safety and environmental protection.

As an example, UNECE should coordinate and strengthen the activities of all Working Parties involved in climate change mitigation to strengthen their commitment for the implementation of their work programme, such as:

(i) the activities on Intelligent Transport Systems (ITS) should be considered not only in conjunction with road vehicles, but, in a broader view, extended to the innovative technologies in transport infrastructures as well as in communication and information systems.



(ii) UNECEs exchange of best practices in sustainable transport policies within THE-PEP should be strengthened and should be aimed at fostering worldwide partnerships on energy efficiency and sustainable transport. Further conferences, workshops and studies should be organized to share experiences in transport policy, traffic management, GHG data analysis and share more general information with member States on how to address, in an integrated and holistic manner, the challenges for sustainable transport, environment and health.

(b) initiate and perform international projects to ease the implementation of global, regional and national policies on climate change mitigation and adaptation.

As an example, the ITC and World Forum welcomed the initiative by UNECE together with all other United Nations regional commissions to launch the UNDA project aimed at studying the impact of road transport on climate change worldwide (ECE/TRANS/208, para. 95; ECE/TRANS/WP.29/1085, para. 12). The current objectives of this project include the development of an information and analysis tool based on a uniform methodology for the evaluation of CO<sub>2</sub> emissions in the inland transport sector, taking into account climate-relevant indicators and new transport trends. The methodology for evaluating CO<sub>2</sub> emissions will serve as a web-based tool that could be used by all United Nations member States to analyse a wide range of questions linked to CO<sub>2</sub> emissions and to optimize the use of energy sources in the transport sector. Thus, it will be a powerful and transparent analysis tool to develop future transport strategies and to support policy decisions by the member States.

In this respect, the UNECE should consider further possible follow-up actions to the UNDA project such as the enlargement of the analysis tool to include:

- (i) GHG emissions other than CO<sub>2</sub>;
- (ii) transport modes other than inland transport;
- (iii) modelling of economic impact(s).

## **B. Governments**

29. Global warming is a global problem and needs a global solution. Governments have a key position in the international and intergovernmental organization to define the global policy on climate change mitigation. In the different areas of competencies, they should be committed to proactively contribute to climate change actions such as:

(a) Foreign affairs: Governments should adhere to and comply with the existing legal instruments established by the international organizations. They should support initiatives such as the above-mentioned UNDA project, financially contribute to fund them and actively participate in the development in the activities linked to the projects.

(b) Transport and environment: Governments should establish long-term policies for a sustainable mobility and environmental protection through greening the transport sector. At their national level, they should undertake all necessary measures and consider primary objectives such as:

- (i) to support the activities of the World Forum and actively contribute to the development of worldwide harmonized technical regulations with regard to energy efficient and environmentally friendly vehicles based on technology neutral performance requirements and test procedures;
- (ii) to transpose into their national legislation the existing worldwide harmonized regulations to enable a quick introduction on their national market of vehicles with innovative engine and powertrain technologies;

(iii) to implement on their territory new legislations on fuel economy, including financial measures to foster the introduction into their markets of low carbon vehicle technologies; these measures could include on an exceptional basis time-limited financial incentives such as the scrapping scheme for older vehicles;

(iv) to review the road infrastructure and traffic conditions to improve traffic fluidity, including the construction of new roads, a more efficient use of existing roads and the installations of intelligent traffic management systems;

(v) to promote cooperation on the research and development of innovative technologies, which could have an impact on an improved energy efficiency, and to share in that respect data analysis, evaluation methodologies, study results, etc.;

(vi) to review of the different transport modes for freight focusing on the potential to reduce CO<sub>2</sub> emissions, i.e. adaptation of the rules on weights and dimensions of heavy duty vehicles to allow longer and/or larger goods vehicles for long distance transport as well as consideration of efficient transshipment operations between road, rail and inland waterways are essential to achieve a considerable shift of freight transport from road to rail and waterways. CO<sub>2</sub> emissions by rail are in some countries much lower than in others as their railways have reached a higher level of electrification;

(vii) to set up long-term policies on sustainable transport, taking into account the internalization of the costs of all transport modes.

(c) Energy supply: Governments should establish long-term policies to ensure the security of their national supply of sustainable energy. In the short-time, Governments should foster the use of sustainable biofuels. In this respect, it is important to establish international criteria, currently under development at the Ecole Polytechnique Fédérale de Lausanne (EPFL)<sup>3</sup>, for the sustainable production of liquid and gaseous biofuels. Governments should promote use on their national territories of sustainable biofuels which comply with these international criteria, once established. Furthermore, they have to ensure that the generation of electricity and production of hydrogen is sustainable.

(d) Urban planning and infrastructure: Governments should establish long-term policies to green the cities according to the principle “living and working door to door”. They should consider decentralization and reorientation of urban and rural development focusing on sustainable mobility (more wealth, less motion). Energy efficient public transport means should have the highest priority in national programmes for sustainable transport. In this respect, the installation of an efficient and smart grid for the supply of electricity and hydrogen for future vehicles is an urgent prerequisite to foster the penetration of hydrogen, fuel cell and electric vehicles into the market. Smart and performing transport infrastructure should be a “must” to ensure an efficient traffic flow, such as advanced traffic management systems using ITS (e.g. intelligent traffic lights, electronic tolling systems, traffic information and guidance systems), NO<sub>x</sub> pollution-reducing and noise-reducing pavements, geographical separation of infrastructures for the different users i.e. motor vehicles, cyclists, pedestrians. Furthermore, Governments should consider efficient intermodal transport especially for freight.

(e) Finance and treasury: Governments should review their taxation policy in view of a possible reduction of GHG emissions. A shifting of the transport sector from the use fossil fuels to the use of electricity and hydrogen will considerably cut the current tax

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<sup>3</sup> For more detailed information, see: <http://energycenter.epfl.ch/page84341.html>

income of Governments from taxation of fossil fuels. They should consider, case by case, the possible implementation of financial measures such as:

- (i) tax incentives for low-carbon products such as green vehicles;
- (ii) taxation of energy intensive products;
- (iii) road pricing and CO<sub>2</sub> related taxation instead of vehicle ownership taxation;
- (iv) restructuring of the budgetary use of fossil fuel taxes;
- (v) special time-limited incentive programmes such as scrapping schemes for the renewal of the fleet.

(f) Education: Governments should review their education systems to enable children to understand low carbon principles and energy efficiency already in school. At a national level, education should focus on the main principles:

- (i) avoid spoilage or waste of energy;
- (ii) evaluate the impact of any personal action on the personal CO<sub>2</sub> footprint (in case of mobility: impact of walking, cycling, using public transport means, etc.);
- (iii) use of energy-efficient technologies (especially in housing, transport and industry);
- (iv) contribute to the conversion of current systems to sustainable development.

(g) Information campaigns: Governments and cities should promote mobility plans and public demonstrations to encourage the use of public transport, car pooling, car sharing, etc. which allows benefits for the community, especially in highly congested areas. They should provide continuous and updated information to the public regarding the potential of possible measures to reduce their personal CO<sub>2</sub> footprint. Furthermore, they should ensure that consumers are informed by simple and clear means (e.g. eco-labelling) about their choice of products with regard to its energy efficiency. In the case of need for mobility, a person should have easy access to all necessary information of possible transport modes and, for each mode, the impact of her journey on her personal CO<sub>2</sub> footprint. This will ease her choice for the greenest mobility either to walk, to cycle, to use public transport means or a private car. Governments and cities should also consider launching local or regional pilot projects or initiatives to foster, according to the specific needs in their region, the market penetration of new energy efficient technologies including public infrastructure deployment, taking into consideration new business plans based on public-private partnerships.

### C. Road-user, operator and consumer associations

30. Road-users, consumers or people in general can considerably reduce their personal CO<sub>2</sub> emissions only by adapting their behaviour to the basic principles of avoiding transport, choosing the most energy efficient transport mode and driving in a most efficient way:

- (a) Before using a means at transport, people should consider the impact of any of their actions on his personal CO<sub>2</sub> footprint. In their choice, they should opt for the greenest mobility. Especially commuters and long distance travellers should consult route ranking websites;<sup>4</sup>

<sup>4</sup> As an example of such a website, please consult: <http://www.routerank.com/en-ch/>

(b) Passengers using public transport services should opt for the greenest transport means.

(c) Car owners should also consider the possibility of car sharing or car pooling. A number of cities introduced such programmes to encourage use by employees.

(d) Car drivers should be aware of the eco-driving principles (keep a uniform pace, predict traffic trends, use high gears when possible, avoid overtaking, check tyre pressure, etc.). These principles present key advantages and important benefits to the driver:

(i) it is easy to implement and applicable to the whole existing vehicle fleet;

(ii) due to the reduction of fuel consumption, it is highly cost-beneficial for the driver/operator;

(iii) it is environmentally friendly due to the reduced vehicle engine emissions with regard to noise, gaseous pollutants and CO<sub>2</sub>;

(iv) it will immediately result in a remarkable environmental improvement, but also improvement of comfort and road safety aspects.

(e) Vehicle owners should fit the most appropriate tyres on their vehicles (snow tyres in winter time and summer tyres in summer time) and regularly check the tyre pressure. In the case of new tyres, they should always opt for tyres with low rolling resistance.

(f) Professional drivers of freight and passenger transport should benefit from a driver education programme including the above mentioned eco-driving principles. Skilled drivers can considerably contribute to the reduction of CO<sub>2</sub> emissions.

(g) Freight operators should optimize their road transport logistics with regard to efficient fleet management i.e. avoiding unnecessary freight movements through urban areas, using modular transport and/or longer trucks for long transport distances, etc. Such measures lead to improved competitiveness for the transport operator.

(h) A consumer or operator interested in buying a new vehicle should especially consider the energy efficiency of the potential vehicles, which can best fit his or her needs.

## **D. Automobile manufacturers and their suppliers**

31. The automobile manufacturers and their suppliers should make available to their customers different types of vehicles with innovative technologies with regard to the energy efficiency of its engine, powertrain and aerodynamic shape:

(a) The manufacturers should offer at a broader scale:

(i) mono- or bi-fuel as well as flex-fuel vehicles equipped with engines which can use alternative fuels such as Liquid Petroleum Gas (LPG) or Compressed Natural Gas (CNG) or ethanol;

(ii) vehicles with electric powertrains, such as Hybrid Electric Vehicles (HEV), Plug-in Hybrid Electric Vehicles (PHEV) or pure Electric Vehicles (EV);

(iii) Hydrogen and Fuel Cell Vehicles (HFCV);

(iv) all vehicles should reduce weight and should be equipped with smart energy efficient engine management systems, stop and go function, gearshift indicator, tyre pressure monitoring systems (TPMS), brake energy regeneration systems, etc.

(b) The tyre industry should supply tyres with low rolling resistance and rolling noise.

(c) Other suppliers should deliver energy efficient electric/electronic devices, for e.g. lighting and light-signalling systems, heating systems with low energy consumption, etc.

(d) Mass production of such new vehicle technologies makes such systems more affordable for consumers.

(e) Taking into account the integrated approach for environmentally friendly vehicles, production sites and assembling plants should have low CO<sub>2</sub> emissions and new vehicles should have a high-level of recyclability.

32. The automobile manufacturers and their suppliers should continue to cooperate in establishing worldwide harmonized regulations with performance oriented and technological neutral provisions, such as the new test cycles for the emissions of pollutants and particles, including CO<sub>2</sub> (WLTP, Worldwide harmonized Heavy-Duty Certification procedure, Worldwide Harmonized Motorcycle Emissions Certification Procedure, etc.).

## **E. Research and development**

33. The automobile industry is one of the largest private investors in research and development worldwide. Up to now, the shifting of the automotive sector from the use of fossil energy to the use of hydrogen and electric energy has been difficult due to the technological and safety constraints of energy storage systems. Today, automotive batteries remain costly and provide a relatively short range due to their high weight and low specific storage capacity. Furthermore, the storage of hydrogen may raise safety problems for vehicles involved in a collision. Therefore, further urgent work in research and development is needed and should be endorsed by the community, especially:

(a) for advanced automotive batteries, further work is necessary:

(i) to improve the performance, reliability, durability, recyclability, safety and crashworthiness;

(ii) to reduce their weight, size, fire risks and production costs;

(b) for fuel cell technologies: further work needs to be done on the safety and crashworthiness of storage systems at compressed or liquid hydrogen;

(c) for internal combustion engines using hydrogen as fuel: further work is necessary on the safety and environmental impact of such engines (steam vapour is also a GHG and, therefore, contributes to climate change);

(d) Innovative storage systems for electricity, e.g. the use of batteries of the electric vehicle fleet connected to a smart grid.

34. There remains a strong need for research in the area of advanced battery technologies, especially with regard to battery performance, reliability, durability, production costs and recyclability. Battery technologies based on lithium-ion technologies as well as the expected growth in the production of electric motors may result in an increased demand for lithium, copper, neodymium or other elements and raw materials. This could potentially lead, in some critical producer countries, to controversial political and economical interests and may even result in severe conflicts. There is a need for further investigation and studies on more coherent data on the worldwide production and supply of such materials, the measured and indicated resources and reserves (proven and probable). In this respect, research and development on advanced batteries should not be restricted to one single technology but enlarged to other technologies in parallel. Furthermore, full recycling of batteries should become a main issue to improve the life cycle of batteries.

## **F. Mass media**

35. The mass media can considerably contribute to disseminating information to consumers in general and, therefore, can considerably contribute to the efforts to globally reduce the CO<sub>2</sub> emissions. The continuous dissemination of information on effective measures can persuade consumers to adapt their daily actions and habits on improved energy efficiency.

## **V. Summary**

36. The WP.29 Round Table on Climate Change and Transport was held in Geneva on 24 June 2010. A number of excellent presentations were made by representatives of the main stakeholders involved in transport and a large number of suggestions for possible measures to reduce inland transport CO<sub>2</sub> emissions and, thus, to contribute climate change mitigation were given. The Round Table was followed by a very fruitful discussion highlighting the need to “green” the inland transport sector via an integrated approach.

37. For the effectiveness of that integrated approach, all stakeholders involved, i.e. the international and intergovernmental organizations, the governments, the automotive industry and their suppliers, road-users, operators, consumers, researchers, journalists as well as the energy suppliers have to contribute. An excerpt of possible measures which should be taken by the different stakeholder are listed in chapter IV of this document.

38. All background documents, presentations and related documentation can be consulted on the UNECE website at:

[http://www.unece.org/trans/events/ClimateChange\\_Transport.html](http://www.unece.org/trans/events/ClimateChange_Transport.html)

## Annex

### Chronology of CO<sub>2</sub> relevant activities of WP.29

1. The World Forum WP.29 adopted a number of UNECE Regulations to limit the emissions of pollutants (carbon-monoxide CO, hydro-carbons HC, nitrogen-oxides NOx and particulates) from motorcycle engines (Regulation No. 40), from combustion engines of four-wheeled vehicles (the so-called EURO levels for commercial vehicles in Regulation No. 49 and for passenger cars in Regulation No. 83) as well as from tractors and Non-Road Mobile Machinery (Regulation No. 96). Since 1970, a substantial abatement of more than 95 per cent in emission limits (more than 20 times lower than those established 40 years ago). Regarding particulate emissions, the levels are now much lower than those initially set up in 1990. These were large steps forward to cleaner vehicle engines and WP.29 goes forward to “green” road vehicles.
2. The World Forum and in particular its subsidiary Working Party on Pollution and Energy (GRPE) work on the further reduction of the emissions of the above mentioned gaseous pollutants as well as the fuel consumption of vehicles in order to reduce their CO<sub>2</sub> emissions and to improve their energy efficiency.
3. CO<sub>2</sub> is a GHG and has to be taken into consideration in discussions on climate change mitigation. The World Forum adopted, already in 1997 Regulation No. 101 for the determination of the energy consumption or CO<sub>2</sub> emissions of vehicle engines. However, the provisions were limited to the measurement procedure only.
4. The World Forum undertook already a large number of measures and established Regulations for the use of alternative energy sources such as liquefied petroleum gas (LPG with Regulation No. 67 in 1987), compressed natural gas (CNG with Regulation No. 110 in 2000) and specific LPG and CNG retrofit systems (with Regulation No. 115 in 2003).
5. Furthermore, the World Forum adopted a number of amendments to the above mentioned UNECE Regulations to type approve electric vehicles (in addition to Regulation No. 100 in 1996), hybrid electric vehicles (in 2004) and recently also for the plug-in hybrid electric vehicles (2008). In 2008, the provisions of Regulation No. 83 have been updated to allow the use of biofuels (2008).
6. The World Forum demonstrated in 2007 that there is a close link between market fuel quality and the emissions of pollutants from motor vehicles. It recognized that further reduction of emissions through more stringent emission regulations required more advanced emission control technologies, which drives the crucial need for appropriate fuels to be available on the market to consumers. To this aim, the World Forum set up an informal group to develop recommendations on market fuel quality to enable that vehicles, which were tested in conformity with the United Nations regulations and using specific reference fuels for the tests, use in their daily service fuels with specific characteristics relating to the vehicle emission levels and technology type of the engine in order to avoid a degradation of the emission control devices (e.g. catalytic converter, particle filter).
7. Other innovative technologies such as hydrogen and fuel cell vehicles are still under consideration within the World Forum. In this respect, experts of the Working Party on Passive Safety (GRSP) recently developed safety provisions for all specific components, their installation on vehicles as well as their crashworthiness. With regard to the safety of hydrogen and fuel cell vehicles, a first set of amendments to existing regulations had been finalized in 2010 to prevent passengers of such vehicles from electric shocks not only in the daily use of such vehicles but also in case of frontal and lateral collisions. The experts

continue to consider further improvement on fire risks of vehicles equipped with electric batteries.

8. As an outcome of the third Conference on Environmentally Friendly Vehicles held in Dresden, Germany, the World Forum decided in 2008 to set up under GRPE an informal group on EFV. The informal group had held a number of meetings and agreed on the need to consider an integrated approach on the basis of a well-to-wheel analysis, when evaluating the whole lifecycle of the vehicle with regard to the emissions of gaseous pollutants, CO<sub>2</sub> as well as noise. In this respect, the production and distribution of fuels (well-to-tank), the energy efficiency of vehicles (tank-to-wheel) as well as the recyclability and the final disposal of vehicles after their use have to be taken into consideration.

9. The World Forum also established, in March 2008, a GRPE informal group to develop WLTP, including the measurement procedure for CO<sub>2</sub> emissions. According to the road map to develop such a regulation, the experts are expected to finalize the draft regulation on WLTP by 2014. The expert groups will also consider the introduction of other innovative engine technologies and energy efficient powertrains, such as intelligent engine management systems (e.g. stop and go function), the eco-driving function or gear-shift indicator, etc.

10. The Working Party on Noise (GRB) is working mainly on further noise reduction by road vehicles (Regulations Nos. 41 and 51). The World Forum already established a new noise measurement method for motor vehicles and considers now new limit values for this new testing method. GRB also considers similar proposals for a new measurement method for two- and three-wheelers.

11. In 2007, the World Forum established Regulation No. 117 on tyre rolling noise and wet grip adhesion. Recently, an amendment to this Regulation had been adopted to insert a new test method for the measurement of the tyre rolling resistance. These provisions are aimed at promoting tyres with a low rolling resistance. The World Forum also adopted a proposal to fit new vehicles with TPMS to ensure the correct inflation of tyres fitted on vehicles. This will improve not only vehicle safety but also improve the energy efficiency by reducing the rolling resistance.

12. Other subsidiary bodies to WP.29 consider a number of measures to improve the energy efficiency of vehicles. For example, experts consider a multitude of ITS linked to innovative vehicles technologies such as driver assistant systems or smart traffic management systems to avoid e.g. traffic congestion. Furthermore, experts consider a number of possible measures to reduce energy consumption of electric vehicle equipment (e.g. LED lighting devices) and the vehicle weight (i.e. materials, down sizing).

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