This document was noted by Ministers at their Session in Prague on 30-31 May 2000.

The full report will be published during 2000.
VEHICLE EMISSION TRENDS

CONCLUSIONS

Report CEMT/CS(2000)6 provides an overview and comparison of vehicle emissions standards in Europe, Japan, the USA and California. Its purpose is to provide an international context for assessing the outlook for vehicle emissions trends and standards. It describes the impact of vehicle emissions on health and the environment and assesses the adequacy of emissions limits adopted for new passenger car engines and for heavy duty diesel engines. The results and conclusions of the analysis are reported briefly here.

Continuing air quality problems from vehicle related pollution have been stimulating innovative pollution control approaches around the world. As these approaches are implemented, steady progress in reducing urban air pollution problems is occurring.

An example is the experience in Southern California’s Los Angeles Basin, which has had the most aggressive motor vehicle pollution control program in the world over the past forty years. From 1955 to 1993, peak ozone concentrations were cut in half. The average annual number of days above the Federal carbon monoxide standard fell from 30 to 4.3 between 1977 and 1992 and lead levels are now 98 percent lower than in the early 1970’s. Most remarkably, this achievement occurred while the regional economy out-paced the national economy in total job growth, manufacturing job growth, wage levels and average household income. In short, a strong focus on environmental protection can be compatible with strong economic development.

However, the vehicle population and kilometres travelled by vehicles continues to increase, especially in the rapidly industrialising developing countries of the world. To keep pace with this growth while lowering vehicle pollution even more, the US, Europe and Japan are continuing to develop even tighter controls for coming years. Controls initially introduced in these countries are gradually also being adopted by other countries.

With the recently adopted US national Tier 2 standards and California Low Emissions Vehicle 2 standards, it appears unlikely that any further tightening of light duty vehicle emissions standards will be needed in the USA in the future. The one possible area for additional control of these vehicles is with regard to toxic emissions. US heavy duty engine emissions controls are not yet completed, however, and the Environmental Protection Agency has indicated its intention to substantially tighten requirements during 2000 with the new requirements to be introduced in 2007 approximately. Gasoline fuel sulfur levels have been reduced to an average of 30 ppm but auto manufacturers have indicated that this will not be sufficient and pressure will continue in future years to lower these levels even more. Diesel fuel sulfur levels will likely be reduced in the future; EPA has indicated its intention to propose maximum levels of 15 ppm during the coming year.

While Japan has recently tightened standards, it is expected that additional controls at least for heavy duty engines and fuels will be introduced in approximately 2002 for the 2007 Model Year. Gasoline sulfur levels are already low but it is expected that efforts to reduce diesel fuel sulfur levels will gain momentum in the next two years.
In Europe, European Union light and heavy duty vehicle and engine standards have been substantially tightened over the past few years and further tightening is not likely in the near future. There has been a conscious decision to set less stringent standards for diesel fuelled cars than for gasoline fuelled cars in recognition of the superior fuel economy potential of diesel vehicles. Gasoline and diesel fuel sulfur levels have been capped at a maximum of 50 ppm by 2005 in the European Union but Germany has indicated that it will seek a maximum diesel fuel sulfur level of 10 ppm by 2007.

One response to reducing greenhouse gases has been to increase the use of highly efficient diesels in the passenger car and light truck sectors. However, these vehicles emit higher amounts of NOx and particulate matter than the gasoline fuelled alternatives and have been linked to increased cancer risks\(^1\). Further, some evidence indicates that currently applied technologies which reduce the mass of PM emitted may result in an increase in the number of very small particles. Since smaller particles have the potential to be ingested more deeply into the lung than larger particles, they may actually be more hazardous. To offset both the increased cancer risk and the concern with small, ultrafine particles, particle filters will likely be used in the future. Peugeot introduced such filters on certain new car models in 2000. The EU particulate matter standards for 2005 are expected to be met by the use of particle filters on all diesel passenger cars. If it turns out that manufacturers can and do meet the standards without filters, however, it is possible that standards will be tightened further in the future.

No country has adequately addressed the vehicle contribution to carbon dioxide emissions with the result that the fraction of global CO\(_2\) emissions arising from the transport sector is increasing. Europe has taken the lead with a voluntary commitment to reduce new car fuel consumption by 25% over the next decade and Japan is closely following suit. In the US there has been substantial focus on developing advanced vehicle technologies in the laboratory but in reality new car fuel economy continues to decline.

Finally, today’s vehicles depend on properly functioning emission controls to keep pollution levels low. Malfunctions in the emission control system can sharply increase emissions. A relatively small number of vehicles with serious malfunctions frequently cause the majority of the vehicle-related pollution problems. Effective inspection and maintenance programs can identify these problem cars and assure their repair. By assuring good maintenance practices and discouraging tampering and misfueling, inspection and maintenance remains the best demonstrated means for protecting a national investment in emission control technology and achieving the air quality gains which are needed. On-board diagnostics have been introduced in the USA to help ensure better maintenance. On-board diagnostic requirements are being progressively introduced from 2000 in Europe as well. Substantially expanded durability requirements and continued improvements in onboard diagnostic technology are being pushed in the US to shift more of the in use emissions burden to vehicle and engine manufacturers.

Because each region uses different test procedures, it is difficult to make precise comparisons regarding the relative stringency of EU, US, Californian and Japanese emissions regulations. Ignoring the test procedure question, the accompanying figures summarise the passenger car and heavy truck requirements for nitrogen oxides and particulate matter, the pollutants most critical to air quality and choices for engine and exhaust treatment technology over the coming decade.

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\(^1\) The German UBA has carried out a study which concludes that currently produced new diesel cars have more than 10 times higher cancer risk than new gasoline fuelled cars.
Comparison of Passenger Car Emissions Standards in the EU, USA and Japan

Nitrogen Oxide Limits
\( \text{g/km for petrol engines} \)

<table>
<thead>
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<th>Year</th>
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<th>California</th>
<th>Japan</th>
<th>EU</th>
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<tr>
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<td>0.35</td>
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Nitrogen Oxide Limits
\( \text{g/km for diesel engines} \)

<table>
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<tr>
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<tr>
<td>2005</td>
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<td>0.7</td>
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Particulate Matter Limits
\( \text{g/km for diesel engines} \)

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<tbody>
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<tr>
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<td>0.05</td>
<td>0.04</td>
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</tbody>
</table>
Comparison of Heavy Duty Diesel Emissions Standards in the EU, USA and Japan

Nitrogen Oxide Limits
\( \text{g/kWh} \)

Particulate Matter Limits
\( \text{g/kWh} \)

Note: Californian passenger car regulations set two emissions limit levels. All vehicles must meet the upper limit, with a series of quotas that increase over time for the proportion of vehicles that must meet the lower limit.