

## ACEA comments on impact assessment to CO<sub>2</sub>/cars strategy

### In Brief

- The impact assessment’s **problem definition is misleading**, which causes a **mismatch between the real challenge and the proposed solutions**.
  - The impact assessment has **left out crucial parts, concerning the societal costs and the economic consequences amongst others**, which were part of the original version of the document that served to prepare the Commission’s CO<sub>2</sub> Communication from February 7.
    - The impact assessment reports “no perceptible impact on employment”. This contrasts with the original version of the impact assessment, which stated explicitly that “**car exports decrease and car imports increase**” as a result of the proposed policy, that “some **shifting of jobs and production outside the EU** is happening especially within the small car segment”, that **Russia “could be an interesting new product location for European volume brands**” and that “at the supplier industry, **additional job cuts** have to be expected”.
    - The impact assessment acknowledges that the proposed policy will have **unintended consequences on car segments**, including a shift from diesel to gasoline cars. What is not reported anymore, contrary to the previous text, is a **reduction of the number of small cars and an increase in the number of large cars**. “This is because the scenario implemented corresponds to an increase of purchase costs by more than 10% for small cars”, and even “+18% for small petrol cars” below 1.4l.
  - The EU has espoused the principle of cost-effectiveness. **According to the Commission’s ECCP consultant, the proposed measures on vehicle technology are not cost-effective**. More can be done for the environment at lower costs to society.
  - The impact assessment **does not report the costs industry and consumers face**: while the Commission’s ECCP consultant calculated societal costs of €132 to 233/t CO<sub>2</sub> abated for going from 140g/km to 120g/km, the impact assessment brings the costs significantly down, deviating from independently established figures.
  - The impact assessment **ignores important measures and policy options** from the outset (such as eco-driving, infrastructure measures, some biofuels), thus denying larger cost-effective CO<sub>2</sub> reductions
  - The impact assessment admits that the proposed policy will lead to an **increase in kilometres driven** because of the “rebound effect” of installing expensive technology that, once a car is bought, makes driving cheaper in day-to-day use. This again shows the shortcomings of the current focus on vehicle technology/new cars, whereas most CO<sub>2</sub>-emissions come from increased mileage.
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## Background

### 1. Misleading problem definition

On page 4, the impact assessment reports rising road transport CO<sub>2</sub> emissions. The figures used are those of road transport as a whole, not of passenger cars. This is misleading, firstly because passenger car CO<sub>2</sub> emissions have been stable or even declined in key EU markets over recent years, and secondly because the proposed future policy does not focus on road transport as a whole, but on **new** passenger cars and light commercial vehicles.

On page 4, the charts show emissions from the transport sector as a whole, i.e. also including air transport. This misrepresents the nature of the issue, and tries to legitimise the suggested policy focus on passenger car engine technology. Of course, an integrated approach (combining efforts involving vehicle technology, fuels, taxation, infrastructure and driving style) to CO<sub>2</sub> reductions would have the advantage of affecting overall road transport. However, DG ENVI has excluded measures such as eco-driving and infrastructure adjustments from its policy proposal.

On page 4, the impact assessment states that the situation in the transport sector makes it “harder for the EU to meet its Kyoto commitments”. This contrasts strongly with the 2006 Commission Communication on CO<sub>2</sub>/cars (COM(2006) 463 final), which concludes that the car industry, through its CO<sub>2</sub> Commitment, has “delivered a sizeable contribution to the EU strategy for reducing greenhouse gas emissions and to its Kyoto reduction objectives”. Indeed, the average emissions from new cars have decreased by 13% since 1995.

The misleading problem definition leads to a mismatch between challenge and solution: On page 8, the impact assessment correctly states that “improvements in car technology have delivered the bulk of the reduction”, while the impact of labelling and fiscal measures has been negligible (see page 18). Instead of refocusing on the demand side, and realise the true “joint endeavour” of the existing EU strategy’s 3 pillars (Commitments, taxation, labelling), DG ENVI proposes to regulate supply, continuing the current imbalanced situation at high costs.

### 2. Economic impact

The impact assessment reports “no perceptible impact on employment”. This contrasts strongly with the previous version, which summarised macroeconomic effects of the proposed policy on pages 33/34. The following are quotes from the original impact assessment:

- “Transport demand, GDP and real consumption are slightly affected with a downward trend”;
- “Car imports and exports in the EU experience the largest changes of all macroeconomic variables. This is due to the fact that the assumed increases in car purchase costs make European cars more expensive than those from other world regions. Consequently, car exports decrease and car imports increase”;
- “Some shifting of jobs and production outside the EU is happening especially within the small car segment” due to “rising technology costs”;
- “Especially Russia as an emerging market could be an interesting new product location for European volume brands”;
- “At the supplier industry, additional job cuts have to be expected”.

This contrasts sharply with the current impact assessment’s assertion on page 9 that the proposed measures are “in line” with the Lisbon strategy. Moreover, it is unclear if costs of other policy measures are considered in this economic analysis. The significant costs due to Euro 5 and Euro 6 obligations are only one example of a cumulative impact of requirements.

## 2.1 Impact on car segments

The impact assessment acknowledges that the proposed policy will have unintended consequences on car segments, including a shift from diesel to gasoline cars. What is not reported anymore, contrary to a previous draft, is a *reduction* of the number of small cars and an *increase* in the number of large cars. “This is because the scenario implemented corresponds to an increase of purchase costs by more than 10% for small cars”, and even “+18% for small petrol cars” below 1.4l. Such a dramatic price increase would have dramatic consequences for the automotive industry. It shows that the policy focus is incorrect.

## 3. Cost Effectiveness

The EU has espoused the principle of cost-effectiveness. Those measures should be taken, that will achieve a target at lowest societal costs. According to the Commission’s ECCP (European Climate Change Programme) consultant, the proposed measures on vehicle technology are not cost effective. The impact assessment tries to give the impression that they are by 1) arbitrarily reducing vehicle costs, deviating from the consultant’s independent calculations, and 2) excluding a large number of cost-effective measures from the cost comparison, both in relation to the transport sector (such as eco-driving and infrastructure adjustments) and to non-transport sector measures.

### 3.1 Costs of vehicle technology according to ECCP

Within ECCP2, a consultant for the Commission, TNO, assessed costs and reduction potential of different measures (Task A)<sup>1</sup>. The study concludes that costs of lowering average CO<sub>2</sub> emissions from 140g/km to 120g/km through vehicle technology would translate into societal costs of €132 - €233/t CO<sub>2</sub> abated.

### 3.2 Costs of other transport measures

A full Integrated Approach could help achieve CO<sub>2</sub> reductions at lower societal costs by including alternative fuels, eco-driving, tyre pressure and infrastructure. Within ECCP2, the Commission’s consultant concluded that eco-driving allows CO<sub>2</sub> reductions at negative costs (cost savings) to society. ECCP2 confirmed that alternative fuels allow significant CO<sub>2</sub> reductions at lower societal costs than vehicle technology. Unfortunately, DG ENVI excluded infrastructure from this analysis from the outset. Other studies demonstrate their potential. In fact, Japan counts 28.3Mt of CO<sub>2</sub> reductions in its Kyoto implementation plan. Japan has announced new CO<sub>2</sub> targets for passenger car emissions last year to be applied with by 2015, accounting 52% to infrastructure adjustments and 48% to vehicle technology, leading to an average limit value for cars of 138 gCO<sub>2</sub>/km by 2015.

### 3.3 Costs of other sectors

CO<sub>2</sub> Abatement costs of other industries are demonstrably much lower. In 2001, the European Climate Change Programme (ECCP) identified CO<sub>2</sub> reduction options, concluding that the potential exists to reduce twice the Kyoto target at below €20/t CO<sub>2</sub>. This is the relevant benchmark for policy.

## 4. The impact assessment does not report the costs industry and consumers face

The Commission’s ECCP consultant calculated a retail price increase of €650 for reaching 120g/km. The impact assessment greatly lowers this through a series of operations:

### 4.1 Biased Assumptions on Weight Increase

The impact assessment gives the impression that two scenarios have been considered as regards the future evolution of weight of cars. This misrepresents the ECCP report (Task A),

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<sup>1</sup> [http://forum.europa.eu.int/Public/irc/env/eccp\\_2/library?l=/light-duty\\_vehicles&vm=detailed&sb=Title](http://forum.europa.eu.int/Public/irc/env/eccp_2/library?l=/light-duty_vehicles&vm=detailed&sb=Title)

where three (!) scenarios are considered, namely the central estimate (1.5% weight increase p.a.) and two additional scenarios with decreasing and increasing weight changes (shown on page 77 of the ECCP report). The impact assessment simply ignores the higher scenario and deviates from the central estimate, which the consultant says has “the danger of projecting desired developments”. The effect of this bias is large: a 19% reduction in costs compared to the consultant’s central estimate is assumed. Moreover, the higher estimate, which would increase costs by 21% compared to the central estimate, is completely ignored.

It must be noted that this approach is not only questionable from a procedural or modelling point of view. The impact assessment states, page 14, that “new exhaust emission regulations will be largely met with system optimisation rather than new, additional systems”. This is factually incorrect, as DG ENVI knows well. For example, Euro 5 and Euro 6 legislation require the installation of diesel particulate filters and NO<sub>x</sub> after-treatment systems. Moreover, the consultant stated explicitly that its policy would require large-scale hybridisation, which would add further weight.

#### **4.2 Biased Assumptions on Cost Curve Methodologies**

On page 14/15, the impact assessment states that “two options are envisaged” as far as the cost curve methodology is concerned. This misrepresents the ECCP report, where three (!) scenarios are considered: the central, higher and lower cost curve. The impact assessment simply ignores the higher cost curve! The effect of this bias is large: a 17% reduction in costs compared to the consultant’s central estimate. Moreover, the higher estimate, which would increase costs by 17% compared to the central estimate, is completely ignored.

#### **4.3 Leaving aside costs to reach the baseline**

The impact assessment considers only the costs of moving from 140 to 120 gCO<sub>2</sub>/km by 2012, completely disregarding the costs of reaching 140g/km from the actual situation today. It thus ignores the letter and spirit of the Commitments negotiated with the associations: ACEA, JAMA and KAMA have submitted detailed data to the Commission showing the negative impact on their CO<sub>2</sub> emission reduction efforts of external factors for which they cannot be held accountable. These include regulation, market changes and other factors such as scattered taxation schemes, the weak economic environment, and others. A key factor is the persistent weak demand for fuel-efficient cars and related solutions. Such external factors are explicitly mentioned in the 1998 Commitment and related official documents, in agreement that they need to be considered when evaluating industry’s performance under the Commitment, and when revising the EU strategy on cars towards a new policy framework. Obviously, leaving aside costs to reach the baseline is to the detriment of vehicles in the cost-effectiveness analysis.

#### **4.4 Leaving aside costs to maintain the baseline**

As the consultant explains clearly, costs are associated with maintaining the 2008 target of 140g/km over the following years. This is due to the projected weight increase, which entails an average cost of €245 per vehicle (see page 15 of final ECCP report). The impact assessment seems to leave out this cost.

#### **4.5 High overall Bias distorts Cost-Effectiveness Analysis**

The biased assumptions mutually reinforce each other. All of the divergences from the final ECCP report *lower* cost estimates for vehicles.

### **5. The impact assessment ignores important measures**

On page 25, the impact assessment admits that “imports of **Brazilian ethanol**, that presents higher WtW benefits, have not been taken into consideration”. This is surprising if the

objective of policy is CO<sub>2</sub> reductions – or cost-effectiveness: Brazilian ethanol was assessed to be highly cost-effective in the ECCP final report. There is no justification for their exclusion.

On page 27, the impact assessment states that “the inclusion of **eco-driving**... is not possible due to the lack of monitorability and accountability”. This contrasts with the fact that an EU-sponsored project (ECODRIVEN) monitors and quantifies reductions through eco-driving and includes many stakeholders interested in participating in an EU-wide eco-driving campaign. Moreover, it fails to point out that technology improvements may be monitorable, but that driver behaviour and infrastructure issues need to be considered when translating technology performance into CO<sub>2</sub> emitted. Therefore, building an opposition between vehicle technology (“monitorable”) and eco-driving (“non-monitorable”) is misleading. On page 28, the impact assessment admits “limitations of the current version of TREMOVE for the modeling” of taxation. In other words: as the impact assessment is unable to use an appropriate model for assessing the CO<sub>2</sub> impact of taxation, the only option is regulatory...

On page 11/12, the impact assessment states that several options “have been discarded at an early stage”, including **fuel taxation and infrastructure measures**. This is surprising as fuel taxation could be an effective means of stimulating demand for CO<sub>2</sub> efficient vehicles, encourage drivers to use their cars responsibly, and pull CO<sub>2</sub> saving alternative fuels into the market. Again, this shows a focus on command-and-control measures from the start. Similarly, the justification for excluding infrastructure measures – the fact that transport policy initiatives are part of the recent review of the Transport Policy White Paper – does not convince. The Transport Policy White Paper also refers to EU ambitions in terms of road safety. Obviously, nobody would use this fact to argue against further specific measures on road safety.

## 6. Rebound Effect

The impact assessment admits that the preferred options, all focussing on new car technology, lead to an increase in kilometres driven. This is because of the “rebound effect” of installing expensive technology that makes driving cheaper in day-to-day use. This again shows the shortcomings of DG ENVI’s policy approach, which leaves out important measures on the use of vehicles (e.g. eco-driving, infrastructure measures, some alternative fuels).

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SEC (2006) XXXX

**COMMISSION STAFF WORKING DOCUMENT**

**Annex to the**

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN  
PARLIAMENT AND COUNCIL on the review of the Community strategy to reduce  
CO<sub>2</sub> emissions and improve fuel efficiency from passenger cars and light-commercial  
vehicles**

**DRAFT Impact assessment**

{COM(2006) XXX final}

JAMA & KAMA following the least cost solution per association by 2008/9 as provided by [Task A] Going beyond 140 g CO<sub>2</sub>/km towards 120 g CO<sub>2</sub>/km, the central hypothesis to assess the costs is based on the instrument referred to in [Task A] as "*application of a percentage reduction target at manufacturer level*"<sup>22</sup>.

As highlighted by [Task A], the cost curve for M1-vehicles is very sensitive to the assumptions made on the relative upsizing, to the method for building the cost curve as well as to uncertainties in the cost assessment. Three alternative cost hypotheses were implemented in REMOVE. The 1<sup>st</sup> hypothesis refers to the yearly 1.5% weight increase based on historic data and supported by ACEA. The 2<sup>nd</sup> cost hypothesis uses (as provided in [Task A] report section 3.11.3) - an alternative percentage of autonomous weight increase, that leads to a cost for reaching 120g by 2012 19% lower than the 1<sup>st</sup> hypothesis. The 3<sup>rd</sup> cost hypothesis refers to the alternative method for building the cost curve (as provided in [Task A] report section 3.11.2) providing a further 17% reduction. This leads to the definition of cost "bands" that can be expressed in total costs or in €/ton. Each additional reduction by 5 g CO<sub>2</sub>/km leads to a cumulated Well-to-Wheel (WtW) CO<sub>2</sub> equivalent reduction of circa 100 Mt over the period 2010-2020.

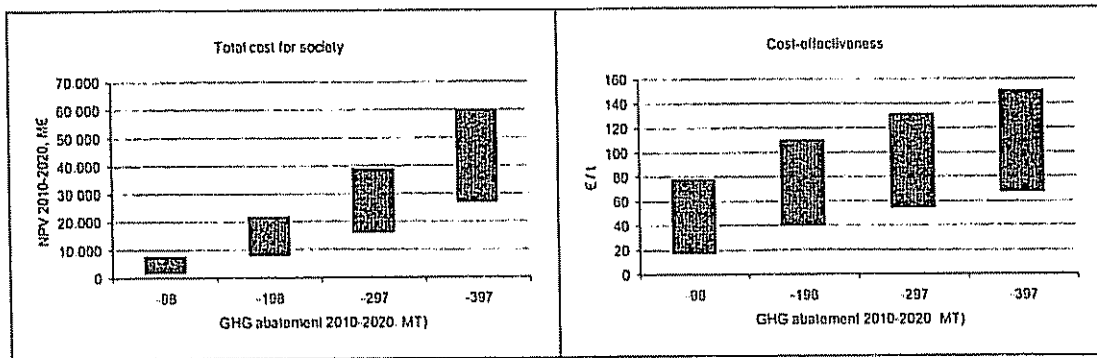
The results differ from the ex-ante calculations provided by [Task A] because in REMOVE the fuel efficiency improvements and the related increase in car retail cost savings lead to a chain of effect on overall (passenger road) transport demand, variation in car sales and stock (including shifts between categories).

**Table 3 – Societal costs, CO<sub>2</sub> savings and cost effectiveness of four different reduction scenarios for passenger cars (cumulated over 2010-2020)**

	135 g CO <sub>2</sub> /km	130 g CO <sub>2</sub> /km	125 g CO <sub>2</sub> /km	120 g CO <sub>2</sub> /km
Mt CO <sub>2</sub>	98	198	297	397
M€	1 708 to 7 672	7 874 to 21 813	16 178 to 39 033	26 886 to 59 781
€/ton CO <sub>2</sub>	17 - 78	40 - 110	54 - 131	68 - 150

**Figure 6 – Potential and cost effectiveness of four different CO<sub>2</sub> reduction scenarios in passenger cars (M1) (source REMOVE)**

<sup>22</sup> This is used as a proxy to derive the possible overall costs of a given CO<sub>2</sub> target, but does not in any way prejudice of the type of instrument that would in fine be proposed to establish a fuel efficiency framework for light duty vehicles



#### 4.2.2. Application of fuel efficient mobile air conditioning systems (MACs)

The assessment of the cost-effectiveness of this measure is based on the additional fuel consumption of cars as a function of MAC systems' energy consumption (reflecting the use of more efficient MACs), as well as the cost differences between fuel efficient and conventional MACs and the market shares of fuel efficient systems. The scenario modelled corresponds to a compulsory introduction by 2012 (with 50% by 2010 and 75% by 2011) of fuel efficient mobile air conditioning systems (both improved R134a and new R744 systems) in new cars

This would lead to an abatement of 13 Mt of WtW GHG emissions over the period 2010-2020, and a cost per ton of WtW CO<sub>2</sub> equivalent would be 10 €, with the fuel price hypothesis retained for the baseline.

However, the actual implementation of the measure depends on the establishment of an agreed measurement procedure to qualify MACs' fuel efficiency, which is until now unavailable. A simplified test procedure has been developed to this end, but this procedure was found not to yield sufficiently reproducible and accurate results<sup>23</sup> to become part of the EU type approval system. An alternative could be to establish benchmarks for MACs' fuel efficiency, associated with caps and monitored at the EU level.

#### 4.2.3. Options to reduce vehicle and engine resistance factors

CO<sub>2</sub> reductions can be achieved by reducing friction via three sub-measures: the use of low-resistance tyres (LRRT), tyre pressure monitoring systems (TPMS), and low-friction lubricants (LVL). These will induce on the one hand extra costs to manufacturers for original equipment and extra annual maintenance costs to consumers, and on the other it will provide fuel savings.

The assessment of the cost-effectiveness of these measures is based on an improved fuel consumption combined with increased cost purchase or annual maintenance costs, but would affect both new and existing cars, in the case of LVL and LRRT.

The scenario modelled corresponds to a compulsory introduction by 2012 (with 50% by 2010 and 75% by 2011) of the device in new cars (TPMS) or for the whole market (LVL and LRRT). The cost-effectiveness of the measure is minored by the fact that the devices

<sup>23</sup> See docs #4 and #6 referenced in Annex 2

complementary measures aimed at influencing consumer purchase behaviour. For modelling purpose, an average abatement of 19% on the M1 cost curve has been implemented in this variant.

The modelling of the policy scenarios with TREMOVE delivers the bulk of the information needed for the assessment of environmental and economic impacts. This is complemented by an analysis of the macro-economic and sectoral impacts of different levels of cost for the society and for car industry in particular, performed with PACE-T and FORCAR respectively. This analysis of the policy scenario is provided in the following sections.

#### 4.4. Environmental impacts

The impact of all scenarios on transport demand would remain limited (Table 7). Option (2) triggers a small decrease in passenger transport demand, while the Options 3A and 3B correspond to a small increase in passenger transport, because the increase in vehicle purchase price and annual maintenance cost is overlapped by the fuel savings, leading to a decrease in passenger transport generalised cost.

**Table 7 - Impact of the Policy options on transport demand – EU25 (Source: TREMOVE)**

	% change vs Baseline	Option 2	Option 3A	Option 3B
Total Passenger.km	2015	-0.05%	0.05%	0.11%
	2020	-0.19%	0.02%	0.15%
Vehicle.km small Passenger cars	2015	-1.01%	-0.40%	0.17%
	2020	-1.12%	-0.46%	0.08%
Vehicle.km medium/big Passenger Cars	2015	-0.13%	0.22%	0.36%
	2020	-0.27%	0.04%	0.17%
Vehicle km Light Duty Vehicle	2015	-0.20%	-0.29%	-0.16%
	2020	-0.24%	-0.32%	-0.22%

Policy Option 2 leads to an abatement of 397 Mt WtW CO<sub>2</sub> equivalent over the period 2010-2020, corresponding to an abatement of 6% for road transport over the period compared to the baseline. Policy options 3A and 3B lead to a somewhat greater abatement, respectively 431 and 412 Mt, which is necessary taking into account the uncertainties of some of the measures considered (e.g. GSI). For the cheaper Variant 3B, there is a smaller abatement due to a rebound effect related to the greater increase in transport demand.

Regarding conventional pollutant emissions (see Table 8), while Option 2 triggers a – although small – decrease in SO<sub>2</sub>, PM and NO<sub>x</sub> emissions, Option 3A and 3B lead

overall to a lower abatement due to increase in traffic, and even to a very small increase in VOC emissions, due to the higher share of gasoline vehicles.

**Table 8 - Impact of the Policy options on pollutant emissions – EU25**

	Option 1 (Base case)		Option 2 (% change vs Base case)		Option 3A (% change vs Base case)		Option 3B (% change vs Base case)	
	2015	2020	2015	2020	2015	2020	2015	2020
Vkm (Bn)	2455.7	2657.7	-0.06%	-0.20%	0.07%	0.05%	0.14%	0.19%
CO <sub>2</sub> exhaust (Mt)	860.9	897.1	-3.88%	-6.67%	-4.10%	-6.91%	-4.03%	-6.79%
CO <sub>2</sub> well_to_tank (Mt)	142.6	151.9	-3.01%	-5.05%	-3.27%	-5.40%	-3.21%	-5.28%
NMVOE exhaust (Kt)	1136.5	895.1	0.00%	-0.05%	0.04%	0.08%	0.07%	0.18%
NO <sub>x</sub> exhaust (Kt)	2150.7	1924.6	-0.06%	-0.16%	-0.06%	-0.16%	-0.05%	-0.13%
PM exhaust (Kt)	122.3	113.9	-0.09%	-0.25%	0.01%	-0.09%	0.02%	-0.06%
SO <sub>2</sub> exhaust (Kt)	18.1	18.8	-1.15%	-1.96%	-1.26%	-2.12%	-1.23%	-2.07%

#### 4.5. Economic impacts

The impact of the policy options on vehicle sales (see Table 9) remains also limited, with option 2 having the main impact on small cars. This is essentially due to the fact that the scenario implemented corresponds to an increase of purchase cost by more than 10% for small cars (<1.4l, the effect is even +18% for small petrol cars), while for big cars the increase is lower than 8%. While this does not question the overall results of the assessment which focuses on the overall light-duty vehicle market evolution, this points to the need to define an instrument taking into account the structure of the car markets, and specificities of various segments in relation to their ability to deliver affordable CO<sub>2</sub> reductions and fuel efficiency improvements.

**Table 9 - Impact of the Policy options on vehicle sales – EU25 (Source TREMOVE)**

% change vs Baseline	Option 2		Option 3A		Option 3B	
	2012	2020	2012	2020	2012	2020
vehicle category						
small car	-1.42%	-1.64%	-0.74%	-0.90%	-0.11%	-0.26%
medium/big car	-0.12%	-0.27%	0.25%	0.05%	0.42%	0.20%
light duty vehicle	-0.16%	-0.24%	0.45%	0.09%	0.60%	0.20%
Diesel passenger passenger cars	-0.82%	-1.15%	-0.34%	-0.67%	-0.34%	-0.66%
Gasoline cars	-0.34%	-0.44%	0.14%	0.03%	0.75%	0.62%

The effects of the policy options on welfare indicators (see Table 10) show that there is a wide scattering between the scenarios leading from almost positive (gain to society) to negative (loss to society) values depending essentially on the fix resource costs assumed to reach the 120 g CO<sub>2</sub>/km equivalent emission target for new passenger cars. Under option 2, the consumer surplus (-18 €bn) is worsened by the marginal cost of public funding (-36 €bn), leading to an overall welfare loss (externalities excluded) of -54 €bn.

In Policy option 3A, the welfare loss due to fix resource cost is much lower in absolute value (-76 €bn compared to -99 €bn for Option 2), and the fuel savings are equivalent, triggering a gain in consumer surplus (+13€bn). However, the marginal cost of public funding still overlaps this gain, and the overall welfare effect is a loss of -25 €bn. In policy option 3, the welfare loss due to fix resource cost is even lower, resulting to a net welfare loss of -7 €bn.

**Table 10 - Welfare Analysis of the Policy options – EU25**

Net present value 2010-2020, M€, difference with basecase (Option 1)	Option 2	Option 3A	Option 3B
<b>Consumer Surplus</b> <i>(including transport demand from business)</i>	<b>-18.315</b>	<b>13 407</b>	<b>30.212</b>
• fix resource costs	-99.333	-76 310	-58.394
• variable resource costs	39.336	40 609	39.150
• taxes	41.383	49 049	49.671
• other effects	299	59	-216
Sum of cost of public funds (general taxation)	-35.995	-39 084	-37.426
<b>Sum welfare</b>	<b>-54.309</b>	<b>-25 677</b>	<b>-7.214</b>

The comparison of this welfare loss with the overall GHG abatement over the same period gives a value for GHG abatement in €/ton. At this stage, it is worth taking into account the fact that the cost estimates selected for the policy option modelling were conservative. As mentioned above (section 3.3.1 and Box 2), the costs of technological options for M1 do not take into account neither synergies in the integration of systems, nor technologies likely to appear between 2006 and 2012 thanks to innovation. Moreover, cost estimates are established for large scale production at a 2012 horizon, but do not account for learning curves and economies of scale beyond that date as technologies penetrate the market on a wider scale, and ex-ante cost estimates are usually much higher than actual compliance costs. These alternative assumptions would result in lower cost, and a rebate of 17% in fix resource costs can here again be considered as an alternative estimate. In the case of Option 3B, this would mean a welfare gain of 4bn€.

This leads to a cost per ton of CO<sub>2</sub> ranging between -4 €/ton for Option 3B with alternative cost assumptions, to 137 €/t for Option 2 with conservative cost assumptions.

**Table 11 - Cost-Effectiveness of GHG Abatement 2010-2020**

Cost per ton of CO <sub>2</sub> equivalent	Option 2	Option 3A	Option 3B
Conservative costs estimates	136.8 €/ton	59.5 €/ton	17.5 €/ton
Alternative costs estimates	99.3 €/ton	33.0 €/ton	-3.8 €/ton

As a complement to this analysis, an additional variant has been modelled, whereby 125 g CO<sub>2</sub>/km average new M1 fleet and a 15 g CO<sub>2</sub>/km reduction for N1 vehicles would be reached by 2012 (option 3A), and further progress would deliver 120 g CO<sub>2</sub>/km (resp. - 30 g CO<sub>2</sub>/km) for the average new M1 (resp. N1) fleet sold in 2015. This additional variant reflects the need to move further towards low emitting cars, and thus the need to reach under type approval conditions the EU objective of 120 g CO<sub>2</sub>/km. This step and subsequent progress will be required as contributions to the future EU efforts to tackle climate change beyond the current Kyoto commitments. Implementation of this alternative leads for option 3A to a cost effectiveness ranging from 62 to 107€/ton. This is however based on technology estimates at a 2012 horizon as provided by [Task A], and it is expected that costs in 2015 will be smaller due to economies of scale, learning curves and potential technological breakthroughs; furthermore the modelling is done with the same time horizon (2020) which thus minimises the benefits in terms of CO<sub>2</sub> emissions (taking into account the fleet renewal time).

A macroeconomic analysis has been carried out<sup>29</sup> in the framework of the dynamic CGE model PACE-T, which has a special focus on the passenger transport sector. The results of this analysis suggest very small changes in all three scenarios compared to the baseline development. Transport demand, GDP and real consumption are slightly affected with a downwards trend. These findings imply that increased purchase costs almost completely outweigh the decreases of fuel costs due to lower fuel consumption. Car imports and exports in the EU experience the largest changes of all macroeconomic variables. This is due to the fact that the assumed increases in car purchase costs make European cars more expensive than those in other world regions. Consequently, car exports decrease and car imports increase. An important caveat to this conclusion is that the analysis carried out does not account for any similar policy in the other regions, in particular US and Japan. While it is difficult to assess to what extent the current reviews carried out in other parts of the world of existing fuel efficiency requirements will imply, it must be acknowledged that the EU is not the only region considering ambitious fuel efficiency targets. The impact on tax revenues is also negative. This effect shows the losses in revenues from fixed taxes due to reduced transportation demand and from variable taxes due to the decrease of fuel consumption and thus fuel tax revenues. The distribution of income is only slightly affected since real wages and interest rates deviate from the baseline to a very small extent. Given all these effects, social welfare is negatively impacted but the size of this effect is very small.

Sectoral impact has also been analyzed with the B&D FORCAR simulation model. Some shifting of jobs and production outside the EU is happening especially within the small car segment as a consequence of a rising cost pressure caused by rising technology costs. Especially Russia as an emerging market could be an interesting new production location for European volume brands. Also the medium car segment will be affected by that development. Less negative effects are shown within the large car segment with its high share of premium brands, as premium segments are faced with lower cost-pressure, however, stronger pressure on innovations, and reputation of the production location is

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<sup>29</sup> The policy scenarios are not strictly equivalent to the last scenarios modelled with Tremove, as the assessment was performed at an earlier stage of the analysis, but are useful to provide the range of macro-economic effects due to a range of abatement cost for CO<sub>2</sub> in the automotive sector

an important argument. At the supplier industry, additional job cuts have to be expected. For dealer networks Option 2 means enforced competition and concentration. In their 2004 European Competitiveness Report<sup>30</sup>, the Commission services paid particular attention to the situation of the automotive industry, and notably underlined that based on the performance on the global automotive market the EU industry was competitive, although it had to face major challenges such as comparatively higher labour costs and poorer productivity than its US and Japanese competitors. The report also stressed that world-wide demand to make vehicles safer and more environment-friendly will continue, and that competitiveness was also dependent on a coherent and cost-effective regulatory framework.

Next to the calculated employment and distribution effects, stronger regulation leads to additional expenditures in research and development (R&D). The incentive to invest into research and development will be a medium and long term consequence which should overall lead to reduced production costs of advanced technologies, and research efforts should be further supported through the EU research framework programmes.

#### 4.6. Social impacts

- Employment

The three options under consideration have no perceptible impacts on employment as a whole in the EU25, although there may be job transfers within the EU and, to a limited extent, outside the EU, especially in the case of option 2.

- Public health

Less CO<sub>2</sub> emissions from passenger transport by road will contribute to reducing climate change and its impacts on the society, such as increased incidence of death or illness due to higher temperature variations, pressure on Governments and insurance systems due to extreme weather events and impacts on ecosystems and natural resources. Some of the measures foreseen will contribute to reduced CO<sub>2</sub> emissions and enhanced road safety (e.g. tyre pressure monitoring systems), and may thus contribute to reducing the number of injuries and fatalities linked to car accidents.

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<sup>30</sup> SEC(2004)1397