Recipe for Germany

How to start decarbonising German transport

June 2016

Executive Summary

This summer, the European Commission will present new targets for member states' Effort Sharing Decision sectors for the period 2021 to 2030 and publish a communication on decarbonising transport. The ESD sets an overall EU climate target of -30% by 2030 below 2005 levels for sectors not included under the EU emissions trading system (non-ETS emissions) – mainly surface transport, buildings and agriculture. The ESD requires member states to limit their GHG emissions by meeting individual binding annual limits.

Germany's anticipated 2030 reduction target for all sectors covered by the ESD will be -39%. Thus, Germany will have to decrease its transport emissions to 97 $MtCO_2$ eq by 2030. Based on the assumptions of our reference scenario, Germany will exceed its carbon budget in the transport sector by 24 $MtCO_2$ eq if it does not undertake further policy action.

The 'recipe for Germany' serves as a guideline on how to reduce emissions from transport and secure the climate target. It analyses policy measures at EU and member state level and quantifies their contribution to decreasing GHG emissions in the transport sector. It shows that Europe-wide, ambitious CO_2 standards for cars, vans and heavy-duty vehicles will be key policy in the German strategy to decarbonise transport. It could cover 86% of the German effort required from transport. National policy instruments will be essential to supplement EU policy and to encourage a shift of passengers and freight to cleaner transport modes as well as to internalise external costs more comprehensively.

1. Context

In October 2014, EU heads of state decided that emissions not included under the EU Emissions Trading System (non-ETS emissions) – mainly transport, buildings and agriculture – must be brought 30% below 2005 levels by 2030. Those sectors are currently covered by the Effort Sharing Decision (ESD). It requires member states to limit their GHG emissions by meeting binding annual limits (annual emission allocations –AEAs). This summer, the European Commission will set new emission targets for the ESD sectors in the member states and publish a communication on the decarbonisation of transport.

The non-ETS sector represents 55% of total EU emissions with transport as biggest emitter (34%). Road transport is the main contributor to climate change and accounts for 95% of the total emissions from the non-ETS transport sector. [1] Light-duty vehicles (LDV - passenger cars and vans) are the main source (around 70%) of road transport emissions. Most of the remaining road emissions come from heavy-duty vehicles (HDV - trucks and buses) with a rising trend. [2]

The AEA will require significant efforts to reduce emissions by the member states in all non-ETS sectors, including transport. Thus, the member states' contribution of the transport sector will depend on their individual 2030 target. EU measures reducing GHG emissions from the non-ETS sectors will have to be

[1] EEA greenhouse gas – data viewer, 2012 emissions data.

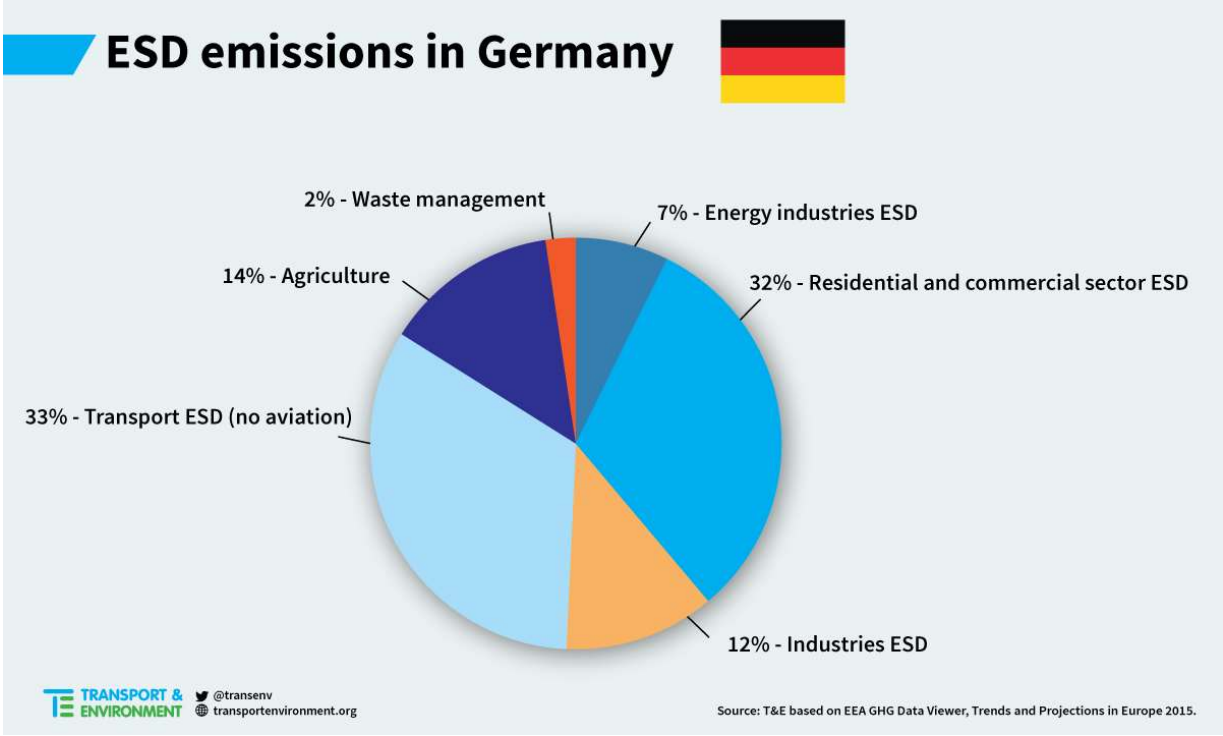
[2] T&E, 2015. Too big to ignore – truck CO2 emissions in 2030. International shipping and extra-EU flights are currently not included neither in the ETS nor in the non-ETS sector.

complemented with national policy action. Action must be taken at both EU and member state level to meet the 2030 ESD target.

The implementation of new, additional CO_2 emission standards for LDVs and HDVs takes place at EU level and needs the commitment from all member states. Other measures, such as the internalisation of external costs through e.g. an increase of fuel taxes, are the responsibility of the member states.

The 'recipes for member states' are a follow up to T&E's 'Road to 2030' report from June 2015. Approximations of the individual member state 2030 targets, reference and different policy measure scenarios are based on the mentioned report and Ricardo's recent SULTAN study. [3]

The 'recipe for Germany' analyses potential policy action and quantifies their contribution to decreasing GHG emissions. It includes both EU measures, that Germany should push for in order to get results at a national level, and measures that are only the competence of Berlin. It aims to give a roadmap to the individual member states in how to get the transport sector to do a fair share towards the achievement of the ESD targets.



2. Objectives of this series of reports

- Firstly, we will quantify the gap between transport emissions projections and emissions levels needed to achieve the individual ESD 2030 targets for member states (Germany, Spain, Italy, France, Poland, and the UK).
- Secondly, we will show how much new car, van, and heavy-duty vehicle standards will contribute towards the target from the transport sector in the individual member states and thus how much effort still has to come from other measures, either at the EU or member state level.

[3] Ricardo Energy & Environment, 2016. SULTAN modelling to explore the wider potential impacts of transport GHG reduction policies in 2030. The SULTAN (SUstainabLe TrANsport) is a high-level calculator to help provide indicative estimates of the possible impacts of policy on transport in the EU (primarily energy use and GHG emissions, also costs, energy security, NOx and PM emissions).

- Thirdly, we will calculate how many CO_2 reductions can be achieved by other measures in order to close the gap between the individual 2030 target and the emission reduction level delivered by new standards, i.e. meet the 2030 target.

The scenarios described in this paper are based on assumptions which are outlined below and do not aim to accurately predict the future. However, they do give a clear indication of what policies will have a significant impact on reducing transport emissions.

3. Effort Sharing and Reference Scenario

3.1. Effort sharing between member states

Individual ESD targets for member states will differ and depend on their GDP and other factors such as cost-effectiveness of GHG reductions.[4]

Member states may transfer part of their AEA for a given year to other member states under certain conditions. However, the overall target must be met. For this report, we assumed each member state will pursue efforts to achieve its own target, proving the transport sector can make a major contribution to achieving it.

The approximated effort for each member state was calculated in T&E's 'Road to 2030' report.
Germany will have to decrease its GHG emissions of the sectors under the ESD by approximately 39% by 2030 compared with 2005 levels.

3.2. Effort sharing between different sectors

This paper assumes that each sector under the ESD has to contribute a proportionate share. Thus, the overall ESD target of 30% implies a 30% emissions reduction target for the EU transport sector. However, the aggregated emission reduction target of 39% for Germany is indifferent towards how this target is being achieved. A lower reduction in one sector therefore implies that it has to be outbalanced with a higher reduction level in another ESD sector.

Assuming that all sectors are aiming at a proportionate reduction level, we considered the share that transport emissions represented in 2012 for each member state. That same percentage was applied to the individual 2030 target emissions.[5]

In the case of Germany, transport CO2 represented 32% of ESD emissions in 2012 and in the fair share scenario this would still be the case in 2030. German CO_2 emissions in the transport sector will therefore have to decrease to 97 $MtCO_2$ eq. by 2030, compared to 160 $MtCO_2$ eq. in 2005.

3.3. Reference Scenario

The reference scenario, created by the European Commission and referred to in this report is presented in detail in T&E's report 'Road to 2030' from 2015.[6] The reference scenario informs us about the impact of current and agreed policies on transport emissions until 2030. The scenario includes policies and measures adopted in the member states by April 2012 and policies, measures and legislative provisions (including on binding targets) adopted in the first half of 2012 at EU level.[7] With these measures, the transport sector in Germany would emit 135 $MtCO_2$ eq. by 2030.

[4] T&E, 2015. Road to 2030: how EU vehicles efficiency standards help member states meet climate targets, June 2015, p. 11.
[5] T&E, 2015. Road to 2030: how EU vehicles efficiency standards help member states meet climate targets, June 2015, p. 14.
[6] European Commission, 2013. Trends to 2050. Reference Scenario 2013.
[7] T&E, 2015. Road to 2030: how EU vehicles efficiency standards help member states meet climate targets, June 2015, p. 12

New reference levels have been developed since the 2030 climate and energy package has been agreed on. One amongst others was developed by Ricardo Energy & Environment which takes changes in GDP forecasts and energy consumption into account. On this basis, the reference scenario from our previous study was deemed too negative – i.e. business as usual emissions too high - compared with other studies. Therefore emissions were adjusted downwards by 10% and Germany would emit 121 $MtCO_2$ eq. by 2030.

The Commission will publish a new reference scenario in the first half of 2016, but in the meantime this approach was considered the most appropriate. However, if the Commission's new reference scenario does not coincide with this positive adjustment and be more negative in its projections, it is clear that the proposed measures in this paper will not be sufficient to achieve the 2030 target. In that case, suggested measures will have to be pursued more ambitiously and other measures will have to be introduced additionally. To show the effect of decarbonising policy measures in a more conservative reference scenario, we undertook further analysis, which can be found in the appendix. [8]

3.4. The gap between a -30% target and the reference scenario

The reference scenario depicts emissions from the German transport sector in 2030 without any further action taken. The expected effort sharing decision between member states would require Germany to reduce its ESD emissions by around 39%. There is a gap between the projected emission level of the adjusted reference scenario and the level where transport emissions should be by 2030.
In Germany the gap in transport between the adjusted reference scenario projection (121 $MtCO_2$ eq.) and the 2030 target fair share scenario (97 $MtCO_2$ eq.) is 24 $MtCO_2$ eq. This is the additional reduction that would need to happen in 2030 in order to achieve its assumed ESD target, while transport emissions retaining today's share.

4. Ingredients

4.1. The EU ingredient: Reductions delivered by new standards

T&E developed a tool to calculate to what extent emissions would be reduced by new, additional and ambitious CO_2 standards for cars, vans and heavy-duty vehicles. The results are based on the following assumptions, all based on the NEDC testing procedure: Firstly, new car CO_2/km emissions would fall to 70g in 2025 and 55g in 2030. Secondly, new van CO_2 emissions would be reduced to 100g in 2025 and to 70g in 2030. Thirdly, for trucks our assumptions are based on the Commission's 2014 heavy duty vehicles strategy that calculated with a 35% improvement potential vs 2015 levels, if limits for 2030 are introduced before 2020. [9] The results are very much in line with the high ambition vehicle standards scenario in Ricardo Energy & Environment's study 'SULTAN modelling to explore potential impacts of transport GHG reduction policies in 2030' published in February 2016. The results and further information can be found in T&E's 'Road to 2030' report.

The report shows that new, additional standards for cars, vans and trucks are indispensable for achieving the 2030 targets and will deliver 21 $MtCO_2$ eq. reductions in the Germany. If these standards are implemented by 2025 and 2030, they could cover about 86% of the transport gap in Germany. Standards for trucks alone can reduce the German effort in the transport sector by 19%. [10] Thus, additional measures for the reduction of CO_2 emissions have to be implemented at an EU or member state level to close the remaining 14% of the gap that is 3 $MtCO_2$ eq. of the emissions.

[8] In the annex we refer to the Commission's reference scenario from 2013 outlined in T&E's report 'Road to 2030'.
[9] European Commission, 2014. Impact assessment accompanying strategy for Reducing Heavy-Duty Vehicles Fuel Consumption and CO2 Emissions.
[10] Please see in the appendix what happens if emission projections from transport for 2030 are higher.

4.2. The German ingredients to close the gap

T&E has calculated the potential contribution of different policy actions, some of them based on results from Ricardo's study, and came up with a recommendation of policy combinations that would deliver the remaining emissions reductions needed.

Fuel taxes are an effective measure to internalise costs from carbon emissions and reduce fuel use. Calculated reductions delivered from an increase of fuel taxation are based on a weighted, long term price elasticity (-0.44) for Euro95 and diesel. [11] A litre of diesel contains more energy and carbon than a litre of petrol, which should be reflected in respective fuel prices. However, the German tax price on diesel is 0.18 €/l lower than the tax price on petrol, creating the wrong incentives. An increase of the price on diesel would converge the diesel price with the Euro95 price and better reflect the CO_2 intensity of diesel. Higher diesel taxes could also be justified for public health reasons since diesel cars contribute disproportionately to local air pollution. Differences of excise duties of Euro95 and diesel range between 0 and 0.340 €/l in the EU. Germany's gap of 0.184 €/l is thus above the EU average. The French and the Belgium government have recently stated they want to create a more level playing field for diesel and petrol. They have started by raising diesel taxes this year by 0.01 and 0.035 €/l. In Germany, an increase of the diesel excise duty by 0.034 €/l would lead to a 3%-increase of the sales price based on 2014 sales price data and 1.22 MtCO2 eq. emissions reductions by 2030 as calculated by T&E. The resulting emission reductions would cover 37% of the gap not covered by more efficient vehicles. [12] It should be noted that there remains a lot of room for fuel tax increases beyond the proposed 0.034 €/l for diesel only.

Further reductions would come from other policies. Their assumed reduction potential is based on the SULTAN calculations by Ricardo. This might lead to slight inaccuracies as individual characteristics in the different national transport sector have not been included. However, the quantification of emissions reductions from certain policy action should indicate the real trend.

The 2014 German study "Klimafreundlicher Verkehr in Deutschland – Weichenstellung bis 2050" [13] recommends additional measures beyond technological improvements, in particular a shift to environmentally friendly transport modes.

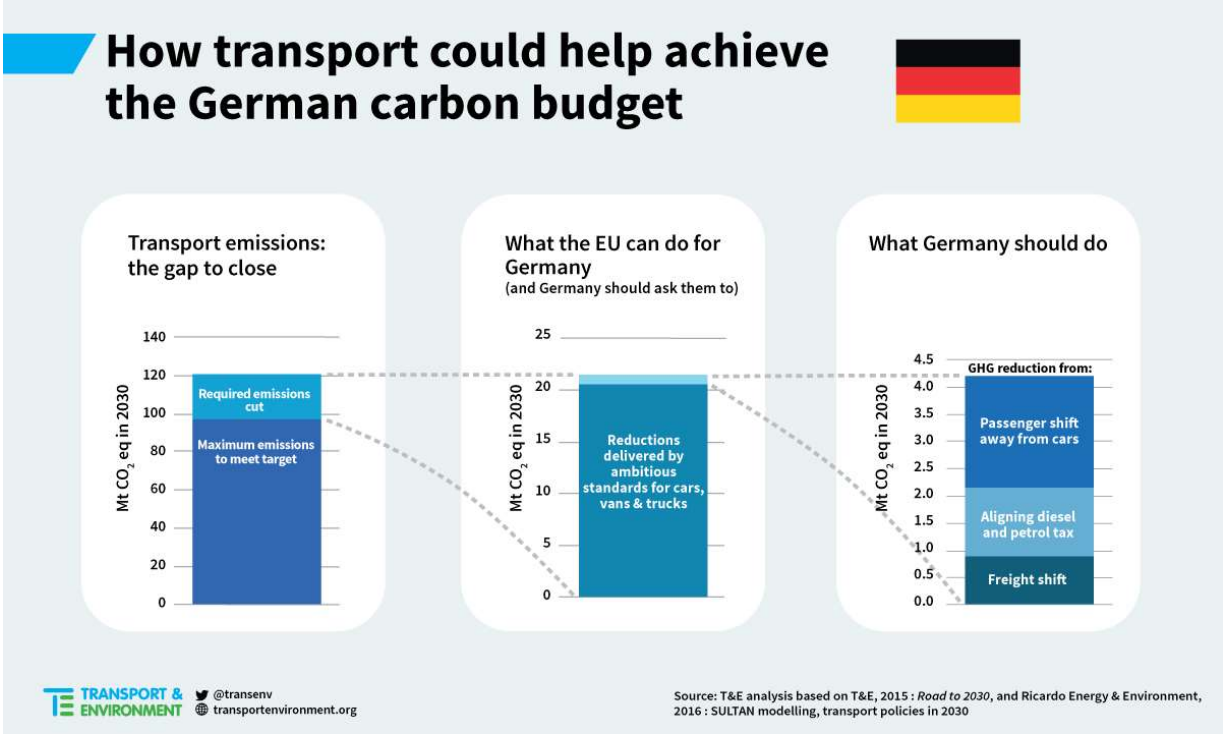
Therefore, policy measures have to be introduced that encourage a modal shift from cars to other cleaner modes (rail, bus, cycling, walking). Based on the assumptions of the Ricardo study, a reduction of 8% car usage in urban areas, 3% in non-urban areas and a 3% share on motorways could lead to 2.09 $MtCO_2$ eq. reductions in Germany. [14] A combination of urban low emission zones, city tolls, and kilometre based road charges on the general road network would be a very effective way to achieve this shift and would also be very effective in dealing with congestion.

The improvement of freight intermodality by reducing heavy truck road transport by 6% through a shift to inland shipping and rail by 2030, would then lead to additional GHG reductions of 0.91 $MtCO_2$ eq. [15] In order to achieve the desired modal shift, target oriented transport infrastructure planning and fuller internalisation of road freight externalities (by extending and increasing the LKW Maut) are key to enhance the modal share of inland vessels and rail. A more extensive LKW Maut would also positively impact freight efficiency which would lead to further emission reductions in the road freight sector.

[11] The values for price elasticities can be found in Ricardo Energy & Environment's 'SULTAN modelling to explore the wider potential impacts of transport GHG reduction policies in 2030', 2016.
[12] T&E, 2015. Europe's tax deals for diesel.
[13] WWF, BUND, Germanwatch et al., 2014. Klimafreundlicher Verkehr in Deutschland – Weichenstellungen bis 2050.
[14] Ricardo's study, p. 25.
[15] More information on the assumptions regarding modal shift for improved freight intermodality can be found in the Ricardo study 'Using SULTAN modelling to explore the wider potential impacts of transport GHG reduction policies in 2030', pp. 25-26.

The national and EU policy measures combined lead to emission reductions of 4.22 $MtCO_2$ eq. producing slightly more reductions than the ESD target requires of the transport sector. However, seen that some sectors or other member states may fail to contribute their share to the overall target, it would help to achieve it nevertheless. As mentioned earlier, it also has to be clear that in case of higher emission projections from transport for 2030 hence a more negative reference scenario, the suggested policy measures up to this point will not be sufficient to close the gap.

A reform of the company car tax leads to a decrease in total passenger-kilometre driven, an improvement in car efficiency and a decrease in new car stock growth and has an emission reductions potential of 0.77 MtCO2 eq. in Germany. [16] Further reductions can come from a rapid deployment of C-ITS having an effect of 1.12 $MtCO_2$ eq. emission reductions. [17] Biofuels too could contribute to meeting the target although it is vital that these are non-land based, 2nd generation biofuels. The 'New Fuels' scenario in the Ricardo study is based on two assumptions: Firstly, 1st generation biofuels should be held constant at their 2015 levels (bioethanol at ~3.4% of petrol demand and biodiesel at ~5.3% of diesel demand). And secondly, with any further growth from current levels avoiding ILUC through the implementation of EU policies to promote sustainable low-carbon liquid fuels, such as waste-based fuels, up to a level of 4% in 2030. [18] Under these assumptions, GHG emissions could be decreased by another 2.03 $MtCO_2$ eq. in the German transport sector. The study by the German environmental organisations highlights other policy measures on top of the ones already mentioned, such as the promotion of better spatial planning, the introduction of a LDV Maut and the extension of the HDV Maut which are distance and emission dependent as well as emission-free mobility in city centres. In addition, higher and more aggressively differentiated car taxes would contribute to greening the vehicle fleet.



5. Conclusions

Based on the results of this modelling exercise, it would appear to be in Germany's interest to support ambitious EU-wide vehicle standards (passenger cars, vans and HDVs) as they could contribute 86% of the

[16] Based on assumption in Ricardo's study, p.28.
[17] Based on assumption in Ricardo's study, p. 13.
[18] Ricardo's study, p. 4.

emission reductions required from the German transport sector. Standards play a key role in helping Germany to achieve the 2030 target in a cost-effective manner. They should be introduced in 2025 and include trucks to have a meaningful impact on the achievement of the 2030 ESD targets. [19]

However, policy measures to encourage efficiency enhancing technologies should be complemented with measures that trigger a change of mobility patterns and of the freight transport system.

At national level, the promotion of modal shift of passenger and freight transport plays a crucial role in supplementing EU policies and thereby helping to achieve the national ESD target.

An increase of diesel taxation would contribute to the alignment of diesel and petrol prices and better account for the CO_2 intensity of diesel. In this way external costs would be internalised and the increased tax yields could be spent on improved infrastructure, further decreasing CO_2 emissions. Additionally, the shift to low-emission transport modes would be further encouraged.

It is clear that the transport sector must play a very important role if we are to achieve the ESD targets. It can make its fair contribution, but still other sectors would also need to do its part. This set of recommended policies for the transport sector would be the starting point for Germany to contribute towards the even more ambitious objectives agreed on in Paris last year.

Further information

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[19] More information on the details of standards is available in T&E's 'Road to 2030' report.

Appendix

Recent reference scenarios, such as the one by Ricardo Energy & Environment, projected less GHG emissions of transport in 2030 compared with the Commission's scenario from 2013. Given these recent more positive emission projections, we saw the need for adjusting our reference scenario, which is based on the Commission's 2013 scenario.

However, it is worth showing the effects of decarbonising policy measures in a more conservative scenario that is with higher emission projections for 2030, as we cannot be sure that the more positive outlook on GHG emissions from transport will hold up in future modelling exercises.

In line with the Commission's reference scenario from 2013, we now assume 135 $MtCO_2$ eq. in Germany in 2030 coming from the transport sector if no further policy action is taken. With an unchanged 2030 target of 97 $MtCO_2$ eq. this leads to a gap of 38 $MtCO_2$ eq. of which 21 $MtCO_2$ eq. can be covered by emission reductions from vehicle standards.

In this case EU-wide vehicle standards would only cover 55% of the gap between reference scenario and the 2030 emission target. Hence 45% of the gap that is 17 $MtCO_2$ eq. would need to be reduced by national policy action. In this scenario, the suggested policy instruments above, namely increased fuel taxation of 0,034 €/l, a modal shift of passengers and freight to low emission modes would fail to deliver the required reductions by far. Thus, Germany would fail to achieve the 2030 target if transport was to produce a fair share.

In this scenario, all national policy measures combined as outlined above (diesel taxation increase of 0,034 €/l, the shift to low carbon transport modes of passenger and freight, a company car tax reform, the introduction of more 2nd generation biofuels as in Ricardo's 'New Fuels' scenario as well as a more rapid deployment of interconnected and automated driving) would still be insufficient and only deliver 9 $MtCO_2$ eq. of the required reductions to close the remaining gap. In this scenario 8 $MtCO_2$ eq. would not be covered by policies taken at EU or member state level.

Therefore, the recommended policies would need to be pursued more ambitiously, e.g. a stronger increase of diesel taxation, and supplementary policies, such as an extension of the LKW Maut, would need to be implemented.

The maximum of policy action to decarbonise transport should be taken in order to achieve the 2030 target under any circumstances.