Setting 2040 climate ambition

A landing zone with ambitious transport policies for the EU

June 2023 - Response to the European Commission public consultation

Summary

As a signatory to the Paris Agreement, the European Union committed to limit global warming well below 2°C above pre-industrial levels. In order to fulfil this commitment, the Union adopted the European Green Deal (EGD) and made the objective to become climate neutral by mid-century legally binding by enshrining it into the European Climate Law. The recently adopted Ff55 package aims to deliver 55% of emission reductions in 2030 compared to 1990 levels as an intermediate target. According to the Climate Law, in 2024 the European Commission must propose the next climate milestones: an EU emission reduction target for 2040 and indicate a GHG emissions budget for 2030-2050.

The EGD and the Ff55 set the path for the deep transformation EU economies must undergo in order to become genuinely sustainable and remain competitive. An ambitious EU target for 2040 is fundamental to accelerate and deepen the process started with the EGD and provide long term planning and investment certainty for people and business.

This document represents T&E's submission to the call for evidence and the questionnaire which make part of the public consultation launched by the European Commission on the definition of the EU 2040 climate target.

Concerning the approach to take on target setting, T&E suggests future emission reduction targets in the EU should:
1. be set every 5-years
2. be kept separate from carbon removals targets
3. include non-CO_2 greenhouse gas emissions, in particular aviation contrails
4. include all emissions with the absolute minimum of exceptions
5. include system efficiency targets for transport
6. keep a global carbon budget as guiding action

Concerning the emissions scenarios for 2040, **T&E modelling shows the FF55 policies for transport would deliver a 30% reduction in 2040 compared to the 1990 baseline.** We find that FF55 will halve

A briefing by **TRANSPORT & ENVIRONMENT**

road transport emissions compared to 1990. However aviation and shipping emissions will increase by 13% over the same period, decreasing by about a quarter from 2005.

T&E's Road to Zero scenarios show that the transport sector can cut its emissions by around 70% by 2040 compared to the 1990 baseline. Aside from the regulations, which mainly focus on accelerating electrification of road vehicles, and Refuel and FEUM for aviation and ships, we include transport system efficiency measures.
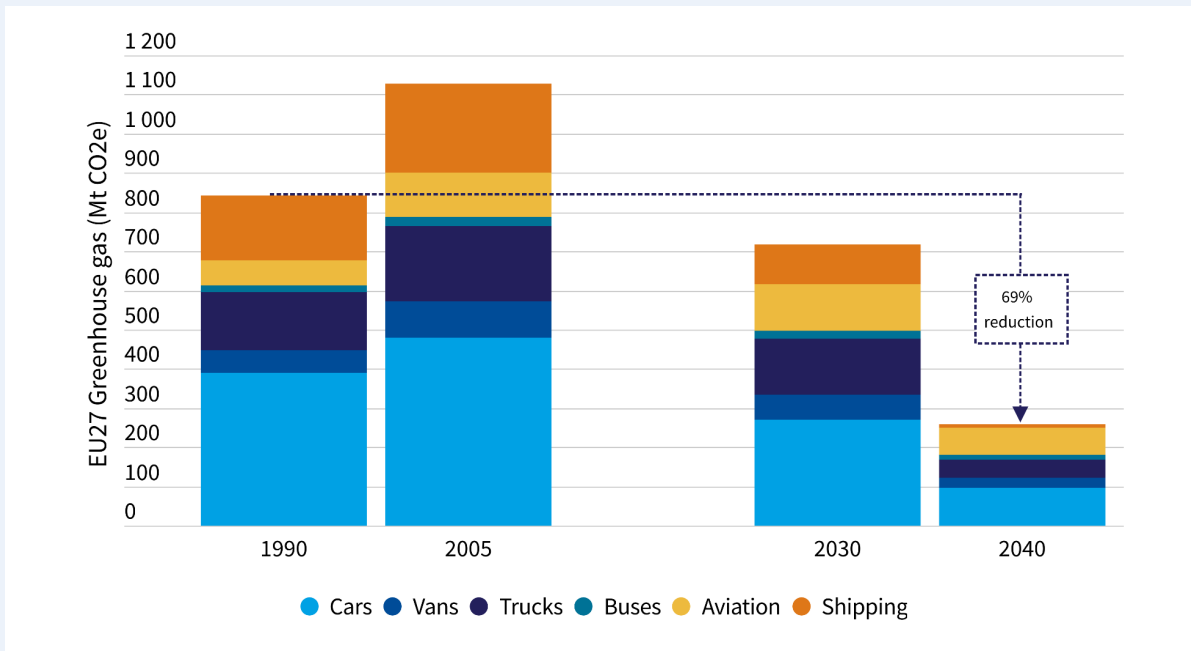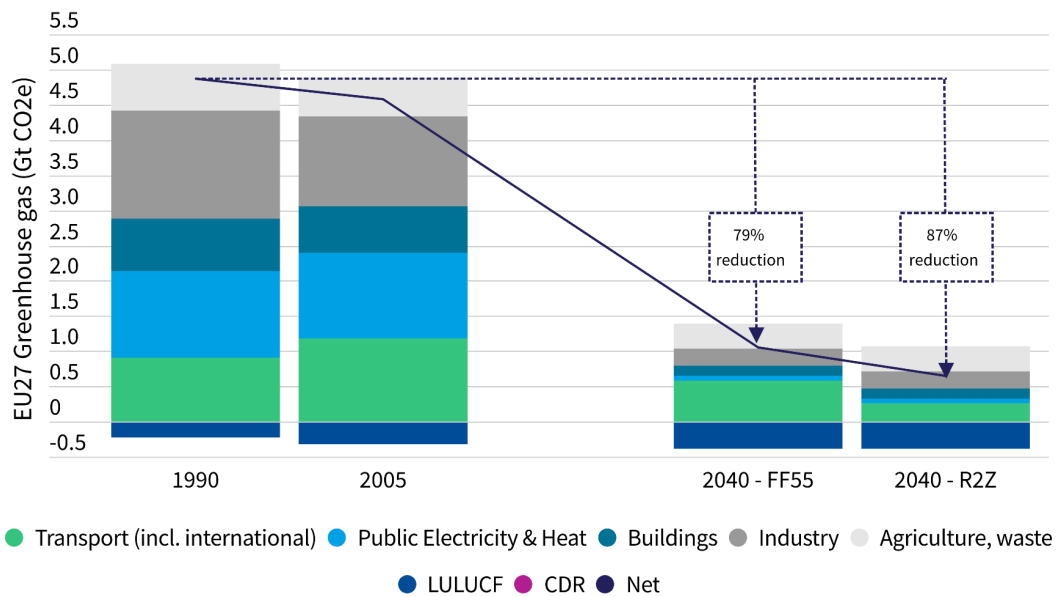

Figure 1: T&E transport modelling of Road to Zero scenario

To see where our transportation scenarios would get us in terms of economy-wide reduction, we took the 1.5TECH and 1.5LIFE scenarios for non-transport sectors of the European Commission's Clean Planet for All. We then compared the results, including 51 MtCO2 of carbon dioxide removals from the 1.5TECH scenario. We see that our scenario gets us to almost a 90% reduction compared to 1990, while FF55 reduces emissions by 79%. Based on other studies that have had deep dives into other sectors and are more up to date than Clean Planet for All, we assume that more rapid emission reductions are possible in other sectors. **This leads us to recommend that a 90% reduction target is possible**.

Chart: EU27 Greenhouse gas (Gt CO2e) by sector for 1990, 2005, 2040 – FF55, and 2040 – R2Z

Legend: Transport (incl. international), Public Electricity & Heat, Buildings, Industry, Agriculture, waste, LULUCF, CDR, Net

79% reduction (2040 – FF55), 87% reduction (2040 – R2Z)

The EU could also adopt the most ambitious target of 100% emissions reduction by 2040, but the implications of such a decision would entail more radical and disruptive changes in the ways that economic and social services are currently performed, which, even if more in line with what's necessary to mitigate climate change, imply far-reaching political decisions. While providing a qualitative presentation of such measures, we don't include them in the modelling of our scenarios nor have we assessed them in more depth.

Contents

1. Introduction and context

As parties to the Paris Agreement, the European Union and its member states pledged to limit global warming to well below 2°C, with efforts to limit it to 1.5°C. In 2021, the EU adopted the European Climate Law[1] committing to decrease its net emissions by 55% in 2030 (compared to 1990 level) and to reach climate neutrality in 2050. According to the Climate Law, in 2024 the European Commission must propose the next climate milestones: an EU emission reduction target for 2040 and indicate a GHG emissions budget for 2030-2050.

In the meantime, the 6th Assessment Report of the IPCC[2] reminds the world that time is running out to stop the climate crisis. The action to avoid irreversible damages to the environment, the ecosystems and human habitats must be intensified. In this context, countries with higher historical responsibility and capability to act are required to act faster, as the UN Secretary General Antonios Guterres[3] recalled in March 2023 when he urged developed countries and geographical entities such as the EU to set net-zero emissions by 2040.

Understanding the maximum reduction of the transport sector, the largest portion of the EU's greenhouse gas (GHG) emissions and the only sector that has seen its emission increase since 1990, will be crucial in order to set an ambitious 2040 target for the EU and step up the emission reduction goals of the EU in line with the IPCC's report and Guterres' incitement.

1.1. What are other organisations saying

The table below summarises what others are saying on the level of ambition of the 2040 climate target. The general conclusion is that the emissions reductions that the Union must pursue by 2040 should be higher than what drawing a straight line from the current 2030 target would imply. A straight line trajectory from the current 2030 targets to net zero would imply a 79% reduction target for the economy. However, given both the climate emergency and the ability and need of the EU to respond in order to safeguard its strategic autonomy and industrial leadership, we should do more than a linear trajectory.

---

[1] Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law'). Available: eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R1119

[2] IPCC (2023) Summary for Policymakers. In: Climate Change 2023: Synthesis Report. A Report of the Intergovernmental Panel on Climate Change. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Available: www.ipcc.ch/report/ar6/syr/

[3] Politico(March 20, 2023) New climate report: UN chief demands EU, US set new targets, Politico. Available: www.politico.eu/article/climate-change-report-un-antonio-guterres-demand-eu-us-new-target/

Organisation	2040 target
European Commission, Clean Planet for All Europeans[4]	Approx. 85% in the 1.5TECH and 1.5LIFE scenarios (net reductions; excluding international shipping and aviation)
European Scientific Advisory Body on Climate Change[5]	Between -88% and 89% compared to 1990 levels (net reductions; including international shipping and aviation)[6]
Agora Energiewende[7]	-90% compared to 1990 levels (net reductions; excluding international aviation and shipping)
Strategic Perspectives[8]	-90% compared to 1990 levels (net reductions; including international aviation and shipping)
Climate Analytics[9]	Net zero GHG emissions between 2040-2045 (excluding international aviation and shipping)

Table 1: Other emissions reduction scenarios for 2040

1.2. Aim of this consultation response

This document has the aim to further detail T&E's response to the questionnaire included in the public consultation and input the Commission's call for evidence by:

---

[4] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE, THE COMMITTEE OF THE REGIONS AND THE EUROPEAN INVESTMENT BANK A Clean Planet for all A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy. Available: eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0773

[5] ESABCC (2023) Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050. Available: climate-advisory-board.europa.eu/reports-and-publications/scientific-advice-for-the-determination-of-an-eu-wide-2040

[6] The 2040 target advised by the ESABCC to the European Commission doesn't include international shipping and aviation, thus it is set between a range of 90%-95%. The level of the target reported in the table is found in the Board's report as an estimation of the implication of including emissions of these two sectors when setting the target.

[7] AgoraEnergiewende (2023) Breaking free from fossil gas. Available: static.agora-energiewende.de/fileadmin/Projekte/2021/2021_07_EU_GEXIT/A-EW_292_Breaking_free_WEB.pdf

[8] Strategic Perspective (2023) Factsheet on pathways to 2040. Available: strategicperspectives.eu/the-post-2030-climate-target-debate-starts-now/

[9] Climate Analytics (2022) 1.5°C Pathways for the EU27: accelerating climate action to deliver the Paris Agreement. Available: climateanalytics.org/publications/2022/15c-pathways-for-the-eu27-accelerating-climate-action-to-deliver-the-paris-agreement/

- Suggesting the approach for setting the 2040 target and suggesting an indicative EU GHG emissions budget;
- Assessing the climate mitigation impact of the Fit for 55 package;
- Compiling T&E's existing 'Road2Zero' scenarios for each mode of transport to identify the 2040 climate target for the sector;
- Compiling the scenario for the transport sector with other modelling results to indicate an economy-wide 2040 climate target;
- Identifying the technological assumptions underpinning the scenarios for transport.

2. Recommendations for target setting

In this section we detail our recommendations to how the European Commission should approach 2040 target setting. In brief, future emission reduction targets in the EU should:

1. be set every 5-years
2. be kept separate from carbon removals targets
3. include non-CO_2 greenhouse gas emissions
4. include all emissions from all sectors with the absolute minimum of exceptions
5. include system efficiency targets for transport
6. keep a global carbon budget as guiding action

2.1. Set 5-year emissions targets

The EU should conform its policy cycles to the UNFCCC common framework which sets a global stocktake every 5 years. It is the same article of the European Climate Law mandating the European Commission to adopt a 2040 target, that also requires that its provision must be adapted to the 'outcomes of international discussions on common time frames for nationally determined contributions' (article 4.7). Switching to 5-years policy cycles is not only needed to conform to international developments, it is also functional for effective policy making in the context of the climate emergency and the scarce time to mitigate it. More frequent monitoring and policy review provide more moments to correct a course of action and ratchet up ambition if needed to adapt to new developments emerging in climate mitigation technologies, geopolitical context, resource availability, and society.

The necessity of shorter policy cycles is proved by the fact that between 2020 and 2021 the EU proposed the Green Deal and the Fit for 55 package which revised legislation that had only been agreed considering that the 2030 climate target (-40% emissions from 1990 baseline) was announced in 2014[10] and was implemented by the set of legislation of Clean Energy for all Europeans adopted only in 2019. Thus, the EU seems to be already responding to the need to legislate within 5-years policy cycles, but outside of any governance framework which would make policy making for climate mitigation and the sustainable transition predictable and certain for citizens and business.

---

[10] United Nations (October, 24 2014) EU Agrees 40% Greenhouse Gas Cut by 2030. Available:
https://unfccc.int/news/eu-agrees-40-greenhouse-gas-cut-by-2030

The implication of a 5-years policy cycle is that the European Commission should propose not only a 2040 target, but also a 2035 intermediate target in its forthcoming legislative proposal.

2.2. Keep emission reduction targets separate from carbon removals targets

The emission reduction target should be defined independently from any deployment of carbon dioxide removals (CDR). The European Commission should therefore set separate targets for emissions reduction, for land-based carbon removals and for removals by technological means, i.e. CDR. As an implication of this, there should be no flexibility to account for land-based carbon removals and CDR against a climate mitigation target, be it set by the Effort Sharing Regulation (ESR) or by the Emission Trading System (ETS).

While it seems clear that the development and deployment of CDR is going to be explored as solutions to tackle the residual emissions, possibly reaching negative emissions in the further decades, they must be intended as *additional* solutions which don't replace climate mitigation. The ESABCC recommendations on the 2040 target seems to adopt a similar approach as it indicates that reducing emissions by 90-95% by 2040 could be done minimising reliance on CDR.

Carbon removals cannot be considered as an alternative to mitigation because their inherent characteristics don't make them equivalent to emission reduction. Recent research[11] shows that the climate does not respond symmetrically to emissions and removals, that means that, because of non-linearity of the processing of the Earth system, the climate impact of one tonne of carbon emitted cannot be neutralised by the removal of one tonne of carbon from the atmosphere. This is valid both for nature-based removals and CDR. Moreover, land-use removals are reversible because of human activity and events of *force majeure* (fires, droughts), while the permanence of technological carbon removals is uncertain[12].

Concerning CDR, its potential deployment is minimal compared to the emissions cuts needed to be in line with the climate neutrality goal, as the estimates of the European Commission[13] itself has shown. Considering that not all removal options are equal and that uncertainties remain, further assessment of the risks, trade-offs and possible impacts on the ecosystems of the different technological removal options available or under research is strongly needed in order to set separate targets, frameworks and legislation for their deployment.

---

[11] Zickfield et al (2021) Asymmetry in the climate–carbon cycle response to positive and negative CO2 emissions. Available: www.nature.com/articles/s41558-021-01061-2

[12] Smith, S. M., Geden, O., Nemet, G., Gidden, M., Lamb, W. F., Powis, C., Bellamy, R., Callaghan, M., Cowie, A., Cox, E., Fuss, S., Gasser, T., Grassi, G., Greene, J., Lück, S., Mohan, A., Müller-Hansen, F., Peters, G., Pratama, Y., Repke, T., Riahi, K., Schenuit, F., Steinhauser, J., Strefler, J., Valenzuela, J. M., and Minx, J. C. (2023). The State of Carbon Dioxide Removal - 1st Edition. Available: static1.squarespace.com/static/633458017a1ae214f3772c76/t/63e3d4602156db24bc18c91c/1675875445298/SoCDR-1st-edition.pdf

[13] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE, THE COMMITTEE OF THE REGIONS AND THE EUROPEAN INVESTMENT BANK A Clean Planet for all A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy. Available: eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0773

2.3. Include non-CO$_2$ GHGs emissions in climate policy architecture.

The European Union's action to reach climate neutrality by the mid century should also incrementally incorporate and strengthen the mitigation of CO$_2$ and non-CO$_2$ greenhouse gases. In the aviation sector for example, intra-EU CO$_2$ emissions are covered by the EU ETS, but non-CO$_2$ effects from contrail formation which can be up to two thirds of aviation's climate impact are not. RefuelEU SAF mandates will help reduce non-CO$_2$ impacts, but there is no direct legislative target for this. Methane emissions, a potent GHG, are indirectly regulated in FuelEU Maritime (FEUM) through a well-to-wake GHG fuel intensity standard. The methane emissions themselves are not covered in a carbon market, however. Additional climate targets must ensure appropriate levels of coverage in both setting direct reduction targets and ensuring the polluter pays principle.

The latest IPCC report shows that stronger non-CO$_2$ emissions reductions help reduce the warming effect of a given remaining carbon budget. Because these gases have a shorter permanence in the atmosphere and higher global warming potential, their mitigation would produce relatively rapid benefits in terms of temperature mitigation. This means that, while CO$_2$ reduction remains a priority, in order to increase the chances to limit global warming to well below 2°C, non-CO$_2$ effects and related mitigation measures must make part of the European Commission's scenario modelling when identifying the Union's remaining GHG emissions budget in 2030-2050, setting the 2040 target and designing the policy tools to deliver the EU's climate objectives.

Specifically, the European Commission should address the non-CO2 effects of the aviation sector[14] by including the necessary policy measures within the set of tools that would enable the EU to accelerate emissions reductions after 2030. The first piece of evidence highlighting the importance of aviation's non-CO$_2$ effects came from the UN's Intergovernmental Panel on Climate Change (IPCC) back in 1999. Since then, a lot of excellent research has been carried out to better understand the effects of these emissions and how to tackle them.

The European Commission was first tasked with addressing the non-CO$_2$ emissions of flying in 2008, and commissioned a landmark report to the European Union Aviation Safety Agency (EASA). The report, published in 2020[15], analysed the latest available science, quantified non-CO$_2$ climate impact of aviation as twice that of CO$_2$, and proposed some mitigation measures.

2.4. Incorporate all emissions from all sectors with the absolute minimum of exceptions

While this is true across the economy, in this section we particularly focus on transport sectors and the existing exceptions to regulation on emissions. These exceptions can arise from regulatory scope that does not cover all emissions and activity, or new sales.

---

[14] T&E (2023) The easy fix to air pollution linked to planes. Available:
www.transportenvironment.org/discover/the-easy-fix-to-air-pollution-linked-to-planes/
[15] EASA (2020)Updated analysis of the non-CO2 climate impacts of aviation and potential policy measures pursuant to the EU Emissions Trading System Directive Article 30(4). Available:
drive.google.com/file/d/1u4_fSu232_8gO5_TUf8GTZKZ6mZcxggG/view

Aviation

The EU ETS covers only intra-EEA[16] emissions, exempting outermost regions[17]. The uptake of zero emission fuels regulated by ReFuelEU covers all fuels supplied at union airports, regardless of destination. In 2022, 64 Mt of CO_2 were outside of the ETS scope. Therefore 58% of CO_2 emissions are from flights with a destination outside of the Union and do not have effective carbon pricing[18]. Private jets[19] are largely beyond the scope of the ETS, accounting for approximately 2.5 $MtCO_2$. Additionally, aviation is responsible for non-CO_2 emissions resulting largely from contrail formation that increases emissions by a factor of 1.7 when using global warming potential (GWP) metrics or approximately a factor of 3 when using a radiative forcing (RF) metric. For the fastest growing transport sector, and with emissions at 5% of the total economy, this regulation gap is no longer justifiable. Similarly, dealing effectively with contrails will require including long haul flights in the scope of EU climate action. Private jets are still largely exempted from EU ETS and ReFuelEU[20].

Shipping

Under the scope of the EU MRV, shipping emissions were 135 $MtCO_2$e in 2020 (well-to-wake, WTW). However, the shipping MRV does not currently cover vessels under 5000 GT, nor larger fishing, offshore and naval vessels, which together account for 33 $MtCO_2$e. In addition, FeulEU Maritime and the shipping ETS regulation only cover 92 $MtCO_2$e, exempting half of extra-EU shipping routes. While there is a commitment to consider extending ETS and FuelEUMaritime to these smaller vessels during the next revision, this is not given. Future regulations should address the remaining exempted emissions through broadening the scope or by having separate laws and targets for the exempted categories of vessel emissions.

The Paris Agreement requires the parties to adopt Nationally Determined Contributions (NDCs), i.e. economy-wide emission reduction objectives. The Paris Agreement does not refer to the International Civil Aviation Organisation (ICAO) nor to the International Maritime Organisation (IMO) as instruments to tackle the emissions of international aviation and shipping; instead it makes clear that countries must make economy-wide emissions reduction, which includes action on all their shipping and aviation

---

[16] The EEA includes EU27 member states as well as Norway, Iceland and Liechtenstein. Flight from the EEA to the UK and Switzerland are also covered by the EU ETS.

[17] For example, the Canary Islands are considered the outermost regions of Spain.

[18] CORSIA, an offsetting scheme developed by ICAO, only covers emissions above a baseline. Research shows that offsets are cheap, so will not be sufficient to drive market change, and are not compatible with decarbonising the global economy, where all sectors will have to decarbonise.

[19] T&E (2021) Private jets: can the super-rich supercharge zero-emission aviation?. Available: www.transportenvironment.org/discover/private-jets-can-the-super-rich-supercharge-zero-emission-aviation/

[20] Private flights carried out by commercial operators are priced, but private flights operated by non-commercial operators emitting less than 1 000 tonnes of carbon dioxide per year or by commercial operators operating fewer than 243 flights in a continuous period of four months or emitting less than 10 000 tonnes of carbon dioxide per year are excluded from the EU ETS. Business aviation is included in the scope of ReFuelEU, which compels the sector to uplift 90% of its fuel at EU airports when departing from the EU (thus forcing it to uplift some SAF). Private flights operated by non-commercial operators or by commercial operators operating fewer than 500 flights per year are exempted from the refuelling obligations.

emissions. Therefore the NDC submitted by the parties must include the emissions of these two sectors[21] (so-called memo items in UNFCCC jargon). Including these emissions in the target is essential as action to reduce these emissions should be taken at the national level. The absence of a universally agreed method to attribute these reductions is not an obstacle to already pursue abatement measures at national level: the EU has demonstrated how these emissions should be allocated between countries.

The ESABCC factored the implications of including the emissions of international aviation and shipping in its advice to the European Commission for the EU climate target for 2040 identifying it within a range of -88% and -89% compared to 1990 levels.

Other surface transport

Current light- and heavy-duty vehicles CO2 standards cover most road transport segments, including cars, vans, buses and most freight trucks. However, off road vehicles, on "non-road mobile machinery" (NRMM) - e.g. construction or rail cars - are currently excluded, as well as lighter modes such as moped and motorbikes. Technology to reduce CO2 emissions from those is available and is the same as with cars and trucks (batteries or fuel cells), so Europe should move to extend its CO2 regulations to these.

Non-road machinery[22] emitted in the order of 100 $MtCO_2$ in 2010, or 2% of the EU's economy-wide GHG emissions. Unregulated trucks in the updated European Commission proposal for heavy duty vehicles CO_2 regulation account for 20% of sales, or approximately 12%[23] of emissions in the sector. Motorbikes and other two wheelers do not currently have a standard to regulate their emissions, despite accounting for 10 $MtCO_2$ in 2021. While these sectors are broadly covered in the ESR targets for countries, without having EU wide standards to ensure adequate supply of cleaner technology, the union risks delaying innovative action in these sectors. A fragmented approach could result in regions of the union missing out on clean vehicles and machines manufactured locally, eventually having to rely on exports from abroad.

2.5. Transport system efficiency standards or targets

The Energy Efficiency Directive (EED) sets out targets across the block to reduce energy consumption. The Directive sets targets for *public sector* transportation, and an indirect link to transport contributing to energy consumption reduction. The latter is mainly achieved through electrification of road transport, and that is driven by CO_2 standards, not by the EED. There are no explicit energy efficiency targets for transport, particularly achieved through *transport system efficiency* targets, that could make big contributions to overall emission reductions for the sector. The current approach from the Commission uses a price on pollution (through the aviation ETS, shipping ETS and road transport ETS2, for example) to incentivise the uptake of cleaner technology or indirectly system efficiency improvements. T&E fully supports the polluter pays principle, but when vehicles are already green (for example battery electric

---

[21] T&E (2018) Aviation and shipping emissions and national climate pledges. Available: www.transportenvironment.org/discover/aviation-and-shipping-emissions-and-national-climate-pledges/

[22] European Parliament (2020) Answer given by Mr Breton on behalf of the European Commission Available: www.europarl.europa.eu/doceo/document/E-9-2020-000679-ASW_EN.html

[23] T&E (2023)Truck CO2: Europe's chance to lead Available: www.transportenvironment.org/discover/truck-co2-europes-chance-to-lead/

vehicles) or there is little incentive to improve efficiency due to the market conditions of the sector (for example shipping), the Commission should consider additional regulation to tackle this.

For example, we have shown what impacts operational efficiency targets could achieve in shipping. Around 18% emission reduction by mandating slow steaming; 10% from other efficiency improvements. In road transport, efficiency improvements for electric vehicles would contribute significantly to reduce unnecessary resource utilisation. An energy per distance target (kWh/km), for example, would tend to favour lighter and more efficient vehicles.

Acceleration on emission reductions could also be brought about by changes in transport infrastructure investment or planning. The way urban spaces and transport infrastructure are planned have a significant impact on travel demand, in terms of chosen transport mode and of distance and frequency travelled. For instance, every percentage point increase in the road network will result in around 0.6% in additional traffic. Similarly, airport expansion leads to more capacity and new routes, increasing passenger demand. Infrastructure projects need to be appropriately assessed for their environmental and climate impact and should aim to reduce the most polluting and resource intensive travel. By implementing the right investment and planning decisions, citizens and businesses would be enabled to switch towards more sustainable mobility habits.

Rapid emissions and transport inefficiency reduction

Table 2 displays a wide array of measures that can be enhanced by national and European policies to encourage and trigger behavioural changes from individuals and businesses and cut demand for energy in the transport sector. These measures were quantified[24] as part of our response to the RePowerEU strategy in 2022, which arose out of the need to quickly find ways to reduce the EU's dependence on Russian energy.

Mode	Measure	Level*	Mtoe oil savings; 2023 vs 2019 (% within mode)	Details
Road	Replace the fuel duty cuts with income support measures.	N	12.9 (5.1%)	Calculated based on national cuts to fuel taxes implemented over a full year.
Cars	Increased teleworking - 3 days per week	N/C	5.0 (3.3%)	Savings from IEA 10-point plan, applied to EU oil consumption
Cars	Shift to public transport, cycling, walking	I/L/N	3.7 (2.4%)	Extrapolating German case of cycling as much as the Dutch as an upper bound for all types of modal shift
Cars	Lowering speed limits on highways to	N	5.0 (3.3%)	Savings from IEA 10-point plan, applied to EU car oil consumption.

---

[24] T&E (2021) How Europe can cut a third of its oil demand by 2030. Available: https://www.transportenvironment.org/discover/how-europe-can-cut-a-third-of-its-oil-demand-by-2030/

Mode	Measure	Level*	Mtoe oil savings; 2023 vs 2019 (% within mode)	Details
	100 km/h			
Cars	30 km/h speed limits in cities	L/N	-	A second order measure to ensure that driving in cities is safer, quieter, and to dissuade unnecessary car use to avoid rebound
Vans	Reducing next day deliveries to specific addresses	L/N	-	Measure not quantified.
Trucks	Lowering speed limits	N/C	2.5 (4.3%)	80 km/h for heavy duty vehicles and and 100 km/h for vans on highways
Trucks	Aerodynamic fittings to trailers	EU	2.0 (3.4%)	Assuming that (on average) all trucks and trailers are fitted with at least one of the following aerodynamic devices: side skirts, boat tails, and cab roof fairing.
Trucks	Eco-driving	C	1.5 (2.5%)	Assuming half of the truck drivers are trained for eco-driving training including eco-driving performance management system
Aviation	50% reduction in corporate travel	C	6.0 (12.4%)	Up to 13.0 Mtoe saved in 2050 compared to business-as-usual.
Aviation	An aviation ticket tax	EU	[2.13,4.26] (4.4%, 8.8%)	[€10,€20] tax on intra-EEA flights, [€50,€100] tax on extra-EEA flights.

Table 2: Summary of energy efficiency measures in transport
*Levels: I=individuals; C=companies, institutions, organisations, universities; L=local/city authorities; N=national government; EU=EU implemented.

EU regulatory approach to transport system efficiency

In addition to the table above, we have identified several other inefficiencies in the transport system that the European Commission could consider to address transport system efficiency. This list in Table 3 is not exhaustive and provides only indicative measures and metrics. We have not assessed the feasibility of all of these metrics, and list them only as guiding principles. In particular, while clearly a compelling option, we look at options going beyond higher pollution charges, for example a price floor for CO_2 emissions from road transport.

Mode	Inefficiency	Possible EU approaches to remedy
Cars	SUV-isation and resource use	Taxation based on vehicle weight and battery efficiency. This should become stringent to favour smaller, lighter and more aerodynamic vehicles. Other metrics could include energy per distance travelled, or CO2 per kWh battery standards.

Mode	Inefficiency	Possible EU approaches to remedy
Trucks	Empty headings, sub-optimal loading	A target or standard, such as energy per work delivered, that encourages optimal loading of trucks and discourages empty journeys on the one hand, and also aerodynamic and energy recuperation design on the other.
Shipping	Operational inefficiency	FuelEU Maritime only considers the carbon content of the energy used to power ships, whereby this metric would provide a target for ship size and segments that encourage practices such as slow steaming, hull, propeller, boiler, and engine optimisation and innovative technologies such as wind propulsion. For more, see our roadmap[25].
Passenger road transport	Energy per distance travelled	A target or standard looking at decreasing the total energy of passenger transport across a city, region or member state would do more to favour investments in and promotion of efficient modes of transport, such as buses, rail, and active mobility.
Passenger transport	Mobility budgets	An accessibility target that would encourage spatial planning to decrease the travel distances required for citizens to access key services and recreational spots. This would include the realisation of the '15 minute city' (see infobox below).
Passenger transport	Urban planning	Limiting the space in road networks, parking spaces, and ease of access for private cars in cities, as we have analysed in previous[26] work. The amount of space dedicated to cars could be benchmarked and targets set to reduce this space.
Cars	Number of vehicles per person	Conceived to reduce car dependency. Create targets on motorisation and mandate shared resources

Table 3: Indicative measures and metrics to address transport system efficiency

Info box

The way people move in urban spaces should significantly change. Better city planning and further development of local public and rail transport would transform the '15 minute city' from a concept to a reality across the EU decreasing the demand for long-distance and polluting travels, as well as congestion and poor air quality, in cities. Facilitated access, in terms of affordability and availability, to

[25] T&E (2021) Decarbonising European Shipping. Available: https://www.transportenvironment.org/wp-content/uploads/2021/07/202104_Shipping_Technological_Roadmap_to_Decarbonization.pdf

[26] T&E (2019) Less (cars) is more: how to go from new to sustainable mobility. Available: https://www.transportenvironment.org/discover/less-cars-more-how-go-new-sustainable-mobility/

public transport, car sharing, electric micro-mobility for citizens, with special attention to those in transport poverty, would make it easier to shift away from car-ownership.

2.6. Keep a global carbon budget as guiding action

The Paris Agreement binds the Parties to limit emissions within the remaining GHG emissions budget necessary to achieve the collective goals. This necessarily implies distributing the global GHG emissions budget among the parties, but the approaches to follow could differ on the basis of a range of historical responsibility, per capita emissions or cost-effectiveness. As such, the identification of a state's or region's share of the global budget is ultimately political.

According to recent research[27] the European Union will already exhaust its fair share of the global carbon budget in 2030. Even if the EU's remaining carbon budget is lower than what it can feasible achieve, its historical responsibility and wealth call the Union to find means to contribute in other ways to the achievement of the Paris Agreement's goals. As also indicated by the ESABCC in its recent advice to the Commission on the indicative EU 2030-2050 GHG emissions budget, by providing sufficient financial resources to help other countries and regions of the world to accelerate their decarbonisation, the EU would facilitate their convergence towards the level of climate effort of industrialised countries. A range of actions in this direction could be taken by the EU, for example through direct climate finance, contribution to international climate funding instruments, making available clean technologies that would enable all countries to take advantage of a 'leap frog' from the fossil fuel age.

3. Compilation of existing scenarios & additional measures EU can take

We analysed the Fit for 55 legislation to see where it would lead the transport sector in terms of emissions reductions in 2040. We consider all departing flights and the full international scope of shipping emissions, including all categories of vessels even if they are not currently regulated.

3.1. Fit for 55 and Road to Zero scenarios - key inputs

In this section, we give a short summary of the main input parameters of technology or fuel uptake for each scenario (Table 4). Where our demand exceeds those of the adopted regulation, we recommend that these are reviewed in accordance with our input when the appropriate regulation is reviewed as scheduled by law. For example, increasing the ambition from the car CO2 stands for 2030 should happen during the 2026 review.

---

[27] ESABCC (2023) Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050. Available: climate-advisory-board.europa.eu/reports-and-publications/scientific-advice-for-the-determination-of-an-eu-wide-2040 and AirClim (2022) Policy implications of Europe's dwindling carbon budget. Available: www.airclim.org/sites/default/files/documents/policy-implications-of-europes-dwindling-carbon-budget-2.pdf

Mode	FF55 scenario	R2Z scenario
Passenger cars	CO2 standards of 15% in 2025, 55% in 2030 and 100% in 2035	CO_2 standards of 15% in 2025, 80% in 2030 and 100% in 2032. Mandate corporate fleets to be 50% zero-emission by 2027 and 100% in 2030.
Vans	CO_2 standards of 15% in 2025 and 50% in 2030, resulting in 38% battery electric van sales in 2030	CO_2 standards of 25% in 2025 and 90% in 2030, resulting in 74% battery electric van sales in 2030
Trucks	Vocational, small and some heavy trucks excepted; CO2 standards for remaining trucks of 45% in 2030, 65% in 2035, 90% in 2040.	CO2 standards for no exempted trucks of 65% in 2030, 100% in 2035; CO2 standard for vocation trucks of 35% in 2030, 85% in 2035, 100% in 2040. Zero-emission new sales target for remaining trucks of 30% in 2030; 80% in 2035, 100% in 2040.
Buses and Coaches	100% new sales share zero-emission buses in 2030; CO2 standards of 45% in 2030, 65% in 2035 and 90% in 2040 for coaches	100% new sales share zero-emission buses in 2027; CO2 standards of 65% in 2030, 100% in 2035.
Maritime	FEUM well-to-wake CO2 fuel intensity reduction targets of 2% in 2025, 6% in 2030, 14.5% in 2035, 31% in 2040, 62% in 2045 and 80% in 2050.	Well-to-wake CO2 fuel intensity reduction targets of 48% in 2030, 85% in 2035, 97% in 2040, and 100% in 2050.
Aviation	2% e-fuel uptake in 2030; 33% in 2040 and 89% in 2050 of final energy demand	

Table 4: Key inputs of the Ff55 and Road to Zero scenarios

3.2. Results: Fit for 55 scenario

We have not seen analysis on the projected price for ETS2 allowance until 2040. The European Commission's Impact Assessment[28] provided ETS2 prices ranging from €35 to €80 per allowance in 2030. Without further information, we assume that the ETS2 prices in 2040 will be equivalent to 2030 prices. An ETS2 price of €35 to €80 per allowance is equivalent to €0.08/lire to €0.20/litre of fuel; at current road fuel prices, this is equivalent to a 5% to 14% increase in price. Assuming a long term elasticity of -0.6, this

---

[28] COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT Accompanying the document DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union, Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and Regulation (EU) 2015/757. Available: eur-lex.europa.eu/resource.html?uri=cellar:7b89687a-eec6-11eb-a71c-01aa75ed71a1.0001.01/DOC_2&format=PDF

would decrease fossil fuel use in cars by 4% to 8%. Given the level of uncertainty, we assume a 10% reduction is achieved in all road mode sectors, except for buses and coaches. This reduction in demand through pricing is incorporated into our road transport modelling results, which centre on clean vehicle uptake based on CO_2 standards from the EUTRM.

Fig. 2 shows the FF55 policies for transport would deliver a 30% reduction in 2040 compared to the 1990 baseline. Owing to transport's increase in emissions since 1990, the FF55 policies would not bring transport emissions below their 1990 levels in 2030. We find that FF55 will halve road transport emissions compared to 1990. However aviation and shipping emissions will increase by 13% over the same period, decreasing by about a quarter from 2005.
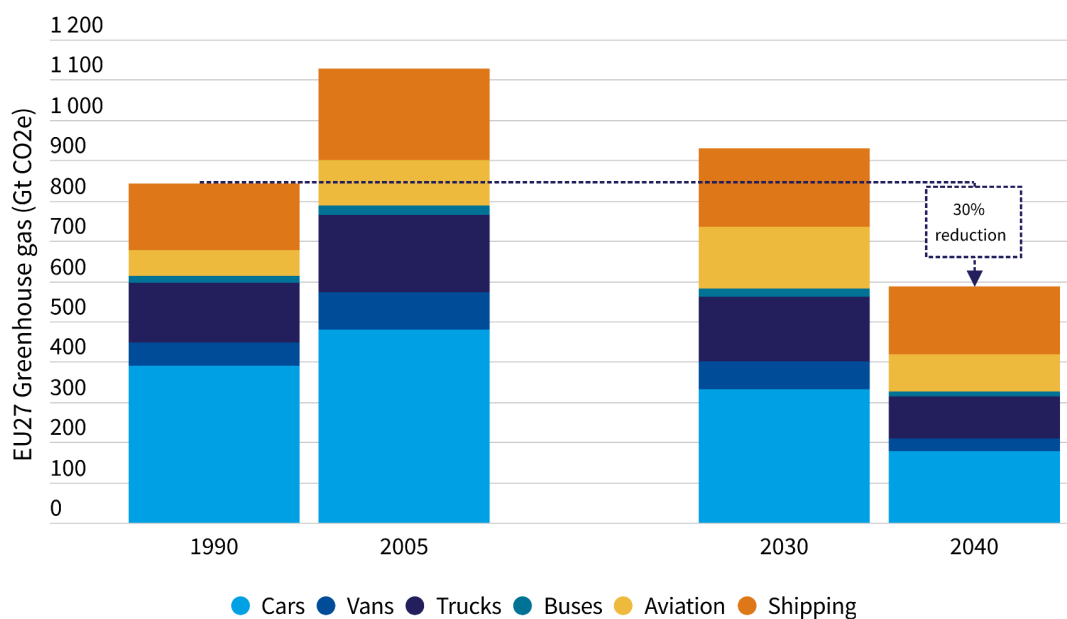

Figure 2: T&E transport modelling of Fit for 55 policy package

3.3. Results: T&E Road to Zero scenario

Here we compare scenarios from our Road2Zero scenarios[29] and where possible, include an analysis of where Fit for 55 (FF55) regulation brings us too.

The Road to Zero (R2Z) scenarios are a compilation of our position on how to decarbonise transport by 2050. These scenarios are more ambitious than FF55 in the short term. While it is unlikely to be politically

---

[29] T&E (2021) Decarbonising European Shipping. Available: https://www.transportenvironment.org/wp-content/uploads/2021/07/202104_Shipping_Technological_Road map_to_Decarbonization.pdf and T&E (2022) Roadmap to climate neutral aviation in Europe. Available: https://www.transportenvironment.org/wp-content/uploads/2022/03/TE-aviation-decarbonisation-roadmap-FINAL.pdf

feasible to re-open the recently agreed FF55 package, we nevertheless show what we have deemed as technologically feasible to rapidly reduce transport emissions. Aside from the regulations, which mainly focus on CO_2 standards for road vehicles, and Refuel and FEUM for aviation and ships, we include transport system efficiency measures.
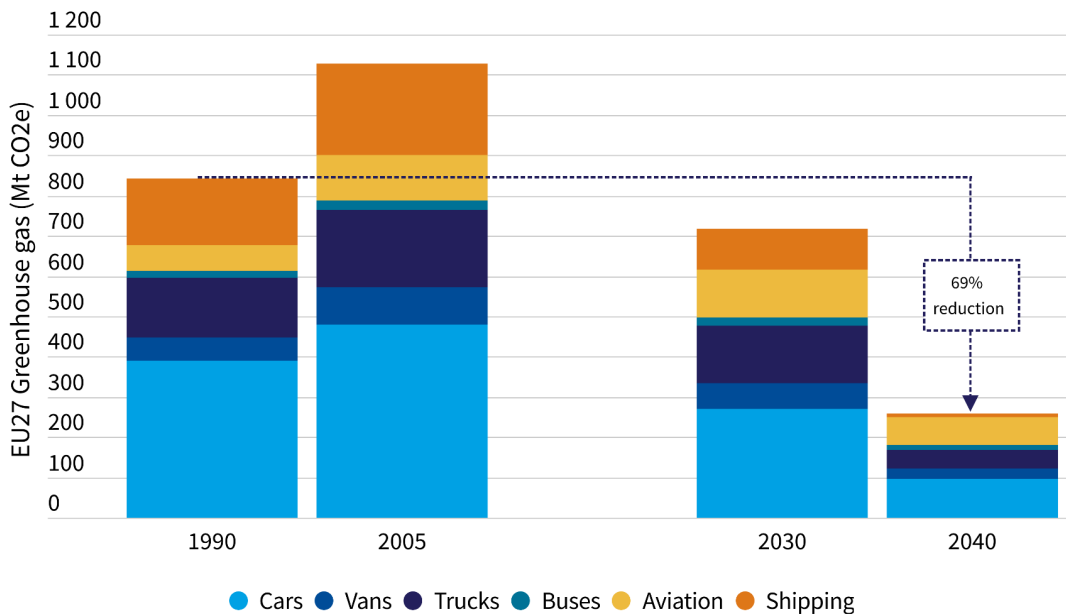

Figure 3: T&E transport modelling of Road to Zero scenario

Fig. 1 shows the R2Z policies for transport would deliver a 69% reduction in 2040 compared to the 1990 baseline. Shipping plays a particularly big role, as the underlying scenario for that mode is the science based target initiative (SBTI). Examples of the transport system efficiency targets across different modes include:

- 22% car activity avoided or shifted. This is assumed to be the result of road pricing via the ETS2, public transport expansion, reducing space for cars in cities, additional homeworking measures, car free days, speed limits and shift to public transport and cycling.
- Corporate air travel halved; leisure air travel capped - through no airport expansion memoranda, and codifying corporate pledges to link travel caps with tax rates.
- Slow steaming of ships and no fossil imports, resulting in the shipping sector's share of emissions that are linked to the transport of coal, oil, and gas to be phased out.
- Lower speed limits (80km/h) for trucks on motorways, retrofitting of aerodynamic devices and more efficient tyres, operational efficiency through the Eurovignette and increased rail freight and inland waterway freight share of activity.

While the overall reduction is significant, the sector still emits 260 MtCO$_2$e in 2030

A briefing by **TE** **TRANSPORT & ENVIRONMENT**   18

3.4. Results: Economy-wide target

To see where our transportation scenarios would get us in terms of economy wide reduction, we took the Clean PLanet for All's 1.5TECH and 1.5LIFE scenarios for non-transport sectors. We plot the results in Fig. 3. This chart includes 51 MtCO$_2$ of carbon dioxide removals from the 1.5TECH scenario, the highest of all scenarios modelled by the Commission. We see that our scenario gets us to almost a 90% reduction compared to 1990, while FF55 reduces emissions by 79%. Based on other studies that have had deep dives into other sectors and are more up to date than Clean Planet for All, we can conclude that more rapid emission reductions are possible in other sectors. This leads us to recommend that a 90% reduction target is possible, and this as a minimum level of ambition would set our position.
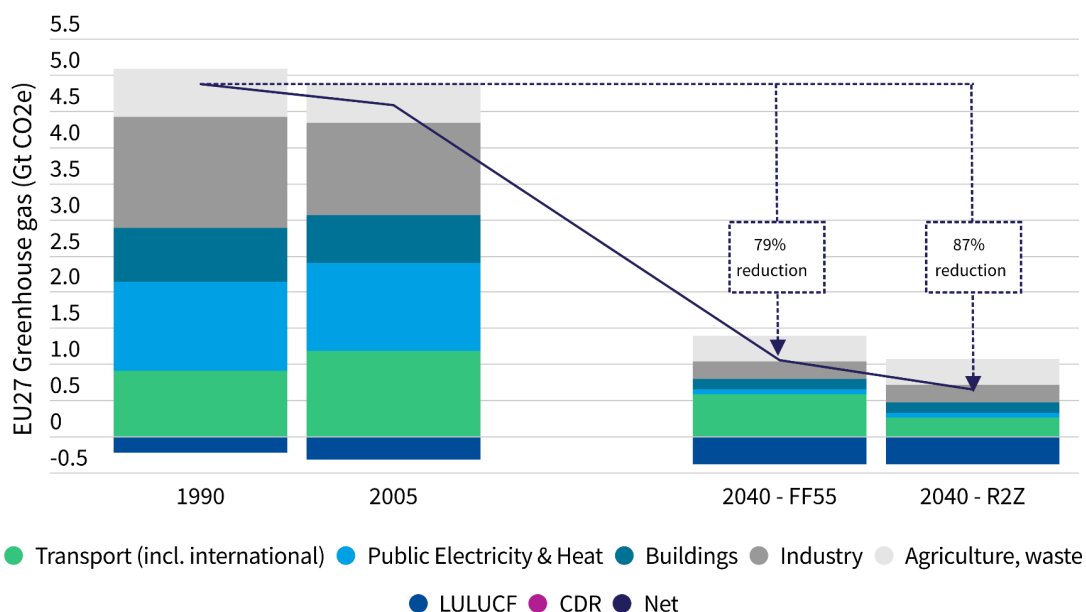

Figure 4: T&E's economy-wide modelling under Ff55 and Road to Zero

3.5. Additional recommendations for the scenario modelling

The technological assumptions underpinning the PRIMES model used by the European Commission to develop the different policy scenarios in its impact assessment should take into account up-to-date data on technologies' availability, efficiency, cost and safety. Since our paper[30] on some of the shortfall of the PRIMES model used by the Commission to guide its policy recommendations, there has been marked improvement in terms of stakeholder input, inclusion of maritime emissions, and transparency on inputs and results. The Reference Scenario still appears to be conservative on electric vehicle uptake, particularly for trucks. The pre-Ff55 2030 targets forced truckmakers to begin producing electric trucks in earnest. Piggy-backing off battery technology developments from light duty vehicles, electric trucks would become much cheaper to run, reinforcing their total cost of ownership advantage against diesel trucks.

---

[30] T&E (2018) The Future of Transport in the European Commission's 2050 strategy. Available: www.transportenvironment.org/wp-content/uploads/2021/07/2018_07_2050_model_paper_final.pdf

The model should also take into account the societal costs of GHG emissions in order to assess the real cost of pollution and avoid distorting policy decisions that only see the investment costs for new technologies, rather than money saved from climate change mitigation and other co-benefits.

A novelty in the legislation is that the European Climate Law provides that the European Commission must consider the *cost of inaction* when proposing the 2040 climate targets, which, as stated in the Call for Evidence, the Commission is set to do by including the potential implications of an increase in global temperatures and the associated extreme weather events. It is important that the European Commission adopt an as wide as possible view of what the potential implications are, including loss in biodiversity, crop-yield loss, increased death rate, health care costs, costs of adaptation to frequent extreme climate events and to degraded human habitats, cost of damage to infrastructure, decreased biomass availability, conflicts over water and other scarce resources, increasing wealth inequality.

Moreover, as stated in the call to evidence, the impact assessment will also consider the **foregone co-benefits** of climate mitigation. These should include not only the benefits descending from cutting the EU's dependence on imported fossil fuels, but also benefits connected to lesser healthcare costs, reduced energy costs, elimination of subsidies to fossil fuels and other polluting technologies, higher competitiveness in emerging markets, and new employment opportunities.

3.6. Additional investments will be needed

A major wave of public and private investments will be needed for decarbonising transport faster and achieving ambitious emission reductions by 2040. To rapidly modify how mobility and transport services are performed in our society, we recommend setting up a long term climate investment plan. This investment plan should focus on the implementation of the European Green Deal and achieving reduction targets at the horizon of 2040.

A permanent funding tool should be created and become the successor of the Next Generation EU fund. Via joint borrowing, the EU should raise money on the financial markets and disburse it in support of radical measures to decarbonise the transport and energy sectors in particular. Combined with a significant earmarking of the future EU Multiannual Financial Framework towards climate and biodiversity, this would enable significant public support to clean technologies, buildings renovation, sustainable infrastructure and support to households with a total of EUR 1 trillion at EU level spent until 2035. On top of additional public financing, the European Union should revive and accelerate its Sustainable Finance agenda for the financial sector to also play its role in decarbonisation.

3.7. Additional measures to accelerate transport decarbonisation

In order to decarbonise transport faster and overachieve -70% the emission reductions by 2040 additional and more ambitious measures would be needed. While the urgency to mitigate climate change and avoid a worsening of the climate crisis which is already unfolding would justify the adoption of the highest possible ambition when setting climate targets, the magnitude and radicality of change that this would require in all areas of the society and economy might be beyond what is in the remit of politics. We revisit

our publication[31] on an analysis on how transport could contribute to a 55% 2030 target. We have not quantified these selected policies. Thus, this section provides a qualitative description of the required measures to radically change the way mobility and transport services are performed in our society at the moment.

Cars and personal mobility

To accelerate emission reduction in cars, the uptake of new zero emission vehicles has its limit. We are currently investigating several policies to reduce emissions from the existing ICE car fleet, which will remain a significant share of activity in the next few decades to come. Other measures would look to further disincentivize car driving. More ambitious measures not currently modelled or assessed include:

- Implementing car sharing uptake policies, so that the current car ownership model changes from largely individual households using one car to several to dozens of households having access to new zero emission shared vehicles. This could be mandated or achieved through, for example, considerably higher taxes on vehicle ownership and parking charges of single occupancy vehicles.
- Implementing and incentivising e-retrofit programs, where older vehicles are subsidised to have their ICE drivetrain replaced with battery electric propulsion.
- Designing a scrappage scheme that incentivises owners of old cars to scrap their car for things like: money, public transport passes, subsidised e-bike purchases, while proper environmental safeguards are enforced to ensure sustainable recycling;
- Reducing vehicle speed would achieve bigger and faster CO_2 reductions from cars before 2030. For example, moving from 130 km/h or 120 km/h to 100 km/h on highways, whilst lowering rural road speed limits to 70 km/h and urban speed limits to 30 km/h. Aside from the direct savings in emissions, the time penalty from driving a car would help drivers to either switch to a cleaner mode of transport or forgo the trip altogether.
- All EU member states ban diesel, petrol and fossil gas (CNG) cars from entering their cities and urban areas.
- Applying a cap or increased charge for vehicle miles that exceed a threshold within a year.

Aviation

In the short term, more radical actions to decrease the emission impact of the sector would require reducing the number of flights. In particular, long-haul flights are disproportionately responsible for aviation's climate impact. Regulators could aim to shrink the aircraft fleet and the distances it flies by 2030. To this end, they could ban certain flights (night time or long haul), reduce the number of slots available at airports or have a cap of passengers.

Trucks and freight

An accelerated decarbonisation of trucks and freight could for example be delivered by banning ICE trucks from all EU cities to push zero emission urban freight solutions, including electric delivery vehicles or cargo bikes. Moreover diesel taxes and road charges could be significantly increased and the use of ICE

---

[31] T&E (2020) How European Transport can contribute to an EU -55% GHG emissions target in 2030. Available: https://www.transportenvironment.org/wp-content/uploads/2021/07/2020_02_TE_EGD_vision_How_EU_transport_can_contribute_minus_55.pdf

trucks during weekends and at night could be banned. Following this, truck kilometres travelled would tend to decrease and modal shift to trains intensify, albeit with additional rail capacity, but it could be economically disruptive and especially disadvantageous for remote regions. Finally, authorities could impose high minimum charges on next day deliveries and on returns so that customers would be discouraged to opt for next-day delivery or unnecessary return of goods.

Shipping

Several additional measures could increase the rate of decarbonisation of shipping:
- Mandating zero-emission operation for new luxury cruise ships[32] starting from 2025 and extend the mandate to all luxury cruise ships by 2035;
- Mandating zero-emission operation for new cargo ships starting from 2030 and extend the mandate to all cargo ships from 2040;
- Very high carbon prices in the range of several hundreds of euros a tonne would likely have a significant and immediate impact on shipping GHG emissions by suppressing demand. However, as this is not a T&E recommendation, we have not assessed the exact emissions impact of this measure, nor have we considered the socio-economic impact of sudden and sharp increases in shipping costs.

Fuels and infrastructure

The EU and its member states could introduce explicit bans on fossil fuel-related economic activities. In particular:
- Ban the construction of new infrastructure for oil and gas transportation and refuelling, especially with EU funds;
- Refrain from any new upstream extraction projects (as in the case of gas extraction in the East Mediterranean) and from supporting any new EU energy partnership involving new oil and gas extraction projects (as in the case of EU partnerships with the UK and Norway).

4. Conclusions

T&E's modelling shows that the current 2030 legislation is not sufficient to impress the pace of change of the transport sector necessary to keep net zero within reach. The FF55 policies for transport would deliver a 30% reduction in 2040 compared to the 1990 baseline. Owing to transport's increase in emissions since 1990, the FF55 policies would not bring transport emissions below their 1990 levels in 2030. At the economy-wide level, our analysis suggests that T&E's scenario would get the economy to approximately 90% of emissions reductions by 2040 (with 1990 as baseline) against a lower 79% reduction by 2040 deliverable through Ff55 legislation.

The results of the scenarios highlight the need to accelerate the decarbonisation of transport and of the whole of the economy. To achieve that, setting an ambitious 2040 target is a crucial first step to define the path of deep transformation that EU economies must undergo in order to become genuinely sustainable and remain competitive. The target and the pathway (among many) the EU will choose to meet that goal,

---

[32] Electrive.com (June 8, 2023) Hurtigruten Norway introduces electric cruise ship. Available: https://www.electrive.com/2023/06/08/hurtigruten-norway-introduces-electric-cruise-ship/

will define its chances of success in guaranteeing the strategic autonomy, industrial leadership and the competitiveness of the European economy in the emerging green global markets and value chains.

In order to reach the targets for transport and for the economy identified through our analysis, we recommend as a feasible course of action the extensive electrification and rapid deployment of sustainable and zero emission technologies coupled with the adoption and/or intensification of measures that increase the energy efficiency and lower the demand for energy use of the transport system. Such a pathway of transformation should reduce to the minimum the risk of negative impact on the environment and resource use, thus reliance on biofuels to decarbonise the economy should be excluded.

The setting of the 2040 target should be conducted on the basis of an approach which guarantees more frequent stock takings via 5-years policy cycles (as in the Paris Agreement framework), that emissions reductions are kept separate from carbon removals (to avoid mitigation deterrence), that all the emissions of the economy are tackled, including non-CO2 GHG and emissions from international shipping and aviation. The European Commission should also consider that a greater share of emissions reduction should be delivered by decreased demand for transport, which could be encouraged by adopting, for example, energy efficiency standards or targets for transport. Finally, setting a 2040 target which is within reach for the EU implies that the Union will consume all of its fair share of the global carbon budget. Thus, the EU should contribute to the goal of minimising the remaining global carbon budget by intensifying climate action abroad and support for decarbonisation of less advanced economies.

Further information

Name: Chiara Corradi
Title: Climate Policy Officer
Transport & Environment
chiara.corradi@transportenvironment.org

Name: Thomas Earl
Title: Director, Modelling and data analysis
Transport & Environment
thomas.earl@transportenvironment.org