Making EVs fit for the future

How to design an environmental score for EVs

A briefing by T&E, IMT (IDDRI) and BEUC - April 2024

Summary

Context:

- As the European automotive industry shifts towards selling only zero emission cars in Europe by 2035, tailpipe emissions are gradually shifting to zero. This leads to a growing importance of emissions linked to material use ('embedded emissions'), as well as the vehicle's energy efficiency. Both these parameters are heavily influenced by vehicle size, aerodynamic performance (shape), weight and amount of material used.
- The 2023 car CO2 law requires the European Commission to consider setting energy efficiency thresholds for electric vehicles (EVs) to address the current regulatory gap regarding the overall environmental performance of EVs.
- Although improving the energy efficiency of EVs is important, an approach solely focused on this unique parameter, as suggested by the car CO2 law, would not be sufficient to effectively assess and improve the overall environmental performance of EVs. Focus on just efficiency would only deliver small, incremental improvements since technological progress and market competition are already driving efficiency upgrades.

Proposed approach:

- To address this gap, the EU needs to come forward with clear rules for rating the environmental performance of EVs and create a European harmonised framework for the overall reduction of the carbon and energy footprint of vehicles. Member States, companies and consumers could then use this framework to compare, rate, and adapt support for EV models while consumers would benefit from more accurate information about the environmental footprint of electric cars. In this briefing, T&E, IMT (IDDRI) and BEUC propose the introduction of a harmonised EU environmental methodology—named the "environmental-score." The proposed metric combines both the energy efficiency and the carbon footprint of EV's main components to ensure a comprehensive evaluation.
- The proposed approach suggests extending the scope to cover embedded carbon emissions from the production of electric cars which account typically for between 50% to 60% of lifecycle emissions of EVs (compared to around 10% for ICEs given the fossil use emissions). The initial focus of the methodology should be on the carbon hotspots: EV batteries (via integration of battery regulation provisions on carbon footprint), steel and aluminium (both based on the Carbon Border Adjustment Mechanism methodology). Together these account

for around 70%-75% of the embedded production emissions of EVs. The proposed environmental score is calculated as follows:

Environmental score =

*energy efficiency (kWh/km) * total carbon footprint of the battery, steel and aluminium (kgCO2)*

- In this briefing, the proposed approach is to multiply the energy efficiency value (use phase) with the carbon footprint value (production phrase). However, an alternative approach could consider adding instead of multiplying these two factors. At this stage, we consider it more simple and workable to proceed to a multiplication of the two most important parameters at stake.

Discussion:

- By introducing the environmental-score, decision makers can foster fair competition among carmakers while encouraging innovation and advancement in environmental performance.
- The methodology provides flexibility as OEMs are free to decide their compliance strategy (potential measures include use of decarbonised steel, aluminium or batteries, improvements in vehicle efficiency or reduction in the average size of cars, batteries or a combination of these measures).
- The environmental score is also a green industrial policy tool as it would leverage the power of automotive to act as a lead market to scale up green steel, green aluminium and clean materials manufacturing. Indirectly, it would favour investment for EV production in Europe in the face of global competition given that lower carbon processes are being scaled in Europe. Most likely this would also benefit local manufacturing as already today steel and aluminium production are on average less carbon intensive in Europe than in China.
- As a second step, the methodology could later be expanded to other production materials and components especially when identified as new embedded carbon hotpots (e.g. carbon fibre materials, plastics, tyres). Ultimately, such rules would serve as a new tool to move towards an approach closer to a lifecycle assessment (although simpler to implement), which would take into account both phases of use and production of a vehicle.
- The score could be used across the EU for many purposes: 1) consumer communication through a labelling system to be included in the Car Labelling Directive (review expected in 2024-2025); 2) in national fiscality frameworks (e.g. vehicle subsidies, or registration tax); 3) as a requirement for corporate fleet targets (national or EU level), or 4) carmaker EU fleet average requirements.
- The score would improve the affordability of EV by encouraging smaller and more affordable EVs, which need to be ramped up to make the transition toward EVs more inclusive. Indeed, the environmental score would provide added value to smaller vehicles thus encouraging demand for these models and improving their profitability.
- While this briefing focuses on BEVs given their dominance in the ZEV market, the proposed methodology should include all ZEV powertrains (e.g. fuel cell hydrogen cars).

- The score should not impede the uptake of EVs by adding barriers or making EVs less attractive or unreasonably more expensive, especially in countries where the EV market has not yet reached maturity. Crucially, ICE vehicles (including hybrids and PHEVs) should in all cases be rated and labelled as having higher environmental impacts given their considerable climate impact (lifecycle CO_2 emissions for ICE and PHEVs are on average 3 and 2 times higher than BEV).
- The proposed approach would provide a simplification of regulatory initiatives and reporting requirements. Indeed, it would merge and simplify the planned EU initiatives on the vehicle lifecycle analysis methodology and the potential energy efficiency thresholds. Instead the proposal is to only focus on the simpler and more applicable EV score as presented in this briefing. Moreover, the score could replace individual future requirements on the carbon footprint of the different components (e.g. battery carbon footprint requirements, or potential green steel or green aluminium requirements).

Recommendations:

- It is time to introduce an EU framework to prevent fragmented approaches across Member States (e.g. the conditionality of the French EV bonus on the eco-score) and make EU electric cars more resource, climate and energy efficient.
- We call on the next European Commission to take the following steps once in office:
    - By December 31, 2025: Adopt delegated acts laying down a common methodology for the assessment and the consistent data reporting of the EV environmental score. This monitoring and reporting methodology should also include a clear guideline on how and where the score can be used.
    - By June 2026: Mandatory reporting of EV environmental scores using the methodology developed by the European Commission.

1. Introduction and context

1.1 Regulatory context: a gap to fill

In March 2023, the EU approved the final car CO2 regulation which sets the framework and trajectory for the transition from internal combustion cars (ICEs) to zero emission vehicles. The regulation has proven to be an effective driver of the transformation of the car industry toward manufacturing and selling electric cars (EVs), albeit at a slower pace than what is needed for the EU to reach its climate goals and to secure leadership in the transformation. Authoritative bodies such as the Climate Advisory Board have highlighted that EU policies should prioritise the uptake of energy- and resource-efficient ZEVs.[1]

However, a shortfall of the regulation is that it is not designed to address the overall environmental performance of electric cars. All electric cars (as well as any other cars emitting no tailpipe CO2) are simply rated as zero emission. This means that large inefficient EVs are considered to have the same environmental performance as small EVs. For example, the Dacia Spring[2] with its 27 kWh battery, weighting a total of 1,000 kg and consuming 13 kWh per 100 km is rated the same way as the Audi Q8 e-tron[3] which has a significantly higher environmental, material and energy impact (114 kWh battery, 2,585 kg vehicle and 26 kWh/100km). Therefore, there is currently a regulatory gap on the environmental impact of ZEVs which needs addressing.

In the absence of harmonised EU environmental rules for EVs, Member States and companies are coming forward with their own rules. For example, the French government has added an environmental criteria to the EV subsidy where only EVs with a production footprint below a certain threshold can get the subsidy[4]. This is creating the risk of a fragmented regulatory approach across the EU, creating confusion, inefficiencies and disincentivising investments.

To address this gap, the EU needs to come forward with clear rules for rating the environmental performance of EVs which will provide a harmonised EU wide framework. Member states, companies and consumers can then use this to penalise, support, rate or compare different EV models based on their overall environmental impact.

The car CO2 law already requires the European Commission to carry out two assessments and methodologies related to the environmental impact of electric cars:

- Assess the impact of establishing minimum energy efficiency thresholds for electric vehicles (recital 19 and article 15[5]) by 2026.

[1] (European Scientific Advisory Board on Climate Change, 2024) Towards EU climate neutrality: Progress, policy gaps and opportunities
[2] EV-database, and Spritmonitor
[3] EV-database, and Spritmonitor
[4] (Transport & Environment, 2023) France's eco-bonus shows how we can promote cleaner made-in-Europe EVs
[5] Recital 19: *"In order to promote the uptake of vehicles that consume less energy, the Commission should investigate the impacts of setting minimum energy efficiency thresholds for new zero-emission passenger cars and light commercial vehicles placed on the Union market."*

- Adopt delegated acts laying down a common methodology for the assessment and the consistent data reporting of the full life-cycle CO2 emissions of passenger cars by the end of 2025. Based on this methodology, manufacturers may, on a voluntary basis, submit to the Commission the life-cycle CO2 emissions data for new passenger cars from June 2026.

Both these files will be on the agenda of the next European Commission after the 2024 EU election. In this briefing we will consider how the next European Commission should approach regulating the environmental performance of EVs and why it should take a broader view and set more comprehensive EU environmental rules on electric cars rather than just energy efficiency thresholds.

The proposed approach aims also at simplifying the complex approach on full lifecycle analysis of cars[6], considering readily available and opposable data, on a narrower scope covering a majority of the EV environmental impact (while being more focused) where important technical improvements are possible and need to be encouraged. Our approach is pragmatic, relies on a simple methodology, can be implemented rapidly and is impact oriented.

1.2 Growing importance of embedded emissions and vehicle/battery right-sizing or eco-design

As the automotive industry shifts towards selling only zero emission cars in Europe by 2035, the impact of vehicle size, aerodynamic performance (shape), weight and material footprint becomes increasingly important and discussed. With tailpipe emissions decreasing and electricity generation getting cleaner the importance of embedded or material emissions increases.

For electric cars, typically between 50% and 60% of life-cycle emissions are linked to vehicle production (EU average figures)[7], out of which batteries, steel and aluminium account for around 75%. For combustion cars, embedded emissions are closer to 10% of the total lifecycle emissions as they are dominated by tailpipe emissions from the combustion of fuel during the use phase.

Larger vehicles also contribute to increasing the relevance of embedded car emissions. Today, 54% of new vehicle sales are SUVs, compared to only 10% in 2010. This trend is making it harder to decarbonise vehicles as emissions savings from electric vehicles are partially offset by emissions caused by growing vehicle size. Indeed, the increasing share of SUVs has negative impacts on raw material usage, space

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Article 15: *"(...) The Commission shall also assess the impacts of establishing minimum energy efficiency thresholds for new zero-emission passenger cars and light commercial vehicles placed on the Union market."* (European Commission, 2023) Regulation on the CO2 emission performance

[6] Lifecycle analyses at the vehicle model are typically very complex, detailed, broad and costly; country specific data is required and it is very difficult to differentiate model versions.

[7] T&E EV LCA: transenv.eu/LCA. E.g. for a medium size BEV produced in 2022 and driven on the average EU electricity mix: production emissions are 10.7 tCO2 (4.7 for the battery + 6 for the rest of the vehicle) versus total lifecycle emissions of 18.9 tCO2 (excluding recycling), or 56.6%.

competition in cities and road safety. In the case of electric vehicles, this leads to larger batteries, with certain forecasts indicating an anticipated average battery capacity exceeding 70 kWh by 2030.

This has an impact on lifecycle emissions, but also on EV affordability given that large EVs are more expensive (and remain so on the second-hand market). Their dominance on the market negatively impacts lower-income groups and pose a great risk for the supply of affordable models on the second-hand market, where most consumers buy their cars. In previous studies, T&E and IDDRI have shown that small BEVs are economically feasible and are the most impactful solution to reduce consumption from battery raw materials[8]. BEUC and ICCT have also shown that BEVs with small or medium batteries are already the cheapest option for many consumers and do fit their daily needs in terms of range without a loss of comfort in charging needs[9].

As we move towards fully decarbonising the transport system, policymakers increasingly need to consider the wider decarbonisation of vehicle production and vehicle or battery right-sizing, as well as eco-design best practices (recycled material content, supply procurement, energy policies etc) and accurate information to consumers.

2. Objective for EV environmental score

With this proposal, T&E, IMT (IDDRI) and BEUC aim to provide a framework which favours the reduction of the environmental and climate impact of cars beyond tailpipe emissions. Our focus is twofold. Firstly, we want to decarbonise the production of EV components (e.g. steel, aluminium, batteries). Secondly, we want to make EVs more resource efficient, more rightly sized. Ultimately, this proposal will make electric cars fit for the all-electric future and the automotive industry a driver of green industry in Europe.

This approach is not limited to an environmental perspective, it also aims at promoting the best industrial practices in Europe and addressing the sovereignty challenges issues related to material demand.

As detailed in section 4, our proposal is for the EU to set common and harmonised rules, a vehicle "environmental-score", to compare and distinguish the environmental performance of electric cars. Along with better consumer information, this indicator could also be used to calculate average fleet environmental performance where carmakers or company fleets get an average "environmental-score" performance for the vehicles they sell or buy each year.

[8] (Transport & Environment, 2023) Clean and lean: Battery metals demand from electrifying cars, vans and buses. (IDDRI, 2023) Métaux critiques pour les batteries des véhicules électriques : comment maîtriser la demande

[9] (BEUC, 2022), Electric cars: cheaper, more sustainable, and long-lasting. (ICCT, 2024), The bigger the better? How battery size affects real-world energy consumption, cost of ownership, and life- cycle emissions of electric vehicles.

3. Why an efficiency metric alone is not enough

The car CO2 law requires the European Commission to assess the impacts of establishing minimum energy efficiency thresholds for electric vehicles[10]. At present, EU EV energy efficiency is only measured based on the energy used while driving a laboratory-based test cycle[11] and is reported in kWh/km. This covers the driving phase only and does not include vehicle production which accounts for much of EV emissions over their lifecycle.

Why vehicle efficiency is important

An approach of an environmental-score which includes energy efficiency presents multiple benefits. First it is simple as a limit could be set based on the efficiency measured at type-approval today and a parallel can easily be made by consumers with energy efficiency labels of household electrical appliances. Secondly, it would ensure that cars consume less energy in the use phase which is positive for car users as well as for the charging system and electricity grids as less energy is needed to travel the same distance. Finally, since the energy consumption of a vehicle is closely linked to its aerodynamics, energy efficiency requirements would likely drive the offer of vehicles with improved aerodynamics and less SUVs.

However, vehicle efficiency is not sufficient and should be complemented with embedded carbon emissions

Despite the benefits of an approach focused solely on vehicle energy efficiency is not sufficiently effective to holistically improve the environmental performance of EVs. Below we explain why an EV regulation on energy efficiency alone is not sufficient to achieve the objective of lowering the material and climate footprint of the future all electric car system.

The main drawback from relying only on energy efficiency for EVs is that the link between energy efficiency and the vehicle weight or battery size is weak. Hence, energy efficiency requirements have a limited impact on the weight of a vehicle and its battery size but also don't address the climate angle linked to embedded emissions (mostly linked to production, materials and the battery) - which are more pressing challenges than the energy consumed by the EV fleet.

As shown on the graph below, the correlation between battery size (on the x-axis) and energy consumption in the use phase (y-axis) is not very strong (high variance). The differences and spread in efficiency for EVs with a given battery size (e.g. 80 kWh) is significant. Conversely, there are EVs with the same energy consumption but have vastly different battery size. In other words, there are SUVs with 80 kWh batteries that are as efficient or even more efficient as sedans with 50 kWh or small 40 kWh BEV. Furthermore, the dotted trend line below shows that for every additional 20 kWh of battery (typical increase by a third), the consumption 'only' increases by 1 Wh/km (typically an increase of 5% of the consumption).

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[10] Recital 19 and article 15. (European Commission, 2023) Regulation on the CO2 emission performance standards for new passenger cars and new light commercial vehicles.
[11] Worldwide Harmonised Light Vehicle Test Procedure (WLTP)

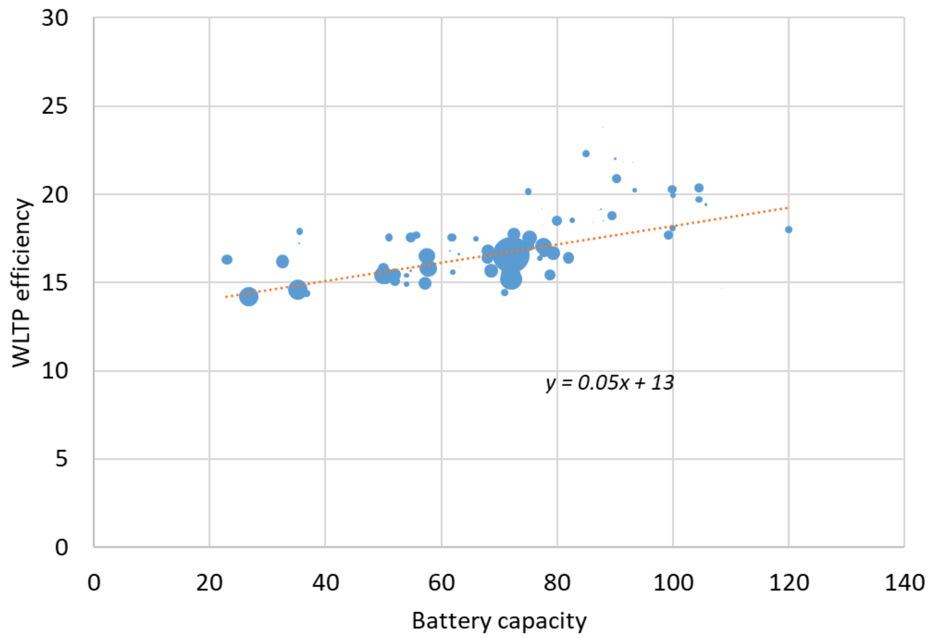
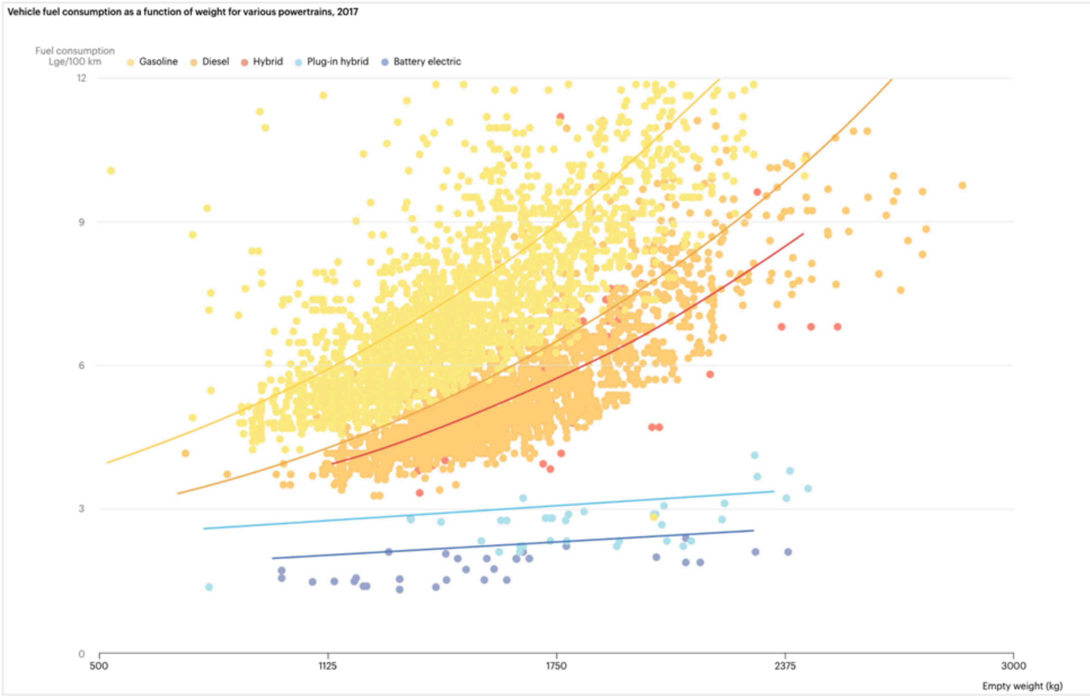


Figure: Energy efficiency and battery capacity of EV models sold in the EU

Similarly, the relationship between vehicle weight and energy efficiency is much less pronounced for EVs. The graph below shows this correlation for both EVs (dark blue) and ICE (yellow and orange) and clearly highlights that weight has a much lower impact on efficiency for BEVs than for ICEs. This is mainly due to the regenerative braking (which allows recovery of energy when decelerating or descending) and efficient motors[12].

[12] For EVs, 80%-90% of the energy is used to power the car, while only 20%-30% of the energy in the petrol is used to power the car



Notes: Lines show exponential correlation. The line gradients show that the dependency of fuel consumption on vehicle mass is much lower for electrified vehicles. The flatter the line, the lower the dependency. Fuel consumption has been normalised across test cycles. Source: IEA analysis based on IHS Markit (2018).

Finally, it should be noted that energy efficiency performance indicators could favour large cars: indeed a long car usually has better aerodynamics than a small one[13] and larger cars which are typically more expensive cars usually have better quality electric and mechanical components that are also more efficient. One example is the very efficient Mercedes-Benz's VISION EQXX which has a 100 kWh battery pack, weighs 1,800 kg, is 5 metres long but reaches a very low energy consumption of 8.3 kWh/100 km.

If the EU regulates only energy efficiency through threshold values (not to exceed), which are likely to be chosen in the upper end of the spectrum to discriminate only the worst performers, there could be perverse effects which result in no shift in the sales from large cars with good and expensive energy management system (also easier to have low aerodynamic drag coefficient Cx), but penalise small affordable EV cars (shorter, lighter, with a reduced climate and material impact over its life lifecycle, but with less aerodynamic performance to maintain roominess for passenger and families), as well as less sophisticated energy management system or aerodynamic boost rather costly features.

Moreover, to a large extent, EV efficiency improvements are driven by the market and competition as EV manufacturers compete on the range of the vehicle models as they seek to increase the range of their models by either improving the efficiency or increasing the battery size.

[13] A sphere has a lower drag coefficient than an ellipsoid, and a shorter ellipsoid more drag than a longer one as air has more time to adjust its laminar movement

In other words, a BEV efficiency approach is not effective to reduce the increase in the average weight, improve resource efficiency of cars or drive towards smaller batteries and better overall carbon footprint.

As a result, new EU environmental rules on EVs need to strike a compromise between material, climate and energy impacts by covering battery and vehicle production, in addition to the vehicle energy efficiency.

4. The proposed methodological approach

4.1 Environmental-score combining efficiency and climate production footprint

The proposed approach is to design the metric as a score covering both the energy efficiency of the vehicle (use phase) as well as the hotspots for the carbon footprint at the production.

As we switch to EVs, it becomes crucial to also address the climate impact of embedded emissions. Indeed around 50%-60% of electric car life-cycle emissions are typically linked to the production of the vehicle for the EU (versus 10% for combustion cars), with batteries, steel, and aluminium accounting for around 70% of these embedded emissions[14]. We suggest keeping vehicle energy efficiency in the metric because 1) assessing energy efficiency requirements is part of the work that the upcoming European Commission has to carry out; 2) energy efficiency requirements, when designed correctly, are effective to improve aerodynamics, hence addressing the growing SUV issue.

[14] 70% based on data from Polestar (Polestar and Rivian pathway report, Supported by Kearney), 76% for the Volvo EX30 (Carbon footprint report, Volvo EX30), and around 70%-75% for the Renautl Zoe (Analyse de cycle de vie comparative nouvelle Zoe & Clio V, Renault, January 2021)

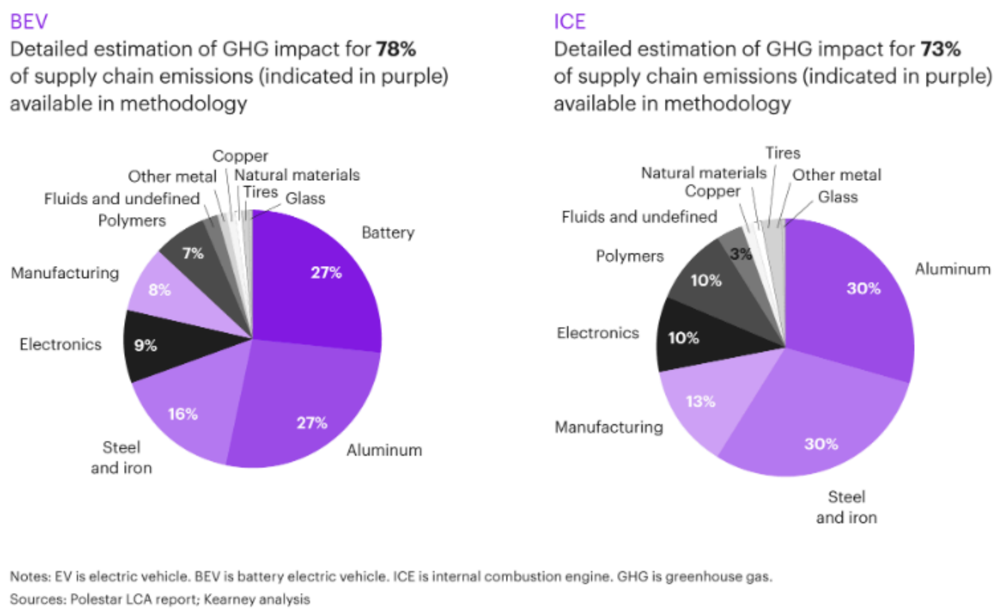


Figure: Breakdown of embedded carbon footprint Ev vs. ICE, Polestar

The proposed environmental-score combines both the vehicle energy efficiency (in kWh/km) with the combined carbon footprint of the EV battery, the steel and the aluminium embedded in the production of the vehicle (in kgCO2).

<u>*Environmental score =*</u> *energy efficiency (kWh/km) * total carbon footprint of the battery, steel and aluminium (kgCO2)*

In this briefing, the proposed approach is to multiply the energy efficiency value with the carbon footprint value. However, an alternative approach could be to do an addition instead of a multiplication by adding a sub-score for the energy efficiency with a sub-score for the production carbon footprint. The multiplicative approach has the benefit of avoiding complex and arbitrary discussions on the weighting and scoring factors, and thus being simpler. An addition would allow to introduce more parameters in the environmental score, such as reparability, recycled content but this would require defining the weight of each term in the calculation, which we believe is complicated and should be constantly reviewed to take into consideration progress or regulatory evolution on each parameter. Nonetheless this specific point could require further discussion and analysis to compare and decide on the best approach.

The European Commission should be tasked to develop the methodology (see recommendations in Section 4.3) which should at the minimum ensure the following:

- Energy efficiency: should be based on real-world usage data extracted from on-board fuel consumption monitoring (OBFCM) devices as soon as possible (the use of OBFCM for EVs will be discussed as part of Euro 7 implementing legislation).
- Carbon footprint of materials: The methodology should be as accurate as possible considering firstly (as default) generic values and secondly the possibility for companies to declare better

performances (which should be verified and enforceable) in order to capture efforts and improvements. In particular for electricity, close temporal and geographic correlation between use and production should be required to ensure additionality (typically via Power Purchase Agreements, or PPAs).

Given the complexity of developing the details of such methodologies, the European Commission is the right body to undertake such exercise in a coordinated and concerted manner with relevant stakeholders.

4.2 Example

In this subsection we provide an illustrative example with 4 different archetypical EV models based on the multiplicative approach (as opposed to the additive approach). The first two models are produced in Europe: one is a large EV with a big battery, the second one is a small EV with a small battery. Similarly, the other 2 models have the same characteristics but are built in China.

In this example, the small European EV has an environmental-score around 700[15], the small BEV produced in China, around 1,200, the large EV produced in Europe 1,300 and finally the large EV produced in China around 2,200. This shows that the environmental-scores vary significantly across the different archetypical EV models and manufacturing locations.

The environmental performance, as indicated by the environmental-scores, reflects not only the size of the vehicles and battery capacity but also the production methods, material procurement (sourcing and processing conditions/localization and recycled content) as well as regional factors. These variations emphasise the importance of considering multiple factors when assessing the overall environmental impact of electric vehicles, and highlight the potential environmental benefits from European production, from right sizing vehicles but also for advancements in clean technology (e.g. the use of green steel and green aluminium, not shown in the infographic below) to improve the environmental-score further enhance the sustainability of electric mobility.

[15] The unit is kgCO2e.kWh/km

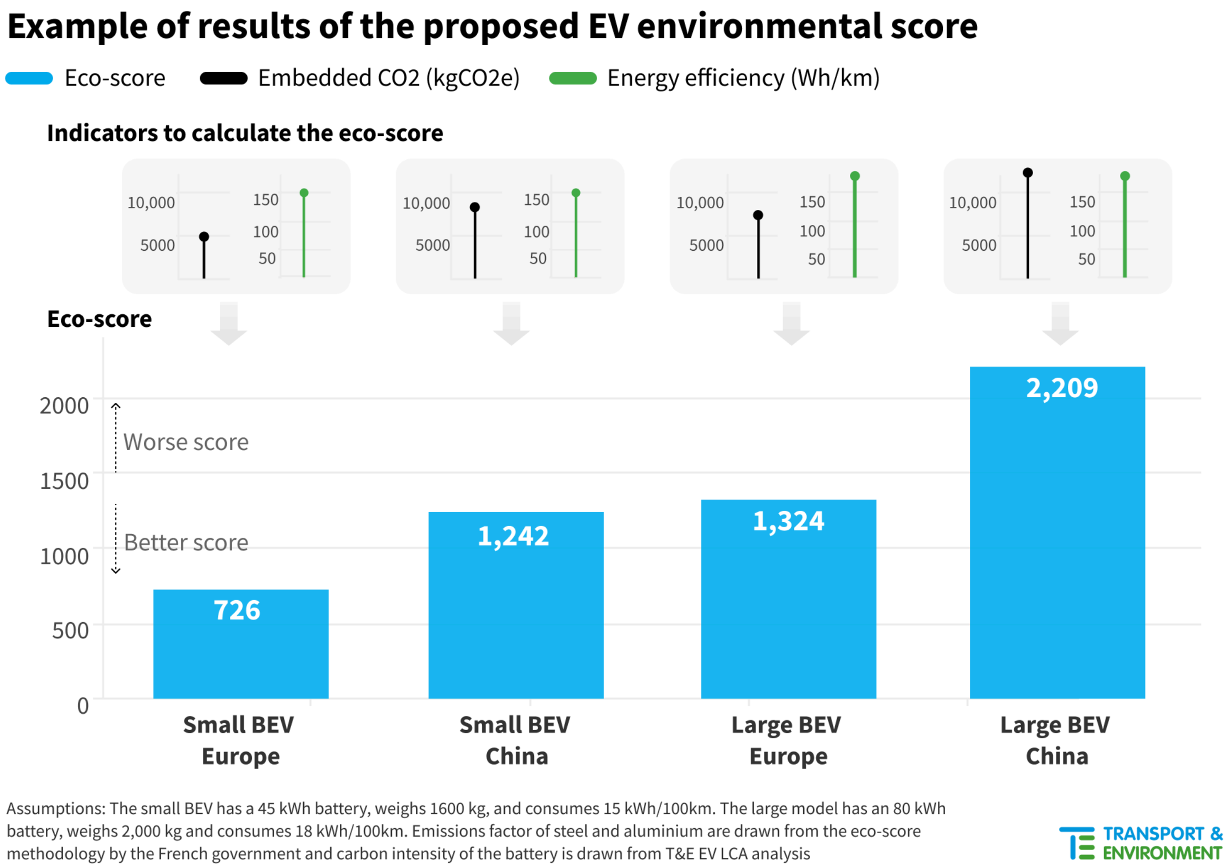


Figure: Results of T&E's proposed EV environmental score

Assumptions: The small BEV has a 45 kWh battery, weighs 1600 kg, and consumes 15 kWh/100km (similar model to a Citroen eC3 and Peugeot e208). The large model has an 80 kWh battery, weighs 2,000 kg and consumes 18 kWh/100km (similar to Tesla Model Y long range). Emissions factor of steel and aluminium are drawn from the methodology put in place by the French government for assessing the carbon footprint of EVs (steel: Europe at 1.4 tCO2/t of steel, China at 2.0 tCO2/t of steel; aluminium: Europe at 8.6 tCO2/t of aluminium, China at 20.0 tCO2/t of aluminium[16]). The carbon intensity of the battery is drawn from T&E EV LCA analysis (55 kgCO2/kWh in Europe and 81 kg/kWh in China, in 2030).

If the overall carbon footprint of the materials used is halved (e.g. with the use of low carbon steel and aluminium and low carbon batteries), then the environmental score would be halved as well. In this case the small BEVs would score 363, and 621 for Europe and China respectively, and for large BEVs the score would be 662 and 1105 respectively.

Although this methodology is designed to rate and compare EVs, for labelling and comparative purposes, all drivetrains should also have an environmental score rating. ICEs (including hybrids and PHEVs) should

[16] In the proposed methodology, CBAM methodology would be used for reporting (average emissions factors are not currently provided by the CBAM methodology). In the absence of reliable forecast for average emissions factors in 2030, we use the current values from the French government methodology.

in all cases be rated and labelled as having higher environmental impacts given their considerable climate impact.

4.3 How the environmental score could be used

First, we call the next European Commission to have the full methodology for the harmonised EU EV environmental score finalised by the end of 2026 alongside with the monitoring and reporting system. The information should be public for all vehicle models. To achieve this the next European Commission should take the following steps once in office:

- Year 1: Develop the environmental-score methodology.
- Year 2: Develop the monitoring and reporting methodology with a clear calendar for introduction and clear guidelines for how the score can be used.

The rules could be used across the EU for multiple purposes:

- Consumer information, in particular the Car Labelling Directive which is expected to be reviewed in 2024-2025 (after being delayed multiple times). Other options include the Green Claims Directive or the future Environmental Vehicle Passport.
- National fiscality: EV subsidies, vehicle taxation (registration, purchase, circulation, benefit-in-kind, business tax deductions etc.).
- Fleet requirements: as part of corporate fleet targets at national level (e.g. corporate fleet targets in France or the possible EU Greening Corporate Fleet initiative).
- Fiscality at city level with circulation or parking charges.
- Tenders: as part of the Clean Vehicle Directive or any vehicles tenders from public authorities.
- Carmaker EU fleet average requirements.

It is important that this environmental score acts as a response to Member State's individual initiatives to set environmental criterias in their taxation and subsidy schemes (e.g. see the French eco-design rules). An EU harmonised methodology would prevent individual member states from setting their own diverging environmental criteria to condition EV purchasing or EV incentives. Furthermore the rules can start to be used to communicate the environmental performance to consumers.

Why individual thresholds are not the most effective to drive changes in the market

Although the car CO_2 regulation refers to efficiency thresholds, which are a cap on individual vehicle performance to exclude the worst performing vehicles, it should be noted that such an approach is not sufficiently effective to achieve the objective set above. Thresholds or individual vehicle requirements would set a high cap (e.g. 0.2 kWh/km for energy efficiency) which would only lead to efficiency improvements at the margins (i.e. from the niche worst performing EVs) without leading to improvements in the overall market. In the case of a weak efficiency threshold, it is likely that the impact on the EV market would be negligible given the few very inefficient models above the threshold would be easily improved and this improvement would be mostly driven by market technological progress in any case.

4.4 Discussion

Below, we explore further, the many benefits of the environmental-score methodology and approach:

- **Effectiveness and fair competition:** The proposed environmental-score introduces a dynamic approach to improving vehicle environmental performance by addressing simultaneously the energy, material, and climate facets for EVs. By setting new harmonised score criteria or targets it allows OEMs to compete and strive for the highest environmental-score and encourages a race to the top, fostering healthy and fair competition among OEMs to improve their products.
- **Comprehensiveness:** The proposed environmental-score represents a significant advancement by transcending the limitations of focusing solely on energy efficiency but rather extending to carbon footprint and resource efficiency which are important considerations in the EU's electrification transition. Recognizing that environmental performance involves multiple parameters, this metric provides a more holistic evaluation of electric vehicles.
- **Consumer-friendly:** Such new rules create a competitive and transparent market signal which can empower consumers to make environmentally informed choices. Since it is based on the most environmentally impactful parameters, (i.e., battery and key vehicle materials) it would help address some of the perceived environmental challenges linked to EVs by providing environmental guarantees and easy-to-understand criterias.
- **Flexibility for OEM compliance:** One notable benefit from this approach lies in the flexibility it offers OEMs to comply. It allows OEMs to tailor their compliance strategies and decide on the trade-offs to make in vehicle design in the most cost effective and competitive way. For example, carmakers could prioritise decarbonisation of embedded emissions (e.g. green steel and batteries) or decide to reduce the average size of their models. Such flexibility promotes innovation and accommodates different industry approaches.
- **Alignment with existing regulations:** this approach ensures coherence in regulatory frameworks by aligning with the existing carbon footprint metric from the EU battery regulation as well as relying on the EU CBAM carbon footprint methodology for steel and aluminium. This not only streamlines compliance for OEMs but also contributes to a harmonised and standardised approach across the EU.
- **Green industrial policy tool:** In the context of Chinese EVs' competition in the EU market, the environmental-score can serve as a green industrial policy tool as it would leverage the power of the automotive sector to act as a lead market to scale up green steel, green aluminium and clean materials manufacturing[17]. By covering the carbon footprint of vehicle production beyond batteries, it indirectly supports European EV production which benefits from cleaner steel and aluminium production.

[17] The automotive sector consumes 17% of the steel in Europe. (Eurofer, 2023) European Steel Figure 2023

- **Scope covering all ZEVs:** although the focus of this briefing is electric cars, the proposed approach should also cover other ZEVs like fuel cell hydrogen cars to ensure a technology neutral approach and avoid creating any market distortion. In that case the embedded carbon from the EV battery is replaced with the embedded carbon from the fuel cell system and the efficiency should also account for tank to wheel efficiencies.
- **Affordability:** This environmental score would not harm EV affordability given the primary driver to improve the environmental score would be to reduce the overall quantity of steel, aluminium, and batteries, which would come with important cost reductions. The score would encourage smaller EVs, which are necessary to make the transition toward EVs more inclusive and are the best fit for the daily trips of most consumer groups. Indeed, the environmental score would provide added value to smaller vehicles (through labelling or targeted fiscal measures) thus encouraging demand for these models and improving their profitability. Additionally, efficiency improvements are beneficial, as it would mitigate the trend of inefficient and highly priced SUVs. Finally, the premium to decarbonise the production of EV is expected to be limited. Indeed, BEUC shows that despite these higher decarbonisation costs that could be passed on to consumers, net zero EVs will still provide significant savings to consumers[18].
- **Modular and adjustable metric:** Tweaks can be made to adjust (e.g. increase or decrease) the relevance of a given parameter. For example, the energy efficiency could be complemented by a 'scaling factor' to scale its importance via a bonus or malus.
- **Future proof regarding evolving technologies and materials:** The environmental-score, while focusing on emissions hotspots, should remain adaptable to evolving technologies and materials and aim to cover an increasing share of the total embedded carbon (e.g. up to 90%). As new materials and production methods emerge, careful monitoring and adjustments may be required to ensure the metric's continued relevance and effectiveness. For example, it is possible that carmakers shift to substitute steel and aluminium with other lighter materials, such as plastics and carbon fibre composites[19]. We suggest that the embedded emissions of plastics and carbon fibre composites should be added to the calculation as a next step. Similarly, we recommend extending the methodology to cover the motor and tyres.
- **Lifecyle analysis is not fit for purpose:** Lifecycle information of vehicles is important to inform decisions but given the complexity of the method, it is only possible to use lifecycle analysis for generic car evaluations (e.g. see T&E's EV LCA analysis: transenv.eu/LCA) rather than directly comparing and rating different models. The EV environmental score has the benefit to be simple and applicable, based on accessible data linked to the vehicle characteristics that are in the control of the carmaker[20]. The European Commission is expected to present a methodology to

[18] (BEUC, 2022) Electric cars: cheaper, more sustainable, and long-lasting
[19] I.e. carbon fibre-reinforced plastic. Argonne National Laboratory (2006) Development and Applications of GREET 2.7 — The Transportation Vehicle-Cycle Model
[20] One of the main differences between the EV environmental score and LCA analysis is the fact that the carbon intensity of the fuel used by the car is not included. This is because, carmakers don't have any control over the fuel used (e.g. the carbon intensity of the electricity used), and carbon intensity of fuels are covered by separate regulations (e.g. grid decarbonisation is progressing rapidly driven by the uptake of cheaper renewables and the EU ETS carbon price.

calculate the lifecycle emissions of different transport modes in the next two years[21] and should look at this scoring method as a way to implement the delegated act in a simple, pragmatic, and realistic way. Already in 2020, the European Commission had tasked Ricardo to establish a methodology for vehicle LCA, and came to the conclusion that LCA was not a feasible, effective, or realistic option for rating vehicles at the individual model level.

- **Simplification of regulatory initiatives and reporting obligations:** Under the current car CO2 regulation, the European Commission has to consider setting requirements on electric vehicle efficiency while at the same time it has to develop a methodology for full lifecycle analysis of cars and vans. Instead of moving forward with these different requirements, we recommend simplifying and merging these initiatives by only focusing on the more pragmatic and applicable EV score presented here. This is justified by 1) the high complexity of developing a LCA methodology at the level of individual models, 2) the burden it would impose on the European Commission to monitor, track, and verify the use of such methodology, as well as, 3) the very important burden it would place on carmakers which would have to maps and report on the details of their supply chains. Moreover, the score could replace and streamline individual future requirements on the carbon footprint of the different components (e.g. battery carbon footprint requirements, or potential green steel or green aluminium requirements).
- **Balancing political feasibility and achievability:** Striking the right balance between political feasibility and achievability is crucial, especially in a context of reduced appetite for environmental regulations. The environmental-score should not impose unrealistic demands on OEMs, ensuring that the standards set are both environmentally impactful and attainable within the industry's current capabilities. The implementation strategy should aim for clarity and simplicity, minimising confusion for both manufacturers and consumers. Furthermore, the regulation should not impede the uptake of EVs by adding barriers or making EVs less attractive or unreasonably more expensive, especially in countries where the EV market has not yet reached maturity.
- **The right tool for Green Deal implementation:** Through this initiative, EU institutions could show their consistency when addressing the systemic energy transition. By introducing such a comprehensive tool, they could show their will to guarantee a successful implementation of the Green Deal and the ICE phase out, notably on the environmental, social, industrial and sovereignty aspects. Plus, today, the industry needs long-term certainty and visibility, therefore, providing an early signal regarding the desired all-electric future and the direction that the industry and the economy needs to take would be beneficial.

[21] (European Parliament, 2024). Press release. Getting rid of different methods to count transport emissions

Further information

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