Levegő Munkacsoport

Contradictions in the evaluation of EU funding for road construction

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Whether it is worth building a new road (or widening an existing one) should be decided by careful analysis. To this end, EU-funded road investments should be preceded by a cost-benefit analysis. Such analyses are usually based on the pertinent EU guides. However, it is questionable whether this is the best basis for making the best possible decision. It is also of serious concern that these guides are often 'creatively' interpreted by the individuals and institutions responsible for the investments.

Photo by András Lukács

The cost-benefit analysis (CBA) of EU-funded road projects is usually based on the European Commission's Guide to Cost-Benefit Analysis of Investment Projects (for the financial period 2014-2020) and the Economic Appraisal Vademecum (for the period 2021-2027), hereinafter referred to as the Guides. In this paper, we provide a short critical assessment of the Guides.

The first immediate question is whether the envisaged road needs to be built at all. EU subsidies, although substantial, are not infinite. At some point they are exhausted, meaning that the limited amount of funding should be used to the best effect. It is even more accurate to use the term 'invested' here, as these projects are in fact investments in the socio-economic development of the given country. Although the Guides generally state that the best possible area to spend EU funds should be sought out, in practice, this is almost never carried out (for example, it is possible that the given amount would be better spent on education or health care instead of building a new road). The Guides also explicitly prescribe that when carrying out a cost-benefit analysis of a road project, the possibility of developing alternative *modes* of transport (e.g. rail) should also be examined. Nevertheless, this wording of the Guides is often (and in some member states almost always) interpreted as meaning that only the various possible *routes* of the planned road should be examined and compared...

The Guides go even further, stating that opportunities to influence demand with appropriate pricing should also be explored. Pricing should be based on marginal social costs and should incorporate externalities in line with the polluter pays principle (as the construction of a road has significant environmental impacts and externalities). These externalities may include cutting down forests, demolishing buildings, as well as disrupting communities and ecosystems. Real-life cost-benefit analyses, sadly, hardly ever examine the possibilities of influencing demand.

One of the important factors in CBAs is the forecasting of demand. However, if the prices are lower than the costs (among others, because the externalities are not included), then the demand models will forecast a higher (in many cases, a much higher) demand than if the true costs would have to be paid by the road users.

When preparing a road project, we should also ask whether and to what extent the investment will have returns. Will it produce positive returns over the longer term, and if so, how much? Will investors be attracted to the areas to be developed, or would the investments rather enable people to *commute away* to more developed areas, sucking skilled labour away from less developed areas? The answer is far from trivial.

In addition, it is not enough to calculate the amount of the one-off investment, as infrastructure also comes with maintenance, conservation and running costs. We need to take these into account. Who should pay for this? The national or local budget? The road users? The inhabitants of the area where the road was built? Again, the dilemma is not trivial.

Distributional effects

But it does not end here. Estimated impacts do not affect everyone in the same way. It is therefore also worth considering their distributional effects. For example, a new motorway is more useful for those who have a car and can pay the toll. The more they can take advantage of it, the more benefit it brings them. In this sense, we can talk about a regressive

distributional effect, where the richer someone is, the more the new developments benefit them. Or we can also talk about a progressive distributional effect, in case the new developments benefit those who had initially been less well off.

The inclusion of distributional effects also highlights how distorted the simple cost-benefit analysis approach of broadly monetising all benefits and drawbacks can be. One such distortion is the so-called *income-time effect*: for higher-income earners, time savings imply greater income benefits. Simply put: they are able to earn more money in the same amount of time saved. Thus, infrastructure improvements that benefit high-income earners, expanding their opportunities and reach, are shown to be of higher benefit in an unreflective, simple cost-benefit analysis. (The Swedish economist Gunnar Myrdal was awarded the Nobel Prize in 1974 for his explanation of this so-called *circular cumulative causality*.)

A similar distortionary effect is also caused by the fact that different social groups already show very different patterns of use at the outset. For example, rich people with good cars are far over-represented on motorways, while those without cars in local public transport. The rich can thus much more easily afford faster journeys and can cover longer distances in the same time. Since the poor cannot pay for this, they are effectively trapped in a smaller accessible geographical space by the slower modes of travel. Thus, if we were to start from the basis of who would benefit more and who would benefit less from a 'development' based on current infrastructure use patterns, such distortions would be included in the calculations from the very beginning. Instead, it would be more appropriate to consider the potential use of a more ideal system (e.g., a high-quality rail system would potentially also induce wealthier people to switch to the train from the highway). Although the Guides state that distributional impacts should be taken into account in cost-benefit analyses, this is not usually done.

The *network effect* also plays a part. With a better-developed network, the CBA often shows that the return on investment for each new developmental element is greater since it makes available the connective elements of an entire network. In the case of a network that has not yet been elaborated, these benefits will obviously not be realised. Again, this effect reinforces that a simple, unreflective CBA favours those already in a better position. For example, the CBA might conclude that a new network element in a well-developed metropolitan transport network has a higher return than in a small rural town where the initial steps of the network have yet to be established. However, in reality, the first roads are the most valuable, while enlarging road capacity in a mature network is not very useful in most cases. The law of diminishing returns applies also to road networks, and thus, the last widening in a well-developed network leads only to a marginal improvement, if at all. Moreover, if such investments are preferred, a new network will never get off the ground.

How should we measure the benefits?

The problem is compounded by the fact that the measurement of benefits is not clear. The primary function of a road is obviously to improve transport and transport facilities. However, this can also be measured in several ways. One obvious way is the reduction in travel time: getting from point A to point B faster. But this is only the benefit in terms of a single trip. In principle, this can reduce the burden on the environment, as shorter journeys mean lower emissions. However, even this is not self-evident, as emissions are also speed-dependent: higher than optimal speeds increase pollution. If the commuting time is reduced by the shorter length of the road rather than its quality, the claim holds better. In principle, the

environmental impact of a journey can be reduced because a shorter journey results in lower emissions. Motorways, however, tempt you to drive faster, which in turn increases consumption and therefore emissions.

This is still not the final picture. What is true for a single trip is not necessarily true for the aggregate. Indeed, it has been observed that easier access means people will use this alternative more often. Thus, in aggregate, the effect of building a new road will be that more people will travel more frequently than before. In other words, what is saved in terms of time and distance on a single trip is more than lost once the total number of trips is taken into account.

Since "time-savings" are often the dominant benefit (in some cases, up to 90% of the total benefit) resulting in transport CBAs, it is of utmost importance to reconsider its real role in CBAs and modify it accordingly in the Guides.

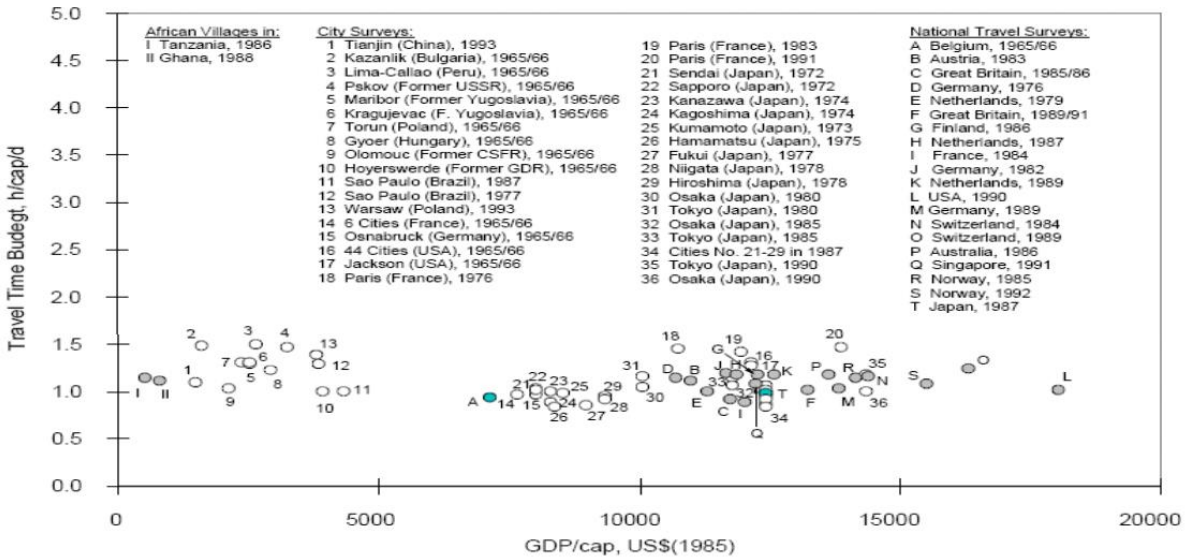
Increased demand

A good example of the induced demand referred to above is the case of road widening. Drivers in the city complain that there is constant congestion. City authorities respond by broadening the road and creating new lanes. However, this in turn creates extra capacity that allows more motorists to use the expanded lanes. The end result is that you soon have bigger congestion, with more cars. In other words, you end up with a greater environmental burden as a result of a development that was originally designed to solve a bottleneck. Experience shows that this is almost always the actual real-life effect. It is not surprising that decreasing rather than increasing throughput (the number of lanes and their width) is now the dominant trend in more developed countries.

There is a simple reason why the construction of a new road or the widening of an existing one creates new traffic that had not existed before: the price influences demand. If the price is low, i.e. if we can travel along a road at little cost and in a relatively short time (remember: time is money!), we will make use of it. If, on the other hand, the cost (also in terms of time) of getting somewhere increases, for example, because of congestion or road closures, then demand will decrease and fewer people will use the road.

There is ample literature showing that increasing transport capacity (expanding existing roads, building new roads) does not save any time at the level of society as a whole (mainly because of the aforementioned induced traffic effect), and even requires extra time. (See for example John Whitelegg's 1993 study 'Transport for a Sustainable Future: The Case For Europe' or Arie Bleijenberg's 2022 article. Further literature on this subject can be found by searching the internet for the terms "induced traffic" and "generated traffic".)

It has also been found that people around the world always spend roughly the same amount of time travelling each day on average (this is the so-called Marchetti constant). In this respect, a less developed country is no different from a more developed one. What is different is the distance travelled. Thus, increasing transport capacity increases the distance travelled, while the time spent travelling remains the same!



The average time spent by a person per day on transport (vertical axis) is practically the same everywhere in the world and does not depend on income (horizontal axis) or historical period. This time is about 1.1 hours. (Source: European Conference of Ministers of Transport, 1977, referred to in a study by TRANSvisions.) A more recent survey on the topic, described in the paper 'Regularities in Travel Demand: An International Perspective' in the year 2000 by Andreas Schafer from the Massachusetts Institute of Technology, comes to the same conclusion. It is also worth reading the study 'The transport-urbanisation dialectic' by Arie Blejenberg.)

A recent study by the Austrian Environmental Protection Agency came to the same conclusion:

"… the reduction of travel time is a comparatively short-term phenomenon, which is explained by the "constant travel time budget": As early as 1979, the hypothesis was developed that the travel time budget in cities all over the world is or was almost identical at different points in time (Zahavi Y. 1979). This hypothesis was empirically verified several times in the following years and decades and the constant travel time budget was quantified to 60 to 90 minutes per day (Marchetti, C. 1994), (Noland, R.B. 2000), (Metz, D.2008), (Litman, T. 2010).

Short-term travel time gains as a result of the constructing a new high-ranking transport infrastructure are compensated for in the medium term. This usually happens because either new destinations are reached at a greater distance (e.g. shopping centres on the outskirts or workplaces in the neighbouring district) or a greater distance from the source is accepted (homes in the countryside with the consequence of progressive urban sprawl).

It can thus be stated that as a result of the construction of high-ranking road transport infrastructure

- *only short-term travel time gains occur,*
- *the average trip lengths are steadily increasing, and*
- *a possible relief of the lower-ranking traffic network results in more or less pronounced additional traffic, so-called induced traffic, in the overall traffic network.*

These responses in the transport system mean that GHG emissions from the transport sector will continue to increase as infrastructure is developed."

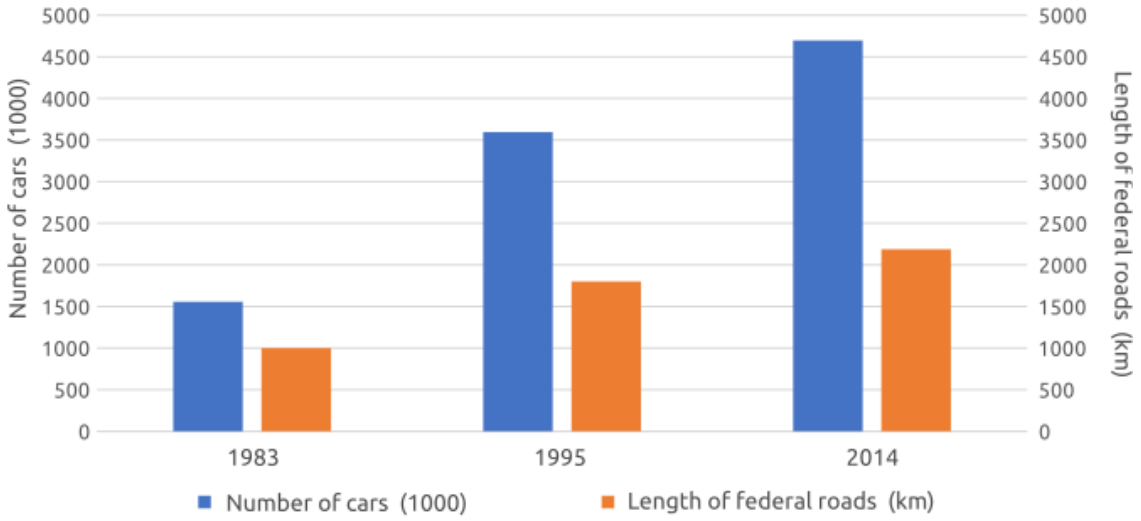


Figure 2: Number of cars and length of federal roads in 1983, 1995 and 2013/2014 in Austria

As shown in Figure 2, the number of passenger cars in Austria more than tripled between 1983 and 2014, from 1.6 million to 4.7 million, and the length of federal motorways (Bundesstraßen) more than doubled, from 1,000 to 2,200 kilometres. The length of local roads increased even more significantly by 25% just between 2008 and 2014, from 71,000 to 89,000 kilometres (no data available for earlier years). Despite all this (or rather because of it?), between 1983 and 2014 the time spent on transport per person increased by 4% on average! What has increased much more is the length of kilometres travelled: by an average of 64% per person (see Figure 3).

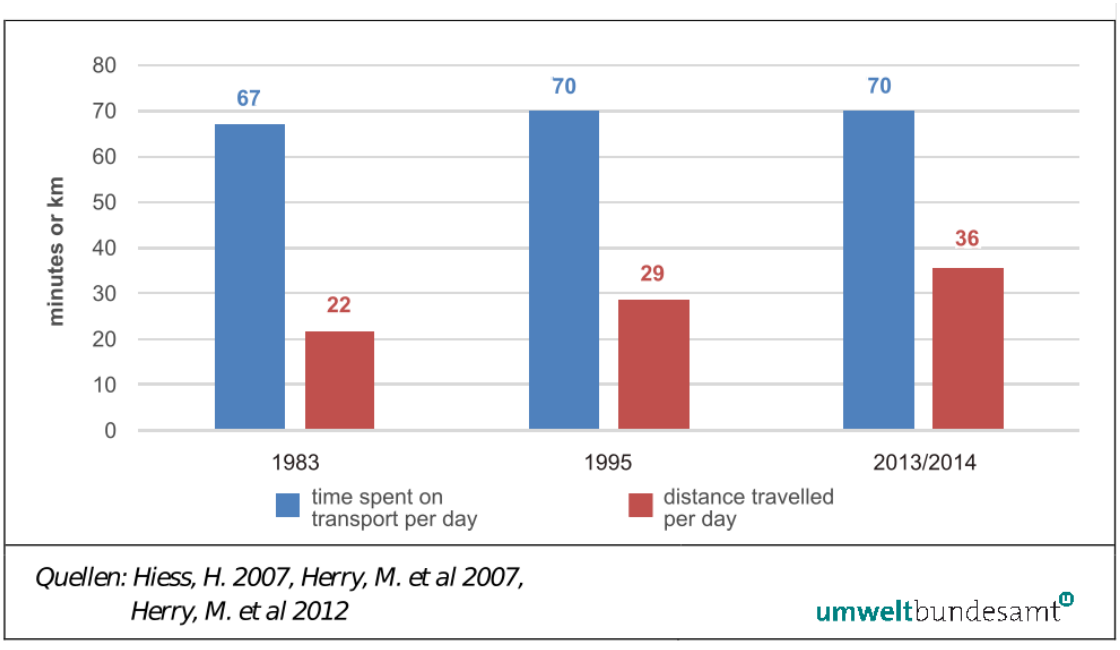


Figure 3: The time spent on transport and the distance travelled per day per person in 1983, 1995 and 2013/2014 in Austria

A similar process was observed in Hungary. Between 1986 and 2010, the number of cars increased by 94% (from 1.5 million to almost 3 million), the length of motorways increased by 268% (from 302 to 1 110 kilometres) (Figure 4), and many other roads were built, and during the same period, the average daily time spent in traffic increased by 6.5%, from 62 to 66 minutes (Figure 5).

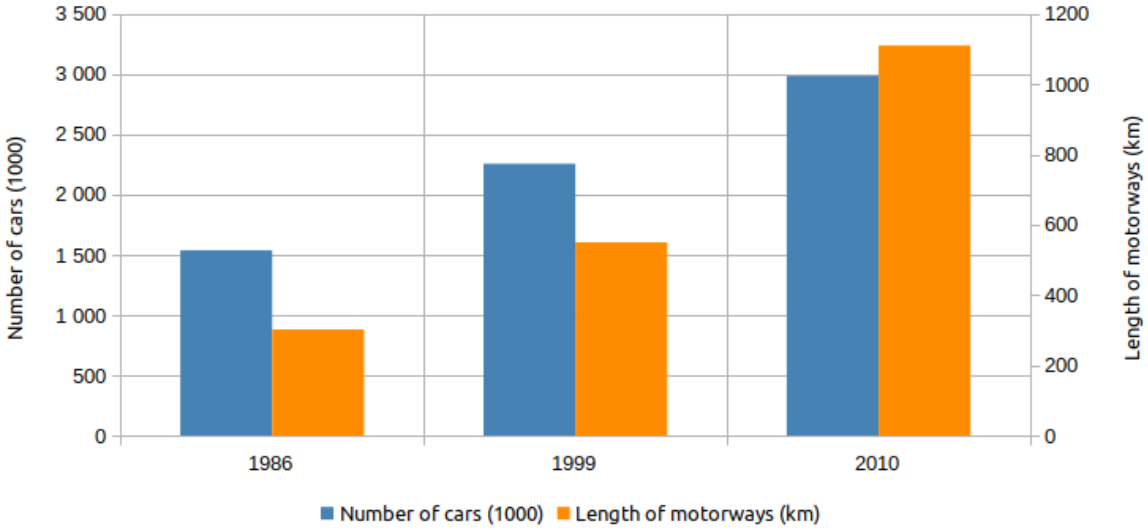


Figure 4: Number of cars and length of motorways in 1986, 1999 and 2010 in Hungary

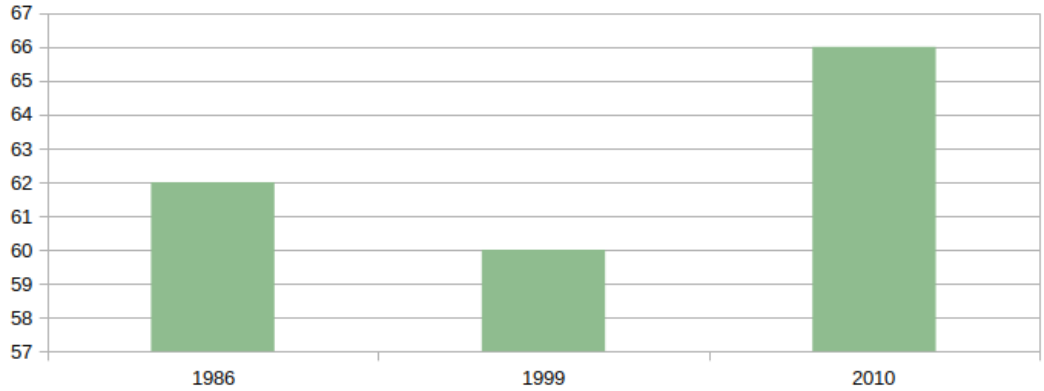


Figure 5: The time spent on transport per day per person in in 1986, 1999 and 2010 in Hungary

According to information received from Deutsche Umwelthilfe (DUH), in Germany, too, 90% of the benefits in the CBA of road constructions is from “time saving”.

Not calculating with the existence of induced demand also leads to wrong assumptions in the CBA concerning road accidents. According to the methodology described in the Guides, the construction of a new motorway reduces the number of personal injury collisions (PICs). This assumption is based on the number of PICs per vehicle-kilometre. However, as mentioned above, the new road will result in more traffic (both on the new road and on the roads leading to it), and the increased traffic, together with the fact that vehicles travel much faster on motorways than on other roads, will result in more accidents in absolute terms. This is supported by data from Hungary: in 2018, 9.7% of fatal accidents occurred on motorways, which account for 0.7% of the country's total road length, so on this basis motorways are 15 times more dangerous than the average for roads of lower rank.

Time pollution

The growth in motorisation (boosted, among others, by new road investment) increases travel time in other ways, too: people have to work more to earn the money to travel. This time should therefore also be taken into account in people's transport time balance! In the case of car travel, for example, all the time spent on buying, using and maintaining a car (including time spent on activities such as repairing the car) should be added to the overall travel time. The most significant element of this time is the time spent earning the money needed to drive. Dividing the distance travelled by the total time spent in this way gives us the so-called social speed of the journey. Calculated in this way, the social speed of car use is equivalent to that of walking and is generally much lower than that of cycling.

The social speed of motoring was highlighted by Ivan Illich in his brilliant book *Toward a History of Needs*, published in 1978. Illich calculated at the time that the social speed of motoring in the United States of America was about 8 kilometres per hour. This calculation did not include the costs and losses due to environmental and health damage. Taking the latter into account, as well as the current income and price situation in an upper middle-income country like Hungary, the social speed of motoring is barely the speed of a pedestrian. It follows that, by expanding the road network, we are losing time and, with it, speed at the societal level.

Behavioural-economic biases

In addition to the above, many of the biases that the discipline of behavioural economics has identified in recent decades often occur during planning. The following are examples of these, following Bent Flyvbjerg's study:

- *Strategic misrepresentation*: information about a project is deliberately distorted, for example for political reasons.
- *Optimistic bias*: the potential outcome of a project is deliberately painted too rosy.
- *Uniqueness as a distortion*: a project is presented as unique, not comparable to anything else.
- *Over-confidence*: the planner believes too strongly in his or her own value judgements and vision.
- *Hindsight bias*: the tendency to evaluate events that have already happened as having happened because they did.
- *Retrievability bias*: we take more marked account of experiences that are easier to recall from memory.
- *Ignoring the baseline effect*: we ignore the initial situation and focus instead on partial developments.
- *Anchoring effect*: our perception of a broader indicator is constrained to a narrower field by known specific information, as opposed to the broader potential of the unknown.
- *Escalation of exposure*: our previous exposure leads us to make further commitments in the same direction, even though what would rationally be needed would be a diversification of our exposures.

In our times, in the age of the global environmental crisis, any investment that would further degrade the environment must be abandoned. This principle should not be overridden by

narrow economic interests. However, as can be deduced from the above, the construction of roads in the current circumstances is often irrational even from a broader economic point of view.

Nevertheless, if the construction of a new road might seem to have more environmental benefits than harm, then the following factors should also be taken into account:

- The monetisation of time-savings should be excluded from the economic appraisal of road infrastructure.
- It should be mandatory to compare the economic costs and benefits of new road infrastructure to the development at least one alternative means of transport (not merely to different road-routing options).
- Decarbonisation pathways should be considered in the baseline for economic appraisal of long-term infrastructure projects.
- The suggested shadow prices for carbon should be treated as the obligatory minimum for the CBA.

Budapest, 4 January 2023
Updated: 16 March 2023
Second update: 14 May 2023

Supported by:

Federal Ministry for Economic Affairs and Climate Action

on the basis of a decision by the German Bundestag

European Climate Initiative EUKI

Disclaimer: This study has been produced in the framework of the project "Towards a climate neutral EU: efficient allocation of EU funds" funded by the European Climate Initiative (EUKI). EUKI is a project financing instrument by the German Federal Ministry for Economic Affairs and Climate Action (BMWK). The EUKI competition for project ideas is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. It is the overarching goal of the EUKI to foster climate cooperation within the European Union (EU) in order to mitigate greenhouse gas emissions.
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