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Perspective

A wolf in sheep's clothing: Exposing the structural violence of private electric automobility

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ABSTRACT

The world is running out of time to avoid cataclysmic climate impacts. Therefore, determining which decarbonisation strategies are more effective and inclusive in reducing anthropogenic dependency on fossil fuels is vital for governments' decisions on investment. This research argues that the electrification of private automobility is neither effective nor equitable. Considering the current electricity mix of the grid, this electrification merely shifts the CO_2 emissions and other pollutants from urban to rural areas. The strategy of private automobility electrification does not look beyond the problem of tailpipe emissions and hence cannot eliminate the deficiencies of the car-dependent system that require system-wide solutions, such as traffic congestion and road accidents. Prioritising this strategy not only maintains existing inequities but also increases social injustice and delays the implementation of more effective interventions. We argue that using private EVs structurally violates the biosphere and human communities in three ways: (1) production of inequities, (2) pollution and waste, and (3) the space of the exception (the 'Electric Vehicle Bubble'). Finally, we conclude that eradicating private automobility is necessary to realise climate and transport justice. Focusing on inclusive strategies, such as supporting public transportation, shared mobility, and active travel modes, instead of offering incentives for EVs, are the means of progressive redistribution of wealth and can satisfactorily meet people's basic needs and governmental climate targets.

1. Introduction

Humans are squandering their own future and the biosphere's by clinging to harmful habits and egregious consumption patterns. To fulfil climate-neutrality targets, a systemic change in the ongoing interaction between humans and the non-human environment is required. Immediate and rapid reduction in greenhouse gas (GHG) emissions is essential, and countries feel urged to adopt multiple mitigation strategies. Human societies have only a short time to stop the irreversible impacts of climate change, so determining which decarbonisation strategies are more effective is vital [1].

The transportation sector accounts for a massive proportion of GHG emissions, and therefore many of the mitigation policies target this sector [2]. Automobility, a self-reinforcing system that dominates modern everyday transportation, prioritises travel by private vehicles and leads to car dependence [3,4], often to the detriment of more sustainable mobility modes [5]. Many governments consider the electrification of private vehicles as a crucial mitigation measure to reduce anthropogenic dependency on fossil fuels [6]. As a result, recent years have witnessed a growing interest in EV technology, and several automobile manufacturers have shifted or plan to shift solely to the production of private EVs instead of private internal combustion engine vehicles (ICEVs). The argument behind this shift is that EVs will eventually replace fossil-fueled vehicles, and a ban on ICEV sales by governments is a decisive step leading to this transformation [7]. We agree that EV technology is innovative and can be helpful, for instance, in transforming public transportation or on-demand services [8]. However, we argue that utilising this technology in private automobility produces forms of structural violence, and therefore, governments should not prioritise private EVs over non-motorised, shared mobility and public transport. This study analyses the structural violence produced by EVs. It is important to note that some forms of structural violence are common for both EVs and ICEVs, but some others are exclusively engendered by EVs. Therefore, although we criticise private EV use, we do not advocate

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keeping ICEVs on the streets; rather, we emphasise eliminating the car-oriented culture and private automobility.

Structural violence can be defined as indirect damage inflicted on human society and the biosphere from the consequences of people's activity and passivity [9,10]. Unlike direct violence that a person imposes on another person, structural violence demonstrates itself in a structure in which direct harm does not necessarily occur. This kind of violence can be traced to inequitable opportunities among members of society. It creates social injustice and indirect suffering, resulting from a divided society with the upper class dominating social resources and the lower class having limited access to those resources [11]. Structural violence is embodied in this skewed system and reinforced by modernist consumerism. It gives wealthy people the right [12,13] to consume resources legitimately and without limit while exploiting the poor, and this relationship is not reciprocal [14]. From this perspective, structural violence and social injustice can be used interchangeably [15]. Such practices are common to capitalism and include laying off the labour force while avoiding both environmental regulations and taxes, which is then justified by imperatives of profit [11]. Similar social dissonance happens when rich households are offered subsidies to purchase an EV as their second or third car [16] while the less well-off are given a Hobson's choice to spend their few resources on relatively costly public transport [17] that is inadequate to their needs because of underinvestment. In the transport realm, another good example could be a heated 'Tempolimit' debate in Germany [18]. Car drivers effectively opposed introducing the speed limit on motorways claiming that unlimited speed is their right. Such a right is, however, denied to e-bike or scooter riders because a technological speed limit [19] is imposed by manufacturers of these vehicles.

Except for the study of Braun and Randell [20], which concentrates on road accidents and deaths, the linkage between automobility and structural violence has not yet been given the attention it deserves. Therefore, it is crucial to focus on this topic from environmental and social points of view. Previously, Büscher and Fletcher [21] introduced three integrated forms of structural violence resulting from ecotourism activities considered by many to be a sustainable replacement for tourism. As mentioned above, private EVs are considered by many as a sustainable substitution for ICEVs. Therefore, with some changes, these three integrated forms can be adopted for our case. With the aid of extensive research on the available literature on car dependence, electric automobility, and sustainability in transportation, we argue that using EVs structurally violates the biosphere and human communities. We categorise this violence into three forms: (1) production of inequities, (2) production of pollution and waste, and (3) production of the space of the exception (the 'Electric Vehicles Bubble'). This bubble prevents consumers from perceiving the negative socioenvironmental impacts of driving private EVs, and it also gives impunity to manufacturers to exacerbate existing social inequities and devastate the biosphere by producing private EVs.

2. Production of inequities

Car orientation, specifically private automobility, regardless of the type of vehicle, produces several injustices. One could even say that an inherent element of living in a car-dependent society is inequity. Since Ford's mass production revolution, and despite initial opposition in many parts of the world, cars have proliferated in urban settlements [22,23]. Promoting EV usage leaves the problem of the mass usage of private cars unresolved. EVs further block sustainable transport choices of households, leading to continuity in the current form of extreme dependency on private cars and reducing the chances to shift toward active modes, shared mobility, and public transport [2,24]. Replacing ICEVs with EVs can be legitimately viewed as an attempt to reinforce a car-oriented society.

Injustice produced by EVs manifests itself in various forms. Car crashes [20] and traffic congestion negatively affect human societies and are among the problems which will not be solved by using EVs. Traffic congestion generates stress and triggers negative emotional reactions in other transport mode users, for instance, cyclists [25] and public transport commuters (Fig. 1). The strategy of private vehicle electrification will not ease the congestion problem in cities; rather, it will likely intensify the traffic as households opt for EVs as their second or third car [16]. Similarly, road space allocation is an issue. Private EVs and their charging facilities will occupy a substantial amount of public space. The average private car is in active use only a few per cent of its time, and for the remaining time, the vehicle is parked at home or elsewhere [26]. Having fewer car parks would allow more space to be allocated to active travel modes and green places, enhancing the liveability of urban areas. In the urban environment, car infrastructures block the development of other more sustainable and equitable transport options, such as cycle and bus lanes and walking paths [27]. In this manner, spatial violence is manifested in unjust road space occupancy. The increasing volume of cars in the streets also leads to the construction of more roads [28] and higher occupancy of land.

Another important strand of this debate relates to EVs' relatively high cost [29], which makes them luxury goods. Most of the population cannot afford them [30]. This issue intensifies the divide between the rich, who can enjoy these hi-tech vehicles and the poor who cannot afford them. In this way, governmental prioritising of private EVs exemplifies the egregious consumption of the rich and the regressive redistribution of resources to them. In contrast, the shared economy of owning less and sharing more [31] curbs excessive consumption.

In addition, there is a need for a much higher uptake of private EVs (90 % in the case of the US) if the electrification of the vehicle fleet is the major emission mitigation strategy, and replacement at this scale would claim half of the generated electricity [32]. Also, the negative impact of EV charging on the grid cost can be a valid concern [33]. Evidence shows that increasing the number of private EVs requires more electricity and is associated with a hike in the cost of energy from the local grid.

The United Nations Sustainable development goal 10 (SDG 10) emphasises progressive greater equality by adopting just fiscal policies and allocating more financial support and resource to the bottom 40 % of the population. In terms of the vulnerable segment of the population, Stefaniec et al. [34] argued that transport justice entails that wealthier people should not benefit to the detriment of the disadvantaged groups. The policy of EV purchase rebates, which has been adopted in many countries, contradicts the targets of SDG 10. That is because these rebates currently have low cost-effectiveness, are mainly used by wealthier households, and expire when lower-income groups need them [16,35]. Another concern is the observed pattern of fewer urban young people having a driving licence, which suggests that they are not interested in owning a private car [23]. Therefore, any governmental subsidisation of private EVs excludes certain younger segments of the population.

3. Production of pollution and waste

This section highlights the structural production of pollution and waste by EVs. ICEVs commonly produce a massive amount of emissions and waste, resulting in direct and indirect biosphere degradation and a hazardous condition for human health. One can argue that by eliminating tailpipe emissions, EVs substantially reduce the undesirable outputs of driving and positively contribute to the net-zero carbon target. Based on estimations, the complete replacement of ICEVs with EVs, accompanied by other efficiency improvements for freight and lightweight cars, has the potential to reduce GHG emissions of inland transportation by between 30 % to 70 % [1]. The potential air quality improvements due to EV deployment can reduce premature deaths in highly polluted urban areas [36]. However, one primary concern relates to the EVs' electricity sources. In 2019, almost 63 % of the world's electricity was generated in fossil fuel power plants, and the ratio was more than 68 % in the case of China (the biggest market for EVs), over

Fig. 1. Unjust road space allocation in Dublin city. Here, two lanes are occupied by private vehicles being driven or parked. Such an arrangement privileges car owners over bus users.
This kind of scene will not be removed from cities if EVs replace ICEVs (Source: Authors' collection).

63 % in the United States and above 40 % in Europe [37]. Without electricity generated from renewable sources, electrified automobility merely shifts the CO_2 emissions and other pollutants from cities to rural areas [38], leading to rural communities' being disadvantaged, and this simple transfer cannot effectively tackle the global threat of changing climate. This is a valid concern until the grid is fully cleaned up. In contrast, travel behavioural shifts toward active, shared, or public modes of transport are far more effective in reducing GHG emissions. Changing commuting patterns and reducing the volume of driving private cars are among the most effective ways to mitigate personal emissions [39–41].

The complex extraction procedures for EV battery production, and also the battery end-of-life recycling complexities, make the environmental footprints of EVs higher than ICEVs [42]. Batteries used to power EVs require various kinds of elements. EV batteries contain some hard-to-extract and hard-to-recycle materials, in particular, lithium and cobalt [43]. Also, the extraction of these materials threatens the biosphere and raises concerns about neocolonialism in Africa [44]. An unsustainable cobalt supply chain inflicts unbearable ecological and social burdens, such as child labour [45] and, for local communities in the Democratic Republic of Congo, adverse health issues and a hazardous, toxic, uninhabitable environment [46].

Similar to ICEVs, many EV body parts are made of plastic, which gives them a comparable negative environmental footprint. Also, vehicle-related particulate matter (PM) emission, in their several forms of fine ($PM_{2.5}$), coarse (PM_{10}), or larger particles, are predominantly emitted from non-exhaust sources such as tyres, brakes, and road abrasion [47], which is common for both ICEVs and EVs. In addition, EVs are heavier than ICEVs, and this generates even more PM from tyres and road surface wear [48]. Made up mainly of heavy metals [49] and microplastics [50], PM is poisoning the oceans, carcinogenic, and connected to many other serious human health problems. Furthermore, there is a high risk of fire in lithium batteries used in EVs due to thermal runaways and road accidents [51] which can result in releasing poisonous gas and possible explosion.

Overall, although replacing private ICEVs with EVs can reduce GHG emissions [32,52] and improve air quality in urban areas [36], this shift increases environmental toxicity resulting from private automobility [53] due to the reasons mentioned above.

4. Production of the space of the exception (electric vehicle bubble)

We now consider 'the space of the exception', another form of structural violence produced and experienced because of electric cars. The concept was articulated by Ong [54] in relation to boundaries set territorially to give controlled opportunities to individuals within them by granting freedom of resource flows, for instance, special economic zones. This understanding was then extended by introducing the concept of a bubble to emphasise a limited comprehension of the threats that activities within the bubble present to the outward environment [21,55]. We define an 'electric vehicle bubble' ('EV bubble') as having both features. It offers a privileged position to individuals within it in the form of purchase grants and other policy incentives. It is also this bubble that shields EV consumers, manufacturers, and policymakers from an awareness that they are responsible for the two aforementioned forms of

structural violence, namely the production of inequities and the production of pollution and waste. The bubble conceals the actual negative footprints of shifting to private electric automobility, the negative aspects that do not correspond with the socioenvironmental vision of EVs as a saviour technology. That is because the social and environmental externalities are outside the bubble. Therefore, driving EVs is responsible and sustainable only if seen within the confines of the bubble.

Bubble functions in a way that, within it, people are not agitated by mundane, socioenvironmental or political issues such as climate change; they do not feel concerned about the consequences of their actions or inaction [21]. Driving EVs gives them this comfort and leaves them in a sphere of ignorance regarding the relatively hidden corollaries described in this research. Consequently, EV drivers avoid being labelled anti-environmental agents as they continue their habits with no socio-environmental concerns.

Furthermore, private EV manufacturers are seen as responsible and environmentally friendly producers within the boundaries of the bubble. The automobile industry is one of the major engines of capitalistic economies and represents their economic accomplishments [28]. Those car manufacturers that shift to EV production are supported by governments, and their products are subsidised to attract more customers [16]. The bubble gives impunity to manufacturers who increase their profit by destructive anti-environmental practices and resource exploitation for manufacturing private EVs. Therefore, it can be concluded that shifting to private EVs is a marketing ploy rather than a sustainable and ecologically ethical alternative. Being adopted by automakers as a strategy that allows prolonging their economic profits, private vehicle electrification is initiated and reinforced by policymakers who falsely believe that transport emissions and externalities can be reduced by reactive and anticipatory policies rather than a transformation of the underlying system dynamics [56].

In summary, within this bubble, EVs are purchased by people with a distorted image that is supported by policymakers; they both find the reduced emission profile of EVs a sufficient justification for maintaining the system of private automobility. Private car fetishism by consumers, profit-maximisation-oriented strategy by manufacturers, and short-term vision by policymakers work together to conceal the structural violence of private EVs within the EV bubble.

As long as the bubble exists, observers are impotent to recognise and speak of what is or is not pro-environmental behaviour, as well as the sustainability or unsustainability of this shift to EVs. Therefore, what is needed is 'a continued critique of the processes that create unequal conditions and distributions within the space of the exception' [11]. The EV bubble will burst when society widely recognises the real consequences of prioritising private EVs over other sustainable transport modes, when driving private EVs is revealed to frequently contradict sustainable transport targets. Such bubble bursts illustrate well the dynamics behind the individual or social change that occurs rapidly once the right conditions are set. Confronted with new information, people's judgment can alter dramatically and swiftly. The bubble bursts exactly when collective sentiment has shifted so that previously radical ideas suddenly seem fair and progressive, while former conditions and distributions appear regressive and in need of revision [57].

5. Discussion and conclusion

What governments prioritise and incentivise as a substitute for ICEVs shapes the future travel behaviours of people and the whole transport system. This study discusses how governmental strategy regarding EV technology affects society and the environment. The analysis presented here shows that the personal automobility paradigm (both ICEV-based and EV-based) intensifies structural inequalities and causes irreparable damage to the environment. Hence, neglecting the negative externalities of private automobility is irresponsible, and 'replacing combustion engine vehicles with EVs is merely a strategy to lose more slowly from the social and environmental points of view' [34].

The authors of this article believe that governments should urgently opt for a transport framework concentrated on the progressive redistribution of wealth and care for more disadvantaged parts of society. In line with SDG 10, which emphasises reducing inequities and immiseration, there is a need for a radical reorientation of priorities away from privatisation to public and shared mobility. The transport sector needs this drastic shift. This transformation should concentrate on sharing rather than owning [31]. Prodigal consumption and mobility patterns should not be subsidised. Instead, these incentives should be allocated more equally across society in a manner allowing all groups to access them, paying special attention to the most vulnerable ones. Interestingly, low-income groups travel more sustainably even if the primary driver of such behaviour might not be a lower environmental footprint. Therefore, financing public transport options, shared mobility, and infrastructure for active travel modes contribute to the promotion of social equality and have a serendipitous, lower impact on the biosphere.

It should be mentioned that the current study did not aim to unfairly demonise EV technology in particular. On the contrary, we believe that this technology is important in shaping the post-automobility era. Our critique has not targeted the nature of this technology but rather how it tends to be viewed as a silver bullet to solely cope with all socio-environmental shortcomings of private transportation. Moreover, although we enumerate the forms of structural violence accompanying private EV use, we do not advocate keeping ICEVs on the streets; rather, our goal is to vanquish car dependence, private automobility, and the car-centred culture. Employing EV technology in public transportation and commercial services is an effective way to realise climate and energy justice and should receive attention and resources.

We agree that technological transformations are critical components of the systemic change required to achieve climate neutrality. However, technology alone cannot solve all the problems and save the biosphere and human societies. Technological advances alone are insufficient to reduce environmental impacts and mitigate climate change caused by GHG emissions [32]. The behavioural change following the shift of mental models is equally important and complex [38]. However, besides the transformation of behaviour and technology, reorientating how and what governments invest in, incentivise, and subsidise is another important contributor to sustainable and zero-carbon societies. Effective systemic change occurs from top to bottom simultaneously with grassroots changes. As governments possess public policy tools, they can far more effectively cope with socioenvironmental externalities and redirect travel behaviours toward sustainable and satisfying vehicle ownership substitutions. As a result of shifting public sentiment, driving a private car when other more-sustainable transport choices are available may come to be seen as a shameful act similar to littering.

We hope that our observations and analysis aid further research and practice by providing the groundwork for more scrupulous conceptualisation and investigation of the intertwined implications and processes of private automobility and social injustice in transport system development.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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