The Elephant in the Road

Dr David Williams
Senior Project Manager- TRUUD
University of Bristol

This paper emanates from the project 'Tackling the Root Causes Upstream of Unhealthy Urban Development' (TRUUD), 2019–2024, £6.7 million. This work is supported by the UK Prevention Research Partnership [grant number MR/S037586/1], which is funded by the British Heart Foundation, Cancer Research UK, Chief Scientist Office of the Scottish Government Health and Social Care Directorates, Engineering and Physical Sciences Research Council, Economic and Social Research Council, Health and Social Care Research and Development Division (Welsh Government), Medical Research Council, National Institute for Health Research, Natural Environment Research Council, Public Health Agency (Northern Ireland), The Health Foundation, and Wellcome.

The views expressed in this working paper do not necessarily represent those of the funding organisations.

Abstract
Politicians worldwide continually fail to adequately address the biggest risk and cause of injustice to 21st century society: The car. The Elephant in the Road. This paper builds on my work across two transdisciplinary projects designed to explore ways to improve societal health, with one exploring ways to reduce emissions (Disruption Project) and the other looking at changes we can make to our urban environment to reduce the prevalence and impact of non-communicable diseases (TRUUD). Both studies have identified the complexities of delivering change through a range of interventions and changes to the way we think and both have identified the damage caused to peoples' health through poor air quality, sedentary lifestyles, mental health issues due financial worries associated to the car. Car-centric governance adversely impacts the poorest members of society who lack the means to travel by car, suffer from poor quality public transport infrastructure, and are often at greater risk of adverse impacts of road traffic from air and noise pollution due to housing availability.

This thinkpiece explores our relationship with the car and how it has become 'natural' to the world around us and how this elephant is trampling us, through design, emissions, fatalities and sedentary lifestyles to become a worldwide killer. The second section discusses how we feed this elephant in the road through infrastructure, planning and taxation, and our emotive relationships with our vehicles. Finally, the presentation concludes by summarizing the techniques that have been use to tame the elephant, through examples of good practice that demonstrate the benefits to society from The Netherlands, Paris and the UK and the benefits they have provided in tackling the 21st century challenges caused by the Elephant in the Road.

Introduction

The challenge of delivering the United Nation's Sustainable Development Goals (UN, 2025) is series of what Rittel and Webber (1971) called 'wicked problems'. Wicked problems are societal problems that have complex, multi-faceted solutions involving actors from different fields being required to act in the best interests of humanity. Globally people's health is worsening through issues such as poor air quality and sedentary lifestyles. Natural resources are in decline due to the release of pollutants into the air, our water and the earth causing a rapid decline in the planet's ecosystems whilst heating our planet. These issues are caused by human behaviour and activities and can be reversed through changes across society. Despite having potential albeit challenging solutions to these wicked problems they receive little traction and often conflicting coverage in the media, and little support by many politicians across the world. This is because the majority of solutions involve significantly

reducing our use of cars and motorised transport. This is the Elephant in the Road. The solution that many people do not want to talk about.

How has the car become such an essential part of 21st century living? The car is now embedded in the way we think and the way we design our environment. Walker, Tapp and Davis (2023) call this motornormativity where people have: *"…shared, largely unconscious assumptions about how travel is, and must continue to be, primarily a car-based activity*". Car travel has become the dominant mode of travel across the World since the beginning of the 20th Century, shaping our society, our social status whilst impacting on our health, wealth and happiness. This paper discusses how this happened and what steps we can take to reduce car use. The paper broken down into three sections. The first section explores how the 'Elephant is Trampling Us', demonstrating the impact car-based activities have on our health and the environment. The second section explores how we are 'Feeding the Elephant' through the policies we create and the infrastructure we provide to travel. The third section discusses how and where countries and city's politicians are taking steps to "Tame the Elephant". The paper concludes by discussing the next steps and likely challenges to achieving the United Nation's Sustainable Development Goals through tackling the Elephant in the Road.

The Elephant is Trampling Us

Ever since the first cars were rolled onto our roads in the 19th century they have encroached on public space, slowly restricting the movements of people unable to drive. Car ownership provides considerable benefits to people who own them Ikezoe *et al*. (2021) providing opportunities to access work and social engagements. Key points in life such as parenthood can lead to car ownership (Kent, 2025) that becomes embedded in everyday life. Losing the ability to drive can cause issues to peoples' mental health in later life when they are physically unable to drive (Musselwhite and Shergold (2013), as the ability to control their leisure and social lives is dramatically reduced. Car ownership has become an essential requirement for people to be able to engage with society. The problem is that cars are expensive to purchase, maintain, insure and run.

Even though cars are expensive they provide many benefits for those who own and use them. Car ownership is aspirational with adverts depicting freedom from the mundanity of every day life (Gunster, 2004). Many people give their vehicles names and give them human traits and personalities. This can be attributed to the fact that people see faces in the layout of cars (Miesler *et al*., 2011: Windhager *et al*., 2012: Keaveney *et al*., 2014). Car ownership is seen as part of being successful and these actions form part of Walker *et al*'s concept of Motonormativity (Walker *et al*., 2023). But what happens to those who are unable to afford their own car? In 2022, 22 percent of households in the UK had now access to a car (DfT, 2023a) meaning that many of people were unable to access the benefits of a transport system designed around private use of the car. Motonormativity is summarised succinctly by the quote incorrectly attributed to former UK Prime Minister Margaret Thatcher. The quote states that: "*the man who, finding himself on a bus beyond the age of 26, can count himself a failure"* (Harris, 2014). Failure to become part of the car culture is seen as an individual's failure rather than a failure of society to provide adequate transport for all.

Life for people, whether they like it or not revolves around cars. Almost every person alive today has grown up in a World where cars and navigating the infrastructure provided for them is embedded as part of their every day life. This creates risks for both those driving and those outside the vehicles. Globally 1 in every 34 deaths are attributed to motorised vehicles and since their invention 60 to 80 million people have been killed by cars (Miner *et al*., 2024). If fatalities caused by motor vehicles were a disease then humanity would be seeking a cure, yet the death toll is accepted as a hazard of modern life. Many drivers fail to see non-motorised road users as people (Cubbin *et al*., 2024) with collisions framed as accidents (te Brömmelstroet, 2020) rather than incidents that can be avoided with appropriate infrastructure design, vehicle design and restrictions to speed. Evidence from the USA shows that pedestrians impacted by crash victims are often from lower income households than the people driving the vehicles (Giron *et al*., 2024). This further demonstrates the

challenges for people without access to their own vehicle when the infrastructure is designed primarily around car usage.

Environmentally cars also cause significant problems to peoples' health and to the natural environment. In the European Union Carbon Dioxide (CO_2) increased 12 percent between 1995 and 2019 (Enerdata, 2022). The release of CO_2 emissions has a significant impact on climate change, increasing the planet's global temperature increasing the likelihood and strength of weather events such as droughts and floods, making it difficult to grow food (Met Office, 2025). Reducing greenhouse gas emissions, including CO_2, from all sources is therefore essential to the earth remaining habitable for humans. Other sectors in the UK have reduced emissions in the last decade but transport's emissions have remained steady (DfT, 2023b), suggesting the transition to low carbon travel is taking longer and is harder to deliver for transport, which directly impacts on day to day practices of people than other sectors such as energy production. Changing the mode of transport or switching to an electric vehicle and installing the charging infrastructure impacts directly on the people travelling. Practices do not need to change if the source of energy produced changes from fossil fuels to green energy.

Perhaps the most surprising one of the most overlooked impacts of motorised vehicles is the impact they have on local air quality. In 2023 a study by The Guardian newspaper found that 98 percent of Europeans were breathing polluted air (Taylor and Duncan, 2023). Air pollution is often invisible and the impacts are chronic rather than immediate and obvious. Breathing nitrogen dioxide (NO2), particulate matter ($PM_{2.5}$) is proven to have a significant impact on the human body and the majority of non-communicable diseases to peoples' respiratory and cardiac systems or their organs (Schraufnagel *et al*., 2019). Air quality can have a significant impact on a range of health outcomes throughout life from stillbirths (Xue *et al*., 2022), adolescent cardiac arrhythmias (He *et al*., 2022) lung cancer (Hill *et al*., 2023: Chen *et al*., 2024), breast cancer (White 2025), and in later life dementia (Duchesne *et al*., 2022 : Christensen *et al*., 2023). Whilst the increase in electric vehicle sales is positive in the reduction NO_2 and other tailpipe emissions, electric cars heavier than petrol/diesel still of particulate matter from brake and tyre wear (Timmers and Achten, 2016). Reducing or removing motorised transport from urban areas therefore makes sense to protect human health and the environment.

Having traffic noise as a constant presence in your life can also have an impact on peoples' health and provides another reason to reduce or remove traffic where appropriate. Noise, like air pollution, can impact on cardiovascular health (Münzel et al., 2021: Moreyra *et al*., 2022). The TRUUD project has produced a video that outlines how noise (and air pollution) can impact on peoples everyday health and wellbeing (TRUUD, 2024). Sleep deprivation can cause long-term health impacts and co-morbidities as people are unable to sleep. In developing the TRUUD project's Health Appraisal of Urban Systems (HAUS) valuation tool, the research team incorporated the impact of noise pollution into the economic model to allow planners and developers to understand the impact of noise pollution alongside other urban issues such as air quality and access to green space (Le Gouais *et al*., 2024). Understanding and addressing the impacts of noise are therefore vital to improving peoples' health.

Anxiety caused by traffic congestion can have a significant impact on peoples mental health (Conceição *et al*., 2021: Garrido-Cumbrera *et al*., 2023). People can be locked into car dependency rather than choice (Dashtestaninejad *et al*., 2023) due to availability of property, caring commitments and the lack of alternative modes of travel. Owning your own vehicle is costly, and the value of cars depreciates significantly through use. The system of ownership and financing vehicles locks people into a system of sunk costs to use their vehicles. This has existed for almost 100 years, with John Keats identifying the issues of car ownership in the USA in his book *The Insolent Chariots* (1958). Keats identified where the pressure of finance payments, fuel and vehicle repairs have a significant impact on peoples' mental health as the failure of their vehicle can mean the failure of them to fulfil their work, caring and social commitments.

Not moving your body enough is another side effect of a motonormative society. The lack of movement can also cause problems for people leading to obesity and a rise in non-communicable diseases. Sedentary lifestyles, urban infrastructure prioritising car use and social meanings promoting car use perpetuate the issue. In 2023 the Department for Health Improvement and Disparities (OHID) estimate that 64 percent of adults in England were overweight or living with obesity in 2023 (OHID, 2024). This has increased three percent since 2013 (Williams, 2014). Obesity and the treatment of the associated non-communicable illnesses was estimated to cost the NHS £6.5bn every year (Department of Health and Social Care, 2024). Many proposed solutions deal with the symptoms of obesity rather than the causes. Some changes in are occurring with initiatives such as the Soft Drinks Levy reducing sugar in products (*Ibid*, 2024). Structural changes are required to stop the *Elephant in the Road* from trampling us. Implementing these effectively is essential if we are going to tackle the wicked problems impacting on our physical and mental wellbeing and the planet's ability to sustain human life.

Feeding the Elephant

The challenges facing society have become wicked problems because of the number of systems, processes and physical assets lock in and perpetuate car ownership and travel by motorised vehicles. Walker and te Brömmelstroet, (2025) build on Walker *et al*.'s (2023) concept of Motonormativity by discussing the biases that exist within society. These biases influence peoples' perceptions of different modes of travel and this influences the language used and expectations that around travel. Similarly, Spotswood *et al*. (2015) also identify the meanings that exist around transport and use the sociological concept of *Social Practice Theory* to examine the materials and competences that also exist around travel. When materials, such as infrastructure are designed for motorised transport, and people have the competences to drive and travel this way this sustains this mode of travel for the majority of people. Trying to use alternative modes can be expensive and time consuming if the transport links do not easily connect. People may also lack the knowledge and experience of travelling by mixed modes, or public transport making it easier to default back to travelling by car.

In 2019, Williams *et al*. demonstrated that funding and finance were the main driver for change in the way people travel. In the UK the majority of infrastructure funding is spent on highway infrastructure through the Road Infrastructure Strategy (RIS) (Williams, 2022), which dwarfs spending on other transport infrastructure locking in travel by motorised transport. With the majority transport finance provided by the UK Government is focused on motorised transport infrastructure this leads to inequality in transport for the 22 percent of households in the UK that do not have access to a car (DfT, 2023a). This inequality of transport options is compounded by a 28 percent reduction in bus services in the UK between 2011 and 2023 (Rural Services Network, 2024). This is coupled with cost of travelling by car doubling compared to car use since 1997 (Campaign for Better Transport, 2023) has further increased inequality for those without access to a car. The prioritisation of funding for highways, specifically motorways and A roads, has lead to poor quality public transport provision and poor quality walking and cycling infrastructure that lacks integration in many places in the UK (Laker, 2024).

Nearly every politician is happy to stand in front of a new piece of transport infrastructure within the area they represent but very few are prepared to do the same in front of existing infrastructure that has been repaired. Kurt Vonnegut explains the reason for this in his book *Hocus Pocus* (1991): *"Another flaw in the human character is that everybody wants to build and nobody wants to do maintenance".* With local highway authority budgets experiencing their 15th year of austerity budgeting for infrastructure maintenance has reduced significantly across the UK highway network. The Institute of Civil Engineers (ICE) have highlighted the risk to the nation's infrastructure network, especially bridges (ICE, 2025) from the failure to fund infrastructure maintenance. With limited budgets focusing on the highest priority infrastructure that carries the greatest risk to users this can often mean that walking and cycling infrastructure maintenance is not prioritised in maintenance budgets (Williams, 2014). In addition, winter maintenance in the UK similarly prioritises motorised transport. Sweden

takes a different approach where disadvantaged women are more likely to walk so footpaths are cleared of snow and ice as the first priority (Schmitt, 2018). Both general and winter maintenance regimes can lock in car dependency and cause disadvantages to those who require safe walking and cycling provision and access to public transport stops and stations.

Taxation of vehicles is also lever used by government that locks in car use. Paying to tax your vehicle adds an additional level of sunk costs for drivers. Taxation of vehicles however is one of the biggest challenges for the government, where revenue is received through taxation on vehicles and fuel is likely to drop significantly if the current system remains in place. The planned move to electric vehicles could see the UK treasury lose between £20bn and £40bn per year (Goodwin, 2024) with this revenue likely to be lost by 2040 (Santo and Cornford, 2023). Taxation of motorised travel is an important source of revenue for the government and this risk to public funding has re-ignited the debate around road user charging (Goodwin, 2024) that has surfaced many times since the 1960s. The reduction in tax however from travel offers the opportunity to break from this model and identify new taxation for electric and motorised transport such as the introduction of road pricing, pay as you go models as well as promotion of alternative modes of travel.

How governments transition into low carbon futures will have a significant impact on our future. The built environment as well as the transport infrastructure influence our health and wellbeing. The type of developments that are delivered lock in travel practices of those who live in towns and cities across the World. Meanings and prior life choices can influence where people choose to live (Rahman and Sciara, 2022), as can changes in peoples' life courses (Clark *et al*., 2014) in relation to their work and family lives. These factors along with affordability and location influence where people choose to live. Local planning authorities can have some say in the type of developed delivered (Le Gouais *et al*., 2024), but this depends on who owns of the land. In Bristol, the City Council developed the Frome Gateway Framework that set out the Council's vision for the area of how the developments will enhance the city (Bristol City Council, 2024). The framework includes enhanced walking and cycling infrastructure and several car free developments. Where planning authorities have less say over the development area they are limited in what planning gain can be delivered through tools such as the Community Infrastructure Levy.

Evidence suggests that due to the temporal nature of planning and the changes in profitability private sector developers can often change or reduce planning gain in an effort to make their development more profitable for shareholders (Williams, 2023). The competing demands of developers, who need to make a return on their investment, and both the developer and local authorities desire to create healthy, sustainable places often come in to conflict as the costs of developments escalate over time. This can be due to a range of to changes including the rising cost of materials, changes to government policy and other externalities with developers looking to reduce risk and protect their profits (van den Hurk *et a*l., 2022). Local authorities, who need to comply to government targets for new housing are then limited with what health based solutions they can enforce through their role as the planning authority.

Taming the Elephant

Ratcheting is the concept where every system, process and physical asset that locks in car ownership makes it difficult to break. Shove (2003) identified the concept in relation to bathing and washing clothes that lock in high water usage, which has parallels with car usage causing negative externalities. Significant spatial reorganisation of towns and cites is required if we are to break the patterns of travel by car. It may appear impossible to *tame the elephant* but there are several examples of where countries or cities across the World have tried to reduce car use, breaking the ratcheting process and reducing the negative impacts of excessive car use. Many of the changes begin at the bottom of the transport system through social movements that opposed car culture. In The Netherlands in the 1970s an organisation called *Stop de Kindermoord* (Stop Murdering Children) was set up in protest at the number of children dying in road accidents across the country (Verkade and te Brömmelstroet, 2022). *Stop de Kindermoord* used powerful imagery in campaigns to highlight the impact of fatalities on Dutch people changing the narrative around transport infrastructure. This

process was slow but changes to urban design through the development of woonerf (home zones) areas of cities through the 1970s to restrict through traffic in residential areas (*ibid*, 2022). This has led to many towns and cities becoming what Bruntlett and Bruntlett (2022) call *Child-Friendly Cities*, where children do not need to be chaperoned on journeys to school or into town, as the walking, cycling and public transport system make it safe to travel safely. Removing or reducing the risk of accidents with motorised transport increases opportunities for independent travel reducing the need for children to be driven to school.

Opportunities to walk and cycle The Netherlands are extensive after 50 years of funding into appropriate infrastructure but car travel still exists and some parents in still prefer to drive their children to school, and in some cases demand infrastructure to be built that enables this to happen (Verkade and te Brömmelstroet, 2022). Removing car use completely is impractical and penalises those who have no other choice, but restricting vehicle trips can produce health and environmental benefits. The city of Paris in France has seen a reduction in trips by car over the last decade. Large-scale investment in cycling infrastructure through new cycle lanes and cycle parking (O'Sullivan, 2021), has led to the number of cyclists doubling between 2022 and 2023 (Breteau, 2023). As well as providing new cycling infrastructure the French government have provided financial incentives to switch travel from cars to electric bikes (Bremner, 2022). Providing infrastructure provides and helping people access Ebikes provides the opportunity for travel to change, but it is important that along with the *carrot* to incentivise change there is also a *stick* to direct people to change. This stick is a policy to increase parking charges for the largest privately owned vehicles, known as Sports Utility Vehicles (SUVs), with the charges related to the weight of the vehicle (Chrisafis, 2023). Motorised SUVs create more pollution, cause more damage to infrastructure and increase the risk of fatalities. Reducing or removing the incentives to drive them in towns and cities improving the environment for others.

Although the delivery of schemes in The Netherlands and Paris have been successful they have met resistance. This is also the case in the UK where the delivery of low traffic neighbourhoods (LTNs) has been controversial this despite the evidence demonstrating that they tame the impacts of the *elephant in the road* by increasing levels of walking and cycling (Aldred and Goodman, 2021), reducing noise pollution (Ipsos, 2024) and air pollution (Yang *et al*., 2022). Public dissatisfaction around LTNs can be around the way they are introduced and people feel that they are being forced upon them, restricting their freedoms. This is stoked by the rise in conspiracy theories and government rhetoric around sustainable cities (Walker, 2024). To counter these challenges the TRUUD research team are developing a set of tools to demonstrate the best approach to public engagement. The initial evidence from the research suggests that there is no consistent approach to the delivery of LTN engagement in the UK (Black *et al*., 2025: In Press). The TRUUD team are producing a guidance document to outline the best engagement approaches that are designed to deliver effective public engagement on issues that can be seen to be controversial.

Next Steps

Despite the compelling evidence that the *elephant in the road* is trampling us, impacting on our physical and mental health and the environment, there still appears to be very little desire by many politicians to *tame the elephant*. As transport researchers it is up to us to use the evidence we have gathered to demonstrate the need and ways to tackle the wicked social problems that prevent us meeting the UN's Sustainable Development Goals. This includes identifying opportunities to influence how we deliver transport services and infrastructure. The solutions to the wicked problems lie in the approaches used to engage with the public around the delivery sustainable transport infrastructure and improvements public transport infrastructure that are more inclusive. These need to provide local authorities the skills and knowledge to tackle conspiracy theories and anti-sustainable transport rhetoric. Through the promotion and design of safe, healthy and environmentally sustainable transport it is possible to deliver the UN's goals on health and the environment and address the *elephant in the road*.

References

Aldred R., Goodman, A. (2021) "The Impact of Low Traffic Neighbourhoods on Active Travel, Car Use, and Perceptions of Local Environment during the COVID-19 Pandemic." *Findings*. https://doi.org/10.32866/001c.21390

Black, M., White, J., Williams, D. (In Press) What constitutes good public engagement in the context of street improvement schemes such as Low Traffic Neighbourhoods (LTNs)? *Frontiers in Sustainable Cities.*

Bremner, C. (2022) *On your ebike, and here's €4,000 for it says Macron*. Available from: https://www.thetimes.com/uk/politics/article/on-your-ebike-and-heres-4-000-for-it-says-macron-z8sb80629. [Accessed 13/05/2025.]

Breteau, P. (2023) *A Paris, la fréquentation des pistes cyclables a doublé en un an*. Available from: https://www.lemonde.fr/les-decodeurs/article/2023/11/11/a-paris-la-frequentation-des-pistes-cyclables-a-double-en-un-an_6199510_4355770.html. [Accessed 13/05/2025.]

Bristol City Council [BCC] (2024) *The regeneration framework*. Available from: https://fromegateway.co.uk/index.php?contentid=83. [Accessed 17/03/2025.]

Bruntlett, M., Bruntlett C. (2021) *Curbing Traffic: The Human Case for Fewer Cars in Our Lives*. Island Press: Washington DC, USA.

Campaign for Better Transport (2023) *A Fare Future for rail: A blueprint for fares and ticketing reform*. Available from: https://bettertransport.org.uk/wp-content/uploads/2023/10/2310-fare-future-report.pdf. [Accessed 16/05/2025.]

Chen, J. Atkinson, R., Jovanovic Andersen, Z., Oftedal, B. *et al*. (2024) Long-term exposure to ambient air pollution and risk of lung cancer – a comparative analysis of incidence and mortality in four administrative cohorts in the ELAPSE study, *Environmental Research*, 120236, https://doi.org/10.1016/j.envres.2024.120236.

Chrisafis, A. (2023) *Paris mayor plans to triple SUV parking tariffs to cut air pollution*. Available from: https://www.theguardian.com/world/2023/dec/08/paris-mayor-plans-to-triple-suv-parking-tariffs-cut-air-pollution. [Accessed 16/05/2025.]

Christensen, G. Zhenjiang Li, Z., Liang, D. et al. (2024) Association of PM2.5 Exposure and Alzheimer Disease Pathology in Brain Bank Donors—Effect Modification by APOE. *Genotype*, 102 (5) https://doi.org/10.1212/WNL.0000000000209162

Clark, B.,Chatterjee, K., Melia, S., Knies, G., Laurie, H. (2014) Life events and travel behavior: exploring the interrelationship using UK household longitudinal study data. *Transport Research Record*, 2413:1, 54-64. https://doi.org/10.3141/2413-06

Conceição, M. A., Monteiro, M. M., Kasraian, D., Van Den Berg, P., Haustein, S., Alves, I., Azevedo, C. L. and Miranda, B. (2023) 'The effect of transport infrastructure, congestion and reliability on mental wellbeing: a systematic review of empirical studies', *Transport Reviews*, 43(2), 264-302. https://doi.org/10.1080/01441647.2022.2100943

Cubbin, W., van Paridon, K., Keyes, H. and Timmis, M. (2024) 'Close passes caught on camera – How knowledge and behavioural norms relate to perceptions of liability when cars overtake cyclists', Transportation Research Part F: Traffic Psychology and Behaviour, 100, pp. 308-322.

Dashtestaninejad, H., Van De Coevering, P. and De Kruijf, J. (2023) 'Car Use: A Matter of Dependency or Choice? The Case of Commuting in Noord-Brabant', Urban Planning, 8(3). https://doi.org/10.17645/up.v8i3.6549

Department of Health and Social Care (2024) *Government plans to tackle obesity in England*. Available from: https://healthmedia.blog.gov.uk/2023/06/07/government-plans-to-tackle-obesity-in-england/. [Accessed 09/05/2025].

Department for Transport (2023a) *National Travel Survey 2022: Household car availability and trends in car trips*. Available from: https://www.gov.uk/government/statistics/national-travel-survey-2022/national-travel-survey-2022-household-car-availability-and-trends-in-car-trips#:~:text=Household%20car%20access,-Chart%207%3A%20Percentage&text=The%20proportion%20of%20households%20without,every%2010%20households%20in%20England. [Accessed 29/04/2025].

Department for Transport (2023b) *Transport and environment statistics: 2023 (2021 data)*. Available from: https://www.gov.uk/government/statistics/transport-and-environment-statistics-2023/transport-and-environment-statistics-2023. [Accessed 06/05/2025].

Duchesne, J., Gutierrez, L., Carrière, I., et al. (2022) Exposure to ambient air pollution and cognitive decline: Results of the prospective Three-City cohort study, *Environment International*, 161, 107118, https://doi.org/10.1016/j.envint.2022.107118 .

Enerdata (2022) *Transport emission trends in the EU*. Available from: https://www.enerdata.net/publications/executive-briefing/transport-co2-emissions-trends.html. [Accessed 06/05/2025].

Garrido-Cumbrera, M., Braçe, O., Gálvez-Ruiz, D., López-Lara, E. and Correa-Fernández, J. (2023) 'Can the mode, time, and expense of commuting to work affect our mental health?', *Transportation Research Interdisciplinary Perspectives*, 21, 100850. https://doi.org/10.1016/j.trip.2023.100850

Giron, A., Xiaohan Gu, X., J. Schneider, R. (2025) Socioeconomic characteristics of drivers versus pedestrians in pedestrian crashes, *Transportation Research Interdisciplinary Perspectives*, 29, 101308, https://doi.org/10.1016/j.trip.2024.101308.

Goodwin, P. (2024) *The Smeed Report on Road Pricing: Still influential after 60 years, but the difficult issues still remain*. Available from: https://tapas.network/64/goodwin.php. [Accessed 09/05/2025.]

Gunster, S. (2004) 'You Belong Outside': Advertising, Nature, and the Suv. *Ethics & the Environment*, 9:2. Available from: https://www.jstor.org/stable/pdf/40339086.pdf. [Accessed 29/04/2025.]

Harris, T. (2014) *Local Bus Services*. Hansard Volume 587: debated on Wednesday 5 November 2014. Available from: https://hansard.parliament.uk/Commons/2014-11-05/debates/14110571000001/LocalBusServices?highlight=thatcher%20bus%20failure#contribution-14110578000014. [Accessed 29/04/2025.]

He, F., Yanosky, J., Fernandez-Mendoza, J., Chinchilli, V., Al-Shaar, L., Vgontzas, A., Bixler, E, Liao, D., (2022) Acute Impact of Fine Particulate Air Pollution on Cardiac Arrhythmias in a Population-Based Sample of Adolescents: The Penn State Child Cohort. *Journal of the American Heart Association*. 11:18. https://doi.org/10.1161/JAHA.122.026370

Hill, W., Lim, E.L., Weeden, C.E. *et al.* (2023) Lung adenocarcinoma promotion by air pollutants. *Nature* 616, 159–167. https://doi.org/10.1038/s41586-023-05874-3

Ikezoe, K., Kiriyama, E. and Fujimura, S. (2021) “Analysis of car ownership motivation in Tokyo for sustainable mobility service and urban development,” *Transport Policy*, 114, pp. 1–14. Available at: https://doi.org/10.1016/j.tranpol.2021.09.002. [Accessed 29/04/2025.]

Institute of Civil Engineers (2025) T*he State of the Nation: Infrastructure in 2025*. Available from: https://www.ice.org.uk/media/4robmpno/ice-state-of-the-nation-2025.pdf. [Accessed 09/05/2025.]

Ipsos (2024) *Low Traffic Neighbourhoods: Research Report.* Available from: https://assets.publishing.service.gov.uk/media/65f400adfa18510011011787/low-traffic-neighbourhoods-research-report.pdf. [Accessed 07/06/2024].

Keats, J. (1958) *The Insolent Chariots*. Crest Books, New York (USA).

Keaveney, S., Herrmann, A., Befurt, R., and Landwehr, J. (2014) The Eyes Have It: How a Car's Face Influences Consumer Categorization and Evaluation of Product Line Extensions. *Psychology and Marketing*, 29:1, 36-51. Available from: https://doi.org/10.1002/mar.20501. [Accessed 29/04/2025.]

Kent, J (2025) Car ownership through the parenting journey and beyond, *Travel Behaviour and Society*, 40, 101011, Available at: https://doi.org/10.1016/j.tbs.2025.101011. [Accessed 29/04/2025.]

Laker, L. (2024) *Potholes and Pavements: A Bumpy Ride on Britain's National Cycle Network*. Bloomsbury Sport: London.

Le Gouais, A., Eaton, E., Hanss, K., & Kidger, J. (2024). Using health evidence to influence healthier urban development: a qualitative evaluation of a researcher–practitioner collaboration. *Cities & Health*, 1–14. https://doi.org/10.1080/23748834.2024.2412436

Met Office (2025) Effects of climate change. Available at: https://weather.metoffice.gov.uk/climate-change/effects-of-climate-change#:~:text=How%20will%20climate%20change%20impact,affected%20by%20climate%20change%2C%20too. [Accessed 06/05/2025.]

Miesler, L., Leder, H., & Herrmann, A. (2011) Isn't It Cute: An Evolutionary Perspective of Baby-Schema Effects in Visual Product Designs. *International Journal of Design,* 5:3. Available from: https://www.ijdesign.org/index.php/IJDesign/article/view/1023. [Accessed 29/04/2025.]

Miner, P., Smith, B. M., Jani, A., McNeill, G., Gathorne-Hardy, A. (2024) 'Car harm: A global review of automobility's harm to people and the environment', *Journal of Transport Geography*, 115, 103817. https://doi.org/10.1016/j.jtrangeo.2024.103817.

Moreyra, A. Subramanian, K. Mi, Z. *et al*. (2022), The impact of exposure to transportation noise on rates of myocardial infarction in New Jersey, *Journal of the American College of Cardiology*, 79, 9, Supplement, 1148, , https://doi.org/10.1016/S0735-1097(22)02139-8.

Münzel, T., Sørensen, M., Daiber, A. (2021) Transportation noise pollution and cardiovascular disease. *Nature Reviews Cardiology*, 18, 619-636. DOI: 10.1038/s41569-021-00532-5.

Musselwhite, C., Shergold, I. (2013) Examining the process of driving cessation in later life. *Eur J Ageing* 10, 89–100. https://doi.org/10.1007/s10433-012-0252-6

O'Sullivan, F. (2021) *Inside the New Plan to Make Paris '100% Cyclable*. Available from: https://www.bloomberg.com/news/articles/2021-10-22/how-paris-will-become-100-cyclable. [Accessed 13/05/2025.]

OHID (2024) *Obesity Profile: short statistical commentary May 2024*. Available from. https://www.gov.uk/government/statistics/update-to-the-obesity-profile-on-fingertips/obesity-profile-short-statistical-commentary-may-2024. [Accessed 09/05/2025.]

Rahman, M. Sciara, G. (2022) Travel attitudes, the built environment and travel behavior relationships: Causal insights from social psychology theories, *Transport Policy*, 123, 44-54, https://doi.org/10.1016/j.tranpol.2022.04.012.

Rittel, H., Webber, M. (1973) Dilemmas in a General Theory of Planning. *Policy Sciences*. 4, 155-169. Available from: https://www.sympoetic.net/Managing_Complexity/complexity_files/1973%20Rittel%20and%20Webber%20Wicked%20Problems.pdf. [Accessed 25/04/2025.]

Rural Services Network (2024) *The decline of bus services in rural England: a deeping divide*. Available from: https://rsnonline.org.uk/the-decline-of-bus-services-in-rural-england-a-deepening-divide#:~:text=A%20Decade%20of%20Decline%20and,regions%20in%20a%20precarious%20position. [Accessed 16/05/2025.]

Santos, G. Cornford, C. (2024) Road transport electrification and motoring taxation in the UK, *Energy Reports*, 4326-4337, *https://doi.org/10.1016/j.egyr.2023.12.017*.

Schmitt, A. (2018) *Why Sweden Clears Snow-Covered Walkways Before Roads*. Available from: https://usa.streetsblog.org/2018/01/24/why-sweden-clears-walkways-before-roads. [Accessed 09/05/2025.]

Schraufnagel, D., Balmes, J., Cowl, C., De Matteis, S., Jung, S., Mortimer, K., Perez-Padilla, R., Rice, M., Riojas-Rodriguez, H., Sood., A., Thurston, G., To, T., Vanker, A., Wuebbles, D. (2019) Air Pollution and Noncommunicable Diseases. *Chest Journal*, 155:2, 409-416. https://journal.chestnet.org/action/showPdf?pii=S0012-3692%2818%2932723-5

Shove, E. (2003) *Comfort, cleanliness and convenience: the social organization of normality*. Oxford & New York: Berg Publishers

Spotswood, F., Chatterton, T., Tapp, A. and Williams, D. (2015) 'Analysing cycling as a social practice: An empirical grounding for behaviour change', *Transportation Research Part F*: Traffic Psychology and Behaviour, 29, pp. 22-33. https://doi.org/10.1016/j.trf.2014.12.001

Taylor, M., Duncan, P. (2023*) Revealed: almost everyone in Europe is breathing toxic air*. Available from: https://www.theguardian.com/environment/2023/sep/20/revealed-almost-everyone-in-europe-breathing-toxic-air. [Accessed 06/05/2025.]

te Brömmelstroet, M. (2020) Framing systemic traffic violence: Media coverage of Dutch traffic crashes, *Transportation Research Interdisciplinary Perspectives*, Volume 5, 2020, 100109, https://doi.org/10.1016/j.trip.2020.100109.

Timmers, V., Achten, P. (2016) Non-exhaust PM emissions from electric vehicles, *Atmospheric Environment*, 134, 10-17, https://doi.org/10.1016/j.atmosenv.2016.03.017.

TRUUD (2024) *Living in unhealthy places: The lived experience*. Available from: https://truud.ac.uk/living-in-unhealthy-places/. [Accessed 06/05/2025.]

United Nations (2025) The 17 Goals. Available from: https://sdgs.un.org/goals. [Accessed 25/04/2025.]

van den Hurk, M., Williams, D., Luis dos Santos Pereira, A., & Tallon, A. (2022). Brownfield regeneration and the shifting of financial risk: between plans and reality in public-private partnerships. *Urban Research & Practice*, 17(2), 149–170. https://doi.org/10.1080/17535069.2022.2144430

Vonnegut, K. (1991) *Hocus Pocus*. Random House: London, pp198.

Verkade, T., te Brömmelstroet, M. (2022) *Movement: how to take back our streets and transform our lives*. Scribe Publications: London.

Walker, I., Tapp, A. Davis, A. (2023) Motonormativity: how social norms hide a major public health hazard. *International Journal of Environment and Health (IJENVH),* 11:1. https://www.inderscience.com/offers.php?id=135446. [Accessed 29/04/2025.]

Walker, I., te Brömmelstroet, M. (2026) Why do cars get a free ride? The social-ecological roots of motonormativity, *Global Environmental Change*, 91, 2025, 102980, https://doi.org/10.1016/j.gloenvcha.2025.102980.

Walker P. (2024) *Ministers prioritised driving in England partly due to conspiracy theories*. Available from: https://www.theguardian.com/uk-news/2024/jan/10/shift-from-15-minute-cities-in-england-partly-due-to-conspiracy-theories. [Accessed 16/05/2025.]

Windhager, S. Bookstein, F., Grammer, K., Oberzaucher, E. Hasen Said, Slice, D., Thorstensen, T., and Schaefer, K. (2012) "Cars have their own faces": cross-cultural ratings of car shapes in biological (stereotypical) terms*, Evolution and Human Behavior*, 33:2, 109-120. Available from: https://doi.org/10.1016/j.evolhumbehav.2011.06.003. [Accessed 29/04/2025.]

Williams, D. (2014) *Social practice theory and sustainable mobility: An analysis of the English local transport planning as a system of provision*. PhD, University of the West of England.https://uwe-repository.worktribe.com/output/806568/social-practice-theory-and-sustainable-mobility-an-analysis-of-the-english-local-transport-planning-as-a-system-of-provision. [Accessed 09/05/2025.]

Williams, D. (2022) Highway Infrastructure Delivery Through Government Finance and PPPs. In: Hakim, S., Clark, R. and Blackstone, E. (eds*). Handbook on PPPs in Transportation*, Springer-Science. https://link.springer.com/chapter/10.1007/978-3-031-04628-5_10

Williams, D. (2023). Enabling the practices in an urban regeneration system of provision. *Regional Studies, Regional Science*, *10*(1), 167–183. https://doi.org/10.1080/21681376.2023.2178323

Williams, D., Spotswood, F., Parkhurst, G., Chatterton, T. (2019) Practice ecology of sustainable travel: The importance of institutional policy-making processes beyond the traveller, *Transportation Research Part F: Traffic Psychology and Behaviour*, 62, 740-756, https://doi.org/10.1016/j.trf.2019.02.018.

White A. (2025) Growing Evidence for the Role of Air Pollution in Breast Cancer Development. *J Clin Oncol*. 20;43(3): 244-247. doi: 10.1200/JCO-24-01987.

Xue, T., Tong, M., Li, J., Wang, R., Guan, T., Li, J., Li, P., Liu, H., Lu, H., Li, Y., Zhu, T. (2022) Estimation of stillbirths attributable to ambient fine particles in 137 countries. *Nature Communications* 13, 6950. https://doi.org/10.1038/s41467-022-34250-4.

Yang, X., McCoy, E., Hough, K., de Nazelle, A. (2022) Evaluation of low traffic neighbourhood (LTN) impacts on NO2 and traffic. Transportation Research Part D, 113, 103536. https://doi.org/10.1016/j.trd.2022.103536.
.