International Transport Forum

Improving the Quality of Walking and Cycling in Cities

Summary and Conclusions

193 Roundtable

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The International Transport Forum

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This report expands on the expert discussions during the ITF Roundtable on Increasing Walking and Cycling in Cities held in Paris and virtually on 28-29 November 2022. It formulates targeted advice to national and other policy makers on effectively framing and deploying pro-active mobility measures that contribute to four over-arching policy goals: equity, enjoyment, environment, and efficiency.

Lake Sagaris (Pontificia Universidad Católica de Chile) chaired the Roundtable discussions.

At the ITF, John P. Pritchard and Philippe Crist drafted the report with inputs from Roundtable participants. John P. Pritchard, Philippe Crist and Marcio Deslandes organised the event. Charlotte Bracke and Mila Iglesias provided administrative support to the Roundtable. David Prater copy-edited the report and prepared it for publication. Jagoda Egeland reviewed the report.

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Glossary

Active travel	Travel undertaken by foot, bicycle or other human-powered modes.
Car	A motorised road vehicle, other than a moped or a motorcycle, primarily designed to carry one or more persons. This includes sports utility vehicles.
Car blindness	A form of cognitive processing bias which results in focusing on certain elements of the urban scene while large, motorised vehicles are pushed to the back of peoples' perception to the point of becoming "invisible".
Car blinders	While car blindness renders automobiles effectively invisible, the idea of the car is also so entrenched that it can become difficult to see beyond the car. This inability to identify alternatives to the car can be described as a "blinder".
Collective transport	Transport services designed for groups to travel simultaneously, and which are available to the general public. It includes transport by bus, metro, tram and train, regardless of whether it is privately or publicly operated, or the way the service is delivered.
Cost–benefit analysis (CBA)	A systematic method for summing all the expected benefits and costs arising from a particular action (e.g. a proposed transport project) and comparing them using discounting to make benefits and costs accruing at different times comparable.
Disability-adjusted life years (DALYs)	A measure of degraded life years combining years lost due to premature deaths as well as years of ill health.
"Decide and provide"	A vision-led approach to transport planning that involves making infrastructure investment decisions in response to stated goals.
E-bike	An electrically assisted or electrically propelled bicycle-like vehicle. Regulatory distinctions regarding different classes of e-bikes are typically based on speed and whether the rider must be pedalling for the electric motor to engage.
Kick scooter	A human-powered street vehicle with a handlebar, deck and wheels propelled by a rider pushing off the ground. Models exist with two, three or four wheels. Standing scooters are distinguished from skateboards by the presence of a central control column and a set of handlebars.
Monetise	To convert a benefit or cost into an equivalent monetary value.

Moto-normativity	Decisions about motorised transport, by individuals and policy makers, that show unconscious biases due to cultural assumptions about the role of private cars and which may systematically distort policy decisions and prevent addressing the role of the car objectively. It can result in a built-in acceptance of risks and harms from motor vehicles.
Pedelec	A type of pedal-assisted electric bicycle where the electric assistance cuts off when the vehicle reaches approximately 25 km/h (exact limit depends on local regulations). A pedelec only provides assistance when the user is pedalling.
Systemic violence	The harm people suffer due to social structures or the institutions sustaining and reproducing it. Much of this violence is not deviant, neither departing from usual and accepted standards nor necessarily intending to cause harm.
"Predict and provide"	An approach to transport planning that involves making infrastructure investment decisions in response to existing or projected demand.

Executive summary

Key messages

Overcome car-centric thinking

Decades of car-centric development have made its assumptions the unquestioned norm. As a result of this "moto-normativity", risks and harms from motor vehicles may be accepted when they are unacceptable in other contexts. Many cities have begun to question this approach.

Think beyond infrastructure

Focusing on infrastructure is not enough to ensure pedestrians and cyclists will feel safe and secure and enjoy walking and cycling. Policies must also target street violence, social disadvantage and other factors.

Redesign planning processes

Processes for transport investments have traditionally prioritised car-centric options. A vision-led approach can provide the basis for redesigning these processes, and help ensure active travel contributes to more inclusive, sustainable cities. Work in progress across a number of cities worldwide suggests such a shift is possible.

Main findings

Walking, cycling and other active mobility solutions can benefit cities and urban environments. In addition to the positive health benefits of active travel, these modes and the facilitation of their use can be valuable levers for improving city life. Active travel contributes to four overarching policy objectives: increased efficiency of movement and access, improved environmental quality and performance, greater life enjoyment and fulfilment for people, and an equitable distribution of benefits (and burdens).

The major mobility challenge is creating compelling travel conditions and high-quality travel experiences for people walking and cycling and ensuring that both are linked to equally high-quality forms of collective motorised transport. This challenge applies particularly to those who are already actively travelling but can potentially encourage others to incorporate more walking and cycling in some of their trips. This extends to future generations who can grow up in an environment where they can choose to travel actively without being disadvantaged or exposed to elevated risks.

Encouraging people to walk and cycle and ensuring they can do so safely and enjoyably goes beyond infrastructure provision and must necessarily reach outside the transport system. Transport measures such as reducing speeds in urban areas contribute to this goal. However, other measures are needed to encourage walking and cycling. This includes better land-use planning which can foster more activities to be reached on foot or through cycling. Additionally, seamless integration with public transport can ensure that accessibility to more remote opportunities is maintained.

Reshaping urban planning frameworks, away from a car-focus can help redirect investment to better outcomes for pedestrians and cyclists. Additionally, it is essential to reduce systemic violence which constrains mobility in many contexts (e.g. traffic violence and gender-based violence). While the underlying causes for these societal issues, and their solutions are broader than the purview of transport authorities, improving the quality of walking and cycling in cities requires physical safety and social safety. As such, successful walking and cycling policies must be embedded within the broader social context. Local contexts should always be considered. Understanding what the local population wants and needs is essential.

Recommendations

Focus on improving the quality (not quantity) of walking and cycling in cities

Calls for a general increase in walking and cycling are welcome, but at the same time may not be the most helpful departure point to achieve better walking and cycling outcomes. Such an approach can show a lack of awareness of the diverse lived experiences of different individuals and groups worldwide. In many contexts, particularly in low- and middle-income countries and among disadvantaged groups, individuals seek to reduce the burden associated with their mobility. Ensuring the dignity, safety and wellbeing of those already walking and cycling, even under adverse conditions, would put conditions in place for others to walk or cycle more.

Democratise mobility space to ensure citizens can travel more safely, healthily and in comfort

Current moto-normative mobility systems in cities with one dominant mode (the car) and all other alternatives relegated to the margins have created an environment of fear while systematically restricting the mobility of those who cannot, or choose not to, move by car. Moto-normative policies expose other road users to elevated physical and emotional risks, negatively impact well-being and contribute to the exclusion of those who cannot fully participate in motorised hypermobility. Pedestrians suffer the most under these conditions, but the negative impacts extend across society. A more democratic mobility system would allow citizens to travel in more ways without compromising their safety, health and comfort.

Incorporate violence reduction as a critical transport policy goal

Systemic violence – including gender-based violence, road-traffic violence, criminal violence and policing violence – impacts who travels as well as how, when and where citizens travel. It acts as a barrier to walking or cycling. Despite this, transport planners and policy makers often fail to carefully consider the impacts of violence in transport policies. Identifying the extent to which different forms of violence are present in local contexts, and incorporating violence reduction as a critical transport policy goal, contribute to delivering better transport outcomes.

Remove car blinders from transport appraisal methods and consider a broader range of alternatives

A vision-led approach to policy making in transport will help ensure that car “blinders” are not embedded in the processes underpinning policy and investment decisions with respect to our transport systems. Moreover, appraisal frameworks should aim to capture a broader range of impacts and evaluate costs and benefits to all groups of interest, particularly vulnerable or underprivileged groups. A robust consultation process incorporating a broad range of stakeholders can help ensure that the right projects are considered and ultimately chosen.

Remove moto-normative policies to increase the effectiveness of new pro-walking and cycling policies

Incorporating active mobility policies in contexts that favours individual motorised mobility often puts walking and cycling at odds, creating a dangerous environment where they compete for the limited space leftover from the allocation to motorised transport. It is not enough to add new policies and measures; existing policies that define the aim, allocation and use of mobility space around maximising (motorised) vehicle throughput and flows must also be reconsidered and removed. This includes reducing speeds in urban areas.

Decouple walking and cycling to focus on the different needs of pedestrians and cyclists

Active mobility policies should clearly distinguish between walking and cycling and avoid conflating both to the detriment of each. Walking and cycling share many similarities and benefits, including their active component, which contributes to better health outcomes. Still, they are also vastly different modes that different groups use for various purposes. They require different infrastructure and policies to ensure they can be done safely, securely and enjoyably.

Ensure access to high-quality collective transport to enable better walking and cycling

The scale of today's cities often makes it necessary for people to travel further and faster to maintain access to destinations and opportunities. Walking, cycling and other active modes have more limited temporal and geographical scales than motorised transport. As such, improving pedestrian conditions and designing effective walking, cycling and public transport integration are vital to maintaining accessibility while still encouraging more people to walk or cycle in an enjoyable, safe and secure manner that improves the liveability of cities and reduces the environmental impact of urban transport.

Tailor active mobility solutions to local contexts

Local populations are best positioned to understand their own needs and wants. It is essential to clearly define policy goals and interventions to ensure desirable outcomes for the people most directly affected. Learning from other cities, regions and countries is essential for developing good active mobility frameworks worldwide. However, governments should avoid top-down approaches and imported solutions without local engagement. Failing to include local communities in meaningful policy co-construction processes will likely ensure that policies do not achieve their intended goals.

What is active travel?

Walking, cycling and other forms of active travel benefit people and urban environments in ways that other, more sedentary modes cannot. The potential positive health benefits of active modes, coupled with policies that facilitate their use, can be valuable levers for improving cities' liveability and environmental quality. Nonetheless, different active modes may require tailored infrastructure and policies to encourage safe, secure and enjoyable travel.

Active travel is "travel in which the sustained physical exertion of the traveller directly contributes to their motion" (Cook et al., 2022). Active travel modes require continued physical input. When they involve vehicles, they act as "convivial" technologies that work with rather than instead of humans (Illich, 1973). Whether or not travel includes active human physical exertion is a policy-relevant differentiator between travel modes since active travel confers important individual and societal benefits not shared by other, more sedentary travel modes. These primarily relate to the health and accessibility impacts of active travel.

Active travel describes many other forms of travel beyond walking and cycling (e.g. manual wheelchairing, kick-scooting, skateboarding, skating, running, and skiing). Nonetheless, walking and cycling comprise the vast bulk of active travel in most contexts. Of these two, walking is the dominant active travel mode in many urban contexts – particularly in the Global South and countries with low motorisation rates (Sagaris et al., 2022). When comparing countries with similar motorisation and income levels, the relative share of walking versus cycling may vary significantly – high-cycling countries tend to be low-walking countries and vice versa (Pisoni, Christidis, and Navajas Cawood, 2022).

The intensity of physical exertion is a factor to consider when assessing benefits, but establishing minimum thresholds may unnecessarily exclude certain modes. What matters is the sustained nature of the physical exertion necessary for travel (Cook et al., 2022). Using kick-scooters or e-pedelecs are forms of active travel (i.e. they cannot advance without continued human physical exertion). In contrast, e-kick scooters and throttled e-bikes are not active travel modes since they are designed to advance without continued human exertion.

Some may also experience active travel as a constraint rather than a positive addition to their lives. For example, in various contexts, people need to walk or cycle excessive distances because of a lack of affordable alternatives. In others, the quality, safety and security of the travel environment itself is poor. Regardless of whether active travel is seen as a benefit or a constraint, a major challenge worldwide is to create compelling travel conditions and high-quality travel experiences for people walking and cycling. Similarly, links to high-quality collective transport are a prerequisite for truly liveable cities.

The number of people engaged in active travel is significant in many global contexts, but especially in countries with lower levels of motorisation. Historically, however, increases in income, road infrastructure development, direct and indirect support mechanisms and subsidies have fuelled the growth of individual motorisation at the expense of active travel. These developments have marginalised those who do not have access to – or wish not to use – personal motorised transport for their everyday mobility.

The re-configuration of the built environment to favour motorised travel speeds has brought benefits to some but has crowded out active travel as a viable option for many.

Car travel results from a "system of provision" (Mattioli et al., 2020) that delivers a compelling experience for those able to travel by car. Unlocking and maintaining the potential benefits of active and sustainable forms of travel will require a similar vision-based system of provision.

The construction of the car-based system did not occur all at once. Creating high-quality active travel experiences must account for both "necessary" and "sufficient" conditions (Wiersma, Bertolini and Harms, 2021). Sufficient conditions only become relevant only once the necessary conditions are met. For example, safe cycling and pedestrian streets will only have the potential to significantly improve the likelihood of cycling or walking if opportunities or destinations are within walkable or rideable distances. Examples include basic necessities (e.g. healthcare access), economic activities (e.g. work and shopping), opportunities for social interactions with friends and family, leisure (including undirected strolls), and collective transport stops and stations.

What role can policy play in resolving the tension between the positive outcomes of active travel and the range of challenges and barriers to its maintenance or uptake? This report investigates how cities have developed and changed over the past century, becoming captive to personal motorised transport, and how pervasive moto-normative frameworks have created self-reinforcing conditions that make it difficult to look beyond the car. It highlights the inherent systemic violence that maintains moto-normativity, i.e. the pervasive, largely unconscious assumptions that make car-centric development appear coherent, natural and privileged (Walker, Tapp and Davis, 2022). This includes road-traffic violence, gender-based violence, policing violence and criminal violence.

The report addresses how walking and cycling can contribute to better cities that are healthier, safer and more enjoyable, providing residents with benefits that improve their well-being and contribute to larger environmental goals. It offers actionable policy advice on improving the quality of walking and cycling in cities. The report's recommendations focus on those who are already walking and cycling or travelling by other active modes, but also on ways to encourage others to further incorporate active travel for some of their trips.

The benefits of active travel

Active travel contributes to many desired societal outcomes, and its benefits are clear, compelling and well-documented. Nonetheless, they often fail to motivate the kind of meaningful policy action their magnitude would imply. This is partly due to the gap between what these benefits promise in theory and what they deliver in practice. How much and under what conditions can active travel's potential plausibly be achieved?

Understanding the benefits of active travel helps guide policy, prioritise actions and ensure that decisions lead to greater gains than losses. Some of these benefits can be easily captured and used in traditional transport appraisal and project and policy assessments, including cost–benefit analysis (CBA). Others, while important and sometimes even dominant, are harder to capture in existing transport decision-making processes and thus are often left out of consequential policy or investment decisions.

While understanding the benefits of active travel is essential to increasing its uptake, it is not sufficient, especially against the backdrop of sunk investments and systemic inertia working against more walking, cycling and other forms of active travel. This section describes the benefits of active travel and discusses how, where and under what conditions they appear. The remainder of the report explores how to close the gap between potential and practice.

Active travel contributes to four over-arching policy objectives:

1. increased efficiency of movement and access
2. improved environmental quality and performance
3. greater life enjoyment and fulfilment for people
4. more equitable distribution of benefits (and burdens).

These four endpoints are interlinked and overlapping. For example, living a fulfilled life because of improved health is not only important to individuals but is also important to society since good health and life satisfaction improve overall productivity and generate economy-wide cost savings. Likewise, improving the quality of spatial access afforded by foot or cycling generates both societal and individual benefits. However, the methodological basis for assessing benefits relating to enjoyment and equity is less advanced than that for assessing efficiency-related or environmental benefits.

Efficiency-related benefits of active travel

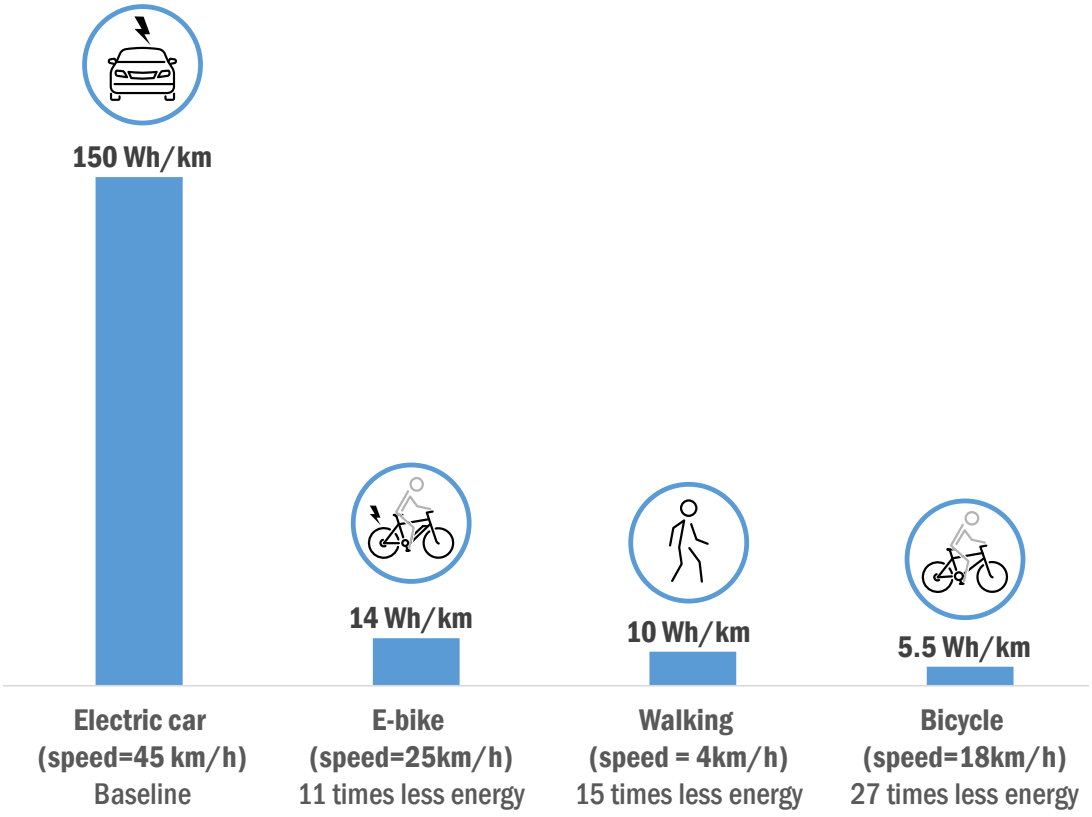
Efficiency is an inherent public policy objective since it maximises productive outcomes for any given resource input. In transport, efficiency typically refers to the use of infrastructure (e.g. vehicle or pedestrian flow), energy (e.g. travel output by unit of energy input) or time (e.g. speed, travel-time savings and the maximisation of monetary value or the number of opportunities that can be accessed within a set amount of time) (ITF, 2019; Piatkowski and Marshall, 2018). It can also refer to the use of space (ITF, 2022a).

Efficiency can also refer to outcomes that go beyond transport – for example, the number of social interactions per trip or improvement in health outcomes per hour of walking or cycling. These are not always included in policy appraisals focusing on transport-specific outcomes but are nevertheless important. In the case of health, such benefits may outweigh countervailing disbenefits such as those linked to crashes and exposure to air pollution.

"Efficiency" is a measure of performance that is tied to a specific productive outcome. There are many productive outcomes that are relevant for transport or for public policy more broadly. For example, a street designed for average motor vehicle operating speeds may be efficient in moving vehicles but inefficient in moving people in vehicles since each motor vehicle requires more space than a person walking or cycling. Common metrics for assessing traffic efficiency (e.g. vehicles per hour, peak-hour service levels, peak-hour congestion or delay and travel-time losses) are all designed to evaluate a specific measure of traffic efficiency: moving motor vehicles. As such, they are not necessarily easy to apply to active modes or even relevant for planning and developing policies supporting active travel (Piatkowski and Marshall, 2018).

At a minimum, benchmarks for assessing the contribution of active travel to overall transport activity should be assessed on a per-person rather than a per-vehicle basis. Indeed, in specific circumstances, active modes may be more efficient than other modes (see Figure 1). For example, active travel represents the most energy-efficient of all travel modes. In practice, however, the attractiveness of walking, bicycling and e-biking drops off as travel distances get longer despite their inherent energy efficiency.

Figure 1. Energy efficiency of active travel compared to an electric car



Source: Based on de Bortoli and Christoforou (2020).

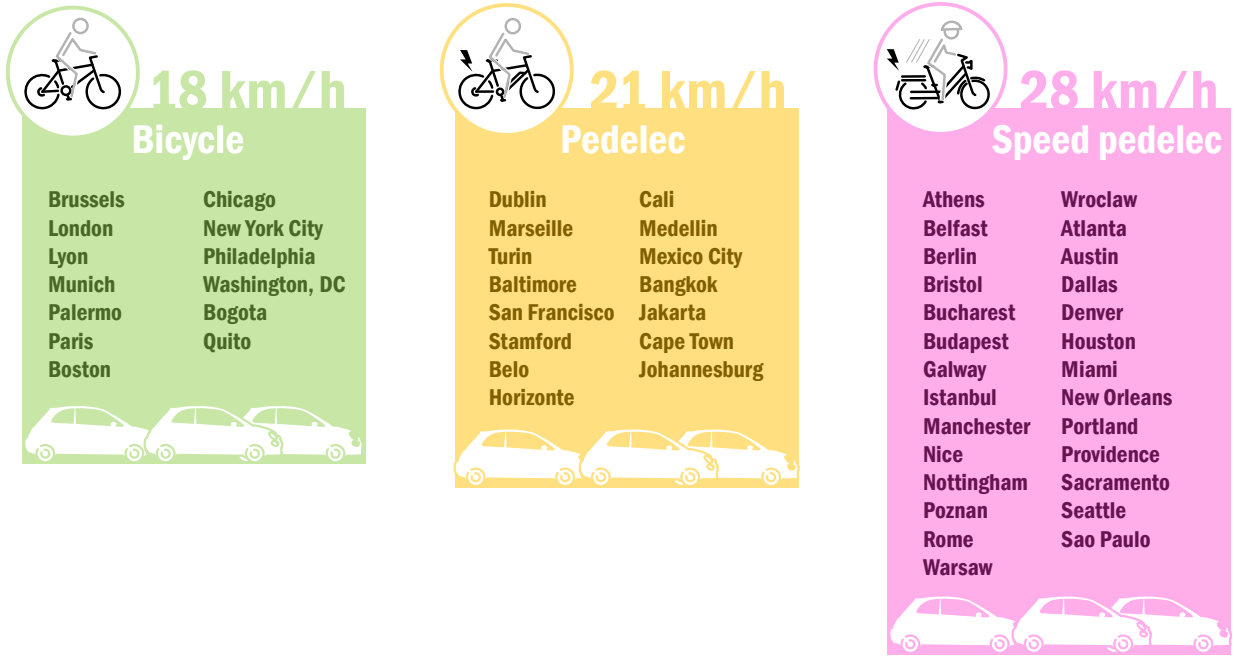
When most people are travelling, active travel is often fast enough. While active travel may not generally compare favourably to motorised modes in terms of travel speeds, this may not hold at peak travel times, in congested conditions or for certain trip distances. On average, bicycles, e-bikes/pedelecs, speed pedelecs and kick-scooters have lower operating speeds than average motor vehicle operating speeds. Nonetheless, in urban cores, especially when dedicated infrastructure is provided, and street networks are more permeable to active modes than motor vehicles, travel speeds converge (see Figure 2).

In many cities around the world – but especially in the largest and most congested conurbations – peak-hour bicycle speeds match or even surpass motor vehicle speeds. This does not mean that active travel is a viable option for all longer-distance urban trips or all contexts. Public transport is still the most space and energy-efficient mode for these trips. However, the bulk of urban travel is not comprised of long-distance trips but of short trip segments. Many of these trips could be walked or cycled (for longer distances) if streets were less inhospitable and motorised traffic levels were lower.

Related to time or speed efficiency is the delay required to initiate a trip. Walking can start instantaneously and, to a lesser extent, so too can cycling trips (depending on how near the bicycle is parked). This spontaneity may be matched by motor vehicles in certain contexts but in urban cores and away from residential locations, motor vehicles are rarely parked directly where people commence their travel.

Another measure of efficiency is the amount of space consumed by travel. Such space is at a premium in core urban areas. Space consumption metrics must account for the amount of time-space exclusively occupied. For travel, this means accounting for both the static (parking or pick-up/drop-off time) and dynamic (on-street movement) elements of travel. The ITF (2022a) uses the square-metre-hour metric (m^2.h), which captures both elements. This indicator underscores the space efficiency of active and well-used collective transport compared to other travel modes. For specific trip distances, active travel – particularly cycling – is also competitive compared to car travel in terms of speed (see Figure 2).

Figure 2. Cities where bicycles are as fast or faster than peak-hour car speeds in urban cores



Source: Adapted from INRIX (2022); Schleinitz et al. (2017); Twisk et al. (2021, 2022).

Environmental benefits of active travel

Maintaining or increasing active travel contributes to improving the environmental performance of everyday mobility. This should be evaluated both in relative (how much better is active travel for the environment than alternative modes?) and absolute terms (what is the overall contribution of active travel to reducing environmental pressures?). It should also be evaluated on how well active travel contributes to less impactful lifestyles more generally. For example, does a pro-active travel environment enable people to use their cars less?

The answers to these questions depend on the actual lifecycle performance of active travel modes. No travel mode is zero-emission on a lifecycle basis. Furthermore, the extent to which trips are either substituted or generated by improved active travel conditions also plays a role. Plausible trip-replacement rates (i.e. the number of car trips that could be replaced by walking or cycling) provide valuable information when assessing the lifecycle environmental impacts of increasing active travel rates.

The bulk of trips in urban contexts (including in town and village centres) are short (i.e. less than five kilometres). In high-income countries, most short trips are made by car (Beckx et al., 2013; Castro et al., 2019; Keall et al., 2018; Neves and Brand, 2019). Not all of these trips can be substituted by walking. Similarly, not all longer-distance trips can plausibly be cycled or e-cycled.

Longer-distance trip chains can be challenging to break up. Mobility constraints and the need to carry objects, children or pets can impact whether trips can be plausibly replaced. Nonetheless, most urban contexts have a significant reservoir of potentially walkable or cyclable trips. Transferring these trips away from cars to active travel may have disproportionate positive environmental impacts (Beckx et al., 2013; De Nazelle et al., 2010).

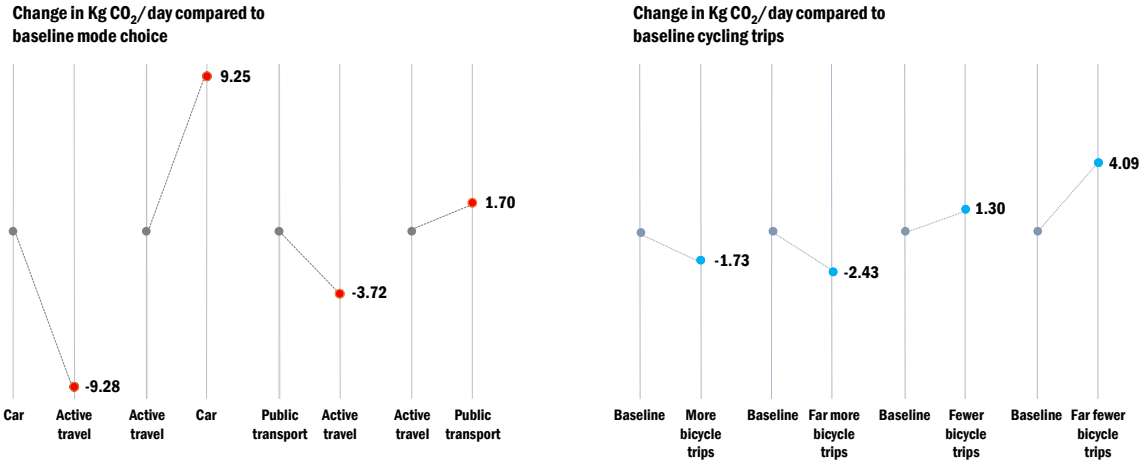
Active travel reduces carbon dioxide emissions

A recent assessment of the climate-related impacts of changes in active travel accounting for trip substitution effects shows significant relative impacts on lifecycle carbon dioxide (CO_2) emissions (Brand et al., 2021). Accounting for trip-related emissions from longitudinal panel data in seven European cities, the study found that changes in daily travel behaviour (frequency and length of trips) and mode choice had significant active travel CO_2 reduction benefits. Increases in walking and cycling consistently reduced overall lifecycle CO_2 emissions, indicating that active travel trips replaced more polluting ones.

Figure 3 shows the change in CO_2 emissions resulting from shifts to and from walking and cycling and the impact of more or less cycling trips as compared to baseline cycling levels. These are significant changes on a per-person basis. For example, a person riding one more bicycle trip per day and driving one fewer car trip per day for 200 days per year would emit approximately one-half ton less travel-related CO_2 on a lifecycle basis. This represents about 7% of the annual per-capita CO_2 emissions for people living in the European Union.

These specific CO_2 reductions are significant. However, in absolute terms, longer-distance travel constitutes the bulk of passenger-related CO_2 emissions – and, by extension, the bulk of environmental damage – from road transport. Urban passenger emissions account for only 32% of all passenger transport emissions and 17% of all transport emissions, including freight (ITF, 2023b). Intercity, regional and international longer-distance travel accounts for the majority of passenger emissions.

Figure 3. Carbon-emission impacts of mode shift and cycling trip changes in seven European cities



Source: adapted from Brand et al. (2021).

Active travel contributes to enjoyment, life fulfilment and health

While many things contribute to enjoyable and fulfilling lives, their relative importance depends on specific life conditions and contexts. Nonetheless, good physical and mental health ranks consistently highest as a contributor to happiness across diverse global contexts and populations (IPSOS, 2022). Active travel incorporates and maintains physical activity in everyday life, contributing to good health and happiness.

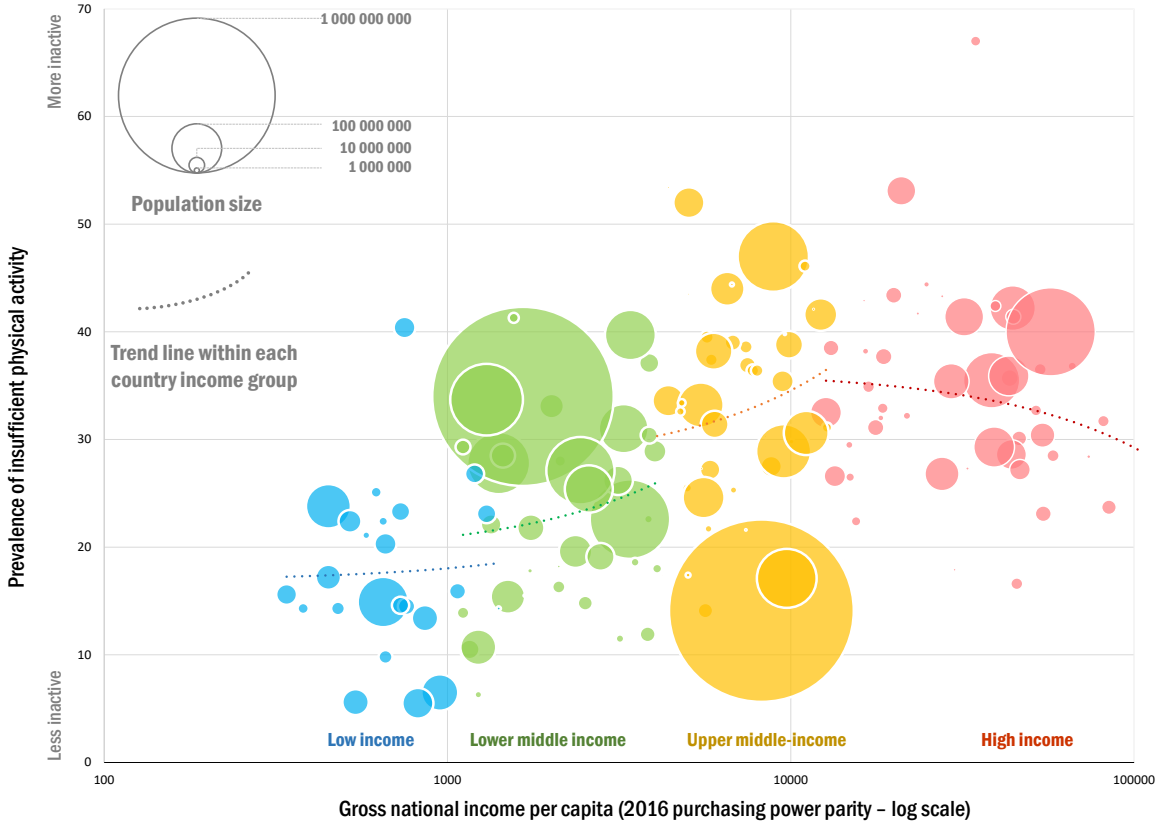
By definition, active travel involves physical activity, which is positively correlated to multiple health endpoints. However, active travel also exposes people to risks which may erode some of the benefits of physical activity. These principally relate to crashes and physical trauma, and exposure to air pollution. Nevertheless, on balance and on average, active travel's positive contribution to good health is orders of magnitude greater than the negative health impacts of crashes and air pollution. At the same time, this benefit is not uniformly distributed across populations, which has equity implications.

Insufficient physical activity imposes significant burdens on people and society

Good health is elusive for many. Physical trauma injuries and communicable diseases are significant sources of poor health and early mortality, but the global burden of non-communicable diseases is large and growing. Insufficient physical activity and sedentarism – particularly prolonged sitting – are important but addressable risk factors for non-communicable diseases and poor mental-health outcomes.

Physical inactivity and excessive sitting increase the risk of obesity, coronary heart disease, stroke, hypertension, diabetes, cancer, osteoporosis, osteoarthritis, depression and dementia (ITF, 2013; Nikitara et al., 2021; WHO, 2022a, 2022b). It is the fourth-highest risk factor for mortality, contributing to approximately 3.2 million premature deaths per year. Physical inactivity also results in 32.1 million disability-adjusted life years (DALYs) per year. In 2016, approximately one-quarter (27.5%) of all adults were insufficiently physically active, engaging in less than 150 minutes of moderate physical activity per week (Guthold et al., 2018; WHO, 2022b). Factors contributing to this physical inactivity include more sedentary work, a lack of public space in which to be active, increased road traffic, degraded air quality and increased dependence on passive travel modes (Lorenzo et al., 2020).

Figure 4. Prevalence of insufficient physical activity by country, population and income group



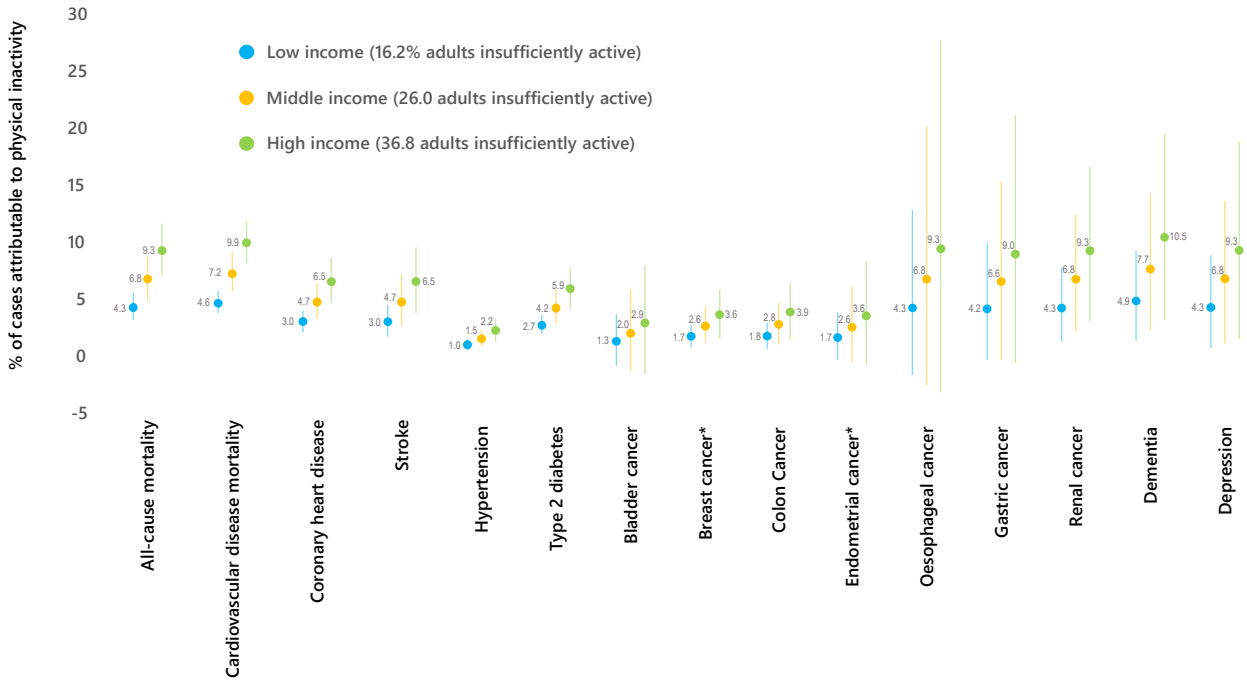
Source: Adapted from Guthold et al. (2018).

Levels of adult inactivity vary (see Figure 4), but wealthier countries generally display higher levels of insufficient activity than lower-income countries – with a slight drop off in the wealthiest countries (Guthold et al., 2018; WHO, 2022a). Average rates of insufficient adult physical activity range from 36.8% in upper-income countries to 26.0% and 16.2% in middle and lower-income countries, respectively (Guthold et al., 2018).

This disparity is due to higher work and travel-related physical activity rates in lower-income countries and an increased prevalence of sedentary work and motorised transport in higher-income countries. Men displayed lower average rates of physical inactivity globally than women (23.4% and 31.7%, respectively). Rates of physical inactivity are stable or growing in most countries, irrespective of income (Guthold et al., 2018). Adolescent rates of physical inactivity (defined as less than one hour daily of moderate to vigorous activity) are elevated and less correlated to income across all countries and income groups, displaying rates ranging from 79.4% in upper-income countries to 83.9%, 79.3% and 84.9% in upper-middle, lower-middle and low-income countries, respectively in 2016 (Guthold et al., 2020).

Insufficiently active people have a 20-30% greater risk of premature death than people who meet the WHO minimum activity guidelines (WHO, 2022b). Physical inactivity is responsible for up to 8% of all non-communicable diseases globally. It also accounts for 7% of all deaths and 7% of deaths from cardiovascular disease (Katzmarzyk et al., 2022). Physical inactivity significantly contributes to many non-communicable diseases – especially cardiovascular disease, certain kinds of cancer, dementia and depression.

Figure 5. Disease burdens attributed to physical inactivity by world income region



Source: Adapted from Katzmarzyk et al. (2022).

The global burden of insufficient physical activity is not uniformly distributed (see Figure 5). High-income countries displayed almost twice as many deaths attributed to physical inactivity compared to low-income countries (9.3% and 4.3%, respectively). Similarly, high-income countries consistently displayed twice as many deaths as low-income countries for each of 14 specific risk factors. Middle-income countries accounted for the highest number of deaths as well as cardiovascular disease-related deaths attributable to insufficient physical activity (69% and 74%, respectively). While the highest relative burden is in high-income countries, the greatest number of people affected by diseases linked to insufficient physical activity live in middle-income countries which account for the bulk of the world's population (Katzmarzyk et al., 2022; WHO, 2022a, 2022b).

According to a conservative estimate, the cumulative burden of direct healthcare costs, indirect costs, DALYs and lost productivity amounted in 2013 to INT$ 67.5 billion. Direct costs due to insufficient physical activity amounted to INT$ 53.8 billion, INT$ 31.2 billion was paid by the public sector, INT$ 12.9 billion by the private sector and the remaining INT$ 9.7 billion by households (Ding et al., 2016). This burden has not decreased as rates of physical inactivity have remained stable. The societal burden is unevenly distributed, with higher-income countries bearing a larger share of direct medical costs and productivity losses and lower-income countries bearing the brunt of the disease burden, as measured in DALYs (Ding et al., 2016).

Active travel maintains and improves health outcomes

The antidote to physical inactivity is simply to become more physically active. Increased physical activity reduces poor health outcomes and premature death associated with low activity levels and attenuates the negative health impact of excessive sedentary activities and sitting time (Ekelund et al., 2016). Despite a simple and straightforward "treatment", efforts to increase global and regional levels of physical activity have not met with much success. The WHO General Assembly target of a 15% reduction in physical

inactivity by 2030 remains in jeopardy (Andersen et al., 2016; Cardon and Salmon, 2020; Reis et al., 2016; WHO, 2022a, 2022b).

Increasing levels of physical activity will require expanding beyond traditional health sector interventions. A multi-sectoral and multilevel approach to reducing physical inactivity must involve schools, sports and recreation, urban planning and transport (Reis et al., 2016; WHO, 2022a). However, while exercise- and leisure-based interventions have delivered as expected, gains have proven difficult to maintain. One explanation for this is that humans, by nature and physiology, have evolved to avoid unnecessary exertion – this means that although exercise is good for people, it is often difficult to keep up (Lieberman, 2021). Another reason is that in many low- and middle-income countries, people are already physically active, and the added benefit of physical activity through "exercise" may not be relevant. Nonetheless, rates of physical inactivity are growing in all world income regions, so there is merit in establishing policies that support maintaining or increasing moderate amounts of physical activity in everyday life.

Daily active travel is fundamental to physically active and healthy lives. It thus directly contributes to better life enjoyment and fulfilment by attenuating multiple non-communicable disease burden risks. The contribution of active travel to multiple health endpoints is extremely robust and well-documented (de Hartog et al., 2010; Götschi, Garrard and Giles-Corti, 2016; ITF, 2013; Lorenzo et al., 2020; Matthews et al., 2007; Mueller et al., 2015; Nieuwenhuijsen et al., 2016; Rabl and De Nazelle, 2012; Reiner et al., 2013; Rojas-Rueda, De Nazelle et al., 2011; Saunders et al., 2013; Vancampfort et al., 2018; Vogel et al., 2009; Wanjau et al., 2023; Wanner et al., 2012; Woodcock et al., 2011). These endpoints cover all those identified in reviews of the health impacts of increased physical activity (see Figure 5) and are indicative of causal and not just correlative associations. Active travel actively contributes to reducing health risks.

Evidence on an additional health risk factor – obesity and elevated body mass index (BMI) values – is mixed, with some studies finding a strong but not causal correlation and others finding that BMI values decrease among physically active people (Dons et al., 2018; Wu et al., 2021). A crucial question is whether active travel decreases travellers' BMI or whether people with lower BMI are more inclined to walk or cycle. Evidence indicates that the latter holds: people with elevated BMI levels are less predisposed to walk or cycle, whereas people with lower BMI values are more likely to walk or cycle (Kroesen and De Vos, 2020). This underscores the need to address obesity from a whole of society perspective – including diet – since reducing BMI delivers broad health benefits from the uptake of active travel and other forms of physical activity.

Recent evidence strongly suggests that active travel improves mental health and cognitive function. Here too, the developing evidence supporting a correlation between active travel-induced physical activity and improved health outcomes is robust. People walking or cycling for work-based commuting report higher levels of life satisfaction and lower incidence of degraded mental health and depression (Avila-Palencia et al., 2018; Fyhri et al., 2023; Humphreys, Goodman and Ogilvie, 2013; Knott et al., 2018; Martin, Goryakin and Suhrcke, 2014; Singleton, 2019; Wild and Woodward, 2019). While much of the evidence on the linkage between active travel and mental health comes from higher-income countries, there is supporting evidence for the mental health benefits of active travel in lower-income populations (Mason, Curl and Kearns, 2016) and lower- and middle-income countries as well (Chen et al., 2021; Syahputri et al., 2022).

The health improvement effect of active travel is conditioned by whether the physical activity incurred by travel substitutes or is additional to other forms of physical activity (Möller et al., 2020). It is also not linear across most health endpoints, with the greatest health improvement experienced as people with sedentary or low physical activity lifestyles start increasing their levels of physical activity (de Nazelle et al., 2011; Hollingworth, Harper and Hamer, 2015; ITF, 2013; Mueller et al., 2015; Rabl and de Nazelle, 2012; Rojas-Rueda et al., 2011; Saunders et al., 2013).

Active travel nonetheless confers benefits to those who are already physically active. The overall contribution of active travel to health shifts from health improvement to maintenance of good health as levels of physical activity increase (Hollingworth, Harper and Hamer, 2015). The intensity of physical exertion is a factor as well, although health benefits already manifest themselves at the WHO minimum physical activity recommended level of 150 minutes of moderate physical activity per week for adults. Higher levels of physical exertion, such as faster cycling or walking, or active travel in hilly environments, deliver benefits more quickly or deliver greater benefits for the same amount of travel time.

The health benefits of active travel outweigh its negative impacts

Any assessment of the overall impact of active travel on health must account for some of the health risks associated with walking, cycling and other forms of active travel. These risks include exposure to air pollution – particularly fine particulate matter from fuel combustion and car brake pad and tyre wear – and the risk of injuries or death due to crashes (ITF, 2013).

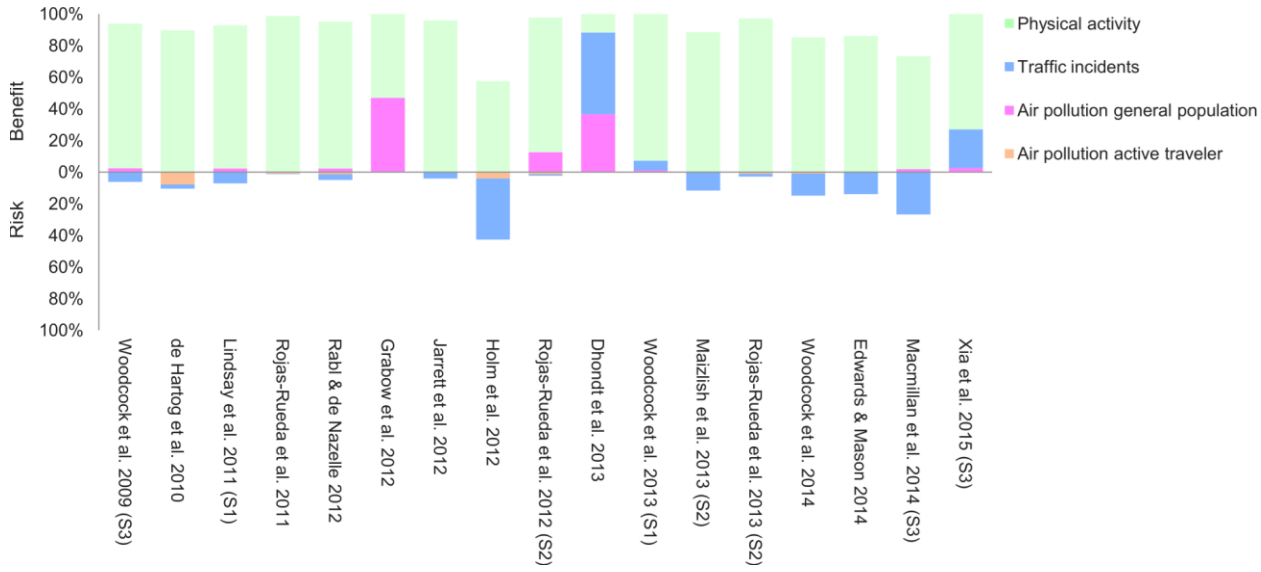
Exposure to ambient air pollution is typically less for those walking or cycling in or near traffic than for car occupants and decreases significantly as pedestrians and cyclists move away from the roadway. Fine particulate matter deposition in the lungs – and thus the final negative health impact – is nonetheless greater for cyclists due to their increased ventilation rate (ITF, 2013). Individual travellers face increased air pollution-related risks, but when their trips replace more polluting modes (e.g. cars or low-occupancy diesel public transport) the countervailing impact of overall reduced levels of air pollution determines the final societal health impact.

Light, severe and fatal injuries also mitigate the overall health benefits of active transport. These injuries and deaths occur at lower rates as more people walk or cycle (ITF, 2013), although the causality of this relationship is unclear. It may be that there are “numbers in safety” – more people walk and cycle in safe and secure environments – rather than “safety in numbers” – an increase in people walking makes traffic environments safer (Bhatia and Wier, 2011). As with air pollution, people walking and cycling are exposed to crash risks, but when their trips replace trips by larger, faster and more deadly vehicles, the overall societal crash risk may decrease, all else held equal.

Health-impact assessments (HIAs) establish the balance of positive and negative health impacts at both the individual and societal levels to guide policy. HIAs consistently show significantly positive health benefit–risk or benefit–cost (when impacts are monetised) ratios in favour of active travel (de Nazelle et al., 2011; Holm, Glümer and Diderichsen, 2012; Lindsay, Macmillan and Woodward, 2011; Mueller et al., 2015, 2018; Rojas-Rueda et al., 2011; Rojas-Rueda et al., 2012, 2013; Woodcock et al., 2013, 2014).These range from -2 to 360, with a median value of nine times more benefits than risks in 30 studies analysed by Mueller et al. (2015).

Figure 6 shows the net benefits calculated for all studies covering multiple health pathways. In all but one, the health benefit from physical activity outweighs the negative health impacts of air pollution and traffic injuries and deaths.

Figure 6. Review of health impact assessments of shifting to more active travel



Source: Adapted from Mueller et al. (2015).

More recent HIAs support these findings, although they find walking and cycling have different overall health impacts. The overall cost–benefit ratio for monetised health benefits versus disbenefits examined in seven European cities was overwhelmingly positive for cycling. In Rome, for example, the ratio was EUR 70:1, with lower ratios recorded in Zurich (EUR 62:1), Barcelona (EUR 35:1), Vienna (EUR 22:1) and London (EUR 8:1) (Mueller et al., 2018). For Barcelona, the overall average annual economic benefits, including observed shifts to walking and cycling, have been estimated at EUR 47.3 million per year for walking and EUR 4.7 million per year for cycling (Pérez et al., 2017). In Italy, estimates of the average overall monetised health benefit of active travel across nine cities of more than 300 000 inhabitants has been estimated at EUR 0.32/km for walking and EUR 0.06/km for cycling, dropping to EUR 0.02/km for e-bikes (Mela and Girardi, 2022).

Differences between walking and cycling in HIA outcomes are linked to the greater impact of air pollution and crashes on cyclists on a per-kilometre basis. Most active travel HIAs have been undertaken in Europe and North America; therefore, their applicability to other global contexts may vary. Nonetheless, HIAs undertaken in lower-income countries also report similar positive outcomes for walking and cycling (de Sá et al., 2017; Woodcock et al., 2009). There is also evidence that the same associations between environments that encourage active travel, ensuing levels of active travel and the health benefits realised from active travel-related physical activity in higher-income countries hold in lower-income countries (Benton et al., 2023; G. Ferrari et al., 2020; Ferrari et al., 2020; Siqueira Reis et al., 2013).

Beyond HIAs, CBA exercises can help guide policy decisions if they account for the unique characteristics and benefits of active travel. Adapted CBA must account for the health impacts of active travel and should also capture effective travel speeds, especially at times when most travel occurs (Mulley et al., 2013). An expansive CBA exercise adapted for active travel accounting for climate change, air pollution, noise, soil and water quality, land use and infrastructure, traffic infrastructure maintenance, material resource requirements, vehicle operation costs, travel time, congestion, health benefits, crashes, perceived safety and discomfort and quality of life and tourism finds that walking and cycling generates a benefit of EUR 0.37 and EUR 0.18 per kilometre in the EU. Conversely, each kilometre driven by car in the EU imposes an external cost of EUR 0.11 (Gössling et al., 2019).

Accounting for people: The distribution of active travel benefits and disbenefits

The balance of evidence overwhelmingly indicates that society benefits from active travel in safe and secure conditions. But what does the evidence say about the distribution of those benefits in different contexts and among different population groups, and especially for lower-income, under-represented and otherwise disadvantaged groups? The answer to this question matters because pro-active travel policies may not deliver intended outcomes across the whole of society if most of the benefits flow only to some of the population. Likewise, pro-active travel policies may not deliver expected benefits in contexts and countries where the ability or willingness of people to act on them is curtailed or where the starting points impact how strongly or how quickly benefits accrue. The balance of evidence on the distribution of the benefits of active travel indicates that active travel is "healthy for all but less beneficial for many" (Braun et al., 2023).

On a basic level, the benefits of active travel are only realised if people actually walk, cycle or otherwise engage in active forms of travel. In many instances – and especially in lower- and middle-income countries and within lower-income populations – people walk or cycle not out of choice or concern for health but because no affordable alternatives are available (Arellana et al., 2020; Benton et al., 2023; Ghimire and Bardaka, 2023; Keall et al., 2022; Loo and Siiba, 2019; Sagaris et al., 2022; Stehlin, 2019; Vanderschuren and Jennings, 2016). Nonetheless, the link between perceptions of active travel as being synonymous with poverty does not always hold, as in the case of a recent survey in Nairobi (Basil and Nyachieo, 2023). An additional factor to consider is that the prevalence of ill health and multi-morbidity among low-income populations also dampens the uptake of maintenance of active travel in those population segments (Braun et al., 2023; Braun, Rodriguez and Gordon-Larsen, 2019; Vancampfort et al., 2018).

In all countries, the travelling environment may discourage walking and cycling due to network discontinuities, pollution and unwelcoming and dangerous traffic and street environments (Benton et al., 2023; Bostock, 2001; Carboni, 2021; Carboni et al., 2022; Figueroa Martínez et al., 2019; Grudgings et al., 2018; Mullen, 2021; Prati, 2018; Stark and Meschik, 2018). Active travel in inhospitable contexts is unpleasant, dangerous, uncomfortable and strenuous. As soon as people can afford other options such as motorbikes, public transport or cars, many will stop walking and cycling to get around (Benton et al., 2023; Ghimire and Bardaka, 2023; Sagaris et al., 2022; Stehlin, 2019). Among higher-income groups and contexts, unwelcoming traffic and street environments will prevent many people not already walking or cycling from ever starting. Encouraging the maintenance or increase of walking or cycling based on health or other benefits in these contexts will not match many people's lived experiences or priorities and thus will likely not deliver the expected results.

Spatially disaggregated or population-specific assessments of active travel benefits ensure that policies supporting active travel uptake are more equitably distributed. Evidence from such assessments shows that, in many cases, this equitable distribution does not occur. A spatially disaggregated HIA of increased cycling in the greater Los Angeles area found that while all race and income groups benefited, some benefited much less than others (Braun et al., 2023). The overall estimated effect of more cycling (a 50% increase over current levels) was a net reduction of 12.4% in overall mortality and net block-level reductions in mortality ranging from 4% to 14% (Braun et al., 2023).

Disaggregated analysis of benefits shows that benefits accrue most strongly to non-Hispanic white, upper-income and college-educated population segments. Blocks with higher percentages of Black and Hispanic residents, lower income and higher poverty levels and a higher percentage of no-car households experienced significantly fewer benefits. There are many plausible reasons for this disparity. These include

reduced traffic safety and increased crash risks, closer proximity to motorways, higher ambient air pollution levels, and a lack of cycling infrastructure. At the same time, low physical activity levels and poor baseline health imply that these neighbourhoods would benefit most, and most quickly, from increased cycling (Braun et al., 2023).

Another study examining the association between active travel, socio-economic status, gentrification and self-reported health in the United States found similar racial and socio-economic disparities (Barajas and Braun, 2021). Overall, cycling for utilitarian travel in the previous week and increased walking were correlated with higher levels of self-reported health. This was much less the case for cyclists of colour and lower-income cyclists. Racial and socioeconomic disparities in reported health differed little among population groups for walking trips. Many of the same explanations for the gap in active travel and self-reported health between different population groups outlined above also hold for this study. For example, 18.1% of Black adults self-reported poor or fair health compared to only 7.9% of White adults (Barajas and Braun, 2021).

The uneven distribution of active travel benefits affects how well pro-active travel policies achieve their aims and materially improve people's lives. People experience these benefits in different ways and at different levels. Government policies must account for these differences. For instance, general active travel promotion, cycling skill classes or communication efforts based on the health benefits of active travel will most likely not gain traction where active travel environments are inhospitable. Policies deploying infrastructure, improving safety and security and reducing exposure to pollution may be more effective in realising overall benefits in these instances. Likewise, focusing infrastructure development where the relative benefits of active travel are already high (e.g. in high-income neighbourhoods with less disadvantaged populations) will likely bring fewer societal benefits than if they were rolled out uniformly on a regional basis or at least in disadvantaged communities first (Barajas and Braun, 2021; Stehlin, 2019).

Why improving the quality of walking and cycling is so challenging in many modern cities

Clear and compelling reasons exist to retain or increase walking and cycling in cities and towns worldwide. Doing so, however, will require addressing the physical, social and institutional space given to privately owned motorised transport, including cars, vans and lorries. Simply seeking to deploy pro-walking and pro-cycling policies in places designed to facilitate the use of large motor vehicles is rarely a successful strategy. Understanding, addressing and adjusting the technological embeddedness of individual motorised transport in cities is critical to improving walking and cycling in cities.

Technologies – especially those adopted at scale – are consequential because of how they change the world around them and not only because of what they enable people to do. Technologies are not isolated from their use and effect. Acquiring the skills needed to use a technology – and its concomitant use – creates a mental model of linkages between action, effect and meaning. This mental model or "system of meaning" supports the further use and anchoring of that technology in society (Nye, 2007). This has been true for successive technological revolutions from the invention of the wheel, the printing press, electricity, the shipping container and many others. The changes to which technology contributes are often directed and desired. Indeed, successful technologies create value for their users, which is why they are popular. But "latent in every tool are unforeseen transformations" (Nye, 2007) that are not anticipated, often not wanted, and almost always grow stronger with time.

As with other technologies, the uptake of the car has shaped society – particularly cities and towns – in ways that reinforce its use. Changes in transport infrastructure, land-use patterns, related services such as insurance and financing, and policy-making frameworks favour car use – and, in doing so, suppress walking, cycling and other non-mobility uses of public space. Other underestimated or unforeseen outcomes of 20th-century automobile-focused development include its contribution to traffic deaths, injuries and other degraded health outcomes; local environmental stresses and global climate disruption; and the economic burden generated by congestion, pollution, diminished health and mortality.

Automobility has positively contributed to the lives of many people. Still, it has also imposed costs that have only been understood and measured long after cars first showed up on city streets. Automobility has also physically reshaped cities and changed how people carry out activities in urban space. Today's cities and towns are larger and more spread out than ever before. They are designed in ways that often require residents to travel quickly and for long distances to fully participate in society and maintain access to labour, social and leisure opportunities, healthcare, and other necessities. This spatial distribution of opportunities and the accompanying framework of institutional support makes cities both car-friendly and car-dependent – just as it makes them walking- and cycling-deterrent.

In cities built to facilitate car use, and given the historical benefits the car initially conferred, it becomes difficult to address their role objectively. Furthermore, any assessment of the car versus other alternatives is influenced by largely unspoken and unconscious assumptions about car travel as the default, preferred and permanent way to get around (Walker, Tapp and Davis, 2022). This "moto-normative" worldview results in a built-in acceptance of risks and harms from motor vehicles that would not be acceptable in other domains. This worldview also complicates accurately assessing the severity and range of negative impacts associated with car use (Verkade and te Brömmelstroet, 2022).

How the car became the norm in cities

Like other transport modes such as the bicycle, the rail-based streetcar and the horse-drawn carriage, the car was first introduced into cities as a luxury good. All these technologies had two things in common when introduced. First, each allowed people to access more opportunities in the roughly one hour that people globally devote to daily travel, irrespective of city and era (Marchetti, 1994). Second, each was universally explicitly opposed on the grounds that the speed they introduced was both dangerous and socially undesirable. As with prior transport technologies, mass production brought down the purchase cost of cars, and public support for infrastructure and energy supply brought down operating costs. What differed with the car was that the speed differential with other transport modes was significant and led to so-called "hypermobile" societies (Norton, 2007, 2008; Adams, 2005).

Cities in hypermobile societies are designed or often redesigned, with motorised transport as the default (and often unquestioned) modal choice. This approach focuses on delivering speed-induced travel time savings to individuals but often ignores the impact on other users and amenities in cities – notably the use of space by non-car occupants (Crozet, 2019, 2020). These cities are, in many ways, fundamentally "car-dependent" (Goodwin et al., 1995; Gössling S., Mattioli, 2020).

Society has increasingly conflated the mobility of people with the mobility of people in cars (Gartman, 2004). This shift frames what defines freedom of movement, what constitutes a good life and what it requires, with automobility at the centre of all three answers (Sheller and Urry, 2000). The increase in access and opportunity afforded by the car and its contribution to economic and societal advances are clear and unquestioned. But these benefits have eroded conditions for travel by other means (walking and cycling in particular) just as the benefits they confer to car occupants have themselves eroded with mass motorisation.

In hypermobile societies, opportunities are dispersed across ever-expanding and sprawling urban and non-urban agglomerations. Those who cannot take part in this hypermobility are disadvantaged and have an increased risk of social exclusion. Beyond the negative impact on those who cannot benefit from hypermobility, hypermobility impacts all. Evidence suggests that hypermobile societies are more dangerous, anonymous, less trusting and, as a result, much more isolating (Adams, 2005).

As with other technologies that exert large and systemic effects with their dominance, the uptake of car usage crowds out the use of other transport modes. As car-based planning has taken hold, land uses best served by longer distances and fast travel have become the norm (Crozet, 2020; Norton, 2008). Commercial or other amenities and opportunities are spaced out in clusters best accessed by cars, and the area delineated by streets increases just as the number of amenities and opportunities within those areas decreases. Changes to the physical layout of the city make it easier to use a car to go about daily life, but the distances and travel speeds it imposes make it increasingly difficult – or impossible – to live without access to a car. In this way, the car (like other dominant technologies) exerts a "radical monopoly", whereby its consumption becomes compulsory to lead a fulfilled life (Illich, 1974). This radical monopoly has been reinforced through network externalities (Webber, 1992) that increased the value of private vehicle ownership as vehicle ownership increased. This increase in value is directly tied to the complementary public (and private) investment increases that accompanied the growing prevalence of private cars (King, Smart and Manville, 2022).

Much of the intrinsic utilitarian value of the car can only be achieved by restricting other non-motorised activities. From a utilitarian perspective, the car gives users the ability and potential to travel at very high speeds and over long distances with limited physical exertion. However, this can only be achieved if the

car driver can travel without major obstacles. These benefits decrease if car drivers are not prioritised or allocated enough reserved space to reach those speeds. They also fall as the number of drivers increases.

The car provides its users with the highest value when several conditions are met. First, policy makers maximise the space reserved for large and motorised vehicles' exclusive use. Second, priority is given to car users over other modes and the number of potential conflicts with other modes is minimised by removing these other modes from "car space". Third, the number of car users must be contained.

In short, if the movement of pedestrians, cyclists and other road users with lower maximum and average speeds are restricted while reserving space for car drivers, the first condition for car drivers to travel faster is achieved. The wider the space, the faster the possible speeds. Similarly, prioritising the speed of car drivers by reducing the number of intersections (e.g. limiting where pedestrians may cross and how they may cross the car space) further benefits car users. However, as the number of car drivers increases, the degree to which these benefits are conferred to their users decreases through crowding and congestion.

Moto-normativity contributes to the systematic marginalisation of non-car transport modes (and other public space usages) across several domains, including investment, space allocation and use, and traffic priority. This system has also perpetuated power and gender imbalances. Moto-normative traffic systems have largely been designed for (some) men by other men. Planners and engineers seeking to be "gender blind" have, in practice, neglected women's needs and desires (Sahama, Wyeth and Pojani, 2021).

As a result, the least powerful members of society have tended to be those who more often travel without cars. Racialised communities, women and low-income groups are often overrepresented in public transport ridership (see e.g. American Public Transportation Association, 2017), and women have also been found to make more walking trips than men in a variety of different contexts (Goel et al., 2023). Additionally, non-car travel modes have generally garnered less interest and funding.

A central feature of moto-normativity has been the monopolisation of mobility space by motorised transport. Mobility space is among the most contested spaces in cities, and there is ample evidence of its unequal and often inequitable distribution (e.g. ITF, 2022a). Urban street space and mobility space have long been spaces of competition between different socio-technical systems, with proponents of different uses fighting to establish or retain the "legitimate" right to use this space (Norton, 2007) and thus influence how it is allocated. Over the last century, motor vehicle proponents and policy makers largely succeeded in prioritising street space usage for motorised transport and thus de-emphasised its use for non-motorised transport alternatives and other non-mobility uses.

The resulting disproportional over-allocation of public mobility space for the use and storage of private vehicles was part of a larger trend in the 20th century of privatising and commoditising public spaces. This process has had important social and political implications limiting (to varying degrees) people's ability to move, meet, and interact freely (Kirby, 2008; Kohn, 2004). Within the larger prism of public space tension between the private and public realms, urban road space was ceded to (private) motorised transport, effectively constraining all other uses for the benefit of a few. This over-allocation of space to the car is particularly inefficient. More than 80% of personal vehicle space usage per unit of time corresponds to the static use of space while vehicles are parked (ITF, 2022a).

For much of the past century, policy makers have allocated ever more space to the car. Road capacity for motorised vehicles has been expanded to increase car speeds, simultaneously reducing the space allocated to other modes and uses. Increased road capacity has, however, given rise to further demand for motorised travel, including induced demand (see Goodwin, 1996). This has contributed to increases in travel times, which have often triggered a new bout of road capacity expansion at the expense of all other users and uses. While local conditions mediate the impact of induced demand, there is widespread

evidence of its significance. Importantly, induced demand is likely higher for capacity improvements in urban areas or on highly congested routes (WSP and Rand Europe, 2018).

Re-centring cities around walking and cycling requires changing the moto-normative model of city life and development. However, shifting away from the private-car paradigm can be complex and slow (Pisoni, Christidis, and Navajas Cawood, 2022). One of the principal reasons for this is that moto-normativity encourages car "blindness" and car "blinders", both of which emerge from cognitive processing biases. Both forms of bias make it difficult to re-legitimise non-motorised road space usage.

How moto-normativity shapes our view of mobility in cities

Moto-normative assumptions may suppress efforts to increase walking and cycling, as well as more diverse uses of urban public space. The associated unintended biases that can arise from these assumptions must be acknowledged and understood to successfully guide efforts to diversify urban mobility and provide more choices to people in how they move and live in cities and towns. This section describes how moto-normativity shapes views of mobility and how "car blindness" and "car blinders" in both public discourse and in decision making can make it more difficult to see past the car but easier to ignore many of its negative impacts.

What that was a convergence of a worldview, business interests, and individual interests conflated into a societal imperative to shape cities for speed and individual convenience. The transport systems of cities today did not occur by chance: cities became car-centric cities because they were designed to accommodate and facilitate car use. Over time, the processes that reinforce the car as the default norm for urban mobility become less visible as the system is further shaped around the car.

Car blindness: The invisibility of moto-normativity

The car has achieved such hegemonic power that its role in policy making and target setting is often invisible. In the chaos of urban reality, cars can come to seem endemic given how abundant, ever-present, and engrained they are in the everyday existence of so many urban centres. Under these conditions, the scale of the space allocated and used to accommodate car travel in cities is difficult to contextualise. In contrast, small micromobility vehicles (fewer in number and much smaller in size), street vendors and sidewalk cafés tend to be viewed by some sections of the population and policy makers as cluttering up public space. Too often in these discussions on public space usage, private cars are not seen – nor is the amount of space given to them in urban landscapes questioned.

Any attempt to re-allocate space is contested by different users, who would like the space to be allocated in their favour, with motorists being particularly averse to bike-lane introductions (see e.g. Wild et al., 2018). Wilson and Mitra (2020) have also argued, relying on a Canadian case study, that opposition to cycling infrastructure tends to relate to policy makers concerns regarding the loss of road space for the car, with politicians often hesitant to support policies perceived to deter motorised transport usage. Users of alternative modes of transport are often seen as illegitimate usurpers of space that should be reserved for car users (e.g. Kaplan and Prato, 2016). Additionally, despite disproportionate amounts of space already allocated to motorised travel, there is evidence that the general public systematically overestimates the amount of mobility space allocated to non-motorised modes while underestimating the space allocated to the car (Szell, 2018).

Car blindness is also prominent in discussions on perceptions of road safety. Despite the overwhelming nature of vehicular violence, whereby drivers of cars disproportionately injure and kill other road users,

users of other modes are typically held to significantly higher standards than car drivers concerning the violence they perpetuate and other associated risks. For example, 45% of fatalities in the EU resulting from crashes occur in collisions with a car; this figure rises to 65% when including collisions with other large, motorised vehicles such as buses, trucks and lorries. These values increase to 66% and 95%, respectively, when considering only collisions between two road user and excluding unknown causes and single user crashes (EC, 2023; see also Figure 8 in the following chapter). Deaths and injuries perpetuated by users of alternative modes also appear more politically unacceptable than the violence perpetuated by car users. In everyday life, and in different contexts, how the risks of any vehicles that are not large cars and vans are presented to the public does not reflect the reality that car drivers are the ones injuring, maiming and killing most people involved in crashes and collisions.

A clear example of the disparity in public discourse between car drivers and users of alternative modes is seen in how safety is discussed and often framed for new emerging micromobility alternatives such as e-kick scooters. It is common to read headlines in leading newspapers, periodicals and news agencies, particularly in the Global North, highlighting the dangers of these vehicles. For instance: "Pedestrians 'will face danger if e-scooters get road approval': Plan for street trials poses serious threat to health, experts warn" (Tapper, 2020) in the *Guardian*, and "Electric scooters described as an 'absolute menace'" in the BBC (2022). These headlines, and the broader blindness to the car's negative impacts, align with discursive storylines that are often seen in different stages of socio-technical transitions, including the transition from the horse and boogie in the late-19th and early-20th centuries (see e.g. Geels, 2005), the establishment of car dominance in the 20th century (see e.g. Roberts and Geels, 2018) and the more recent attempt to decarbonise societies more broadly (see e.g. Geels, 2014).

Socio-technical transitions can be broadly understood as potentially including four stages (Roberts and Geels, 2018). In the first stage, the radical innovation emerges in the fringes, and its early proponents attempt to establish legitimacy. This is followed by a stage where the proponents seek to embed the innovation in a broader societal context. Here they can achieve further support for the development of their innovation but are faced with problems arising from the system's expansion. A stabilisation of expectations and rules characterises this stage. The third stage sees the more mature innovation attempt to compete directly with the established regime and replace it. Its success or failure at this stage likely rests on the ability to seize windows of opportunity caused by the disruption of the former hegemony. Finally, the final stage sees the once radical innovation becoming "institutionalised and taken for-granted, resulting in adjustments in infrastructures, policies, lifestyles and views on normality" (Roberts and Geels, 2018: 516).

The differences in how the car is portrayed in public discourse and the portrayal of new emerging mobility modes (e.g. the e-kick scooter or the pedelec) or older modes (e.g. the bicycle), whose proponents are seeking to establish or re-establish within the mobility landscape, can be better understood by relying on this socio-technical transition lens.

The car is firmly entrenched as the dominant mobility mode, and its supporters are interested in maintaining the status quo. At this stage, some of the most salient supporting storylines relate to the car being here to stay and about how car use has become a "basic right" (Roberts and Geels, 2018). This is reflected in the common complaints about space re-allocation benefitting cyclists or other users which is present in many different contexts where the prioritization of the car is deeply entrenched. Examples of this "bikelash" (Wild et al., 2018) can be found in mass media reporting worldwide, especially when space is re-distributed from car users. In different contexts, including, Latin America (Diario Libre, 2022; Noticias SIN, 2021; Segovia, 2022), North America (Barron, 2019; Maslin-Nir, 2023), Europe (Bradshaw, 2020; SIC Noticias, 2021) and Australasia (Ore, 2022) the reporting highlights citizen and business complaints about

the introduction of bike lanes using similar arguments of the added difficulty of finding parking or the supposed increase in car traffic congestion.

At the same time, e-scooters and, to a lesser extent, bicycles can be better understood as currently being somewhere between the first and second stages of a socio-technical transition in most contexts. Their proponents are still trying to legitimise the transport mode and seek political support to further embed these modes in the urban mobility sphere. Ironically, much of the discourse around e-scooters being dangerous "toys", a nuisance, and of little value to the general population mirror the storylines that were used against the introduction of the car in the early and mid-20th century in the United Kingdom (Roberts and Geels, 2018) and the United States (Norton, 2008). Roberts and Geels' (2018) historical analysis highlights that in the late-19th and early-20th century, motor vehicles were often discussed as dangerous nuisances that were toys for the upper classes and endangered others.

This backlash against e-scooters and their users has successfully impacted policies despite little empirical evidence of their negative impact. The criticisms also starkly contrast with the continued acceptance of the negative impacts car drivers impose on others in cities. The discourse of e-scooters as dangerous and annoying additions to urban mobility systems has prompted many cities, including Paris, to reconsider their acceptability as part of cities' mobility landscapes. For example, the mayor of Paris, Anne Hidalgo, described the scooters as "nuisances" (France24, 2023). Complaints from residents about "reckless driving" by scooter users, scooters cluttering the sidewalks and their perceived danger following fatal collisions prompted the city to hold a referendum on the legality of rental scooter operators (*Le Monde*, 2023). The outcome of the referendum resulted in Paris not renewing any e-scooter operators' contracts, with all ceasing operations by 31 August 2023 (Ville de Paris, 2023).

Any death or injury is one too many and should rightfully be seen as unacceptable. Similarly, every incident where citizens feel unsafe while using the transport system needs to be scrutinised by the public in general and, particularly, by policy makers. Precisely because of this, as the transport system diversifies and a greater variety of vehicles and form factors enter the mobility system, great care must be taken so that their inclusion does not come at the expense of those who choose to walk (ITF, 2023c).

However, moto-normativity does not allow societies to examine the potential dangers car drivers impose on others with the same critical lens. While the discussion over the safety challenges of e-scooters was taking place in Paris, the scale of the problem did not reflect which vehicles were more often involved in crashes that resulted in injuries in the city. In 2020, small electric personal mobility devices (*EDP Moteur* in French), including e-scooters, solo-wheels and hoverboards represented less than 5% of all vehicles involved in road incidents resulting in injury. In contrast, motorbikes represented 28.6% of the vehicles, and 39.8% of the vehicles were large four-wheeled vehicles, including cars, sports utility vehicles, buses, vans and lorries (ONISR, 2023).

But Paris is not alone in this framing of e-scooters as dangerous public nuisances. The City of Sydney refused to take part in a rental e-scooter scheme trial because of concerns for pedestrian safety (Cassidy, 2022). The mayor, Clover Moore, stated: "The data from emergency departments both nationally and internationally on e-scooter injuries is sobering . . . The risks, not just for riders but for pedestrians, especially people with disability and the elderly, are obvious" (Cassidy, 2022). At the same time, in the Australian state of Queensland, three scooter-user deaths led to calls to re-think regulations (Kelly, 2022).

Similarly, leading newspapers in Spain have often included articles focused on the speed at which e-scooter users travel (Marinas, 2022), and on concerns that they are likely to injure pedestrians because of their "wrong use", highlighting instances were elderly citizens have been injured by carelessly parked scooters, or been frightened by the speed at which passing scooters were traveling or being injured by collisions (e.g. Vila Galán, 2022). However, very few scooters are capable of travelling at maximum speeds that

approach car speeds. Data for the EU demonstrates that cars injure, maim and kill all users of the roads – regardless of mode (EC, 2023). Additionally, where data is available (e.g. in the United Kingdom, statistics show that a great proportion of drivers exceed speed limits on all roads, including local roads, where speeds are limited to 30 mph (approximately 50 km/h). In 2022, under free-flowing traffic conditions, 50% of car drivers exceeded the speed limit on 30 mph roads (UK DfT, 2023).

In contrast, incidents of car violence are often discussed as inevitable (te Brömmelstroet, 2020), and the discourse often focuses on the victim's responsibility. For example, many practitioners and policy makers see distracted walking as a problem despite weak evidence of its impact (Ralph and Girardeau, 2020). Until policy makers can objectively and dispassionately confront the adverse effects of the car and the directionality of many of these impacts with the same clarity that they address the potential negative consequences of other modes, tackling the inequity related to transport outcomes in cities worldwide will remain a challenge.

Car blinders: The inability to see beyond the car

While car blindness renders the negative impact automobiles effectively invisible, the idea of the car is also so entrenched that it can become difficult to see beyond the car. This inability to identify alternatives to the car can be described as a "blinder". Car blinders have become so prevalent that even in cities and countries where a small or very small minority of the population owns or has access to private vehicles, moto-normativity remains central to policy making, design and planning.

The notion of car "blinders" emerges from similar cognitive processing biases as car "blindness". Car drivers adopt mental representations of their environment that are linked to the complex task of operating a motor vehicle (Bellet et al., 2009; Galpin, Underwood and Crundall, 2009). What drivers look for and notice is shaped by what matters to car drivers – for example, where to accelerate, what hazards to look for, or where to park. In practice, this means that car drivers are less aware of other users of road space when these do not register as critical to the driving task. Reverse evidence shows that cyclists who are drivers perform much better at perceiving other road occupants (Beanland and Hansen, 2017). Related to saliency bias is "normal bias" where people fail to see a clearly visible element in their environment – for example, the "looked but failed to see" error (Wolfe, Kosovicheva and Wolfe, 2022).

In these instances, the brain filters out rare elements that are not considered crucial to an immediate task, even if these things may be clearly and prominently visible. Post-crash car interviews often reveal that drivers looked but failed to see pedestrians, cyclists or other non-car road users simply because they were not part of the driver's task perception. Another example of how car use influences driver perception is that car drivers driving through low-income areas form negative views of these neighbourhoods, whereas people walking through the same neighbourhoods tend to have more positive perceptions of the neighbourhood and of its inhabitants (Gatersleben, Murtagh and White, 2013).

The biases that give rise to literal "blinders" in the context of visual and cognitive processing tasks can also manifest themselves through broader cognitive processing and awareness formation concerning which uses and users of shared urban space are seen or not. Many cities with low motorisation rates design their streetscapes for private cars and not for walking and public or informal transport, which are the majority forms of travel in most cases. This results from both aspirational aims, whereby the car is conflated with a notion of progress and the belief in the inevitability of the car.

The inability to see beyond the car or to focus on other modes features prominently in many transport policies, particularly congestion-reduction policies. Congestion is often framed as a critical urban issue, and in recent years there has been an increased understanding of and interest in its associated negative

externalities and the co-benefits of congestion reduction. However, reducing travel times for car drivers and users remains a core policy aim of congestion-reduction policies.

It is easy to see why congestion receives so much attention and investment through a moto-normative lens. It is costly, frustrating to car drivers (who are aware of how much faster they could travel if other cars were not on the road) and highly visible. Congestion delays car travellers while negatively impacting the wellbeing and health of many city dwellers.

However, the congestion problem is a relative one. Even with congestion-related travel-time losses, car users in cities worldwide almost universally have better access to opportunities and can travel faster than users of all other modes. For instance, a large-scale study comparing 117 cities across 16 countries and 6 continents found that the automobile provided better access than walking, cycling and public transport in almost all cities (Wu et al., 2021). In the one exception, Shanghai, the difference in access provided by public transport and the car was less than 10%.

In many urban contexts, the focus on, and treatment of, car-traffic congestion raises a fundamental equity concern. Why should transport policies seek to benefit those who are most well-off and experience the highest service quality? Car occupants are often relatively well off (in comparison to other travellers), as highlighted above. They also travel in the most comfortable conditions, with access to climate control, adequate personal space and an environment they control. They are shielded from much of the violence of the mobility system. Finally, they are allocated and use much more street space than all other users.

Removing car blinders could help authorities prioritise travellers who currently receive less access to opportunities via the transport system, and who often need to travel in less comfortable and less safe conditions. Placing the impact of congestion on car mobility within the context of people's overall mobility could help redirect policies towards supporting all people's travel options – not just those of car occupants.

How moto-normativity influences transport appraisal

Policy makers' tools to evaluate proposed transport projects can also be biased towards the car. This bias is evident in all stages of the transport appraisal process but particularly in four specific stages: 1) the assessment of need, 2) the proposal of projects for consideration, 3) the selection of appraisal methods and 4) the application of these methods.

Car blinders when assessing the need for transport projects

Transport appraisal processes commonly include a needs assessment phase, assessing the need for any potential transport intervention. This stage of project appraisal precedes the definition of any specific project that could respond to this stated need.

Traditional "predict and provide" paradigms are still prevalent in transport policy. These methods define needs based on past transport activities and trends. They forecast demand, which is equated with needs, and provide infrastructure (within budgetary constraints) to meet this perceived need (Owens, 1995). This decision-making paradigm perpetuates moto-normativity because, as highlighted by Lyons (2015), it fails to recognise that investment choices will shape transport demand.

Investment in pro-car development encourages further car use, creating a tautological and self-enforcing loop. The fact that an already established system of provision for the car encourages this type of travel behaviour provides the justification for even further investment in the car. It also perpetuates a decision-making framework that makes it difficult to explore alternatives to the current system of provision. In

effect, it becomes impossible to even consider the aims of the transport system, including whether it should seek to meet or accommodate the growing demand for motorised car-based transport.

A vision-led approach can be effective in addressing these shortcomings. Vision-led planning, also called a "decide and provide" approach, defines transport needs based on their strategic alignment to a vision of the future. It does not seek to predict future demand but instead engages with the underpinning goals and aims of the transport system itself. It looks to define what the future of the system should be and then implement policies and make investment choices that can help bring about these intended changes (ITF, 2023a; Lyons, 2015).

A vision-led approach that, from the outset, considers alternative travel options can therefore be effective in creating an environment where policy makers can pivot away from moto-normativity. It can help ensure that the systemic benefits to the car, accumulated through years of prioritisation within urban transport systems, do not determine or control future policies or maintain the car's current hegemony. As an example of putting a vision-led approach into action, policy makers should consider justifying how any proposed policy or project contributes to achieving a new vision for transport instead of reinforcing the existing vision.

Car blinders impact which project proposals are appraised

The way in which projects are selected for consideration in transport appraisal processes plays an obvious but crucial role in determining which projects are ultimately funded and developed. Regardless of the selected appraisal method, if the policy goals and proposed projects are car-centric, the appraisal process will result in the selection and implementation of car-centric policies.

To remedy this bias, policy makers should consider exploring a broader range of potential projects and expanding the guiding principles for defining need. This sets the stage for the possibility that a transport project that does not favour the car is implemented. To achieve this break with traditional, moto-normative policies and processes, there should be robust consultation processes that include a broad range of stakeholders including non-governmental and civil society organisations, universities and private individuals.

Car blinders in the selection of appraisal methods

Transport appraisal is highly reliant on CBA, which can be a useful tool but has some inherent limitations that policy makers do not always consider properly when making decisions. Experts (see e.g. ITF, 2022) have repeatedly called for the expansion of transport appraisal methods to overcome these limitations. Significantly, efforts have been made to incorporate more dimensions within CBA and to provide policy makers with other frameworks which can be used instead of, or as a complement to, existing CBA frameworks.

Policy makers should understand what is being considered in any assessment framework, particularly the limitations of the methods and data inputs. Understanding appraisal weaknesses and potential blind spots can allow policy makers and analysts to select appropriate complementary frameworks enabling more informed decisions.

While no standard appraisal method is perfect, when correctly applied such methods provide a valuable policy-making tool. However, policy makers must remain vigilant when applying appraisal methods, choosing variables and addressing any potential biases.

Car blinders are prominent in standard appraisal methods and their application

Although the standard transport appraisal (reliant on CBA) attempts to provide an unbiased comparison between alternative proposals, the biases inherent in its application often favour further investment in the car.

The traditional approach to CBA in transport appraisal adopts the aggregated value of travel-time savings as the central benefit measure for infrastructure investments (ITF, 2022b). However, the treatment of travel time savings can favour car users and investments benefiting car use. Those traveling by car tend to be wealthier and have higher car availability, thus resulting in higher ascribed values of time and consequently a larger impact on the outcomes of the results of the CBA (Nahmias-Biran, Martens and Shiftan, 2017).

Moreover, CBA, by its nature, aims to estimate the aggregate net welfare of the population. Although the framework allows the reporting of distribution effects (e.g. across income classes or regions) this is not always applied. (Van Wee, 2012). From a utilitarian perspective, the value of each benefit is aggregated, but in practice, who benefits and who loses and to what extent are important political and ethical considerations.

In their analysis, Nahmias-Biran, Martens and Shiftan (2017) show that without explicitly evaluating the benefits of vulnerable populations when performing economic evaluations, these aggregate frameworks can favour solutions that exacerbate inequities by favouring smaller travel-time savings for wealthier car drivers over larger travel-time savings for others. CBA's emphasis on maximising net welfare for all the population means that micro benefits for many or more well-off travellers generate higher appraisal values than more significant travel-time savings for fewer individuals or the less well off.

Moving from a focus on mobility (i.e. travel times) to a spatial accessibility focus (i.e. the potential to reach opportunities) can help mitigate some of the limitations inherent to the overreliance on travel time savings in CBA (see e.g. Martens and Di Ciommo, 2017). This highlights how decisions about which costs and benefits to include in the analysis (e.g. travel time, motoring costs or injuries) impact the results. Additionally, assigning monetary values to benefits may be more complicated for some than for others. This can bias results if those harder-to-quantify benefits are not included in the larger appraisal framework. The likelihood of better policies increases when a broad spectrum of impacts is considered.

Ensuring that car "blinders" are not embedded in transport appraisal requires a vision-led approach to policy making that expands the scope of considered projects. It also calls for careful consideration and selection of appraisal frameworks and variables that explicitly aim to capture a broader range of impacts, that evaluates the benefits to specific groups of interest (e.g. vulnerable or underprivileged groups), and where decision makers are cognisant of the limitations of any of the chosen frameworks.

Creating safe and inviting cities to walk and cycle requires addressing broader societal issues

Adequately designed walking and cycling infrastructure can contribute to safer environments. Cycling infrastructure has been shown to have some impact on cycling activity (see e.g. Félix, Cambra and Moura, 2020). Still, there is ample evidence of people walking and cycling despite very poor or non-existent infrastructure, as well as evidence of underused infrastructure in other contexts. Understanding how, when, where and why people walk or cycle in cities is a much more complex endeavour than simply looking at infrastructure provision.

From a broader perspective, an infrastructure-only – or even an infrastructure-centric – approach to walking and cycling is insufficient to ensure that cyclists and pedestrians can move around cities safely, securely and enjoyably. Infrastructure alone cannot ensure that people can travel without being subjected to violence, disadvantaged in terms of their access to necessities and opportunities, or exposed to other negative impacts of moto-normative environments. It is also not enough to encourage individuals to start walking or cycling or to do so more often or for longer distances.

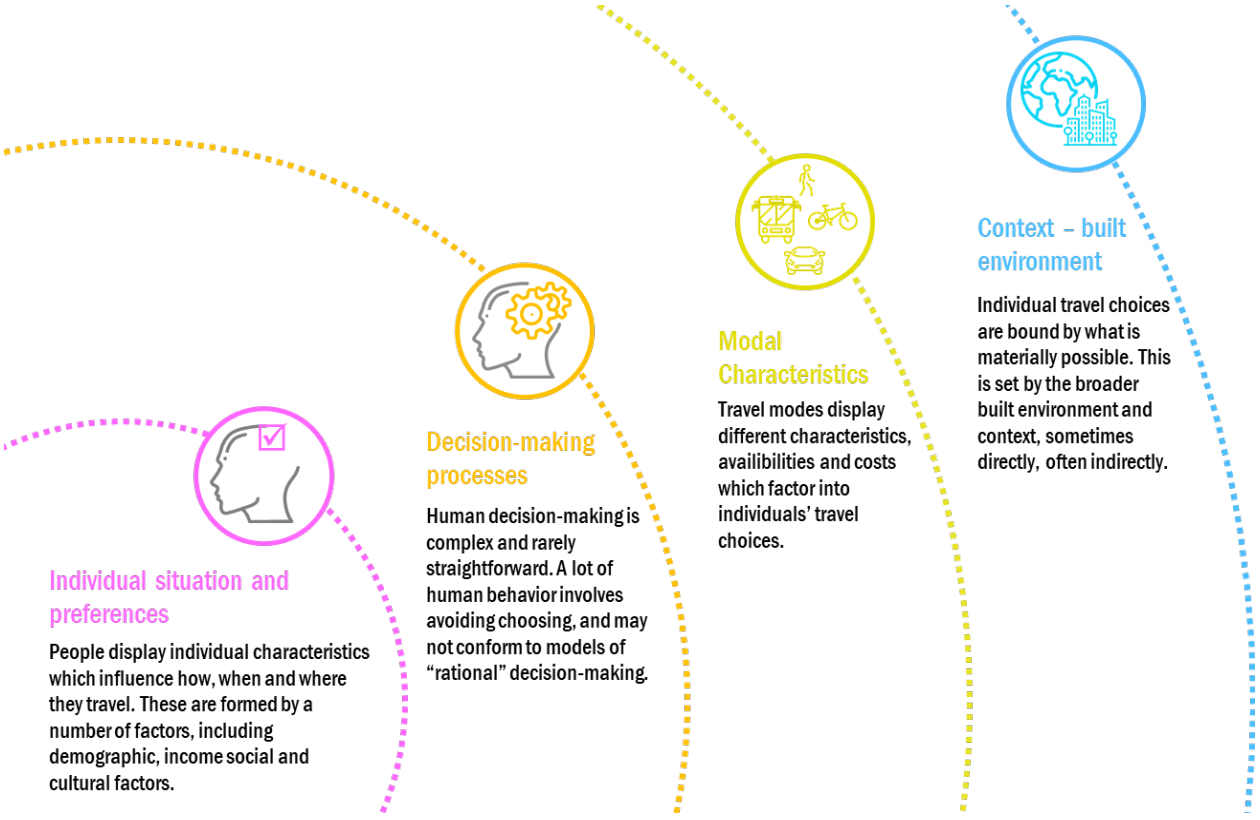
The challenge of creating a safe and inviting city where citizens can walk, cycle or otherwise travel in a dignified manner in a wide(r) variety of ways regardless of their capabilities, motivations or preferences extends beyond the transport system itself. Because transport serves as a connective tissue in cities, it interacts and is intertwined with other urban systems – including physical, social, and spatial systems, which also influence how, when, and where individuals move.

Additionally, the transport system often reflects broader societal issues, including those related to public space allocation and use or violence and insecurity. While many of these issues have deep-rooted causes beyond the transport system, the transport system is not independent of the societal context in which it is embedded. As such, policies aimed at improving the quality of walking and cycling must not be limited to an infrastructure provision lens. In practice, this means that a siloed approach that views walking and cycling policies and outcomes as a transport issue is unlikely to achieve the full extent of the potential benefits of active mobility in cities.

Understanding how travel decisions are made

Policy makers need to consider behavioural levers and systemic changes to better understand why people walk or cycle in cities and why they may choose not to do so. This includes understanding the social and cultural framework that informs the local context, individuals' needs and preferences and how these are formed, the decision-making processes people adopt to select their travel options, the characteristics, benefits, and constraints different modes offer, and the impact of the built environment on travel choices (see Figure 7).

Figure 7. Travel decision-making considerations



Source: ITF (2023).

A shift away from personal motorised vehicles requires understanding people's motives for car use. These include instrumental, symbolic and affective factors (Steg, 2005). These symbolic and affective factors, which include the idea of the car as a conspicuous status symbol, have been characterised as "car pride" (see e.g. Moody and Zhao, 2019). As Zhao and Zhao state: "The self-conscious emotion derived from the appraisal of owning and using cars as a positive self-representation" (2020: 797) must be addressed while encouraging this sustainable transition.

Additionally, land-use and transport systems have promoted and enabled car use, providing extrinsic value to car travel by making it more utilitarian and functional. However, travel is also influenced by extrinsic and intrinsic motivations (Mokhtarian, Salomon and Singer, 2015). Therefore, changing the resulting travel behaviour will require redefining the land-use and transport systems to augment other travel modes' utilitarian and functional characteristics and address the intrinsic motivations for car use.

Recognising the potential of other factors beyond infrastructure

An essential component to consider is the environment that pedestrians and users of slower active modes experience, the context that surrounds them, and the stressors that are part of their lived experience. Many of these other factors, including stress, exposure to violence and insecurity, fall outside the purview of transport ministries and cannot be solved solely with transportation policies. However, successfully achieving many transport aims, particularly those related to active mobility, requires understanding the roles these factors play in the population's mobility.

Perceptions and feelings of insecurity directly shape how travelling is experienced and influence travel-making decisions. If people considering walking or using active modes such as cycling perceive these activities as risky or insecure, this will have a negative impact on their willingness to make use of such modes. For instance, walking while being concerned about one's physical well-being, or expecting to be accosted by criminals or the police, being hit by a car, or sexually harassed or attacked, will always be an unpleasant experience. In this context, other qualities of the built or natural environment, including any active mobility infrastructure, become less relevant.

It is, therefore, essential to consider perceived risk in relation to other measurements associated with the feared event. Transport research, and criminology studies more broadly, have found that experiencing a particular event is highly correlated with the expressed fear of that specific event occurring (see e.g. Ceccato and Loukaitou-Sideris, 2022). However, risk is amplified through social context. Fear and perceived risk may not always perfectly correlate with other less personal risk measures. Institutional structures, social group behaviour and individual responses can shape the perceived experience of risk.

The social amplification of risk can also have secondary impacts, including enduring mental perceptions and attitudes (Kasperson et al., 1988). These perceptions and attitudes that socially amplify risk are relevant to policy makers, advocates and special interest groups interested in changes. This is because, during transitional moments of change, it takes time for individuals to modify their attitudes and for new perceptions to take hold. This necessitates a consistent commitment to new policy directions, and the proposed solutions must be comprehensive enough to communicate an actual change in the paradigm.

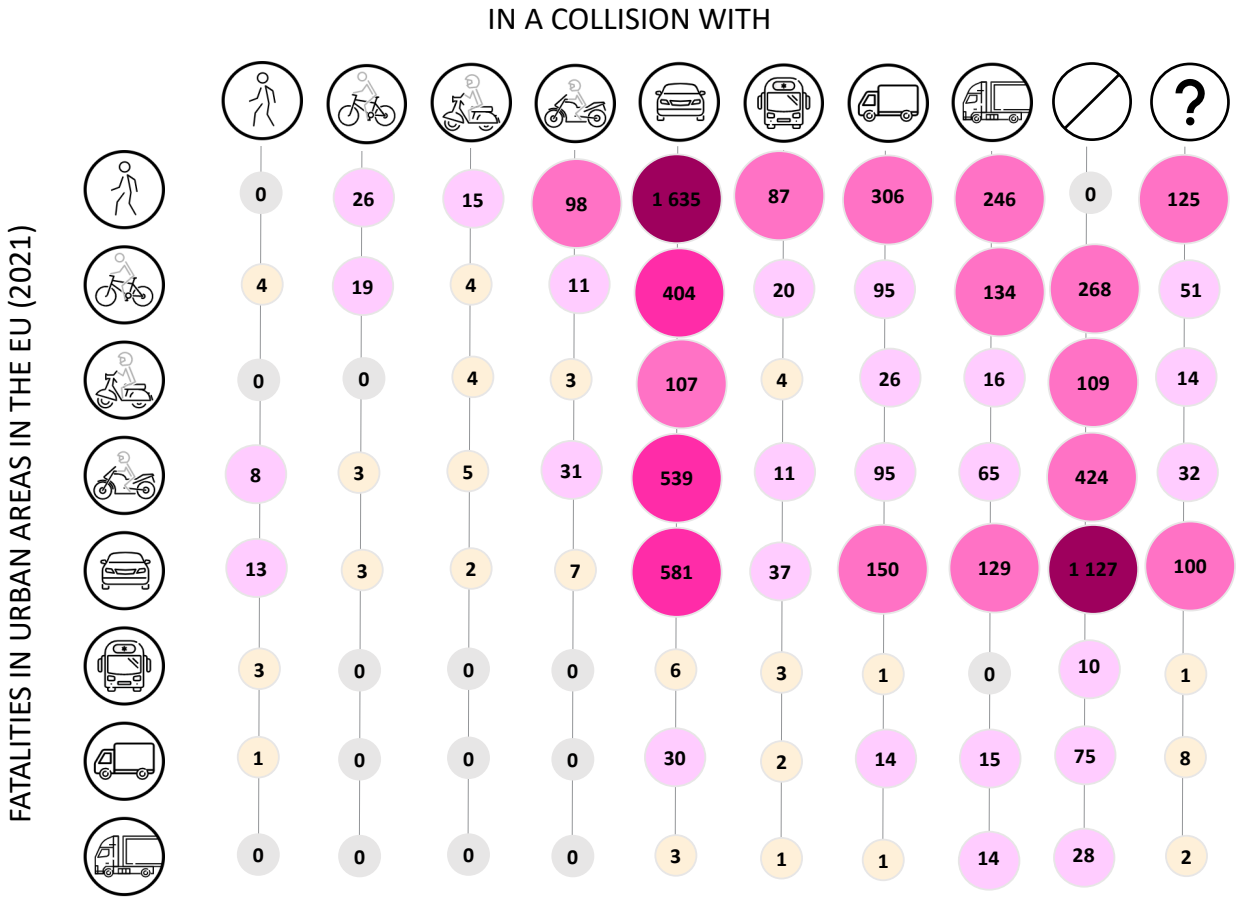
In the context of increasing active mobility and improving the lived experience of walking and cycling, exposure to violence and lack of safety can suppress these activities. Safe and enjoyable active city travel requires physical and social safety (London Cycling Campaign, 2023).

Infrastructure provision with high standards is integral to providing physical safety to pedestrians, cyclists and other road users. Efforts are underway in various contexts to radically improve road safety (e.g. through "Vision Zero" policies). However, these efforts must be accompanied by an equally radical reframing of how road traffic violence is addressed and perceived in public and policy discourse. For example, reporting that uses words such as "accident" – as opposed to "crash" – suggests that car crashes are unavoidable or unpredictable events (Culver, 2018).

Furthermore, reporting of crashes often hides the directionality of their impacts. Car drivers and drivers of other large, motorised vehicles such as vans, lorries and trucks are overwhelmingly involved in severe crashes in urban areas. And those that are more exposed, including pedestrians and cyclists, are disproportionately impacted. For instance, data from the EU shows that pedestrians account for almost 35% of all urban traffic fatalities. Additionally, most pedestrians (64%) die from being hit by someone driving a car (see Figure 8), and 90% die as a result of collisions with large, motorised vehicles of any kind (car, bus, van, truck or lorry). In fact, regardless of the chosen travel mode, most fatalities occur in collisions with cars. Excluding single-vehicle collisions, 62% of all fatalities resulting from collisions between two or more parties in urban areas occur in crashes where the other party is using a car. Together, fast and large vehicles (i.e. cars, lorries and trucks) are involved in 89% of crashes between two or more parties that result in the death of another road user.

Reporting around crashes also dehumanises the incidents, often focusing on efficiency (e.g. travel delays, congestion) and material losses (e.g. associated costs of material damages) rather than the person or persons killed or injured (te Brömmelstroet, 2020).

Figure 8. Road traffic fatalities matrix in urban areas in the European Union, 2021



Note: The data covers fatalities in single vehicle crashes and crashes involving one or more traffic units. Most of the crashes involve only one other vehicle. For multi-vehicle crashes the heaviest vehicles tend to be responsible for the most serious consequences.
Source: Adapted from EU CARE database on road crashes (EC, 2023).

When greater numbers of people walk and cycle, this makes cities safer, especially if the people walking and cycling represent a diversity of ages, genders and social classes. At the same time, pedestrians, cyclists and micromobility and motorcycle users are the most vulnerable road users. Traffic collision rates in which people are killed or serious injured (so-called KSI rates) are lower in cities with higher walking and cycling rates and increase as the number of pedestrians and cyclists decreases (Jacobsen, 2003; Klanjčić et al., 2022).

Recent data from London shows that pedestrians, cyclists and motorcyclists make up 80% of those seriously injured or killed in road incidents and these severe injuries and deaths are much more prevalent in the London ‘s most deprived areas (TfL, 2023). Similarly, pedestrian fatalities continue to increase in the United States. In 2020 there were more than 6 500 pedestrian deaths, a 3.9% increase from 2019 and a 46.2% increase from 2011 (National Highway Traffic Safety Administration, 2022).

Members of lower socio-economic groups are more impacted by serious injury and fatal crashes, and these incidents are also more likely to occur in particular geographic locations (Culver, 2018). This is because lower-income individuals are less likely to have access to personal motor vehicles for their trips and because disadvantaged areas tend to have higher rates of substandard and often unsafe infrastructure.

Unlike the central role of high-quality infrastructure in achieving physical safety, achieving social safety often requires addressing broader societal issues. Ensuring social safety necessarily requires looking beyond an infrastructure-only approach. To do this, transport policy makers need to co-ordinate with other relevant authorities and engage with other relevant stakeholders to address these factors relevant to their mandates but outside of their remits.

Considering the potential deterrent of fear, violence and stress

All things considered, it is possible to ensure safe, secure and enjoyable walking and cycling in cities. But this cannot be achieved by only providing new infrastructure for pedestrians and cyclists. It is necessary to critically examine the underlying violence that constricts daily mobility. People want to feel safe and secure as they move through the city.

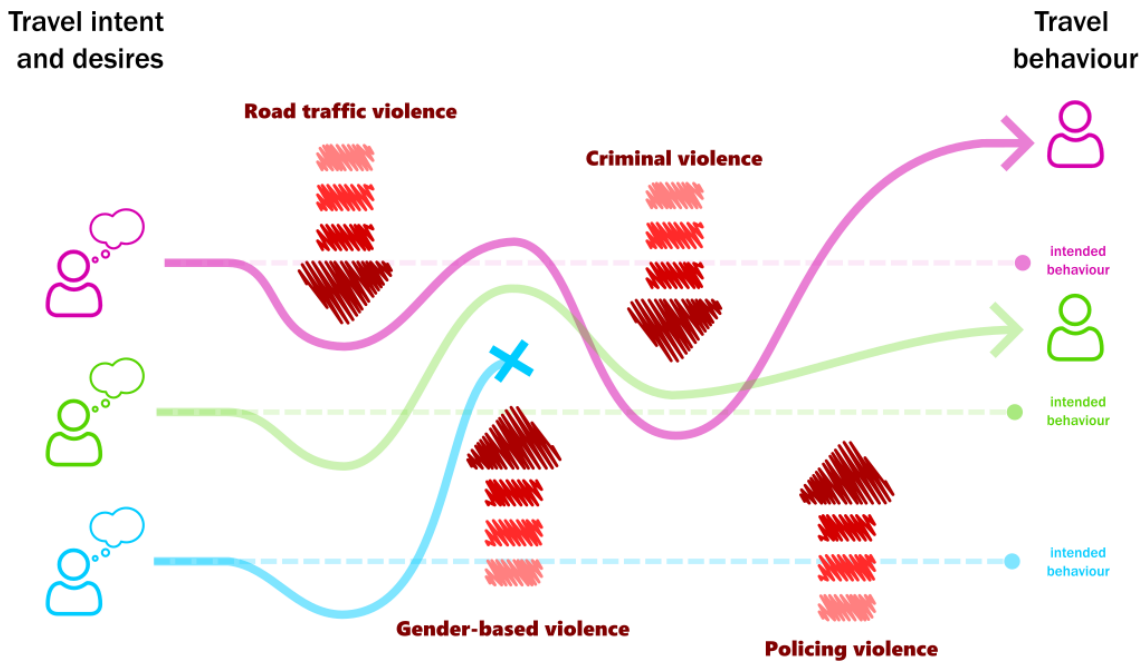
Although high-quality infrastructure is part of the solution, it is not enough to ensure that city dwellers can move through the city securely and without being subjected to all manner of violence. For that to occur, it is necessary to engage with deeper system leverage points (Abson et al., 2017), changing both the incentives and other rules of the system, as well as the underlying paradigm out of which the current car-dominated system arises. In doing so, it is possible to respond to many of the barriers to walking or cycling, particularly in the context of developing economies, that discourage their use (see e.g. Mogaji, 2022).

When discussing the violence experienced on the roads, it is essential to note that not all violence is deviant, departing from usual and accepted standards or even necessarily intending to cause harm. As Ruggiero points out: “Systemic violence refers to the harm people suffer from the social structure and the institutions sustaining and reproducing it” (2019). Systemic violence and its impacts extend beyond transport and mobility. However, victimhood, fear, uncertainty, or feeling unsafe can significantly condition a person’s mobility. It can lead to avoiding or forgoing trips, altering modal and routing choices, or limiting the time at which trips are taken (see e.g. Ceccato and Loukaitou-Sideris, 2022; Giménez-Nadal, Echeverría and Molina, 2023; Kash, 2019). In this sense, systemic violence and fear mediate daily mobility by modifying or constricting travel intents and desires (see Figure 9).

Pedestrians, users of micromobility (including bicycles) and people who combine these modes with collective transport tend to be the most exposed to these risks. This is due to the lower speeds at which they travel with little to no protective envelopes. As a result, they are exposed for longer periods of time, increasing the likelihood of being subjected to violence while travelling in public.

Women, in particular, face frightening and violent everyday situations that constrain their mobility (Allen et al. 2018; Stark and Meschik, 2018). This includes unwanted sexual attention and harassment which can be visual (e.g. leering), verbal (e.g. catcalling), physical (e.g. touching), obscene (e.g. exhibitionism) and intimidating (e.g. blocking of the way) (Quiñones, 2020). While there is some evidence that women and men similarly perceive injury and collision risks, the risk of being verbally abused and bullied while cycling is much higher among women (Graystone, Mitra and Hess, 2022). In London, a recent survey also found that 9 out of 10 women faced verbal abuse and road aggression, with 93% reporting that drivers had used their vehicles to intimidate them (London Cycling Campaign, 2023).

Figure 9. How systemic violence mediates daily mobility



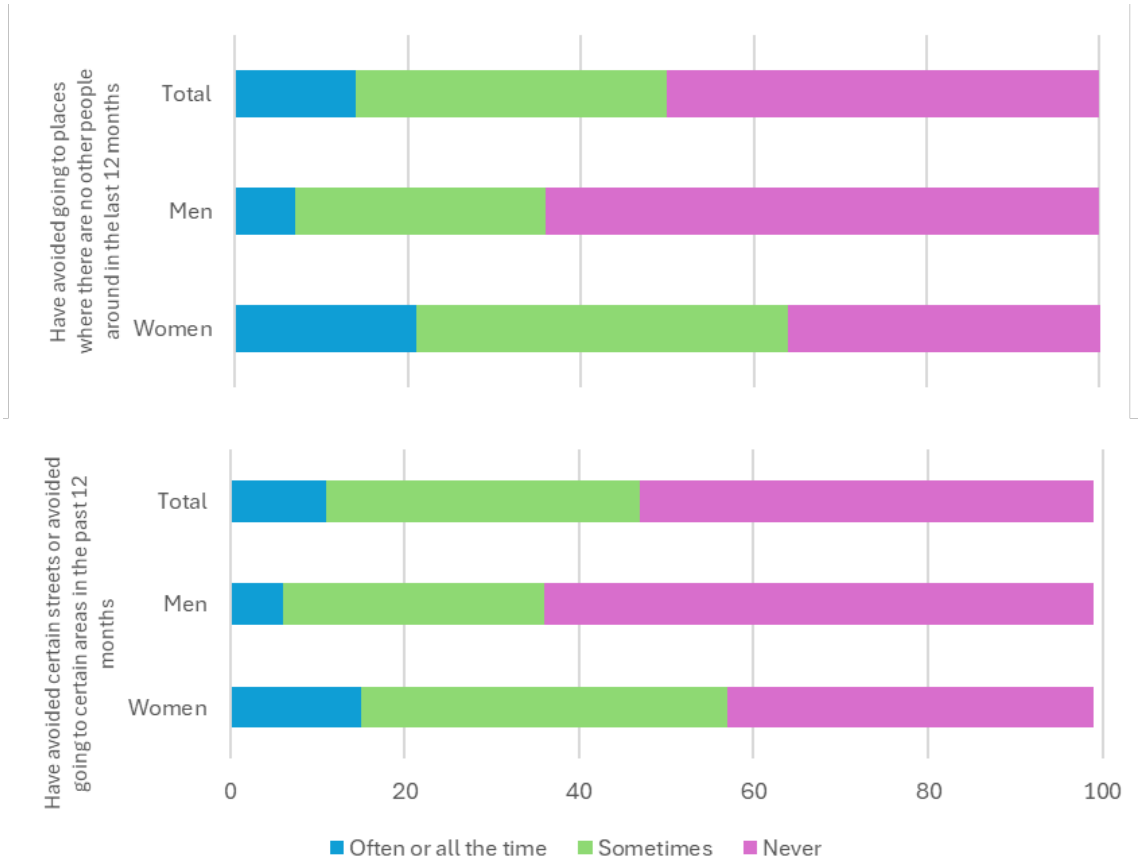
Source: ITF (2023).

Additionally, there is evidence that women make more walking trips than men in a variety of different contexts (Goel et al., 2023) and are often more reliant on public transport, where they are further exposed to gender-based violence while waiting in stations and stops and on transport vehicles (Ceccato and Paz, 2017; Chowdhury and van Wee, 2020). Other racialised groups, including members of the lesbian, gay, bisexual, transgender, intersex, queer/questioning (LGBTQ+) community, are also subjected to gender-motivated violence that impacts their mobility (Lubitow et al., 2017; Weintrob et al., 2021).

Importantly, planners and transport professionals often play down the reality women face when travelling. Some consider it a non-problem that does not merit their attention or is outside their purview (Kash, 2020). However, the evidence is clear that the issue of violence and harassment against women in public spaces is a global phenomenon, particularly sexual harassment. In the 27 EU member countries, for instance, according to the 2019 EU Fundamental Rights Survey (FRA, 2019), 22% of recent violent incidents of a sexual nature faced by women occurred in the street, a square, park, car park, or other public place. By contrast, men reported that 40% of their violent encounters that were not sexual occurred in these locations.

While this exposure to violence impacts mobility and conditions how and when people travel, the impacts are much more pronounced among women in Europe, with 64% reporting avoiding going to places if there were no other people around and 57% reporting avoiding certain streets or specific areas for fear of assault or harassment (see Figure 10). The use of these avoidance strategies is highest among young women aged 16-29 but remains higher for women of all ages than men of any age.

Figure 10. Strategies for avoiding assault or harassment in the European Union, by gender



Source: FRA (2019).

Marginalised and racialised groups also face significant barriers and negative repercussions while moving in many cities. Within racialised systems, members of racialised groups, particularly young racialised men, face systemic violence and biased policing. They are more often stopped by police (Baumgartner, Epp and Shoub, 2018) and tend to suffer greater consequences for alleged wrongdoing. As a result, in many contexts, these men tend to face additional barriers to travel actively due to a confluence of factors, including a higher risk of being subjected to "stop and search" policing (Osei and Aldred, 2023).

How to re-centre mobility spaces on people

This report recommends a series of actions to improve the quality of walking and cycling in urban mobility, and to ensure transport policies centred on walking and cycling have broad positive societal impacts. These recommendations can help cities move beyond moto-normativity.

Much of the discussion around mobility transitions has focused on changing the engine types of existing vehicle types rather than fundamentally changing the vehicles themselves (ITF, 2023). However, a transition to greener vehicle fleets without systematically rethinking how the population travels and changing the form factor of the vehicles used would not address much of the violence that is perpetuated in the system. However, a transition to greener vehicle fleets would not address much of the violence perpetuated in today's transport system without systematically rethinking how the population travels and the form factors of the vehicles used to travel. Importantly, this complex system of violence would remain in place even if the transport sector is fully decarbonised.

The negative impacts of moto-normativity are not limited to the adverse environmental effects of internal-combustion-engine (ICE) vehicles. Much of the structural violence accompanying private ICE vehicles also accompanies zero-emission vehicles (Hosseini and Stefaniec, 2023). For instance, road-traffic violence and the injuries and death caused by vehicle users would continue to occur in the absence of tailpipe emissions. Similarly, the stress and emotional impacts associated with actively travelling and interacting with motorised traffic will continue regardless of the motorised vehicle or engine type, and even with the development of autonomous vehicles.

A systemic change that facilitates more or higher quality walking and cycling will require policy makers acting decisively to seize policy moments when they arise and leverage the momentum to try to change the underlying aims of the system. A clear example of this was seen during the pandemic. Many cities had begun re-allocating urban space away from its exclusive use by cars and towards a more diverse range of uses and users prior to the disruptions caused by Covid-19, but the pandemic accelerated this trend. It also led many public authorities to start to re-allocate mobility space previously reserved for motorised transport for other purposes. This provided alternatives for people to exercise and interact safely under varying levels of confinement, social distancing, and restrictions on indoor and group activities. Authorities focused much of their attention on pedestrianising different road segments and rapidly deploying infrastructure for active wheeled mobility in the form of new cycle lanes and boulevards. They have also re-allocated space for non-mobility uses (e.g. restaurant seating replacing roadside parking).

This extraordinary re-allocation of space was widespread, occurring in every continent and at least 60 countries (Combs and Pardo, 2021). Public authorities were able to implement these changes because of the significant disruption to mobility and activity patterns under extraordinary confinement measures. In many cities and countries, trips and working commutes were considerably reduced during the pandemic, particularly among higher-income and educational groups (for an overview, see ITF, 2023a). In many instances, cities were able to fast-track the implementation of existing long-range plans for deploying cycling and walking infrastructure with little public opposition. These cities, such as Paris, were able to accelerate already existing cycling plans and institutional frameworks for walking or cycling and implement changes in a more coherent manner (Verlinghieri and Aldred, 2023). However, even where long-range

plans did not exist, the significant reduction in motorised traffic allowed cities to (at least temporarily) redistribute some space from cars and to people walking, cycling or otherwise using public space.

Pandemic-related mobility reductions and space reallocation successfully reminded citizens of what it felt and looked like to have fewer cars in cities and use public space in different ways. Nevertheless, the focus on rapid deployment of infrastructure meant that many infrastructure changes were not conducive to safe and enjoyable travel once motorised traffic returned to pre-pandemic levels. Even cities that were better positioned to implement solutions more coherently still suffered from many of these same shortcomings as other less well-prepared cities.

While this highlights how policy makers can use policy opportunity windows, it also highlights how much more work is needed to achieve long-lasting systemic changes to the way mobility systems in cities are organised. Re-centring cities on people and moving the focus from attempting to optimise motorised vehicle throughput to one that aims to create a friendlier, more liveable city where society can benefit from walking and cycling in safe and secure conditions requires important changes to transport policy making.

Focus policies on improving the quality of walking and cycling in cities

Increasing walking and cycling in cities is a worthy policy goal that can have many positive outcomes. However, the focus of initiatives and interventions should extend beyond the sole discussion of modal shares, increased active travel, and physical activity benefits. Instead, they should centre on improving the quality of walking and cycling in cities. They should also ensure that walking and cycling policies contribute to increasing liveability, counteract social exclusion (particularly, but not limited to, transport-related exclusion), enhance cohesiveness, and support more just urban outcomes.

The call for a general increase in walking and cycling can be misguided and shows a lack of awareness of the diverse lived experiences of different individuals and groups worldwide – especially where active travel is already the dominant travel mode, as it is in many cities worldwide. For the same reasons, it is problematic to couch this argument solely or mainly on the potential positive health outcomes associated with physical activity benefits. The health benefits that active mobility provides are substantial and widespread. However, this argument is most salient for the Global North and the wealthier and more affluent population segments in other regions.

Discussions of the importance of increasing physical activity or ensuring that people walk and cycle more often or for longer can fall on deaf ears in places where, and among individuals whose, daily mobility is already often too physically taxing. This is especially the case among large segments of the population in the Global South and disadvantaged groups in the Global North, who cannot afford to rely on private motorised transport for their travel and do not have the luxury of working in non-physical labour.

Under these conditions, and given the social capital associated with aspirations of car ownership, these calls can be seen as out of touch and elitist. They can also perpetuate the idea that walking or cycling is not for everyone. Focusing on improving conditions for active mobility is much more inclusive and would benefit more people. Ensuring the dignity, safety and wellbeing of those already walking and cycling, even under adverse conditions, would benefit society while responding to the needs of those currently most disadvantaged in their mobility.

Democratise mobility space to ensure citizens can safely and securely travel in more ways

The current unequal allocation of space, and the implicit and explicit prioritisation of car travel embedded in moto-normative policies and views, result in unjust outcomes for society. Moto-normative policies particularly disadvantage and expose other road users to elevated physical and emotional risks, negatively impact well-being and contribute to the exclusion of those who cannot fully participate in motorised hypermobility. Pedestrians suffer the most under these conditions, but the negative impacts extend across society.

Furthermore, the car has only achieved and maintained this position through a systematic marginalisation of all other public space uses and allocation. As a result, improving the quality of walking and cycling in cities must involve restorative measures that re-democratise public space and provide residents with feasible and dignified alternatives for their mobility regardless of their capabilities, motivations or preferences.

A democratic mobility system would allow citizens to travel in more ways without compromising their safety and comfort. In such a system, participation and inclusion are not predicated on access to private motorised transport. Nor should mobility be constrained to prioritise car drivers. Unless there are specific reasons not to do so, every part of an urban region should be developed and organised so that the advantages of not owning a car are at least equal to the advantages of owning a car (Gilbert, 1998; OECD, 2002).

Moto-normativity can be perpetuated through pluralistic ignorance (see O'Gorman, 1986), or a mistaken shared belief about the degree to which the public (or particular groups) agree or disagree with an idea. This creates a mismatch where actions can be in direct opposition to the preferences of the person making the decision (as well as the majority's preferences). A particular alternative, such as the car, is so entrenched that citizens and policy makers overestimate how much this matches the preferences of others.

With this context-based approach in mind, four basic strategies emerge to build effective pro-active mobility policies. These relate to crucial outcomes that must be considered together but introduced according to local contexts and circumstances.

Secure and maintain existing levels of active mobility

Active travel already represents a significant number of trips in many contexts. This is especially the case for walking but also true for cycling. However, active travel is sometimes burdensome and experienced as a constraint. It is burdensome because it is pushed to the margins of urban space, increasingly occupied by space-inefficient, costly and fast vehicles. Public authorities must seek to maintain much of this activity while rendering it less burdensome and better able to contribute to people living fulfilled lives.

Avoid excessive motorisation

Many countries and cities are not highly motorised but are on a trajectory to become so. This strategy applies to low but swiftly motorising contexts and seeks to shift that trajectory to a car-light city.

Reduce car dependence

Many urban areas have been designed to facilitate car use, which has locked in high levels of car dependence. The use of cars delivers individual and collective benefits, but dependence on cars erodes these benefits above certain thresholds. In these cases, it is hard to increase the uptake of active mobility actively and effectively without addressing and reducing car dependence. While measures to increase active mobility may be seen as "additive", they cannot succeed at the scale often targeted without concomitant "subtractive" policies aiming to curb car use (including fiscal treatment, space allocation and direct/indirect subsidies).

Improve and increase the uptake of active mobility

These strategies and measures specifically seek to increase attractiveness, lower the cost, improve safety, and otherwise incentivise or guide the uptake of active mobility. They are the "additive" component that must be tethered to "subtractive" actions. Most policies in favour of active mobility (e.g. infrastructure, speed management, education) fall within this space.

Incorporate violence reduction as a critical transport policy goal

Efforts to reduce car dependency must address the systemic violence embedded in moto-normative cities. In terms of vehicular violence, slower speeds, changes in traffic prioritisation (e.g. *fietstraats*, cycling streets in the Netherlands that are designed as a bicycle route but on which cars are also allowed, but not prioritised, and where car use is limited by the character and design of the street) and restrictions on how and where cars can be used are essential. Car drivers are implicated in most of the deaths, injuries and material losses associated with traffic crashes. These incidents also have a significantly negative mental impact on people, contributing to stressful everyday conditions for many.

Maximum speeds can be reduced, creating a safer and more pleasant environment for all city inhabitants without negatively impacting the average speeds at which drivers currently travel in many cities. Urban network densities often naturally slow down traffic to the point where average urban car travel speeds remain low, even where posted maximum speeds remain high. As such, reducing maximum speeds through a combination of legal frameworks and physical redesign would make the cities safer for all and even come at minimal to no cost to the average driver. Such travel speed management is fully embedded within Safe Systems principles (ITF, 2008; 2022c).

A recent historical analysis of mobility protests in the Netherlands by Bruno, Dekker and Lemos (2021) argues that the country was successful in pivoting to a less car-centric approach to mobility while increasing active mobility in large part because activists successfully lobbied to give cyclists the rights to the space they had before the city prioritised car traffic. These efforts resulted in car-restricting infrastructure, including redesigning the infrastructure to accommodate bicycles and car-free centres, and developingshared-use, low-speed streets where pedestrians are prioritised.

Car-restricting measures are crucial because car users tend to be much more inert travellers, more likely to maintain their mode choice even when faced with changes to travel times, travel costs and life events (e.g. La Paix et al., 2022).

Beyond reducing travel speeds to counter the risk of vehicular violence, policy makers will need to make efforts to ensure people of all races, genders and social groups can move through the city without being subjected to violence of any kind. Transport policies alone will not be enough, but any mobility policy

should explicitly consider how it can reduce violence and ensure that it does not perpetuate existing conditions that facilitate systemic violence. In the transport field, policies to reduce insecurity and violence are varied and are usually controversial because they are seen as either ineffective, shallow (i.e. not addressing the underlying issue) or actually creating the potential for further victimisation (e.g. increasing already biased policing).

Gender-segregated or women-only transportation solutions, which have become popular this century in an attempt to create safer mobility spaces for women, provide a good example of anti-violence transport policies (Dunckel-Graglia, 2013a). Variations of women-only cars on metro lines, buses and trains, as well as women-only rickshaws, taxis and other ridesharing services, have been incorporated in a broad range of different contexts, including Bangladesh, Brazil, India, Indonesia, Israel, Japan, Nepal, Mexico, Taiwan and the United Arab Emirates (Dunckel-Graglia, 2013a, 2013b; Joshi, Roy, Mowri and Bailey, 2022; Shah, 2018).

Such initiatives are often seen as controversial (Joshi et al., 2022) and have also been criticised as superficial solutions that do not address the underlying issues. This is despite the fact that they are often very popular among women and acknowledged as necessary and effective short-term fixes in some contexts (Gekoski et al., 2015). Similarly, some critics have identified such measures as a barrier to gender-sensitive design, which would allow women and girls to actually and fully move freely through cities (see e.g. Shah, 2018). These critics have instead called for addressing the underlying causes of this violence.

These interventions highlight the challenge of reducing violence and the need for a multi-pronged approach to meet this goal. Policy makers must balance short-term wins that reduce some of the violence citizens currently face (e.g. women-only cars on public transport) against a longer-term vision and strategies that ensure change in the system itself. Changes to individual, specific policy parameters must be accompanied by a larger change to the aims of the system itself if systemic change is to occur. By incorporating violence reduction as a critical transport policy goal and explicitly considering reduced violence as a potential co-benefit of transport policy appraisal, policy makers can guide policies that contribute towards people being able to travel safely and enjoyably.

Remove car blinders from project appraisal and consider a broader range of alternatives

Car “blinders” manifest themselves through broader cognitive processing and awareness formation concerning which uses and users of shared urban space are seen or not. They are prevalent in a variety of different contexts, including cities with low motorisation rates that still design their streetscapes for the private car and not for walking and public or informal transport, which are the majority forms of travel in most cases. These blinders are also prevalent in transport appraisal processes to the detriment of society.

Ensuring that car “blinders” are not embedded in transport appraisal requires a vision-led approach to policy making that expands the scope of considered projects. It also calls for careful consideration and selection of appraisal frameworks and variables that explicitly aim to capture a broader range of impacts, that evaluates the benefits to specific groups of interest (e.g. vulnerable or underprivileged groups), and where decision makers are cognisant of the limitations of any of the chosen frameworks.

Transport appraisals must explicitly evaluate the benefits and disbenefits to vulnerable populations and other groups of interest. This is particularly critical when performing economic evaluations. Without doing so, aggregate appraisal frameworks can champion solutions that exacerbate inequities by favouring smaller travel time savings of wealthier car drivers over more considerable benefits for others.

Similar to the practice already in place for broader strategic priorities (e.g. local economic growth), when recommending a project at the conclusion of the appraisal, policy makers should be required to explain how vulnerable road users were considered during the process.

Remove moto-normative policies to increase the effectiveness of active mobility policies

Long-term strategic plans that explicitly prioritise walking and cycling are necessary to improve city walking and cycling. Such strategies should include clear objectives ensuring that city transport plans systematically account for the needs of road users who are not car drivers. One is to expand transport appraisal to account for a broader set of priorities (ITF, 2022b) but it is also necessary to consider the existing legal and policy frameworks and change what is not working. It is not enough to add new policies and measures; existing policies must also be reconsidered and removed.

People systematically overlook subtractive changes. In a set of experiments, Admas et al. (2021) found evidence that people tended to try to "add" components to improve things, with fewer tending to propose eliminating, or subtracting components to reach their goal. However, embedding new pro-walking and pro-cycling policies without modifying and removing existing frameworks that define the aim, allocation and use of mobility space around maximising (motorised) vehicle throughput and flows is unlikely to improve the conditions of pedestrians and cyclists. Nor are they likely to improve the general well-being of the population. Existing restrictive moto-normative policies must be removed when they constrict the system and modified if possible. New complementary policies should be created when needed.

One clear example of subtractive policies supporting more diverse travel practices is redistributing on-street parking spaces to other uses. Between 2005 and 2020, for instance, the city of Paris re-purposed approximately 20 000 on-street car parking spots for use as bicycle, e-kick scooter, motorcycle and moped and shared-use vehicle parking, as well as electric charging infrastructure (APUR, 2019; Ville de Paris, 2021).

Similarly, the city of Amsterdam has also undertaken a comprehensive inventory of demands for the use of public space, re-purposing 5 461 on-street car parking spaces between 2019 and 2023 with a goal of removing 7 000-10 000 on-street car parking spaces by 2025 (Gemeente Amsterdam, 2020, 2023). Such policies are not necessarily "subtractive" in the sense that parking opportunities are being reduced for car users. Rather, they are being re-directed away from on-street parking to off-street parking (which is typically under-used) or peripheral parking facilities connected to other transport modes.

Ensure access to high-quality collective transport to enable better walking and cycling

Walking (and, to a lesser extent, cycling) have limited geographic and temporal scales. However, the scale of today's cities often requires longer-distance and faster travel to ensure access to important destinations, services and other opportunities. Although most journeys in urban contexts (including in town and village centres) are less than 5 km, high-quality collective transport with good geographic and temporal coverages is a powerful component of well-functioning cities where people not only walk and cycle but can do so without being disadvantaged. These disadvantages include limited access and being faced with difficult choices, such as forced car ownership (see Curl, Clark and Kearns, 2018; Mattioli, 2017), where a car is needed to satisfy everyday needs but imposes undue financial hardship.

Improving pedestrian conditions and effectively integrating cycling and public transport is vital to ensuring that accessibility is maintained while still encouraging more people to walk or cycle in an enjoyable, safe and secure manner. It also improves cities' liveability and reduces urban transport's environmental impact. Across different cities, large percentages of active travel, particularly walking trips, are part of public transport trips (Goel et al., 2023). Additionally, low-income groups are more likely to rely on collective transport for their travel. However, in many cities, the level of accessibility provided by public transport systems is lower for low-income communities (e.g. Pritchard, Zanchetta and Martens, 2022).

The quality of public transport (including stops and stations), latent perceptions of walking and cycling, and the conditions of infrastructure and built environments influence travel decisions. Pedestrian spaces leading to and surrounding public transport stops and stations should be safe and welcoming. Seamless cycling infrastructure integration and secure bike parking alternatives at stations are also necessary.

Decouple active mobility to focus on the different needs of pedestrians and cyclists

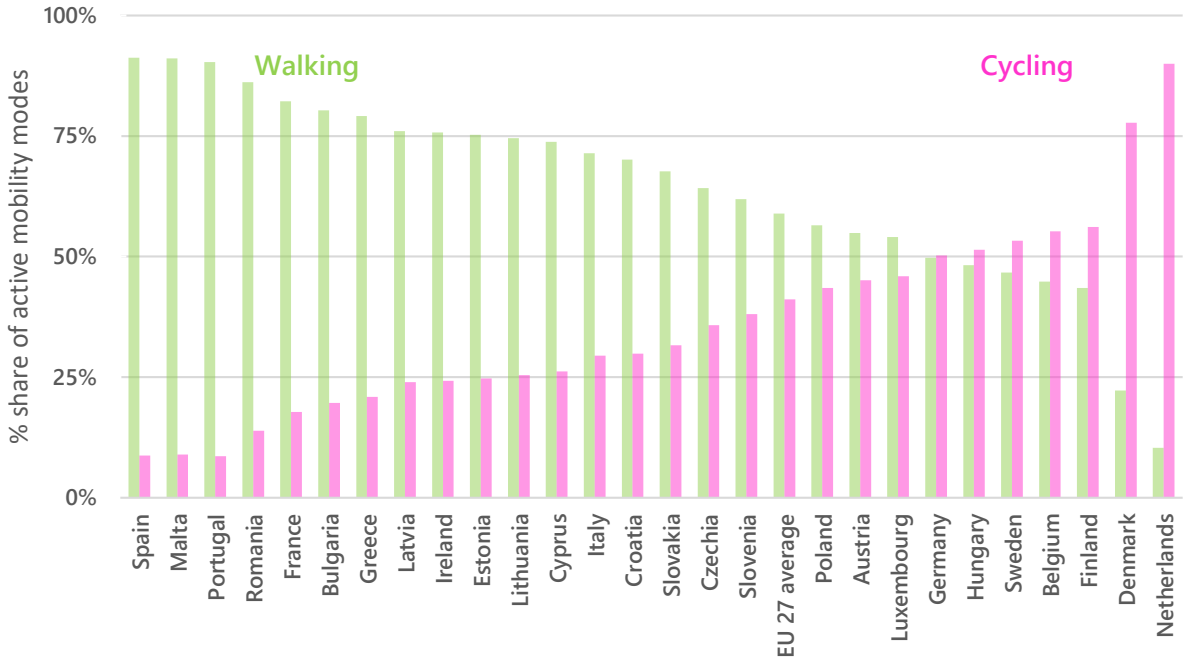
In policy discussions, walking and cycling are often grouped together under the "active mobility" banner. There are some good reasons for doing so. They are both physically active modes which can contribute to positive health outcomes. Additionally, walking and cycling are much more similar in terms of their space usage, speeds, and geographical scales than either is to cars. Therefore, at first glance, they would appear to be natural allies and similar enough to be discussed as if one.

However, the differences outweigh the similarities if considering walking and cycling on their own merits rather than in contrast to the car. Policy goals focused on active mobility that do not clearly distinguish between walking and cycling risk obfuscating the issues that are unique to each mode. What is conducive to enjoyable walking is not always conducive to enjoyable cycling and vice-versa. An improperly designed pro-cycling or pro-walking policy can be counteractive to the other mode.

Designing policy goals and advocating for "active mobility" as an umbrella term for walking, cycling and other modes can be strategically important. However, this should not be taken to mean that any pro-walking policy would also be pro-cycling, or vice-versa, or that a policy that encourages one can easily be used to promote the other. Authorities should identify clear underlying goals, policies and solutions that specifically address the needs of both while respecting the needs of the other.

Additionally, conflicts between pedestrians and cyclists arise if they must compete for the limited space not used by cars. In cities with historically high shares of walking trips where there have been significant increases in cycling, such as Paris, there has been an increase in reported conflicts between both groups (see e.g. Verlinghieri and Aldred, 2023). Under these conditions, pedestrians are often the victims of violence by cyclists and car drivers alike.

Figure 11. Distribution of walking and cycling within active mode shares in the European Union



Note: Figure shows the relative rate of walking and cycling as a percentage of the total active mobility share. The overall active mobility shares differ from country to country.
Source: Pisoni, Christidis and Navajas Cawood (2022).

Data from Europe highlights the difficulty of a one-size-fits-all-active-modes approach. As shown in Figure 11, there are very few countries in the EU where both cycling and walking rates are high. For instance, countries with high cycling rates (e.g. the Netherlands and Denmark) have some of the lowest walking rates among the EU 27 (Pisoni, Christidis, and Navajas Cawood, 2022). This highlights the fact that centring cities on active mobility is still a work in progress, even in cities or countries cited as exemplary with respect to high modal shares of cycling or walking. While there is some overlap in the measures that can induce behavioural change towards more walking or more cycling, policy changes that can lead to increases in cycling might at the same time constrain the likelihood of increased walking or vice versa.

Most people walk (including mechanised and assisted walking or rolling with mobility aids such as wheelchairs) Most people walk. Walking trips are often short, with trips shorter than 500 metres typically performed on foot and seldom undertaken by bike (Schneider et al., 2022). They are also often undirected trips – that is, travel without a particular destination (or where the destination is ancillary to the travel and not the other way around) and which are undertaken for the purpose of the trip itself (Hook et al., 2022; Mokhtarian and Salomon, 2001). As described by Mokhtarian and Salomon: “travel is the activity, movement is the object, and a destination, if there is one (or more) in the usual sense of the word, is to varying degrees incidental” (2001: 697).

Walking is also often combined with other modes as part of larger trip chains. As such, walking trips are often omitted from mobility statistics or, if included, are undervalued because, on aggregate, the total kilometres seem low or insignificant. However, it should be noted that reframing how trips are measured (e.g. by giving greater weight to the frequency of travel or the temporal duration of the trips rather than the total kilometres travelled) can more clearly demonstrate the importance and centrality of walking in urban mobility.

Far fewer people cycle than walk. Cycling, like walking, is often used for undirected travel, although in some contexts the incidence of undirected walking trips has been found to be higher than for cycling (see Hook et al., 2022). However, cycling trips are often longer, making them more likely to be included in mobility statistics and surveys. In several high-cycling environments, Schneider et al. (2022) found that, on average, cycling trips were approximately 4 km long, with 50% being 2 km or shorter. Earlier studies had similar results. For example, Martens (2004) found that the majority of bike-and-ride users in the Netherlands, Germany, and the United Kingdom travelled between 2 and 5 km to transit stops, and La Paix Puello and Geurs (2015) found that commuters tend to prefer to cycle between 1 and 3.5 km to stations (5-15 minutes of cycling). These ranges can vary depending on local contexts, and the uptake of electric bicycles is expanding the typical, average and maximum distances travelled by bike in urban areas.

In addition to the longer average distances travelled by bicycles, cyclists can travel at much higher speeds, reaching typical speeds of 15-18 km/h on conventional bicycles, above 20 km/h for pedelecs, and almost 30 km/h for speed pedelecs, with maximum speeds being even higher (Schleinitz et al., 2017; Twisk et al., 2021, 2022). These new forms of cycling blur the line between active and motorised travel and allow certain groups to partake in hypermobility analogous to that which has accompanied the growth of car travel. They also extend the speed gap between cyclists and pedestrians, whose typical speeds are closer to 3-5 km/h depending on age, gender and physical health (Bohannon and Williams Andrews, 2011).

Interest in cycling, particularly electric-assisted cycling, continues to increase in many parts of the world. This has led to a shift in focus, with more policy attention paid to increasing cycling speeds and efficiencies, as well as the economic footprint of cycling in cities (e.g. through the increase of cycling logistics). The trend towards ever more expensive e-bicycles as aspirational consumer goods has begun to mirror some of the moto-normative discourse associated with the private car. It is, therefore, essential to ensure that the growth in cycling spurred by its electric forms does not come at the expense of safe, secure and comfortable walking environments.

Tailor active mobility solutions to local contexts

Infrastructure that does not adhere to best practices and feels unsafe can reduce the satisfaction of pedestrians and cyclists and deter other users. A recent critical literature review and meta-analysis of potential barriers to cycling in OECD countries (Pearson et al., 2023) highlighted that the most commonly cited barriers were related to safety and infrastructure. However, an infrastructure-centric approach that assumes that “if you build it, they will come” is not enough. Understanding people and their wants, needs, and contexts is necessary to increase walking and cycling where appropriate and, importantly, improve the quality and enjoyment of walking and cycling.

Given the heterogeneity of contexts and conditions in which people travel, a cookie-cutter approach to delivering the benefits of walking and cycling is unlikely to be successful. In the best cases, the benefits may still be delivered as expected. In many cases, expected benefits may not fully materialise due to lower-than-expected uptake. In other cases, the outcomes may be counter-intuitive and detrimental. Part of the problem arises from shoehorning active travel policies in a context that favours individual motorised mobility.

Because benefits are clear, but distributive effects are consequential to their maximisation, authorities must be mindful of adapting pro-active travel initiatives to local contexts and the expectations of potentially impacted populations. Cut-and-paste approaches may make sense for some measures in similar contexts or for specific measures in all contexts, but more often, successful pro-active mobility

policies have more to do with knitting multiple strands that are woven together, each stitch building on the last to create a cohesive whole.

Walking and cycling can be tied to social identities. The cultural idea of who cycles and who walks, how they do it and how they are perceived is critical when discussing and designing potential pro-active mobility policies (Stehlin, 2019). Cycling, for instance, can be perceived as something that is not meant for all groups (Parsha and Martens, 2022; Osei and Aldred, 2023). This is further highlighted by quantitative findings where increases in cycling are often unequal, with certain groups cycling more than others (e.g. Hudde, 2022). In other contexts, local citizens have criticised active infrastructure as misguided and a harbinger of negative gentrifying impacts (Stehlin, 2015, 2019).

Therefore, it is essential to clearly define policy goals and interventions to ensure desirable outcomes for the people most directly affected. Local populations are best positioned to understand their own needs and wants. Failing to include local communities in meaningful consultative or policy co-construction processes will likely ensure that policies will fail or will not reach their intended goals. What different groups respond to in different contexts varies. For instance, in Chile, collaborative learning with students found that creating safer walking routes was not enough: to have a measured increase in participation, the routes needed to be perceived as “cool” (Sagaris and Lanfranco, 2019).

In short, there are no panaceas. Solutions should be tailored to the local context and not be imported piecemeal from other contexts without careful consideration and adaptation. There has been a tendency to not look beyond infrastructure when trying to understand or develop pro-active travel polices worldwide. There has also been a tendency to ascribe moral superiority to cities or cultures with high levels of walking and cycling or, on the contrary, to blame a lack of walking and cycling on moral failures.

Learning from other cities, regions, and countries is essential for developing good active mobility frameworks worldwide. However, governments should avoid top-down approaches and imported solutions without local engagement. Meaningful citizen engagement from the onset underpins successful walking and cycling policies.

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Participants provided their affiliations at the time of their attendance at the Roundtable.

International Transport Forum

Improving the Quality of Walking and Cycling in Cities

This report examines the current conditions of walking and cycling in cities. It reviews the literature on the potential benefits of active mobility, highlighting the importance of moving away from car-centric development. It also explores how cities developed into car-centric environments, with a particular focus on moto-normative assumptions. The report offers recommendations for re-centring mobility spaces on people to improve the quality, enjoyment, utility and safety of active mobility.

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