



Transport Strategies for Net-zero Systems by Design

POLICY HIGHLIGHTS



An important limitation for scaling up climate change mitigation is that climate action mostly focuses on incremental change in the systems that underpin our modern economies and societies. In other words, climate action all too often aims at optimising individual components within these systems rather than transforming the systems themselves, which are actually unsustainable by design. Action to reduce CO₂ emissions in the transport sector is not an exception to this. For decades, mitigation action in the sector has focused on optimising vehicle's emission performance (a component) in car-dependent urban and transport systems.

A **focus on optimising parts** may well mean that climate targets are missed. While many pathways could lead to net-zero emissions, the level of certainty to achieve net-zero targets on time; as well as the synergies and trade-offs between climate and wider well-being, vary significantly across pathways. A focus on optimising parts leads to net-zero pathways and climate strategies that place an overriding focus on technological change to drive the transition, thus assigning a marginal role to reducing demand through transforming systems. Evidence from the IPCC suggests that such a focus can importantly delay mitigation due to rapid growth in energy and material demand – partly driven by transport systems through increased vehicle use – thereby reducing the chances of achieving stringent mitigation targets. In addition, an overriding focus on technological change for improving

parts can limit potential synergies with wider well-being (e.g. health, equity), while also exacerbating other environmental and social challenges and risks (e.g. from high materials demand and high reliance on Carbon Dioxide Removal- CDR technologies).

Contrastingly, IPCC scenarios indicate that policies leading to transformational pathways, i.e. those that transform both demand and supply, can significantly reduce emissions in the short term and lead to net-zero systems by design. While also requiring significant technological innovation, development and deployment, this transformative approach to achieving net-zero systems can, in addition to helping countries achieve stringent mitigation action in the short term, reduce the risks and trade-offs that are implicit in an approach dominated by supply-side technological developments.

Identifying which policies can lead to transformational pathways and net-zero systems by design is fundamental, as these can increase the chances of meeting the Paris Agreement's temperature goal, while providing opportunities to advance wider societal goals. Policies can lead to transformational pathways if they focus on delivering systems that – in their functioning, or by design – **improve well-being while requiring less energy and materials, and producing less emissions**. System redesign has, however, rarely been the focus of climate action.



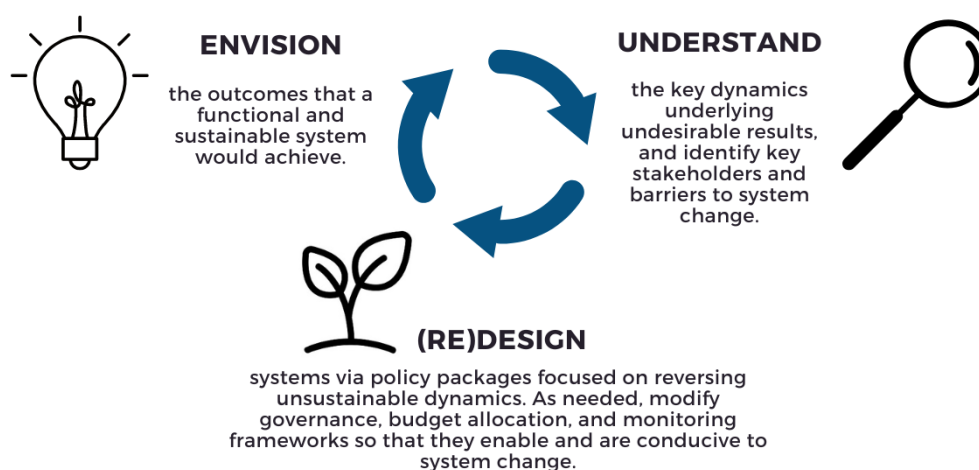
The OECD has developed a process, the Systems innovation for net zero (previously known as the Well-being lens, see Figure 1), to focus climate action on system redesign and accelerate the transition towards net-zero systems. The Systems innovation for net zero process triggers two mind-set shifts, that this report argues are needed to meet net-zero targets on time: i) from means (e.g. GDP) to ends (well-being); and ii) from parts to systems functioning.

The first shift allows envisioning an increase in well-being (health, equity, etc.) through low-demand systems (rather than considering high demand as a condition for high life quality). For policy-making, this means that managing or reducing demand becomes a policy

lever. The second shift sheds light on the importance of understanding the systems' dynamics driving unsustainable results. For policy-making, this means focusing climate action on reversing such dynamics and redesigning systems.

To trigger these mind-set shifts, the process builds on systems thinking insights and has three steps: i) envision the outcomes a well-functioning system achieves; ii) understand why the current systems' functioning is not achieving such outcomes and how the system could be reorganised to lead to better results by design; and iii) redesign the system via policies packages focused on reversing unsustainable dynamics, thus accelerating the transition towards better functioning systems.

Figure 1. The OECD Systems innovation for net zero process
(previously known as the OECD Well-being lens process)



The rest of this summary describes the results of the application of the Systems innovation for net zero process to the passenger surface transport sector, with a focus on urban areas and their commuting zones.

Envision the systems that we need

A well-functioning transport system allows people the possibility of accessing places with ease (accessibility) in a sustainable and healthy manner. Well-functioning transport systems are those in which people walk, cycle and use micro-mobility for the majority of their trips, and in which high emitting and space-intensive modes are used for less frequent trips.

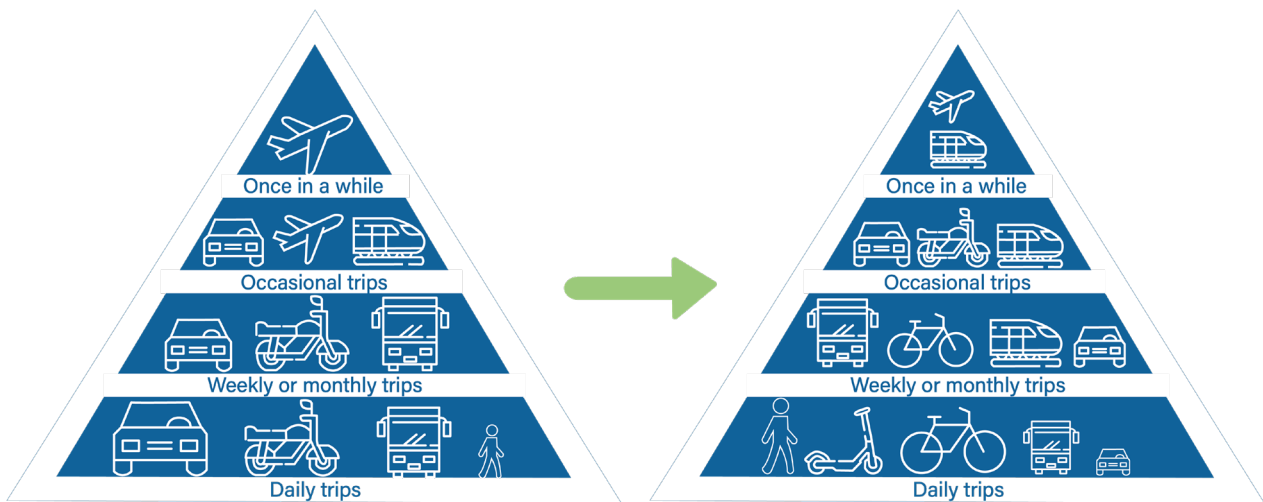
Applying a diet analogy, the system just described would correspond to a “healthy transport diet”, represented in the right panel in Figure 2. Such “diet” is possible thanks to: i) the proximity between people and places; and ii) public space and investment being allocated to privilege active and shared modes, so that these are the most convenient transport modes, and thus those that people choose most

often. By its design, this “healthy” system can yield low mobility and emissions, while at the same time result in better, more equitable and safe access to opportunities and healthier lifestyles.

In contrast, in current transport systems many people use motorised vehicles for the majority of their trips - the sugar and the fat in the diet analogy. These “unhealthy” choices, represented at the bottom of the pyramid in the left panel of Figure 2, are determined by: i) long distances between people and places, and ii) public space and

investment being allocated to privilege private motorised vehicles (cars, motorbikes); which systematically increases their convenience. Importantly, even when often less convenient and safe than cars, public transport is also used by many, often “captive users”, to cover the bulk of their daily trips, due to average long distances to their places of interest. This also adds emissions that could be avoided if high shares of those trips were shorter and made by active modes; as well as if public transport was invested on and made more efficient and cleaner.

Figure 2. From unhealthy to healthy transport systems



Note: The icons illustrate the most frequent means of transportation used per type of trip. As modal shares vary widely across territories, this figure is thus to be understood as an illustration rather than a precise representation of average modal shares.

Understand... ...the systems we have

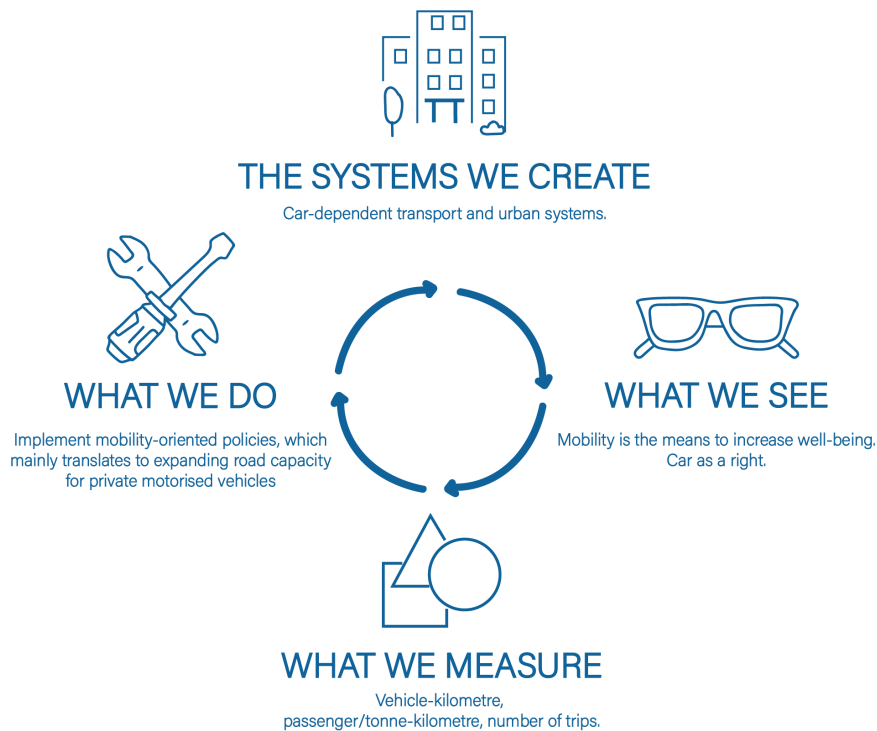
The increased traffic volumes and car use are not an inevitable consequence to which transport and climate policies need to adapt, but the result of unsustainable system dynamics, which can be redesigned. The choice to drive a car or a motorbike is not solely the result of people’s individual preferences (i.e. exogenous to the system) as is often argued. Such choice is determined largely by transport and urban systems organised around

car driving, which leads to induced demand, urban sprawl, and the erosion of shared and active modes of transport (Figure 3). These three dynamics are at the source of high emissions and a number of negative impacts on people’s well being, such as air and noise pollution, congestion, road injuries and fatalities, reduced travel options and unequal access to opportunities.

seen as second-order priorities. Car-dependent systems dominated by the dynamics described above are a result of such focus. The conflation between mobility and well-being, as well as a number of other deeply engrained ideas that foster a mobility mental model have shaped and reinforced mobility-oriented policy-making. A widespread

analytical, rather than systemic, mind-set (and related measurement frameworks) have also contributed to the policy choices observed in the last decades.

Figure 4. The impact of mental modes



A focus on mobility is problematic for at least two reasons. First, mobility is a bad proxy for well-being: people's well-being does not ultimately depend on how much and how far they can travel (i.e. increased mobility), but on the possibility to access places with ease, including by not having to travel long distances (or to travel at all). Second, a focus on mobility, rather than on accessibility, has led to a “proximity blind spot”. Accessibility is the interaction of mobility and proximity, and because trade-offs exist between space used for mobility and for other purposes, delivering accessibility sustainably requires striking a balance between facilitating mobility and creating proximity. Policies focused on mobility ignore (do not see) this trade-off, which partly explains why policies have allocated an arguably excessive share of public space to space-intensive means of transport (e.g. private cars) at the expense of dedicated space to sustainable, cost- and space-efficient modes, as well as to uses beyond transport (e.g. local markets) to create proximity. Rather

than creating proximity and privileging sustainable modes, **mobility-oriented policies compensate the lack of proximity with yet more mobility, locking systems into a vicious cycle of car dependency, high emissions, and low and unequal accessibility.**

In addition, an analytical, rather than systemic, mind-set has also limited the opportunities for policy makers to understand the dynamics behind undesired results, and design policies to tackle problems at its root. When taking an analytical approach, the analyst identifies the part in the system (e.g. combustion cars) causing the undesired result, and looks for a solution to such cause. In contrast, when taking a systemic approach, the analyst' attention shifts away from parts, and focuses instead on understanding what is it in the systems' functioning that leads, in the case of transport, to an increase in the number of vehicles.

...the implications for climate action

Mobility-oriented and analytical mind-sets importantly limit the scope of climate action by focusing the policy maker' attention on decoupling strategies. Decoupling strategies are based on the idea that growing traffic volume (mobility) is exogenous from the system's design, and that higher mobility leads to better life quality. In addition, since most emissions come from combustion motorised vehicles, these are, from an analytical point of view, identified as the part in the system to be optimised or improved (i.e. as the problem). As a result, decoupling strategies limit themselves to improving or replacing (mainly private) combustion engine vehicles. Meanwhile efforts to reduce the number of vehicles, the distances travelled, or car use, are perceived as going against people's freedom and well-being; thus, if undertaken, these efforts are kept at the margin of climate strategies.

Climate strategies focused on decoupling are, however, unfit to achieve net-zero targets on time and to respond to wider environmental and social challenges. Reducing emissions mainly through replacing or improving combustion engines in car dependent systems, which in parallel "push" for more vehicles, is a very difficult (if not impossible) task for policy makers. Indeed, data suggests that emission reductions from decoupling efforts, e.g. from vehicle electrification and improved energy efficiency, have been ineffective in offsetting the increase in emissions due to growing traffic volumes. Climate strategies focused on decoupling also miss opportunities for synergies, and exacerbate evitable trade-offs between climate action and wider well-being outcomes.



Redesign our systems by changing policy priorities

Climate strategies prioritising policies with the potential to reverse the dynamics at the source of increasing traffic volumes can significantly accelerate the pace for achieving net-zero goals. Such policies can contribute to the transition towards car independent systems, where

sustainable modes such as walking, cycling, micro-mobility and public transport become the most convenient transport modes, and thus are those that most people choose for the bulk of their trips. By doing so, such systems can drastically reduce emissions while improving

equity (e.g. by increasing accessibility for women who rely more on public transport and walking), health (e.g. reducing pollution and increasing physical activity), creating job opportunities, and life quality more broadly.

Designing such climate strategies implies a mind-set shift from mobility towards accessibility (from means to ends), and from improving vehicles' performance in car-dependent systems (i.e. an analytical mind-set focused on parts) towards transforming the systems' functioning (i.e. a systemic mind-set) so that people can access places with ease without the need to travel long distances for every daily need. This mind-set shift expands the scope of climate action, as policies can now focus on increasing proximity and the attractiveness of active and shared modes, thus potentially reducing mobility while increasing accessibility and well-being. Policies with the potential to transform the system's functioning and contribute to the transition towards net-zero systems by design include street redesign and improved management of public space, spatial planning focused on creating proximity, and policies to mainstream shared mobility. These are briefly described here below.

The current design of city streets, with excessive and increasing road space granted to cars, fosters induced demand (i.e. increased vehicle ownership and use).

Street redesign and improved management of public space can help reverse this trend by reallocating public space and investment to low carbon and space efficient modes (e.g. according to Complete Streets' principles) and balancing space use between transport and other

uses (i.e. according to place-making principles); **leading to disappearing traffic**. Barcelona's Superblocks are an example of street redesign and reallocation that is planned to transform the whole of the Barcelona Municipality. Parking policy is also crucial to street redesign, and to ensuring public space is managed efficiently and aligned with environmental and social goals (e.g. through parking pricing and regulation). Road pricing can also be a powerful tool, if coupled with street redesign and space reallocation and aimed at the efficient use of space.

Spatial planning aimed at increasing proximity can contain, and eventually **reverse, urban sprawl**. Most territories are organised around dense inner cities centralising services and job opportunities, surrounded by car-dependent residential areas. New development and urban renewal strategies based on accessibility-based planning frameworks such as the 15-minute city could allow urban areas and their hinterlands to become networks of 15-minute cities in which people can move across the territory, but no longer need to travel long distances to meet their everyday needs. Metropolitan transport authorities provide a strong institutional basis for developing accessibility-based strategic planning at the level of metropolitan areas and regions. Regulations such as minimum parking requirements and traffic-based transport assessments, currently steering new developments towards sprawl, can be substituted by regulation promoting the creation of proximity and compact development (e.g. maximum parking regulations and multimodal assessments).



Policies to mainstream shared mobility (including active modes and micro-mobility) are fundamental to reverse the erosion of active and shared transport modes, and accelerate the development of multimodal and sustainable transport networks. Strengthening public transport networks through increased investment and improved methodologies for determining public transport pricing and planning is key to avoid the often-observed public transport low-cost, low-revenue, low-quality trap. In parallel, support to mainstream shared bicycles and micro-mobility, as well as the expansion of on-demand micro-transit services can significantly increase the attractiveness of these modes (also contributing to providing services that can complement the offer of public transport). This can be done via new technologies, integrated subscription cards (e.g. one account to access all transport services available in the city), regulation that promotes cooperation between government and service providers, and government subsidies in areas where micro-mobility or on-demand services can bring social and environmental benefits but may not be profitable for the private sector. Support for the development of new vehicles (e.g. innovative micro-mobility) and the expansion of services for multipurpose trips (e.g. cargo e-bikes, shared (e-) bikes with baby seats, kids' bikes) could also contribute to making shared and sustainable mobility more attractive.

There are numerous synergies between the policies described above, focused on redesigning systems, and market-based instruments, such as carbon pricing. Pricing carbon is fundamental for steering sustainable choices, but its effectiveness is limited in car-dependent systems where such choices are not convenient or available, and where carbon prices can generate negative distributional impacts and thus are publicly difficult to implement. For example,

evidence suggests that the impact of fuel prices on people's choice is low when alternatives to car driving are not available; and that prices' impact on people's choice increases when public transport infrastructure is available. Carbon pricing and policies focused on accelerating the transition towards car-independent systems are complementary and can, together, lead to more efficient and publicly acceptable policy packages.

Innovation and technological change – both at the parts and systems levels – **play a major role in climate strategies aiming at net-zero systems by design.** So far, however, policies and finance have focused on innovation at the parts' level (e.g. technologies to improve vehicles' performance or to developing autonomous cars), leaving the potential of systems innovation untapped (including to increase the effectiveness of innovation at the parts' level).

Systems innovation is innovation aimed at transforming the systems' functioning. Superblocks in Barcelona are an example of low-tech systems innovation. Superblocks innovate in the way in which public space is allocated and designed, thus modifying the systems' structure and significantly impacting people's transport modes' choices. Advanced technologies open up enormous opportunities for systems innovation. For example, GPS technologies and apps allow to move from a system which functioning requires each person to own a car, to systems in which a multiplicity of transport modes are available for people to choose and combine according to their needs. Coupled with the policies described above, these technologies can significantly, and in a cost-effective manner, reduce traffic volumes and emissions, while significantly improving people's daily lives.

This is a typical street today



This is what the same street could look like after radical street redesign, which can reduce emissions while improving people's daily lives.



**This Policy Highlight is based on the OECD publication
*Transport Strategies for Net-Zero Systems by Design.***

Efforts that primarily focus on incremental change in systems that are unsustainable by design are one of the main barriers to scaling up climate action. This report applies the Systems innovation for net zero process (previously known as the OECD well-being lens) process to the transport sector. It builds on the report Accelerating Climate Action and encourages countries to focus climate action on delivering systems that - by design - improve well-being while requiring less energy and materials, and thus producing less emissions. The report identifies three dynamics at the source of car dependency and high emissions: induced demand, urban sprawl and the erosion of active and shared transport modes. The report also provides policy recommendations to reverse such dynamics and reduce emissions while improving well-being, from radical street redesign, to spatial planning aimed at increasing proximity, and policies to mainstream shared mobility. Analysis also shows why the effectiveness and public acceptability of carbon pricing and policies incentivising vehicle electrification can significantly increase after policy reprioritisation towards systems redesign.

For more information:

OECD (2021), *Transport Strategies for Net-Zero Systems by Design*, OECD Publishing, Paris, <https://doi.org/10.1787/0a20f779-en>.

 oe.cd/cc-wellbeing

 Aimee.AguilarJaber@oecd.org and Mariana.Mirabile@oecd.org

 [@OECD_ENV](https://twitter.com/OECD_ENV)

 www.linkedin.com/company/oecd-environment-directorate/

Photo credits: Cover © Jan Kamensky

