1 Overview

This chapter explains why a systemic approach is needed for Ireland to meet its ambitious climate targets and improve well-being. The OECD Systems Innovation for Net Zero process is introduced as a way forward to apply such an approach for innovative policy decision-making in the transport sector. It illustrates why car-dependent systems are unfit for purpose and how these systems can be redesigned via transformative policies. The chapter also provides an overview of the main findings and recommendations of the report.

Current mobility patterns in Ireland show that three out of four citizens, on average, opt to travel by car on a daily basis (CSO, 2019[1]). These mobility patterns are incompatible with the 1.5°C warming limit target and a stable climate. They are also incompatible with the Irish GHG targets of reducing transport emissions by 50% by 2030[1], and with sectoral ceilings limiting emissions in the sector to 54 Mt between 2021-2025 and 37 Mt for 2026-2030 (Department of the Taoiseach, 2022[2]). To meet the 2030 climate target for transport, electrification is necessary but insufficient. Rapid reductions in travel demand and shifts to sustainable modes are needed (Department of Transport, 2022[3]; Society of the Irish Motor Industry, 2022[4]).

Ireland has identified a gap of 13% between the 2030 target and the estimated emission reductions resulting from policies planned for the transport sector. It is becoming increasingly evident that the gap will be larger, since the abatement from electrification, as envisioned in the Climate Action Plan 2021, will be difficult to achieve. Thus, reductions in travel demand and shifts to sustainable modes will need to be larger than initially expected.

Patterns of behaviour (including mobility) are the product of the systems they are embedded in (rather than independent from them) (OECD, 2021[5]). Policies have significantly shaped current systems, and have a huge potential for redesigning them and enabling large-scale behavioural change (see Box 1.1), which would otherwise be unfeasible.

According to complexity science, changes in system structure[2] (i.e. transformative or systemic change) are necessary if patterns of behaviour are to be significantly altered (Meadows, 2008[6]; Monat and Gannon, 2015[7]; Zimmerman, Lindberg and Plsek, 2009[8]). In line with this, the IPCC calls for transformative change in the transport sector to reverse current patterns of behaviour (e.g. people choosing cars over other transport modes for the bulk of trips) and meet climate change mitigation goals (IPCC, 2022[9]). The IPCC defines transformative change as "a system-wide change that requires more than technological change through consideration of social and economic factors that, with technology, can bring about rapid change at scale" (IPCC, 2018[10]).

Box 1.1. What is meant (and what is not) by "behavioural change" in this report

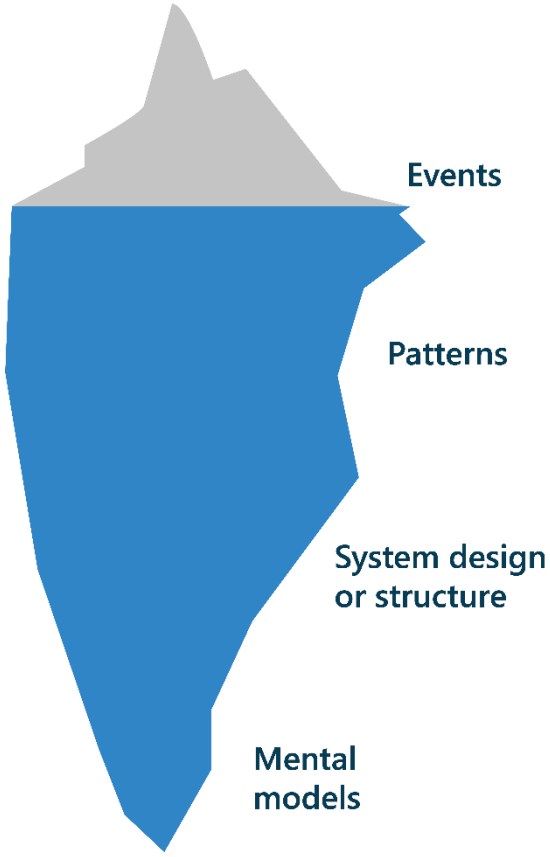
The term "behavioural change" as used in this report is based on the findings of complexity science, which argues that individual preferences and patterns of behaviour largely result from the system structure in which they are embedded (e.g. car-dependent systems) and the mental models (e.g. car-centric thinking) that have shaped such structure. Government policies have been fundamental to shaping current systems and have also had a major influence on prevalent mental models. They will also be fundamental moving forward: with the right policies, systems could be deliberately redesigned to promote and facilitate other choices and trigger large-scale behavioural change which is otherwise unlikely.

This is radically different from a conception of behavioural change that places the emphasis on individual behaviour rather than corporate responsibility and government intervention in shaping systems functioning. Using the term with that meaning creates the erroneous impression that the government's role is mainly to heighten awareness so that people can make better choices. On that interpretation, large-scale behavioural change will result from the aggregation of individuals who become more aware and make "better" choices. This disregards the role of the system, its structure, and prevailing rules in making such choices feasible and attractive for a majority of the population, thus shaping preferences.

Policy rarely focuses on improving the structure of systems by redesigning or transforming them. Instead, most policies focus on improving specific parts of the system. For example, in Ireland, 67%[3] of emission reductions are expected to come from developing better vehicles and fuels.

Making transformative policies the priority can increase the chances that Ireland will meet its climate targets. Identifying transformative policies is a prerequisite for prioritising them, and requires taking a systemic approach (Box 1.2). The iceberg analogy is used throughout the report to illustrate the added value of taking a systemic approach (Figure 1.1). This analogy is a reminder that observed outcomes or events, what we hear on the news (e.g. traffic jams, pollution peaks, road fatalities, growing emissions) are just the "tip of the iceberg". These events (patterns, when observed over time) are the result of systems that have been designed in a certain way and built on dominant mental models. Both the system design or structure and the mental models are invisible to the naked eye – "under the surface" – and a systemic approach brings them to light.

Figure 1.1. The iceberg model



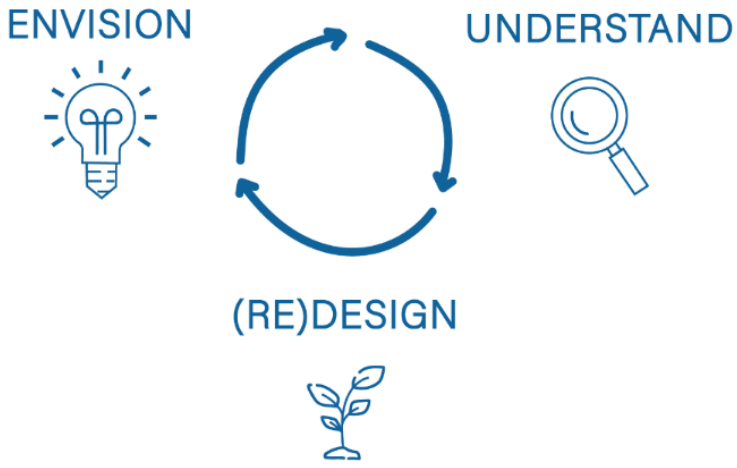
Source: Adapted from (Systems Innovation, 2021[11])

A systemic approach can identify truly transformative policies, based on a deep understanding of the design of the system that needs to be transformed, and the mental models that have shaped it. A systemic approach also leads to a deeper understanding of how policies affect the system's structure and mental models and, conversely, how the system affects policy decisions.

The report focuses on emissions from the passenger surface transport sector and aims to identify the transformative policies that could help Ireland redesign its passenger surface transport system (referred to subsequently as its transport system) in different types of territories[4] and meet its climate goals for this sector. It follows the OECD "Systems Innovation for Net Zero" process (Figure 1.2), designed to help policy makers take a systemic approach via three steps:

1. envision the goal(s) and the patterns of behaviours that a properly functioning system would foster, and challenge ingrained mental models underlying poorly functioning systems;
2. understand why the current system is not achieving envisioned goals and patterns of behaviour and whether implemented and planned policies have the potential to redesign the system;
3. prioritise and scale up the policies that can redesign systems to foster desirable patterns of behaviour and goals.

Figure 1.2. Systems innovation for net-zero process



The analysis is based on information gathered via desk reviews, interviews and workshops with Irish public and private stakeholders, as well as visits to the four territories analysed in more detail: Cork, Dublin, Kildare, and Sligo. A combination of systemic tools was used to understand the system structure and underlying mental models and to categorise policies by their transformative potential (Box 1.2). In addition to guiding the analysis in this report, the methodology developed by the OECD is intended to become a tool that Irish stakeholders can integrate into their decision-making processes.

Box 1.2. Policies through a systemic lens

Policies are transformative or systemic when they focus on transforming the way the parts of a system are organised or interrelated. This focus is based on findings from complexity science, which demonstrate that the outcomes of complex systems depend more on the way in which the system as a whole functions, i.e. the way in which its parts interact (e.g. how road space is allocated across modes and functions), than on the properties of its individual parts (e.g. vehicles' energy efficiency) (Zimmerman, Lindberg and Plsek, 2009[8]).

We rarely think about systems and often attempt to solve problems by subdividing them into parts and trying to improve the efficiency of those parts. This approach, referred to as analytical thinking or reductionism, leads to policies that react to or anticipate patterns of behaviour but do not transform the systems that foster such patterns in the first place.

The OECD "Systems Innovation for Net Zero" process aims to help policy makers identify policy packages with the potential to transform systems and influence future patterns of behaviour. Identifying policies with high transformative potential requires a deep understanding of the system the policy is trying to transform, as well as how the policy affects the system.

The systemic tools guiding this report include:

- the iceberg model (see above) as a visual guide to a systemic perspective
- causal loop diagrams showing the system's interconnections (or structure) and the dynamics at the source of the patterns of behaviour that policies seek to influence
- stock and flow analysis showing the transformative potential of policies affecting flows given current stock levels in the system
- Meadows' leverage points framework, which combines the tools listed above, and is a useful guide to assessing the transformational potential of policies.

See section 3.2.1 for further discussion.

The report also emphasises the need to bring about public acceptance of transformative[1] policies. It highlights the role of communication strategies in transforming mindsets (see sections 3.2.2 and 4.7) and in showing the benefits of transformative policies such as road space reallocation (see section 3.2.2).

1 The terms "transformative policies" and "policies with a high transformative potential" are used interchangeably throughout the report.

The report finds that Ireland has a car-dependent transport system and that this system is unfit to help the country meet its GHG emission reduction goals for the sector while improving well-being. Citizens' preferences, leading to growing car use, are largely determined by transport and urban systems organised around car driving, rather than being exogenous, as often perceived (Box 1.3). Car-dependent systems are mobility-intensive but are ill-equipped to deliver sustainable access (see chapter 2). These systems are characterised by three unsustainable dynamics: induced demand, urban sprawl and the sustainable modes low-attractiveness trap (see chapter 3). Car-dependent systems foster growing car use, leading to high emissions and negative impacts on well-being, such as air and noise pollution, congestion, road injuries and fatalities, reduced travel options, and unequal access to opportunities (OECD, 2021[5]).

Redefining the Irish transport system's goal is a necessary step to move away from the car-dependent system, according to this analysis. Evidence suggests that transport systems designed to deliver sustainable accessibility (rather than increased mobility) can trigger patterns of behaviour aligned with GHG emission reduction targets and lead to improved well-being via better air quality, health and safety, as well as stronger communities and equity (Silva and Larsson, 2018[12]; ITF, 2019[13]; OECD, 2019[14]); (see chapter 2).

For a number of years Ireland has prioritized efforts and attention on policies that this analysis finds have a low potential to help the country transition away from car dependency and towards systems able to deliver sustainable accessibility. This is still reflected in documents such as the 2021 Climate Action Plan (Department of the Taoiseach Ireland, 2021[15]). These policies include EV incentives for private vehicles, increasing the budget allocated to public transport infrastructure compared to what is allocated to car infrastructure, and infill/brownfield development targets. In particular, EV incentives for private cars are often assumed to be a sure and fast route to decarbonising the sector. However, this analysis shows that when implemented within car-dependent systems their potential is limited for several reasons. Firstly, because fleets are "hard-to-change" stocks and replacement will take several decades longer than usually perceived. Secondly, because EV incentives for private cars, rather than reversing, reinforce car-dependency, further encouraging car use and making it more challenging to replace a large and growing car fleet. Thirdly, because when vehicle life-cycle is taken into account, electrifying a growing number of motorised vehicles leads to high emissions produced in the manufacturing and disposal process of vehicles (Hawkins et al., 2012[16]); as well as from electricity production (Holdway et al., 2010[17]).

Ireland has enormous untapped opportunities to reduce emissions, which could be unleashed by prioritising policies with a high potential to transform the car-dependent system and ensuring these policies are implemented (and adapted) across the country. Transformative policies identified by this report (see

more in chapter 3) include road space reallocation, the mainstreaming of on-demand shared services, and communication strategies that shed light on the benefits of a transition towards sustainable transport systems and the consequences of inaction. Chapter 4 focuses on providing recommendations for Ireland to upscale and expand the use of such policies.

By shifting the system away from the dynamics that foster car-dependency, transformative policies can foster behavioural change at scale and increase the effectiveness of electrification efforts. Such an electrification strategy needs, however, to foster rather than hinder the transition away from car dependency and focus on an array of shared vehicles (e.g. e-bikes, shared cars, electric buses – see Chapter 4).

Recommending that policies with high transformative potential should be scaled up does not imply that policies with low or medium transformative potential are necessarily "wrong" or useless. The analysis reveals, however, that these policies are unable on their own to trigger behavioural change away from car use since they do not transform the system that influences these behaviours; the system remains car-dependent and cars are still the most convenient transport mode (see Chapter 3). The effectiveness of the policies identified as having a low or medium transformative potential in car-dependent systems (e.g. carbon and road prices, programmes to improve public and active modes) can increase when implemented alongside transformative policies.

Actions with medium to high transformative potential exist in Ireland, and more recent documents, such as the new Sustainable Mobility Policy (SMP), reflect an effort to make these more central. In line with the recommendations of this report and previous OECD work (see (OECD, 2021[5])), the SMP and the mechanisms for overseeing and supporting its implementation (e.g. the Pathfinder Programme – see Box 1.3) are an important step towards the prioritisation of policies with high and medium transformative potential. As of 2022, however, transformative policies are still marginal and implemented only on a small scale or as pilot projects. The recommendations in this report can complement the action list in the SMP[5] and guide the formulation and revision of other strategic documents (e.g. the 2023 Climate Action Plan) with the aim that transformative policies are effectively and rapidly scaled-up.

Box 1.3. "Car culture" from a systemic approach and its policy implications

In interviews, Irish stakeholders often referred to the "car culture" as a barrier to implementing ambitious climate action. The choice to drive a car or motorcycle is often perceived as an individual preference, exogenous to the system in which the choice is embedded.

Quantitative models guiding transport policy decisions also contribute to this perception, as the estimated (growing) pattern of car use is treated as an exogenous variable, with the implication that the pattern is outside the policy realm. For example, the Marginal Abatement Cost Curve approach that informed Ireland's Climate Action Plan 2021 takes the level of car use as an exogenous input and seeks to decarbonise it using the cheapest technology (considering only direct costs such as vehicle purchase and operation). Similarly, Ireland's national transport models project continued growth in car ownership based on income and demographic projections, and car occupancy is assumed to be constant in standard transport model runs. Alternative futures for car ownership and car occupancy are simply absent from standard national transport modelling (DoT et al., 2021[18]).

Housing preferences are also seen as exogenous. Interviews reveal a sense of inevitability, of being at the mercy of market forces, and a preference for detached houses.

The perception of certain patterns of behaviour (e.g. driving a car) as exogenous from the system in which they are embedded reflects a non-systemic mindset which constrains policy action. Without a systemic mindset and the systemic tools that support it, the system structure and the underlying mental models at the root of the patterns of behaviour and the outcomes observed (the "tip of the iceberg") are invisible, leading to the perception that certain patterns and outcomes are "inevitable". Based on this assumption, policies are constrained to react or adapt to observed patterns of behaviour. For example, growing car use is perceived as inevitable and restricts emission reduction policy to the improvement of the type of vehicle. The fact that 67% of emission reductions are expected to come from better vehicles and fuels according to Ireland's climate strategy suggests that the strategy may have been designed based on the assumption that vehicle use will continue to increase.

The findings of this report are consistent with recent modelling exercises, which suggest the need to scale up policies that can shift travel away from cars (Fulton, Mason and Meroux, 2017[19]; Fulton, 2018[20]; ITF, 2021[21]; Barrett et al., 2022[22]). Recent exercises[6] find that scenarios coupling technological change with large-scale behavioural change can lead to higher accessibility and lower mobility than scenarios focused only on technology, and be more closely aligned with net-zero goals. Scenarios focused on improving vehicles and fuels and taking growing mobility demand as a given fall behind in achieving these goals. The exercises also show that policies that deliver behavioural change will account for a higher share of emission reductions, compared to those delivered by technological change (especially before 2050), than previously estimated.

Focusing climate action on redesigning systems can provide opportunities for a just transition and for a more just system in the end[7]. The characteristics of the transition and those of the resulting system are equally important. Not only the transition process but also the resulting systems should deliver more equitable access to opportunities (including jobs), the regeneration of local businesses, people-friendly neighbourhoods and better health (cleaner air, less noise, more green space, more physical activity) for the wider population.

The rest of the report is structured as follows: Chapter 2 describes the mental models underlying transport systems and policies guided by the goal of mobility. It explains why a system focused on mobility is not fit for purpose and calls for the redefinition of the transport system goal as sustainable accessibility. It shows that systems organised around sustainable accessibility can take different shapes in different areas, building on insights from an exercise covering Dublin, Cork, Sligo and Kildare. Chapter 3 sheds light on the system dynamics underlying growing car use and GHG emissions, and assesses the potential of implemented and planned policies in Ireland to reverse these dynamics. Finally, Chapter 4 makes recommendations for prioritising and scaling up policies identified as having a high potential to accelerate the transition away from car-dependent systems and towards transport systems that (via delivering sustainable accessibility) work for people and the planet.

Box 1.4. Ireland's SMP delivery team and the Pathfinder Programme

The National Sustainable Mobility Policy (SMP), published in April 2022, establishes a strategy for active travel (walking and cycling) and public transportation until 2030 to assist Ireland in meeting its climate commitments (Department of Transport, 2022[3]).

The strategy was developed in response to the transport criteria outlined in the Climate Action Plan 2021. Starting in 2021, the goal is to achieve at least 500 000 additional daily active travel and public transportation journeys, as well as a 10% decrease in kilometres travelled by fossil-fuelled automobiles by 2030. A leadership group has been designated to oversee and deliver the policy's actions and targets (Department of the Taoiseach Ireland, 2021[15]). The leadership group is made up of representatives from various organisations who meet once a month to supervise SMP implementation, making use of their members' knowledge and connections to handle potential risks or overcome hurdles. These regular meetings, to be held until 2025, assess the action plan's development and gather information for the quarterly reports to the Minister of Transportation. The first of these reports, which will describe the degree of success achieved thus far, is scheduled for completion in September 2022. The leadership group has established the SMP delivery team, consisting of representatives from the organizations that currently form part of the leadership group as well as other individuals from academia, community organisations and other parts of the public sector. Their role is to establish the Pathfinder Programme.

The Pathfinder Programme includes projects and activities to implement the completion of the SMP at a local level. The projects must fulfil key criteria such as health, well-being, place-making, permeability and universal design. They include improving cycling infrastructure, electrifying bus services, refocusing on active travel modes (using the "10-minute town" concept), developing a community-based transportation system in rural areas, and upskilling local government staff responsible for meeting sustainable mobility targets. Aspects of road space reallocation, mobility as a service, shared mobility, rural solutions, and the mobility mindset will be incorporated into these initiatives (Department of Transport, 2022[23]).

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Notes

[1] Compared to 2018.

[2] The terms "system structure", "system functioning" and "system design" are used interchangeably throughout the report.

[3] This figure rises to nearly 80% when only the defined emission reduction measures are considered, ignoring an abatement gap of 0.9 MtCO2eq for which Ireland still has to define measures to achieve its 2030 transport sector climate target (Climate Action Plan 2021).

[4] Four focus areas were selected by the Advisory Council for Climate Change to ensure that insights from this project were relevant for the whole of Ireland. These include Dublin, Cork, Kildare and Sligo. Based on the CSO (2019[24]) Ireland categorisation, Dublin and Cork are cities with adjacent areas including satellite urban towns and rural areas with high urban influence. Sligo is an independent urban town; and Kildare is a town whose rural hinterlands have a high urban influence.

[5] For instance, actions targeting road space reallocation in the SMP explicitly mention the need to "review, develop and update guidelines, standards and supporting legislation to allow for a range of solutions to be developed for road space reallocation/redesign to repurpose existing legacy car-based road design" (Department of Transport, 2022[3]). As discussed in Chapter 4, a number of actions undertaken by governments in other countries, which go beyond guidelines, standards and supporting legislation, have proven useful and, in many cases, necessary to trigger large-scale road space reallocation and redesign.

[6] Fulton, Mason and Meroux (2017[19]) and Fulton (2018[20]) develop world urban transport scenarios. They find that emissions can be reduced by about 44% by 2050 (relative to 2015) in a scenario that reinforces high mobility patterns and focuses on improving vehicle technology. A 76% reduction in emissions could be achieved in a scenario in which technological improvements are embedded in a wider policy package that promotes the use of active modes and shared/high-occupancy vehicles, and includes major changes in urban planning. ITF (2021[21]) concludes that the highest emission reductions for the sector (-87% by 2050 relative to 2015) would be achieved if technological change was embedded in a policy package aimed at "reshaping" transport systems and building on recovery to accelerate the pace of change. This scenario would result in much lower total travel (passenger-kilometres) than a business-as-usual one; however, accessibility by both car and public transport, and the relative competitiveness of public transport compared to the car, would be improved. Barrett et al. (2022[22]) develop a transformative scenario for the UK (see more in Chapter 4) and find that the highest emission reductions would be achieved by a policy package that produces "shift and avoid" effects that would account for 60% of total GHG emission reductions, while improving vehicle technologies would account for only 40%.

[7] As will be discussed in Chapter 4, implementing transformative policies can bring benefits in the form of employment creation during the transition away from car dependency.