Wales Centre for Public Policy
Canolfan Polisi Cyhoeddus Cymru

Net zero 2035: Lessons from international initiatives to decarbonise transport

Amy Lloyd, Rosalind Phillips, Helen Tilley
Wales Centre for Public Policy
March 2024

Our Mission

The Wales Centre for Public Policy helps to improve policy making and public services by supporting ministers and public service leaders to access and apply rigorous independent evidence about what works. It works in partnership with leading researchers and policy experts to synthesise and mobilise existing evidence and identify gaps where there is a need to generate new knowledge.

The Centre is independent of government but works closely with policy makers and practitioners to develop fresh thinking about how to address strategic challenges in health and social care, education, housing, the economy and other devolved responsibilities. It:

- Supports Welsh Government Ministers to identify, access and use authoritative evidence and independent expertise that can help inform and improve policy;
- Works with public services to access, generate, evaluate and apply evidence about what works in addressing key economic and societal challenges; and
- Draws on its work with Ministers and public services, to advance understanding of how evidence can inform and improve policy making and public services and contribute to theories of policy making and implementation.

Through secondments, PhD placements and its Research Apprenticeship programme, the Centre also helps to build capacity among researchers to engage in policy relevant research which has impact.

For further information please visit our website at www.wcpp.org.uk

Core Funders

Cardiff University was founded in 1883. Located in a thriving capital city, Cardiff is an ambitious and innovative university, which is intent on building strong international relationships while demonstrating its commitment to Wales.

Economic and Social Research Council (ESRC) is part of UK Research and Innovation, a new organisation that brings together the UK's seven research councils, Innovate UK and Research England to maximise the contribution of each council and create the best environment for research and innovation to flourish.

Welsh Government is the devolved government of Wales, responsible for key areas of public life, including health, education, local government, and the environment.

Contents

Summary

- Transport is the third largest emitting sector in Wales, responsible for 16% of greenhouse gas (GHG) emissions.
- This is a review of international initiatives to reduce transport emissions. It considers how lessons from the initiatives might inform efforts to speed up the transition to net zero in Wales. Examples from 18 countries are presented for three key sectors: surface transport, aviation and shipping.
- Initiatives are categorised into those that help to reduce or avoid the need for travel, shift the transportation of people and goods to more sustainable forms of transport, or improve the operational efficiency of transport modes.
- The most trialled and implemented transport decarbonisation policies identified in our search relate to shift and improve measures in surface transport. This reflects Welsh Government efforts, which have focused on shift/improve to reduce emissions from surface transport, an area of devolved responsibility.
- There were few initiatives identified that helped reduce or avoid the need to travel or transport goods. There may be opportunities to introduce additional avoid measures, but these require a significant degree of behaviour change, and there may be political reticence to impose these types of measures.
- Most initiatives aim to decarbonise transport in areas with high population density. In Wales, strategies are needed that support decarbonisation in both rural and urban settings and more research is needed on initiatives in rural areas.
- Impact data is scarce for implemented initiatives and even where data are available, it is unlikely to be directly transferable to the Welsh context, given different transport needs and socio-economic and geographical constraints.
- Ensuring people and places are connected across Wales requires long term planning across transport sectors and beyond, a range of connected urban and rural transport initiatives, and behaviour change efforts to encourage their use.

Introduction

WCPP have been commissioned by the Welsh Government to provide evidence to support the work of the Wales Net Zero 2035 Challenge Group. The Welsh Government and Plaid Cymru Cooperation Agreement committed to 'commission independent advice to examine potential pathways to net zero by 2035'. In response to this the Wales Net Zero 2035 Challenge Group has been formed, chaired by former minister Jane Davidson. The Group's work is scheduled to run until summer 2024 when it will present its final report. The group will look at the impact on society and the economy, considering the distribution of the costs and benefits and how any adverse effects could be mitigated. The Group is organising its work through a series of five challenge areas. More information on the work of the Wales Net Zero 2035 Challenge Group can be found at: **https://netzero2035.wales**. This evidence review has been prepared to support the Group's work on its fourth challenge area, *How could people and places be connected across Wales by 2035?*

Decarbonising the transport sector whilst ensuring that the people and places of Wales are connected is a necessary step towards net zero. Transport is the third largest emitting sector in Wales, responsible for 16% of greenhouse gas (GHG) emissions (Welsh Government, 2021a). The transport sector also offers some of the most cost-effective opportunities to decarbonise: three place-based pathways to net zero (in Belfast, Edinburgh and Leeds) consistently rank initiatives to reduce transport emissions amongst the top ten most cost – and carbon – effective (Place Based Climate Action Network 2020a, 2020b, 2020c).

An accompanying **background paper** outlines Welsh Government powers and responsibilities and plans for reducing emissions for aviation, shipping and surface transport for decarbonising the transport sector. There are fewer policies relating to aviation and shipping as powers are not devolved in these sectors. Here, we present a review of international initiatives that might complement and further inform Welsh Government efforts to transition to net zero.

This evidence review presents international examples of planned or implemented policies aimed at supporting decarbonisation of surface transport, aviation and shipping; and policies on digital connectivity that could help to reduce or avoid the need for travel. Academic and grey literature were reviewed to identify relevant international examples of transport decarbonisation policies. The review is not exhaustive; rather it indicates the types of initiatives that may be appropriate for Wales. Five subject experts were also interviewed to consolidate the evidence identified in the review. The review identified policies from 18 countries from the early 2000s to date, in middle and high income countries (see Annex). Proposed and implemented policies vary in terms of scale (national, regional or local), and by funding (for example, by central government or private organisations). Policies are

considered in relation to the avoid-shift-improve framework and where available, impact data is presented for implemented initiatives.

Transportation needs and opportunities to decarbonise

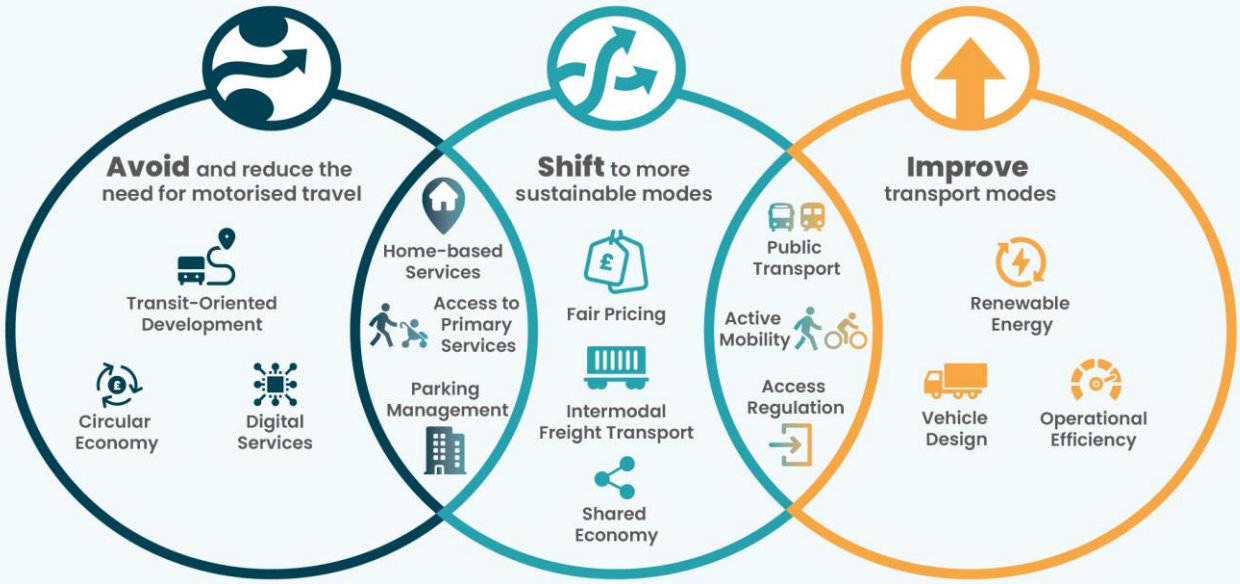
The movement of people and goods within Wales predominantly occurs via surface transport, with aviation and shipping mostly reserved for travel and transportation to the rest of the UK and internationally. Surface transport needs in Wales are shaped by geography, population density, and by the socio-economic needs of the population. Wales is a small country, covering 20,779 km^2, with a relatively low overall population density; 150 people per km^2 compared to 434 people per km^2 in England (Welsh Government, 2022a). Just under a third of the population live in rural localities (Scott, 2020) and population density varies significantly between urban and rural areas (for example, 2,572 residents per km^2 in Cardiff, compared to 26 per km^2 in Powys). There is also variation within rural areas, with some having evenly small, evenly spread, settlements (for example, Anglesey) and others having densely populated strips and sparsely populated hinterlands (for example, Denbighshire) (Welsh Government, 2008; City Population, 2021). Sustainable transport solutions that work in urban areas may not be appropriate in rural settings, and vice versa.

The types of transport needed to enable people to access to workplaces and core amenities (for example, healthcare, schools, etc.) may vary between localities, depending on employment opportunities and proximity to amenities. Those living in rural areas disproportionately rely on private car usage, as opposed to active transport (due to distance) or public transport (due to availability) (Poltimäe et al., 2022). The need to travel may also be affected by digital connectivity, with those in rural areas being disproportionately affected by poor connectivity and therefore may, for example, be unable to work remotely.

The avoid-shift-improve framework

Opportunities to decarbonise the transport sector can be categorised into those that help to reduce or *avoid* the need for travel, *shift* the transportation of people and goods to more sustainable forms of transport, or *improve* the operational efficiency of transport modes. Figure 1 presents a non-exhaustive list of measures. This framework helps to consider the full range of opportunities available to the Welsh Government to reduce emissions associated with connecting people and places.

Figure 1: Avoid Shift Improve measures to decarbonise transport



Source: Slocat, 2021: 6

Surface transport

The most trialled and implemented transport decarbonisation policies identified in our search relate to surface transport. This reflects Welsh Government efforts, which have to date focused predominantly on reducing emissions from surface transport. Table 2 summarises current Welsh Government policies and provides examples of international initiatives, using the avoid-shift-improve (ASI) framework. The following sections provide a description of the types of initiatives covered by each category and more detail about each of the international examples highlighted in Table 2. Initiatives to reduce emissions from freight were outside of the scope of the review.

Avoid surface transport

Avoiding travel may require a suite of initiatives that go beyond the transport sector, such as reducing the need for movement of people and goods through planning reforms and circular economy. These types of initiatives were beyond the scope of this review. However, we reviewed two types of initiatives that may reduce the need to travel: digital connectivity and home working.

Digital connectivity and home working

Of the 18 countries reviewed, six discussed increasing remote working to reduce travel and ultimately emissions, although very few of these policies had been implemented at the time of writing. Remote working may reduce peak time congestion and overcrowding on public transport, and a more flexible model of work could increase public transport usage and consequently generate investments and improvements in its infrastructure (see Carter and Johnson, 2021). The Welsh Government introduced a remote working policy in 2020, promoting a flexible model of working where staff can choose to work in the office, at home or in a hub location (Welsh Government, 2022d). The aim is to see 30% of the workforce working remotely on a regular basis with the explicit aim of reducing the need to travel.

Many approaches to decarbonising the transport sector are linked to its digitalisation, requiring access to phones, laptops, Wi-Fi and data roaming (for example, MaaS, car sharing, bicycle renting). Some groups in society are disproportionately more likely to experience digital and internet poverty including women, older people, people with disabilities, individuals from a low socio-economic status background and ethnically minoritised communities (ONS, 2019). Therefore, to ensure a just transition, policies to decarbonise the transport sector should specifically consider the impact on these groups to ensure that they are not unintentionally excluded.

Table 2: Welsh government policies and international initiatives presented using the ASI framework

Avoid[1]	Shift	Improve
Digital connectivity and home working • Smarter working: a remote working strategy for Wales	**Active travel** • New developments to have active travel infrastructure • Longer distance commuter highways • Encourage workplace travel plans – showers etc • 20mph limits in built up areas • Support e-bikes • **Cycling infrastructure** • **Cycle sharing scheme (for example, BicikieLJ)** • **School Street Closures** (Cardiff) **Public transport** • Address restrictions of de-regulation • Core valley lines • Bus-to-bus hubs in urban and rural areas for second journey • **A single ticket for all modes of public transport (for example, KlimaTicket)** **Shared transport** • **Carpooling (for example, BlaBlaCar)** • **Car clubs (for example, CoMoUK)** • Rural taxi system (Bwcabus/Fflecsi) **(for example, GUSTmobil)** **Mobility as a Service (MaaS) and Mobility Hubs** • **National Maas (for example, in Norway)** • **Regional Maas (for example, REGIOtim)** • **Mobility hubs (for example, in Germany)**	Reduce emissions from freight and logistics • Assess impact of next-day delivery • Multi-modal hubs for cargo • Last mile e-delivery Accelerate the uptake of zero emission cars and vans • UK wide ban on sales from 2035 • Decarbonise public sector fleet • Electric car clubs • Review loan schemes Plan for and invest in EV charging infrastructure • Strategic points every 20 miles • 7 to 11 charging points per EV Zero emission bus fleets All taxis and private hire vehicles to be zero emission by 2028 Decarbonise the rail network Zero emission HGVs

Black text: Welsh Government plans

Turquoise text: International initiatives not currently planned or fully implemented across Wales

[1] While this review focused on transport initiatives, avoid initiatives may be broader and may include other approaches such as the circular economy and planning reform.

Shift to sustainable surface transport

It is estimated that we need to reduce private car use by at least 20-27% by 2030 (more beyond) to meet 2050 net zero targets (Greener Transport Solutions, 2022). This requires an accelerated modal shift to more sustainable modes of transport. There are already a number of planned or implemented Welsh Government initiatives (see Table 2). This review identified a few additional initiatives aimed at increasing active travel and public transport that could be relevant for Wales, and additional categories of initiatives that are not routinely implemented across Wales: shared transport, Mobility as a Service (MaaS), and mobility hubs. These are presented in more detail below. The Sustainable Transport Alliance has collated data on potential carbon savings resulting from modal shift initiatives, presented in Table 3.

Table 3: Potential carbon savings per journey

Policy type	Potential carbon savings per journey[2]
Active travel	Walking and cycling produce no emissions and therefore results in a 100% reduction in CO2 emissions per journey. This can result in the following CO2 emissions, compared to the average petrol car: - 0.5 mile journey saves 0.14 kgCO2e - 1 mile journey saves 0.3kgCO2e - 5 mile journey saves 1.4kgCO2e - 10 mile journey saves 2.9kgCO2e
Public transport	A 30 mile journey by rail produces on average 1.9kgCO2e per passenger compared to 13.0kg in a large petrol car, a reduction of 86% less, or a reduction of 11.1kgCO2. A 30 mile journey by bus produces on average 4.8kgCO2e per passenger compared to 13.0 in a large petrol car, a reduction of 63%, saving 8.2kgCO2e (Far greater savings are made if journeys are switched to fully electric buses, which produce 75% lower emissions.
Shared transport	Emissions from an average car club are 37% lower, saving 3.2kgCO2e per 30 mile journey compared to the average petrol car.

[2] These have been collated by the Sustainable Transport Alliance from different sources and are not directly comparable (Sustainable Travel Alliance 2023)

Active travel

Of the 18 countries reviewed, 12 had implemented or were planning to implement policies that encourage active travel. These initiatives are designed to facilitate a *shift* to less carbon intensive transport modes. Policies relating to the promotion of active transport are typically city-focused (for example, Canada, Denmark, USA). This is often attributed to the fact that those living in rural and isolated areas are less able to adopt cycling and walking as their primary transportation method as they must typically travel further distances to reach necessities (for example, work, school, shops, hospitals) (Transport Scotland, 2022).

The Welsh Government has already pledged to spend £60 million on the development of a safe network for walking and cycling and a 20mph speed limit has been introduced on most residential roads. The E-move scheme providing battery assisted bikes for residents for free has been in operation in some parts of Wales since 2021, supported by Welsh Government funding. E-move is estimated to have saved 600kg of CO_2 in 2021 and a 39% reduction in car journeys has been reported by users (Welsh Government, 2023). A bike rental scheme run by OVO bikes offered users different levels of fees to use bikes around Cardiff and the Vale of Glamorgan (pay as you ride, pay monthly or pay annually). However the scheme was shut down in 2023 due to vandalism and theft (Grey, 2023). The walking and cycling initiatives outlined below provide examples of further opportunities to promote active travel and encourage behaviour change.

Improving cycling infrastructure in Copenhagen, Denmark

One of the most widely recognised examples of promoting and facilitating active transport is the use of bicycles in Copenhagen, Denmark. Cycling in Copenhagen has a history which dates back the 1880s (Emanuel, 2018). Cycling is considered as a primary mode of transport in the city, facilitated through introducing safe and connected infrastructure such as dedicated bicycle lanes and plenty of bicycle parking, and through traffic calming measures on quieter roads; 49% of journeys to work or school in Copenhagen are by bike (Weinreich, 2021). Half of the cycling infrastructure in the city has existed since the 1970s, and there has been a long-established culture of cycling which cannot be easily or suddenly replicated in other locations (Gössling, 2013). However, this does not mean that elements of Copenhagen's approach, such as dedicated bike lanes and traffic calming measures, cannot be adopted in other regions or countries.

A bike sharing app in Ljubljana, Slovenia

In the capital city of Slovenia, Ljubljana, a bicycle-sharing scheme has been introduced to encourage cycling. In the city there are various bicycle terminals which house bicycles which can be hired through the BicikeLJ app or website. Users can hire a bicycle for free if returned to the nearest terminal within an hour and can rehire a bicycle for another free hour by waiting five minutes. Alternatively, bicycles can be hired for a period of up to 24 hours with varying hiring prices. BickieLJ has been active since 2011, with the 800 available bikes used by 17% of the citizens of Ljubjana (Velo-city, 2022).

Bicikelj bikes had been rented more than 9.1 million times since its launch in May 2011 and at the end of April 2022, 17% of Ljubjana residents had an annual subscription. Whilst there are no carbon reduction figures from the bike sharing app in Ljublijana, one report from the UK estimated that the use of bike sharing schemes reduce CO2 emissions by 71kg per person each year (CoMoUK, 2022a).

School street closures in the UK

School street closures (SSCs) create timed traffic restrictions on the road outside of the school gates, with the purpose of improving air quality as well as reducing congestion and road safety issues (Davis, 2020). A project investigating SSCs in the UK found that councils who introduce SSCs not only want to ensure the safety of children but to encourage behaviour change and the promotion of active travel modes (Davis, 2020). A review of 16 studies evaluating the impact of SSCs found medium strength evidence of a reduction in motor vehicle use, an increase in active travel, and public support for the initiative (Davis, 2020). One study investigating SSCs in London found a reduction in air pollution of up to 23% (Mayor of London, 2021).

Public transport

The review of international examples found planned or implemented public transport policies in 14 of the 18 countries. These policies were varied but included improvement of infrastructure (for example, USA), ensuring efficiency (for example, Norway), creating behavioural change through public campaigns (for example, Czech Republic) and changes to ticketing (for example, Austria).

A single ticket for all modes of public transport in Austria

In 2021, the Austrian government introduced the KlimaTicket. Purchasing a KlimaTicket provides unlimited public transport for a year regionally, cross-regionally, or nationally – although there are some regional exceptions. An annual KlimaTicket Ö costs £937, with concessionary prices available for those under 25, over 65 or for those with a disability. In 2024, the 'KlimaTicket Ö for 18-year-olds' will be given to all young adults on their 18th birthday and will provide them with one year of free transport to use within three years (KlimaTicket, n.d). Research into the frequency and routes of KlimaTicket holders is currently being conducted, but more than 200,000 tickets were bought nationwide between October 2021 and January 2023 (European Commission, 2023). Preliminary findings show that 85% of surveyed users of the ticket are replacing car journeys with public transport; and KlimaTicket is considered 'Austria's key policy measure to delivering net zero transport' (OCED, 2022: 2).

Promoting public transport in Usti nad Labem, Czech Republic

In the city of Usti nad Labem, Czech Republic, a public transport campaign was launched in 2008 to increase the number of users of public transport. This was informed by a study of public transport system use and opportunities for improvement in Usti and Labem. The campaign aimed to highlight the advantages of public transport; improve the reputation of public transport; and raise passengers' confidence of public transport (CIVITAS, 2012a).

Campaign activities included a public event, brochures, competitions, promotional public transport vehicles in operation, and educational bus for children, and discussions and workshops. Public transport was also promoted in the local media. However, the evaluation showed only a slight (1%) increase in acceptance levels of public transport provision and 3% increase in awareness (CIVITAS, 2012b). There is no data on the long-term outcomes. This highlights the potential challenges of implementing effective behaviour change initiatives.

Shared transport

Three types of shared transport initiatives were identified: carpooling, car clubs and a rural taxi system. These initiatives are designed to *shift* people away from reliance on single-occupancy cars and offer opportunities to connect those living in rural localities. Carpooling initiatives aim to connect people who are driving in the same direction or to the same location. Car clubs are cars available in a city or locality that can be hired on a short-term basis, aiming to reduce the need to privately-owned vehicles. The Welsh Government has implemented a rural taxi system, Fflecsi (TfW, 2021) and announced a £1 million investment to create a network of car clubs across rural Wales, supporting the reduction of transport emissions whilst ensuring rural communities are connected (Welsh Government, 2024) These initiatives support people to shift from a reliance on car ownership, particularly in rural locations.

Shared transport initiatives are often provided by private enterprises but can also be facilitated through community-led transport services. Run by community transport staff and volunteers, community-led transport aims to fulfil the transport needs of the community that are otherwise unmet. The Community Transport Association (CTA), a UK charity which provides training, advice and operational support to transport related charities within the UK, argues that the Welsh Government's ambition to decarbonise the transport sector can be facilitated and supported by community transport operators, who have been implementing a sustainable transport model within Wales (CTA, 2023).

Of the 18 countries reviewed, seven were planning or had already implemented shared transport initiatives. In some instances, shared transport initiatives have been implemented nationally (for example, France and Austria) and others have been initiated in specific localities (for example, Rome, London and Wales).

National carpooling in France

BlaBlaCar is a private company founded in France in 2006 facilitating a demand-led approach to car sharing, originally available on a webpage and more recently as an app. Using the BlaBlaCar platform, a driver advertises their journey and the number of seats they have available. Passengers can book the available seats, connecting to the driver and arranging a meeting location. BlaBlaCar grew from originally operating nationally, to now being available in 21 countries. Measuring both direct and indirect CO2 savings, the total savings generated by BlaBlaCar operating in eight countries over 12 months equalled 1.6 million tonnes of CO2 (BlaBlaCar, 2019).

Car clubs in the UK

A number of privately-owned car clubs operate in the UK, providing short-term car hire. Members pay monthly or annual membership fees and additional hourly rental rates. Collaborative Mobility UK (CoMoUK), a national charity for shared transport that provides guidance to national, regional and local authorities on how to run schemes, has established car clubs with over 350,000 active members across England, Scotland and Wales (CoMoUK, 2023). In 2022 in the UK each car club vehicle on average replaced 22 private cars and carbon emissions from car club vehicles are 27% lower than the average car (CoMoUK, 2022b).

A national rural taxi system in Austria

The GUSTmobil (Austria) is a government-funded rural taxi scheme. GUSTmobil was trialled in 2017, operating in the regions of lower Austria, aiming to connect dispersed settlements to key public transport hubs or to desired destinations through affordable vehicle hire. Journeys can be booked by telephone or through the website or app. The GUSTmobil enables users to share the ride to reduce the overall cost, which is also reduced if an individual owns a KlimaTicket. The GUSTmobil trial proved successful and came into permanent operation in 2021, however, more work is required to integrate the system with public transport (Bauchinger et al, 2021).

Mobility as a Service and mobility hubs

Four of the 18 countries reviewed were planning or had implemented Mobility as a Service (MaaS) or mobility hubs. MaaS is a digital service that enables users to plan, book and pay for an array of mobility services on a single app or website, such as public transport, car sharing and taxi facilities (Smith et al., 2022). Mobility hubs are physical locations for switching between different modes of transport. These locations might include bike storage, train stations, bus stops and electric vehicle (EV) charging facilities. MaaS systems and mobility hubs can exist separately or can be implemented together (for example, REGIOtim in Austria, see below). By integrating services and facilities into one system, the desire is to

increase the use of public transport and reduce private car dependency (Crozet and Coldefy, 2021).

National MaaS in Norway

On a national scale, Norway have introduced a state-owned MaaS system, which incorporates the travel information such as timetables, prices, stations of buses, trams, trains, ferries, scooters and bikes into one system that is available on a website and an app. The Norwegian MaaS system has not yet enabled all transport providers to connect to the payment service, meaning that not all transport can be booked and paid for through the MaaS system, but this is a focus for future development (Entur, n.d).

Regional MaaS in Graz (Austria) and the Solent (England)

The city of Graz (and more recently the surrounding area of Styria) in Austria have implemented a 'multi-modal mobility network' which incorporates mobility hubs and MaaS. This system is called REGIOtim – or affectionately TIM – providing multimodal mobility nodes and hubs in key areas of the city and the wider region. These nodes are often located at train stations or park-and-ride facilities and provide users with access to e-car sharing, bicycling hiring and parking, and e-charging. As well as mobility hubs, the REGIOtim provided a MaaS system which, through an app, integrates the services and allows them to be planned, booked and paid for (Reichenberger and Bauchinger, 2020).

In the Solent region in England, a MaaS system is currently being trialled, aiming to integrate the planning and payment of various transportation modes from across Portsmouth, Southampton, South Hampshire and the Isle of Wight into one app. Funded by the Department for Transport, the app intends to shift citizens away from private car usage and towards alternative methods of transport (Solent Transport, n.d).

Mobility hubs in Bremen (Germany)

Bremen, Germany is recognised as the first city to introduce a mobility hub in 2003, aiming to address the problems of high private car ownership, congestion and parking difficulties. There are now various mobility points in the area, providing car-sharing vehicles and parking spaces, bicycle storage and EV charging points. All of these are located near public transport (for example, bus stops, train stations). The European Commission (2019) estimate that over two and a half years, mobility hubs and the provision of car-share vehicles has saved 25,850 tonnes of CO2.

Improve surface transport

Improving energy efficiency and reducing vehicle emissions is important in the transition to net zero. The Welsh Government is working on *improving* energy efficiency of public transport fleets. Initiatives include electrifying the Core Valley Lines (Climate Change Committee, 2023), zero emission bus fleets and bus-to-bus hubs. EVs are one of the main strategies for decarbonising transport, through improved vehicle design, operational efficiency, and the use of renewable energy. All 18 countries reviewed stated their commitment to reduce transport emissions through the adoption of EVs.

Ultra-low emissions vehicles

Producing fewer GHG emissions than petrol or diesel engines, EVs are considered to be essential in the decarbonisation of the transport sector. By 2030, 75% to 95% of passenger vehicle sales need to be EVs to meet international climate goals (Climate Action Tracker, 2020). The EV Charging Strategy for Wales outlines plans to roll out EV charging infrastructure across Wales, including charging at home, in the workplace, on streets, on-route charging and at final destinations (Welsh Government, 2021b). This includes fast and rapid chargers, and plans for housing regulations to stipulate EV charging availability for all new homes. The UK government are also introducing a ban on the sale of new petrol and diesel cars and vans in 2035. However, Wales currently has the lowest percentage of electric vehicles in the UK, so more progress is needed to encourage EV use ahead of the ban (Welsh Government, 2021b). International approaches to promoting EV use are varied: Germany hope to have 15 million electric cars by 2030 (Federal Ministry of Finance, n.d); and Denmark hope to stop the sale of new petrol and diesel cars by 2030 (Evans, 2018).

Promoting EVs in Iceland

Efforts to promote EVs in Iceland have been successful in increasing the proportion of EV sales; this has also resulted in declined revenue for road maintenance. In 2012, Iceland introduced tax incentives to increase the uptake of alternative vehicles in the form of value added tax exemptions; EVs carried no excise duties, whereas diesel and petrol vehicles were subject to 30-45% at registration (Wappelhorst and Tietge, 2018). In 2023, half of the cars sold in Iceland in were electric (closer to 90% for private car sales) (Iceland Review, 2024), compared to around 16.5% of cars sold in the UK (ZapMap, 2024). Early in 2024 the tax exemptions were revoked after claims they were unsustainable. The road system in Iceland is primarily funded by excise duties on oil and petrol; declining revenue as more drivers switch to electric or hybrid has made it difficult to maintain, particularly as maintenance costs rise. Buyers of EVs may now apply for a tax free grant to purchase an EV; and a new per-kilometre charge for EV, hybrid and hydrogen vehicles has been introduced.

A summary of the international surface transport policies reviewed are presented in Table 4.

Table 4: Summary of international surface transport policies

Policy type		Countries	Examples of successfully implemented initiatives
Avoid		Austria, Ireland, Scotland, Slovenia, Sweden and Wales	**None identified**[3]
Shift	Active travel	Canada, Denmark, England, Germany, Iceland, Ireland, New Zealand, Poland, Scotland, Slovenia, Sweden and Wales	**BicikieLJ, Slovenia** • A bicycle-sharing scheme introduced in 2011 to encourage cycling. • The city provides various bicycle terminals housing bicycles which can be hired through the BicikeLJ app or website.
	Public Transport	Austria, Canada, Czech Republic, Costa Rica, England Germany, Iceland, Ireland, New Zealand, Norway, Poland, Scotland, Sweden and Wales	**KlimaTicket, Austria** • Provides unlimited public transport for a year regionally, cross-regionally, or nationally. • More than 200,000 tickets bought between Oct 2021-Jan 2023.
	Shared Transport	Austria, France, Germany, Italy, Poland, Scotland and Wales	**BlaBlaCar, France** • App and website developed by private company in 2006 • A driver advertises their journey and the number of seats available; passengers are able to book available seats.
Improve	Ultra-low Emission Vehicles	Austria, Canada, Costa Rica, Czech Republic, Denmark, England, France, Germany, Iceland, Ireland, Italy, New Zealand, Norway, Poland, Scotland, Slovenia, Sweden, USA and Wales	**EVs, Iceland** • Introduced VAT exemption for EVs in 2012; revoked in 2024. • A per-kilometre charge for electric, hybrid and hydrogen vehicles adopted early 2024 due to declining funds to maintain road system

[3] Only transport initiatives were reviewed; avoiding transport use may require a suite of initiatives and as some of these may go beyond the transport sector they have not been included in this review. Wales has implemented a remote working policy; no other similar policies were identified in the international review.

Aviation

15 of the 18 reviewed countries highlighted the need to make the aviation sector more sustainable in their decarbonisation strategies. The majority of policies are focused on the development and use of alternative fuel. One of the few implemented policies to reduce aviation GHG emissions was introduced into French legislation in 2023, banning all domestic flights that could be replaced with a train ride taking less than 2.5 hours. However, the extent to which the law will reduce short-haul domestic flights is uncertain, especially as it does not apply to connecting flights or flights from the main international airport in Paris (Breeden, 2023). A ban on short haul flights may not be an applicable approach for Wales. In 2020 and 2021, of the 10 most common destinations from Cardiff Airport three were UK-based (Belfast, Edinburgh and Dublin) (Welsh Government, 2022c). Travelling to these locations via public transport or ferry would take longer than 2.5 hours. Table 5 presents a summary of the international aviation policies identified within this review.

Table 5: Summary of international aviation policies

Policy type	Countries	Status of policies
Shift	France	**Implemented policies:** Ban on short-haul flights in France • All domestic flights which could be replaced with a 2.5 hour train ride have been banned.
Improve	Austria, Canada, Czech Republic, Denmark, France, Germany, Iceland, Italy, New Zealand, Norway Scotland, Sweden, UK, USA and Wales	**Planned policies:** • Developing and increasing the use of alternative fuel in the aviation sector.

Shipping

The decarbonisation of the shipping sector is in its early stages. The International Transport Forum and OECD consider Sweden to be leaders in the field, with the Swedish Shipowners' Association pioneering a commitment to targets to reduce emissions. Additionally, the collaboration of the association with the government, businesses, industry professionals and academics has supported the essential fostering and sharing of knowledge about shipping decarbonisation. There has also been a considerable uptake of liquid natural gas (LNG) and electrically powered ships, and some ports have begun to adapt to facilitate LNG bunkering facilities (ITF and OECD, 2018).

In 2021, the European Commission introduced a revision of the 2014 Directive which requires Member States to develop national policy frameworks for the development of the market regarding alternative fuels (such as LNG) and their infrastructure (European Commission, n.d; European Parliament, 2023). However, there is emerging research which suggests that the environmental benefits of LNG are potentially negative, and there may be considerable financial loss to the LNG if not retrofitted to run on zero emissions fuels such hydrogen and hydrogen-derived ammonia (UCL Energy Institute, 2022). A summary of the international shipping policies identified in this review are presented below in Table 6.

Table 6: Summary of international shipping policies

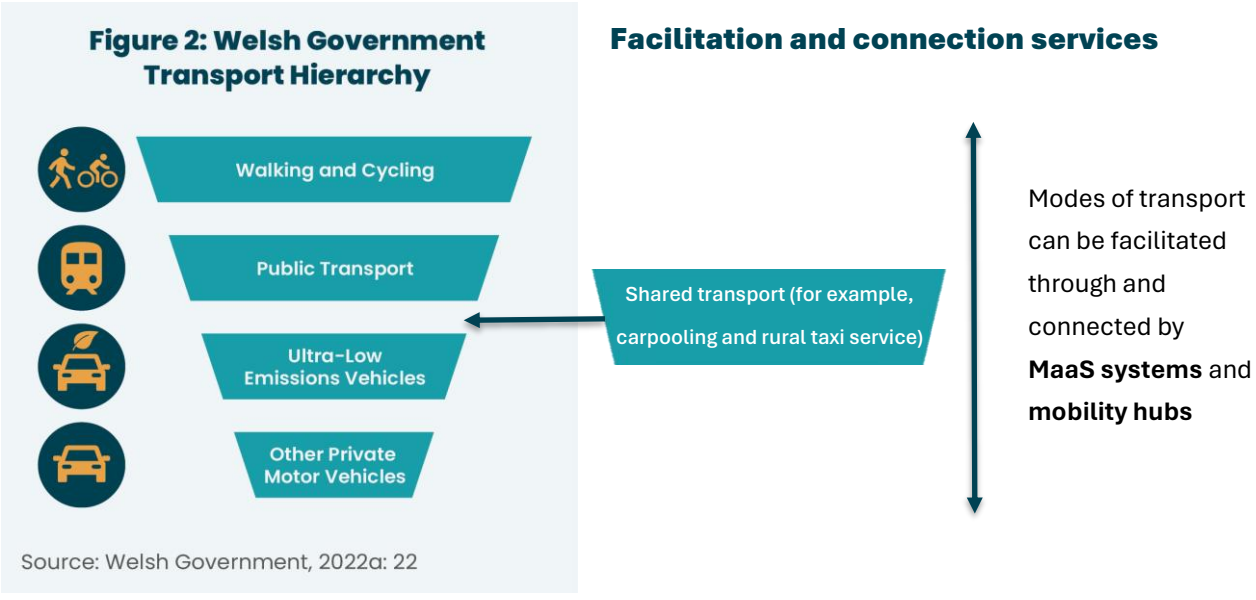
Policy type	Countries	Status of policies
Improve	Canada, Denmark, England, France, Germany, Iceland, Ireland, Norway, New Zealand, Scotland, Sweden, USA and Wales	**Implemented policies** • European Commission Deployment of Alternative Fuels Infrastructure • Directive to require Member States to develop national policy frameworks for the development of the market regarding alternative fuels and their infrastructure. **Planned policies** • The decarbonisation of the shipping sector is in its early stages, but collaboration between stakeholders is supporting the fostering and sharing of knowledge.

Conclusion

Decarbonising the transport sector is essential for Wales to meet its net zero target. Policy levers for reducing aviation and shipping emissions rest mostly with the UK government. Surface transport, a devolved responsibility, offers the Welsh Government greater opportunity to lead the way in connecting people and places and speeding up the transition to net zero. Most of the international initiatives reviewed aimed to address surface travel. Surface travel initiatives – particular those that shift transport use to more sustainable modes - have also been found to be some of the most cost and carbon-effective (Place Based Climate Action Network 2020a, 2020b, 2021).

The international review identified additional initiatives that might further inform efforts in Wales. The Welsh Government's sustainable transport hierarchy (see Figure 2) organises modes of transport from the most sustainable (walking and cycling), to the least sustainable (other private motor vehicles). An additional category was identified in the review, shared transport, which aims to shift people to more sustainable modes of transport such through initiatives such as carpooling and car clubs. This additional category is also referred to in the Carbon Budget 2 in the application of a sustainable travel hierarchy to the public sector fleet (Welsh Government 2021c:197). Initiatives that could be used to further inform efforts to shift from car use to active travel include the cycle infrastructure in Copenhagen and cycle sharing schemes such as BickieLJ. Initiatives that could help inform efforts to improve public transport use include providing unlimited public transport, car sharing schemes such as BlaBlaCar, and Norway's national Mobility as a Service (MaaS). Mobility hubs and MaaS connect different categories of sustainable transport in one system and make trade-offs between different modes of transport more explicit. This could help citizens to consider time and cost comparisons, which may lead to a shift away from vehicle ownership in the long term.

Figure 2: Welsh Government Transport Hierarchy



Source: Welsh Government, 2022a: 22

Few *avoid* initiatives were identified in either Welsh Government or international efforts. However, efforts to reduce the need for travel may go beyond the transport sector and were therefore beyond the scope of this review (for example, planning reforms such as 20-minute neighbourhoods, or circular economy). The surface transport hierarchy above captures the *shift* and *improve* elements of the avoid-shift-improve framework. The Welsh Government's remote working policy was one of the few policies identified that aims to reduce or avoid in the need for surface transport; no other similar initiatives were identified in the international review. Almost all aviation and shipping policies reviewed focused on improve initiatives, aimed at switching from fossil fuels to alternative fuel types. France was the only country reviewed that has implemented an aviation policy that aims to shift transport mode to public transport. There may be opportunities to introduce additional *avoid* measures, for example, by planning reforms and circular economy policies, but these require a significant degree of behaviour change, and there may be political reticence to impose these types of measures.

Few initiatives were identified that address the challenges of rural connectivity. Efforts to decarbonise transport have predominantly focused on areas with high population density as active travel and public transport are more difficult to implement in rural areas. Gustmobil, the rural taxi system in Australia, is similar to the already implemented Fflecsi in Wales. Car sharing, carpooling and car clubs could all be considered as additional opportunities to decarbonise rural transportation. More research is needed on initiatives for rural areas.

It is difficult to calculate the impact of different initiatives on carbon emissions. Impact data is scarce for implemented initiatives and even where data are available, it is unlikely to be directly transferable to the Welsh context, given different transport needs and socio-economic and geographical constraints. Successful implementation would depend on how well these initiatives are aligned with the context in Wales. As the end of the OVO bike scheme in Cardiff and Vale demonstrates, not all initiatives that have been successful elsewhere would necessarily have the same outcomes in Wales. However, the Sustainable Transport Alliance provide broad brush calculations that indicate potential carbon savings from efforts to *shift* to more sustainable modes of surface transport (see Table 3), which could be used to inform efforts in this area.

Lessons from the international examples could be used to enhance the Welsh Government's approach, but there is also an imperative to deliver on existing commitments (as discussed in the **background paper**). For example, the Welsh Government has not met five of nine targets outlined in their EV charging strategy for Wales; and the number of passenger journeys by rail and bus has not yet recovered to pre-pandemic levels (Office of Rail and Road 2023, StatsWales 2023). In April 2023 the transport watchdog, Transport Focus, called on Transport for Wales to 'urgently deliver a more reliable rail service after months of disruption for passengers', calling the current provision 'untenable' (Transport Focus, 2023).

Many of the experts we spoke to argued it is not enough to do more of the same with improved efficiency. In Wales, transport solutions need to shift away from a reliance on car use towards improved networked connections within and between urban and rural areas. Policies aimed at improving public transport need to be complemented by policies that disincentivise car use in urban areas. Where car use is essential, for example, in rural communities, policies and resources may be required to support the purchase and (shared) use of ultra-low emissions vehicles, and associated charging facilities. Reducing car use also needs to be considered as part of a wider land use policy that ensures planning processes include transport considerations. This means homes and amenities planned and developed around public transport networks and modes of transport that can flex around the differing needs of rural and urban communities. However, this review did not explicitly search for wider land use policy in relation to transport services and private car reduction and so the extent to which these policies are being implemented internationally is unclear. Similarly, we did not review efforts to reduce emissions from freight, which could contribute to efforts to reach net zero.

International efforts can offer learning from particular geographical localities, or from particular modes of transport, but there is no gold standard that offers a blueprint for Wales. Ensuring people and places are connected across Wales requires long term planning across transport sectors and beyond, a range of connected rural and urban transport initiatives, and behaviour change efforts to encourage their use.

References

Bauchinger, L., Reichenberger, A., Goodwin-Hawkins, B., Kobal, J., Hrabar, M., and Oedl-Wieser, T. (2021). **Developing Sustainable and Flexible Rural-Urban Connectivity Through Complementary Mobility Services**. Sustainability, 13(3), 1280.

BlaBlaCar. (2019). **Zero Empty Seats**. Retrieved from: **BlaBlaCar - Zero Empty Seats report 2019.pdf - Google Drive**

Carter, I., and Johnson, C. (2021). Remote workinö. **Wales Centre for Public Policy**. Retrieved from **Remote-working-.pdf (wcpp.org.uk)**

City Population. (2021). **Isle of Anglesey**. Retrieved from: https://www.citypopulation.de/en/uk/wales/wards/W06000001__isle_of_anglesey/

CIVITAS. (2012a**). Public Transport Promotion Campaign in Usti nad Labem**. Retrieved from: **Microsoft Word - Deliverable T39.1 - Usti.docx**

CIVITAS. (2012b). **Measure Evaluation Results: Public Transport Promotion Campaign in Usti nad Labem**. Retrieved from: **INCEPTION REPORT (civitas.eu)**

CIVITAS. (2013). **Public Transport Promotion Campaign**. Retrieved from: **Public Transport Promotion Campaign | CIVITAS**

Clark, A., and Rankl, F. (2022). **Building broadband and mobile infrastructure**. Retrieved from: **Building broadband and mobile infrastructure - House of Commons Library (parliament.uk)**

Climate Action Tracker. (2020). **Elaborating the decarbonisation roadmap**. Retrieved from: **Paris Agreement Compatible Sectoral Benchmarks - August 2020 (climateactiontracker.org)**

Climate Change Committee (2023). **Progress Report: Reducing Emissions in Wales**. Retrieved from: **Progress Report: Reducing emissions in Wales (theccc.org.uk)**

Climate Trade. (2022). **Why is it so hard to decarbonize aviation?** Retrieved from: **Why is it so hard to decarbonize aviation? - ClimateTrade**

CoMoUK. (2022a). **CoMoUK Annual Bike Share Report.** Retrieved from: **651329bfee3cbcb604feb6b2_CoMoUK Annual Bike Share Report UK 2022_v02.pdf (website-files.com)**

CoMoUK. (2022b). **CoMoUK Annual Car Club Report**. Retrieved from: **632885c07c790d2577d1445f_CoMoUK Car Club Annual Report UK 2021.pdf (website-files.com)**

Community Transport Association. (2023). **Mapping Wales.** Retrieved from: **https://ctauk.org/mapping-wales/**

Community Transport Association. (n.d). **What is Community Transport?** Retrieved from: **https://ctauk.org/about-cta/what-is-community-transport/**

Crozet, Y., and Coldefy, J. (2021). **Mobility as a Service (MAAS): A digital roadmap for public transport authorities.** Centre on Regulation in Europe. Retrieved from: **Mobility as a Service (MaaS): A digital roadmap for public transport authorities - CERRE**

Davis, A. (2020). **School Street Closures and Traffic Displacement: A Literature Review and semi-structured interviews**. Transport Research Institute, Edinburgh Napier University. Retrieved from: **School Street Closures and Traffic Displacement Project: A Literature Review with semi-structured interviews (napier.ac.uk)**

Department for Transport. (2022). **Jet Zero strategy: delivering net zero aviation by 2050.** Retrieved from: **Jet Zero strategy: delivering net zero aviation by 2050 - GOV.UK (www.gov.uk)**

Department for Transport. (2023). **Transport and environment statistics: 2023.** Retrieved from: **Transport and environment statistics: 2023 - GOV.UK (www.gov.uk)**

Emanuel, M. (2018). **Making a bicycle city: infrastructure and cycling in Copenhagen since 1880.** Retrieved from: **Making a bicycle city: infrastructure and cycling in Copenhagen since 1880 | Urban History | Cambridge Core**

Entur. (n.d). **About Entur.** Retrieved from: **About Entur | Om Entur**

European Commission. (2019). **SHARE-North: Fostering shared mobility solutions for a low-carbon North Sea Region.** Retrieved from: **Inforegio - SHARE-North:**

Fostering shared mobility solutions for a low-carbon North Sea Region (europa.eu)

European Commission. (2023). **Introduction of KlimaTicket.** Retrieved from: **Introduction of KlimaTicket (europa.eu)**

European Commission (n.d.). **Alternative Fuels Infrastructure.** Retrieved from: **https://transport.ec.europa.eu/transport-themes/clean-transport/alternative-fuels-sustainable-mobility-europe/alternative-fuels-infrastructure_en**

European Cyclists Federation (2022) **How the bicycle transformed Ljubljana into a more liveable city**. Retrieved from: **How the bicycle transformed Ljubljana into a more liveable city | ECF**

European Parliament.(2023). **Revision of the Directive on Deployment of Alternative Fuels Infrastructure**. Retrieved from: **12 2023 | A European Green Deal | Revision of the Directive on Deployment of Alternative Fuels Infrastructure (europa.eu)**

Evans, S. (2018). **Denmark to ban petrol and diesel cars by 2030**. Retrieved from: **Denmark to ban petrol and diesel cars by 2030 - Power Technology (power-technology.com)**

Federal Ministry of Finance. (n.d.). **Climate Action Programme 2030.** Retrieved from: **Browsertitel - Climate Action Programme 2030: frequently asked questions (bundesfinanzministerium.de)**

Greener Transport Solutions (2022), **Pathways to Net Zero**. Retrieved from: **PATHWAYS-TO-NET-ZERO-MARCH-2022-1.pdf (greener-vision.com)**

Gössling, S. (2013). **Urban transport transitions: Copenhagen, City of Cyclists.** Journal of Transport Geography, 33, 196-206.

Grey, J. (2023). **Nextbike Cardiff: Bike sharing scheme scrapped due to theft.** Retrieved from: **Nextbike Cardiff: Bike sharing scheme scrapped due to theft - BBC News**

Iceland Review (2024) **Reduced incentives for electric vehicle ownership.** Retrieved from: **Reduced Incentives for Electric Vehicle Ownership (icelandreview.com)**

International Chamber of Shipping. (2020). **The urgent need to accelerate R&D to deliver zero-carbon shipping by 2050.** Retrieved from: **Catalysing-the-fourth-propulsion-revolution.pdf (ics-shipping.org)**

International Transport Forum. (2018**). Decarbonising Maritime Transport: The Case of Sweden.** Retrieved from: **decarbonising-maritime-transport-sweden_0.pdf (itf-oecd.org)**

Ivanova, D., Barrett, j., Wiedenhofer, D., Macura, B., Callaghan, M., and Creutzig, F. (2020). **Quantifying the potential for climate change mitigation of consumption options**. Environmental Research Letters, 15(9), 093001.

KlimaTicket. (n.d). **Frequently asked questions**. Retrieved from: **https://www.klimaticket.at/en/**

Le Vine, S., and Polak, J. (2019). **The impact of free-floating carsharing on car ownership: Early-stage findings from London.** Transport Policy, 75, 119- 127.

Mayor of London. (2021). **New studies show School Streets improve air quality.** Retrieved from: **https://www.london.gov.uk/press-releases/mayoral/school-streets-improve-air-quality**

OCED. (2022). **Austrias 'KlimaTicket' to Promote Low Carbon Mobility**. Retrieved from: **Austria's "KlimaTicket" to promote low-carbon mobility (oecd.org)**

Office for National Statistics. (2019). **Exploring the UK's digital divide.** Retrieved from: **Exploring the UK's digital divide - Office for National Statistics (ons.gov.uk)**

Office for National Statistics. (2022). **Population and household estimates, Wales: Census 2021.** Retrieved from: **Population and household estimates, Wales - Office for National Statistics (ons.gov.uk)**

Office of Rail and Road. (2023). **Regional rail usage.** Retrieved from: **https://dataportal.orr.gov.uk/statistics/usage/regional-rail-usage/**

Place-Based Climate Action Network. (2020a). **A Net-Zero Carbon Roadmap for Belfast, Belfast Climate Commission**. Retrieved from: **A Net-Zero Carbon Roadmap For Belfast (pcancities.org.uk)**

Place-Based Climate Action Network. (2020b). **A Net-Zero Carbon Roadmap for Endinburgh, Edinburgh Climate Commission.** Retrieved from: **A Net-Zero Carbon Roadmap for Edinburgh (pcancities.org.uk)**

Place-Based Climate Action Network. (2020c). **A Net-Zero Carbon Roadmap for Leeds, Leeds Climate Commission**. Retrieved from: **A Net-Zero Carbon Roadmap for Leeds (pcancities.org.uk)**

Poltimäe, H., Rehman, M., Raun, J., and Poom, A. (2022). **In search of sustainable and inclusive mobility solutions for rural areas.** European Transport Research Review, 14(1), 13.

RSB. (2022). **Everything you always wanted to know about SAF (but were too afraid to ask).** Retrieved from: **Everything you always wanted to know about SAF (but were too afraid to ask) – RSB**

Scott, E. (2020). **Fact file: Rural economy.** Retrieved from: **Fact file: Rural economy - House of Lords Library (parliament.uk)**

Slocat. (2021). **Global Transport and Climate Change.** Retrieved from: **1.1-Global-Transport-and-Climate-Change.pdf (tcc-gsr.com)**

Solent Transport. (n.d**). Delivering MaaS with Trafi and their partners**. Retrieved from: **Delivering MaaS with Trafi and their partners – Solent Transport (solent-transport.com)**

StasWales. (2023) **Number of passenger journeys on local bus services by Great Britain country and year**. Retrieved from: **Number of passenger journeys on local bus services by Great Britain country and year (gov.wales)**

Sustainable Travel Alliance (2023) **Accelerating modal shift: evidence on carbon savings and co-benefits.** Retrieved from**: 6502bcd11c5f9f5a6a213bf9_STA Modal Shift Evidence compiled.pdf (website-files.com)**

Transport Focus. (2023). **Watchdog calls for action to improve Transport for Wales rail services.** Retrieved from: **https://www.transportfocus.org.uk/news/watchdog-calls-for-action-to-improve-transport-for-wales-rail-services/**

Transport for London. (n.d). **Car clubs**. Retrieved from: **https://tfl.gov.uk/modes/driving/car-clubs**

Transport Scotland. (2022). **A route map to achieve a 30 per cent reduction in car kilometres by 2030.** Retrieved from: **A route map to achieve a 20 per cent reduction in car kilometres by 2030 | Transport Scotland**

Transport for Wales. (2021). **A brief guide to fflecsi.** Retrieved from: **https://news.tfw.wales/blog/a-brief-guide-to-fflecsi**

Transport for Wales. (n.d). **fflecsi.** Retrieved from: **https://tfw.wales/ways-to-travel/bus/fflecsi**

UCL Energy Institute. (2022). **The shipping sector's costly affar with LNG as a marine fuel.** Retrieved from: **The shipping sector's costly affair with LNG as a marine fuel | UCL Energy Institute - UCL – University College London**

Velo-city. (2022). **Cycling the Change**. European Mobility Atlas. Retrieved from: **BICIKELJ: THE BIKE SHARING SYSTEM THAT IS CHANGING LJUBLJANA (velo-city2022.com)**

Wappelhorst, S., and Tietge, U. (2018). **Iceland is one of the world's most interesting electric vehicle markets.** Retrieved from: **Iceland is one of the world's most interesting electric vehicle markets - International Council on Clean Transportation (theicct.org)**

Weinreich, M. (2021). **Cycling Copenhagen: The Making of a Bike-Friendly City.** Retrieved from: **Cycling Copenhagen: The Making of a Bike-Friendly City | Heinrich Böll Stiftung | Brussels office - European Union (boell.org)**

Welsh Government. (2008**). Rural Wales – definitions and how to choose between them.** Retrieved from: **https://www.gov.wales/sites/default/files/statistics-and-research/2018-12/080313sb102008en.pdf**

Welsh Government. (2021a). **2021 Wales Greenhouse Gas Emissions**. Retrieved from: **https://www.gov.wales/sites/default/files/publications/2024-02/greenhouse-gas-emissions-infographic-2021.pdf**

Welsh Government. (2021b). **Electric Vehicle Charging Strategy for Wales**. Retrieved from: **Electric Vehicle Charging Strategy (gov.wales)**

Welsh Government. (2021c). **Net zero Wales carbon budget 2 (2021-25).** Retrieved from: **https://www.gov.wales/sites/default/files/publications/2021-10/net-zero-wales-carbon-budget-2-2021-25.pdf**

Welsh Government. (2022a). **Statistics Wales Demography newsletter: August 2022.** Retrieved from: **Statistics Wales Demography newsletter: August 2022 | GOV.WALES**

Welsh Government. (2022b). **Wales Roads Review: initial panel report**. Retrieved from: **Wales Roads Review: initial panel report | GOV.WALES**

Welsh Government. (2022c). **Air transport: 2021.** Retrieved from: **Air transport: 2021 | GOV.WALES**

Welsh Government. (2022d). **Remote working.** Retrieved from: **Remote working | GOV.WALES**

Welsh Government. (2023). **Welsh Government extends funding for successful e-cycle schemes.** Retrieved from: **Welsh Government extends funding for successful e-cycle schemes | GOV.WALES**

Welsh Government. (2024). **Network of car clubs will connect rural communities thanks to £1m Welsh Government boost.** Retrieved from: **Network of car clubs will connect rural communities thanks to £1m Welsh Government boost**

Zap Map. (2024) **EV market stats 2024.** Retrieved from: **https://www.zap-map.com/ev-stats/ev-market**

Annex: Overview of the 18 identified countries (and Wales)

Country	Land area (km^2)	Population density (people per km_2)	National, regional or local planned/implemented policies
Austria	83,871	108.6	National, regional and local
Canada	9.9 million	3.9	National
Costa Rica	51,100	102	National
Czech Republic	78,866	347	Local
Denmark	43,094	137.7	Local
England	130,279	434	National
France	248,427	123.3	National
Germany	357,021	237.9	National
Iceland	103,000	4	National
Ireland	84,421	70.4	National
Italy	301,340	197	Local
New Zealand	267,710	20	National
Norway	385,207	15	National
Poland	312,696	124	National
Scotland	77,900	70	National
Slovenia	20,271	105	Regional
Sweden	450,295	25.5	National
USA	9.8 million	34.6	Local
Wales	20,779	151.4	National and local

Author Details

Dr Amy Lloyd is a Research Associate at the Wales Centre for Public Policy

Rosalind Phillips is a Research Assistant at the Wales Centre for Public Policy

Dr Helen Tilley is a Senior Research Fellow at the Wales Centre for Public Policy

For further information please contact:
Dr. Amy Lloyd
Wales Centre for Public Policy
+44 (0) 29 2087 5345
info@wcpp.org.uk

Wales Centre
for Public Policy
Canolfan Polisi
Cyhoeddus Cymru