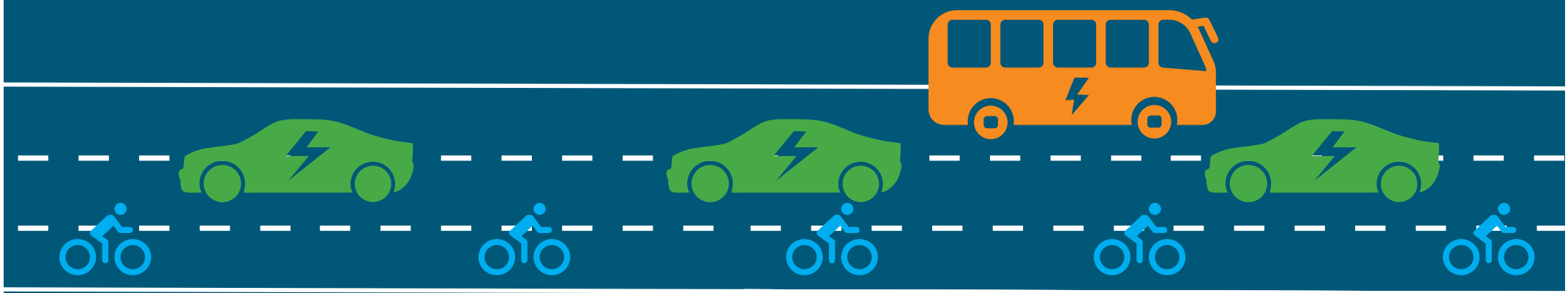
ALIGNING TRANSPORT DECARBONISATION ACROSS POLICY LEVELS

- a comparative review of countries



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DENMARK'S GREEN THINK TANK

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– a comparative review of countries

March 31, 2023

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Preface

This report is the result of the project *The roles and interplays of national, regional, and local authorities in transport decarbonisation.* The project is a collaboration between the Mobility Program at CONCITO, Denmark's green think tank, and Greg Marsden, Professor of Transport Governance at the University of Leeds.

The report undertakes a review of national frameworks to support transport decarbonisation at the regional and local level in three countries, Great Britain, Sweden, and Denmark. On this basis, the report provides as set of recommendations for better aligning efforts to decarbonise transport across policy levels in Denmark. Another aim is to inform the international debate on climate governance in transport.

The project has been enabled and funded via CONCITO's Pool for International Experts, during the period September 2022 to February 2023.

External actors from Denmark, United Kingdom, and Sweden have contributed valuable information to the drafting of the report, including contributions to seminars held in November 2022 and February 2023.

CONCITO and the authors are solely responsible for all content and recommendations.

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Table of contents

Summary

Around the world regional and local authorities have committed themselves to fulfil ambitious climate goals. One of the most challenging sectors is transport. It has become clear that delivering significant CO_2 mitigation in the area of transport is a new and unfamiliar task for many municipalities. At the same time national governments are also struggling to adopt coherent and achievable strategies.

Different levels of government have responsibilities for different parcels of the spatial domain, different sections of the transport system, and different levers in the policy toolbox. Aligning transport planning and policy measures across levels of government therefore has the potential to achieve more effective decarbonisation. Alignment across policy areas and levels has always been desirable but challenging to achieve. For decarbonisation, this requires central governments to provide adequate frameworks. Local and regional authorities are reaching out for leverage, support, and coordination.

This report is about national frameworks to support transport decarbonisation at the regional and local level. The report looks in detail at how the levels are being aligned in three countries, Great Britain, Sweden, and Denmark.

The following key questions are addressed,

- To what extent and how is local transport decarbonisation supported by centrally coordinated initiatives?
- What are strengths and weaknesses of different frameworks and measures applied in practice?
- With a view to Denmark, how could the alignment and coordination across levels be enhanced?

Based on the comparative study, the following recommendations for the Danish context are presented:

1) Develop a clear national strategy for transport decarbonisation pointing towards climate neutrality, to help reduce uncertainties experienced by citizens, business, and local authorities.
2) Explicitly recognize the potential and role of municipal and regional bodies in helping transport decarbonisation, including actions that underpin and implement national measures, as well as measures that employ the unique levers enabled by local conditions, resources, mandates, and democratic engagement.
3) Develop a national support program for Sustainable Urban Mobility Planning with elements like customized national guidance, platforms, and fora of exchange, connected to informal initiatives like European NetZeroCities and the national DK-2020 project.
4) Explore the prospects of consolidating national funding streams from separate short-term pots of money and individual transport infrastructure investments into longer-term unified support packages with a view to delivering low carbon sustainable urban mobility plans and practices.

1 Introduction and overview

1.1 The climate challenge to transport

The climate crisis represents unprecedented challenges for societies worldwide. According to the Intergovernmental Panel on Climate Change (IPCC), human-induced climate change is already affecting many weather and climate extremes in every region across the globe[1]. UN Secretary-General António Guterres has more recently warned that mankind is currently on the road to 'collective suicide'.[2]

Transport is a critical sector in this regard. The IPCC makes clear that meeting climate mitigation goals would require transformative changes also across the transport sector.[3] Yet, experience has shown that transport emissions are hard and slow to mitigate.[4] Transport represents a large and growing share of Greenhouse Gas emissions, now 17% of GHG's globally[5], and around 30% in affluent countries like Denmark, Sweden, and the United Kingdom. And at the local level, transport in some cases represents a far larger proportion, with 40, 50 or even 60 % in some Danish municipalities.

Attention to transport decarbonisation therefore not only engages international bodies and national governments, but *increasingly also regional and local authorities,* who have declared climate emergencies or committed themselves to fulfil ambitious climate goals. An example is again Denmark, where nearly all municipalities in the country have volunteered to deliver Paris Agreement compatible action plans in the so-called *DK2020 project*. In most of these plans, *transport/mobility is targeted as a key intervention area*.

1.2 The role of local action

In most of the local plans, *transport/ mobility is targeted as a key intervention area*. Municipalities have begun exploring options to incorporate carbon mitigation with their existing transport strategies and considering their dual roles to transform within their own organisation, and to act as a catalyst for transformation in the local society (Amundsen et al. 2018).[6] A broad range of potential leavers are available in this regard, from urban planning, to traffic regulation, to public procurement and ownership, to engaging with citizens and local businesses in exploring changes to urban design, travel behaviour, and mobility patterns. In short, climate committed local governments are emerging as dedicated change agents for transport decarbonisation.

The need for bottom-up action to decarbonise transport is also recognized by a range of international bodies. For example, according to the European Urban Mobility Framework launched in 2021, the deployment of zero-emission vehicles will only deliver a part of the solutions. [7] The European Commission as well as other international bodies promote the need for Sustainable Urban Mobility Plans with a combination of measures

1 IPCC (2021). Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.
2 UN Sec. Gen. Guterres, July 2022 https://www.theguardian.com/environment/2022/jul/18/humanity-faces-collective-suicide-over-climate-crisis-warns-un-chief.
3 Jaramillo, P. et al. (2022). Transport, In: Climate Change 2022. Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change
4 Brand, C (2021). 'Seven reasons why transport is so hard to decarbonise' https://theconversation.com/seven-reasons-global-transport-is-so-hard-to-decarbonise-170908
5 Estimate for 2022; www.Statista.com accessed, Jan. 29, 2023.
6 Amundsen, H. Hovelrud, GK; Aall, C; Karlsson, M; Westskog, H (2018). Local governments as drivers for societal transformation: towards the 1.5 C ambition. Current Opinion in Environmental Sustainability 2018, 31, pp. 23–29.
7 European Commission (2021). The New Urban Mobility Framework. COM(2021) 811 final, Brussels, 14.12.2021

AVOID	SHIFT	IMPROVE
Adopt integrated land-use planning to avoid transport need by prioritizing moving people and improving transport access over private cars.	Make investments in, establish pricing for and shift towards low-carbon modes of transport (trains, public transport, cycling).	Complete transformation to zero-emissions vehicle technologies for cars, vans, buses and trucks, and for ships and planes in combination with zero-emissions fuels.

Table 1. The Avoid-Shift-Improve framework for transport carbon mitigation (UNEP (2022). Emissions Gap Report 2022, Nairobi).

to avoid, shift, and improve transport, to deliver climate goals (EIB/JASPERs 2022; UNEP 2022).[8]Moreover, the International Transport Forum observes how differences in culture, local practices, infrastructure, incomes, housing situation and mobility needs create specific conditions that require corresponding approaches to encourage sustainable transport behaviour. Top-down measures may not always reflect such differences and may therefore lead to unintended results or opposition to climate action (ITF 2022).[9] In other words, locally grounded action by regional and local authorities may be more than just an appendix to uniform national interventions.

This enquiry generally starts from the propositions that *first*, effective actions to decarbonise transport are urgently needed, *second,* local climate commitments and plans with a view to transport are already rapidly emerging in Denmark and elsewhere, and *third,* the capacity and propensity of intervention by regional and local authorities *may* be important to help expedite the transition. We will unfold the latter point in Chapter 2.

1.3 Multi-level coordination

The assumption that several levels of authority have roles to play for transport decarbonisation and sustainable mobility has been phrased as the need for *a multi-level governance approach*.[10]

One rationale for this approach sees transport as a complex sector, embedded in different societal logics and geographies. Different levels of authority have responsibilities for different parcels of the spatial domain, different sections of the transport system, and different levers in the policy toolbox. Combining measures and pressures therefore has the potential to achieve more, faster. However, when different levels of authority intervene in the same complex field, coherence, and consistency become important.

A multi-level approach to transport decarbonisation also points to a need for *coordination and alignment* of efforts.

On the positive side it seems obvious that transport decarbonisation can be *facilitated and expedited* if transport strategies are aligned with climate policies, and frameworks, strategies, and actions are coordinated across agencies and levels of government. [11]

Conversely, if governments *do not* align efforts, several undesirable outcomes could be envisaged. One may risk for example, that effective but demanding actions are overlooked or shied away from; that ineffective or unnecessarily costly measures are adopted; that 'green' and 'black' transport projects based in different constituencies counteract each other; or that burdens of reduction is shifted across levels or sectors rather than relieved.

For this reason, observers of transport and climate policy highlight the need for coordinating frameworks and actions,[12] or as put by Tønnesen et al. (2022): "*Given the complexity of transport and the difficulty of reducing emissions, an integrative-governance*

8 EIB/JASPERS et al (2022). Topic Guide: Decarbonisation of urban mobility. Directorate-General for Mobility and Transport, Brussels, December 2022. https://www.eltis.org/sites/default/files/sump_topic_guide_decarbonisation.pdf

9 ITF (2022). Submission to the First Global Stocktake,. International Transport Forum, Paris, 28. February, 2022.

10 See for example Mladenovic, L; Plevnik, A; Rye, T (2022). Implementing national support programmes for sustainable urban mobility plans in a multilevel governance context. Case Studies on Transport Policy, Volume 10, Issue 3, September 2022, pp. 1686-1694

11 Marsden G & Anable J. (2021). Behind the Targets? The Case for Coherence in a Multi-Scalar Approach to Car-bon Action Plans in the Transport Sector. Sustainability. 13(13)

12 For example: SKR (2022). Samordnad-bebyggelse-och-transportplanering. Lärande eksempel. Sveriges Kommuner och Regioner.

approach is relevant."[13] This kind of approach can for example materialize as a National Urban Mobility Policy,[14] or a National Support Program. [15]

The enquiry of the report will therefore address local actions to decarbonise transport *in the context of multi-level governance*, with a view to supporting national frameworks and mechanisms to help align efforts across levels of government.1.4 The DK-2020 experience

The ***specific motivation driving the study*** stems from CONCITO's role as knowledge partner and secretariat for the DK-2020 project, where 95 of Denmark's 98 municipalities have committed to adopt Climate Actions Plans that deliver climate neutrality before 2050.

While transport as noted is a high priority area in most action plans, it has become increasingly clear that *delivering significant transport CO_2 mitigation is a new and unfamiliar task for most local municipalities*.

A recent study of the first 20 completed DK-2020 Climate Action Plans showed that while more than 30% of the actions in the plans are aimed at transport and mobility, each measure in the plan typically shows little mitigation effect (Ea Energianalyse 2022).[16]

Municipalities are generally not advancing comprehensive transformative mobility strategies, and few are emboldened to adopt powerful measures to 'avoid' transport or constrain car traffic. Thus, transport appears as the sector where the comprehensive Climate Action Plans will deliver *the lowest* CO_2 mitigation by 2030 (compared with a BAU projection), namely 23% in 2030 versus 50% reduction for all sectors combined (see Fig. 1).

Another recent survey of climate policies across all Danish municipalities confirms that 77% of responding authorities highlight transport as a sector that is 'very' or 'extremely' hard to decarbonise, while transport is emphasized as the sector where the need for cross- municipal collaboration is the greatest. [17]

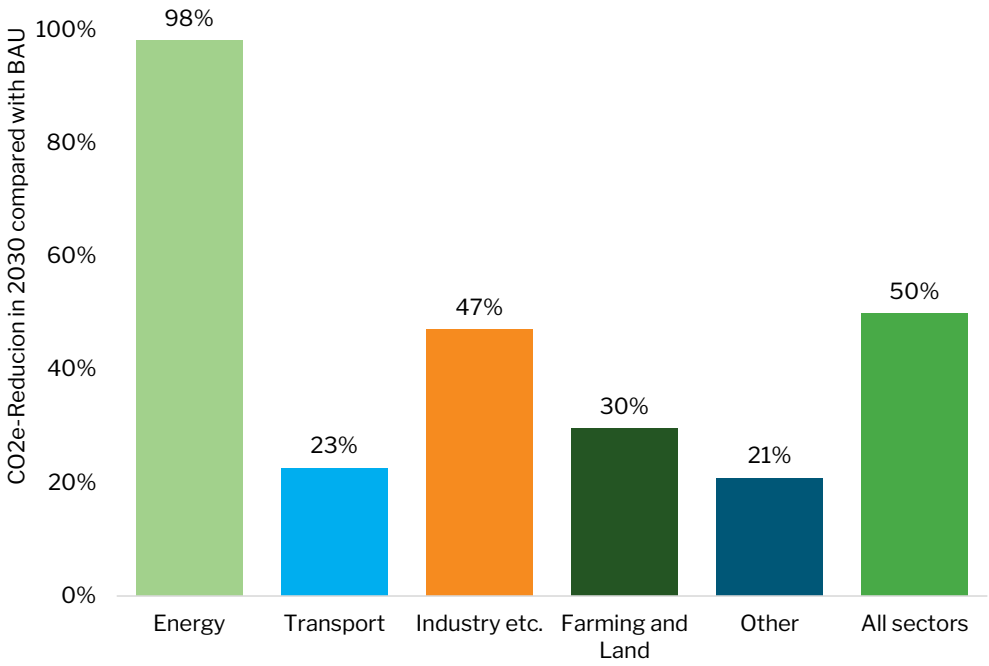


Fig. 1 Projected CO_2e emission reductions from transport in local Climate Action Plan scenarios of 20 DK2020 municipalities. Source: EA Energianalyse (2022)

All in all, while both the need and the desire to mitigate transport emissions are clearly present at the local level, the capacity and leverage to accomplish it is currently felt to be severely constrained.

What has emerged from CONCITO's ongoing scrutiny of Climate Action Plans, dialogue with local actors, and observations of the general discourse, is not one particular isolated obstacle for adequate intervention but rather *a general frustration with lack of government-mediated direction,*

13 Tønnesen, A; Sandkjær Hanssen, G; Bruun Hansen, K; Valencia, SC. (2022). Integrative climate leadership in multi-level policy packages for urban mobility - A study of governance systems in two Nordic urban regions. Transport Policy 128 (2022) 309–317

14 Lah, O et al. (2020). National Urban Mobility Policies & Investment Programmes – Guidelines. MobiliseYourCity Secretariat, Brussels, December 2020. www.mobiliseyourcity.net

15 European Commission (2021) The New Urban Mobility Framework. COM(2021) 811 final, Brussels, 14.12.2021

16 EA Energianalyse (2022). Analysis of the emission reduction contributions of Danish municipalities towards meeting the 70% target by 2030. DK2020, May 2022

17 KL (2022). Kommunernes Klimabarometer (in Danish)

support and resources for local action to decarbonise not least transport and mobility.[18] These observations have raised our attention to the context of national policy and governance in which local action is embedded.

A key aim of this report is thus to describe the existing governing arrangements for local climate action in the area of transport and mobility and look for possible ways to enhance them, or in other words how to empower DK-2020 municipalities and other local authorities to more effective action though design or adaptation of multi-level governance frameworks.

1.5 'Alignment' initiatives around the world

Denmark is obviously not alone in its struggles with transport decarbonisation, and nor are its local authorities. A quick scan of the regional and international scene reveals that similar concerns are widespread, while ways to deal with them differ.

In the following we highlight a few examples before zooming on the cases selected for our study.

Norway's 'Byvekstavtaler' (Urban Growth Agreements, UAG's) stands out as a particularly grand example of a program aligning national transport policy with local greening-of-transport action. An UAG is an incentive arrangement that involves significant state (and toll-road) funding coupled with network cooperation between national, county, and municipal authorities on transport and land-use policies for the larger urban regions.

The overall goal of each UAG is to obtain *zero growth in car traffic*, with the aim that all growth in passenger transport is to be absorbed by public transport, bicycling and walking, which again is intended to deliver reduced congestion noise, air pollution, and CO_2 emissions (Tønnesen et al. 2019).[19] Currently UAG's exist for the nine largest urban areas in Norway. The government allocates very significant funds for UAG's through the 12-year

18 Based on dialogues with municipal planners and stakeholders during DK2020 workshops, plan reviews and other interactions, as well as press announcements and submissions from KL (Local Government Denmark).

19Tønnesen, A; Krogstad, J.R; Christiansen, P; Isaksson, K. (2019). National Goals and Tools to Fulfil Them: A Study of Opportunities and Pitfalls in Norwegian Metagovernance of Urban Mobility. Transp. Policy 2019, 81, pp. 35–44

national transport plans (currently 80 billion NOK, or 7.4 billion € for the 2022-33 period).[20]

Finland has one of the worlds' toughest legally binding climate goals – climate neutrality by 2035. The Municipal Climate Change Solutions Programme of the Ministry of the Environment supports and co-funds local and regional climate action to reduce GHG emissions at least in line with the national target, in a way that is as cost-effective and as widely accepted as possible.[21]

Low-carbon transport actions are included in the program although they represent relatively few of the 134 actions supported so far. Through revisions to the Climate Act in 2022 Finnish municipalities have now become *obliged* to draw up climate plans going forward, either alone or together with other municipalities in their region. The government is currently preparing planning guidance for municipalities.[22] A pool to support the planning process (2.6 million € per year) has been provided.

In the ***Netherlands*** the National Climate Agreement (2019) has specified that 30-40 cities would implement a Zero-Emission Zone for Freight (ZEZ-F), starting from 2025. The government has adopted regulation to secure that new delivery vans and trucks bought after 2025 must be zero-emission if they are to enter cities with a ZEZ-F.

It has also introduced a phase-out program for existing fossil-fuel commercial vans and trucks and tax incentives for shifting to ZE vehicles. To directly support the process in each ZEZ-F city the government has established a so-called expert pool. The pool helps cities identify key challenges for their specific municipality, create implementation plans, share learnings on a national level, and provide tools for the local decision-making process (Holtslag et al. 2020)[23]. As of now, 28 municipalities have adopted Zero Emission Zones, in force from 2025, 2026 or 2027.[24]

As previously indicated, ***the European Union*** is moving towards strengthening the framework for sustainable urban mobility action, also to help deliver its Climate goal of 55% GHG reduction by 2030. The EU has constrained powers at the local planning level due to the principle of subsidiarity and has so far mostly followed a soft strategy focussed on research, knowledge exchange, and general guidance. An example is the recently published Topic Guide for Decarbonisation of Urban Mobility (EIB/JASPERS et al (2022).

The soft approach now is reinforced with a proposal to make a Sustainable Urban Mobility Plan (SUMP) mandatory for all so-called Urban Nodes in the European TEN-T transport network. This will involve some 424 cities above 100.000 inhabitants in Europe, including 4-6 in Denmark. Moreover, national governments are supposed to establish national SUMP support programs, including 'possibly' financial support.[25]

As of February 2023, the details of the proposal are still in negotiation between the European Commission and Member States.In a quite different context, the ***United States Government*** has just adopted their National Blueprint for Transportation Decarbonization. It a so-called 'whole-of government' approach, involving four key agencies, recognizing a need to combine multiple strategies and coordinate action to deliver 'clean, safe, secure, accessible, affordable, and equitable solutions' (DoE et al 2023).[26]

The blueprint combines strategies to *increase convenience* (= reduce avoidable transport through land-use planning, etc.), *improve efficiency* (=

20 https://www.vegvesen.no/fag/fokusomrader/nasjonal-transportplan/byvekstavtaler/
21 https://ym.fi/en/municipal-climate-change-solutions-programme-2018-2023
22 https://ym.fi/en/-/government-proposal-municipalities-obliged-to-draw-up-climate-plans-in-future
23 Holtslag et al. (2020). How-to Guide: Zero-Emission Zones. Don't Wait to Start with Freight! Transport Decarbonisation Alliance, C40 Cities and POLIS. December 2020
24 https://www.opwegnaarzes.nl/over-zes/interactieve-kaart
25 European Commission (2021). Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Union guidelines for the development of the trans-European transport network. COM(2021) 812 final, Strasbourg, 14.12.2021
26 Department of Energy et al (2023). THE U.S. NATIONAL BLUEPRINT FOR TRANSPORTATION DECARBONIZATION. A Joint Strategy to Transform Transportation. DOE/EE-2674, Washington DC, January 2023

shift transport to the most carbon efficient solutions), and *transitions to clean options* (= deployment of zero-emission vehicles and fuels). The Blueprint stands on top of extensive budget commitments in the recent Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA). The Blueprint stipulates significant roles for state, regional and local authorities in transport decarbonisation and invites multi-level collaboration in several areas although it does not detail the mechanisms for multi-level alignment.

These initiatives all represent recent examples of ways to promote transport decarbonisation in a multi-level governance context. While elements from the examples will be drawn on later in this report, we have chosen to review in depth two other international examples for comparability and potential inspiration for the situation in Denmark, namely Great Britain and Sweden.

Great Britain[27] is chosen because of the country's long tradition for national transport policies with Local Transport Plans in England as a key tenet. The devolution history of the United Kingdom and the country's close ties with other English-speaking nations represents experience in national-regional-local governance interaction and potential policy transfer.

The UK also has an advanced climate policy framework, which has served to inspire the Danish Climate Act of 2019, and more recently a specific national decarbonisation strategy has been adopted for each key sector, including transport. Finally, co-author Professor Greg Marsden has a long track record in researching multi-level governance for sustainable transport in the context of Great Britain.

Sweden is chosen because it is a neighbour country to Denmark with somewhat comparable features in terms of population size, income level, culture, politics, welfare system, and urbanization. In both countries the transport sector share of national CO_2 emissions is around 30%. Sweden's overall climate policy framework is also akin to the Danish one, both drawing on elements of the U K model. However, Sweden's system for transport policy and planning is more formalized than the Danish one and Sweden also has more extensive frameworks and measures to support transport decarbonisation actions at both national, regional, and local levels.

Notably, none of the three countries today have legally binding requirements to do Climate Action planning at a local scale. Whilst there is a formal obligation for Local Transport Plans to be prepared in England since 2000, this has been enforced less rigorously by central government in recent years. The similarity in institutional arrangements may enhance comparison and potential applicability across contexts, without necessarily assuming a need for comprehensive institutional or legal reforms.

The way the three examples are reviewed in the report is described in the overview of the report.

27 The United Kingdom comprises four countries (England, Scotland, Wales, and Northern Ireland). Great Britain refers to the first three. Whilst some competencies are held at a whole UK level (e.g., emissions standards) others are devolved to each of the national administrations. Northern Ireland is the smallest of the four countries and has very limited roles for local government in transport so is not included in the review work. There is no devolved administration for England and so Acts passed specifically for England are made in the UK Parliament.

1.6 Overiew of the report

The following key questions are addressed,

- To what extent and how is local transport decarbonisation supported by centrally coordinated initiatives?
- What are strengths and weaknesses of different frameworks and measures applied in practice?
- How could the alignment and coordination across levels be enhanced, with a view to Denmark?

Chapter 2 will provide conceptual framing and typology for the review of countries and coordinating frameworks based on relevant literature. Two items are covered.

First, we review the current discourse on the rationales for central versus local decarbonisation action in transport, consolidating the local level as a relevant focal point.

Second, we review different mechanisms for coordination across scales, from formal to informal and enabling frameworks. This forms a typology to be used in the cross -cutting discussion of the examples.

Chapters 3, 4, and 5 concern Great Britain, Sweden, and Denmark respectively.

For each country we start by briefly outlining the national climate policy framework and key aspects of transport decarbonisation strategies. Then the role of regional and local government in that context is discussed. Finally, mechanisms and frameworks to coordinate and align national and local/regional action are described and exemplified with cases, before each country's situation is summarized.

Chapter 6 offers a cross-cutting discussion of findings while chapter 7 is the conclusion.

The scope of the study is illustrated in figure 2.

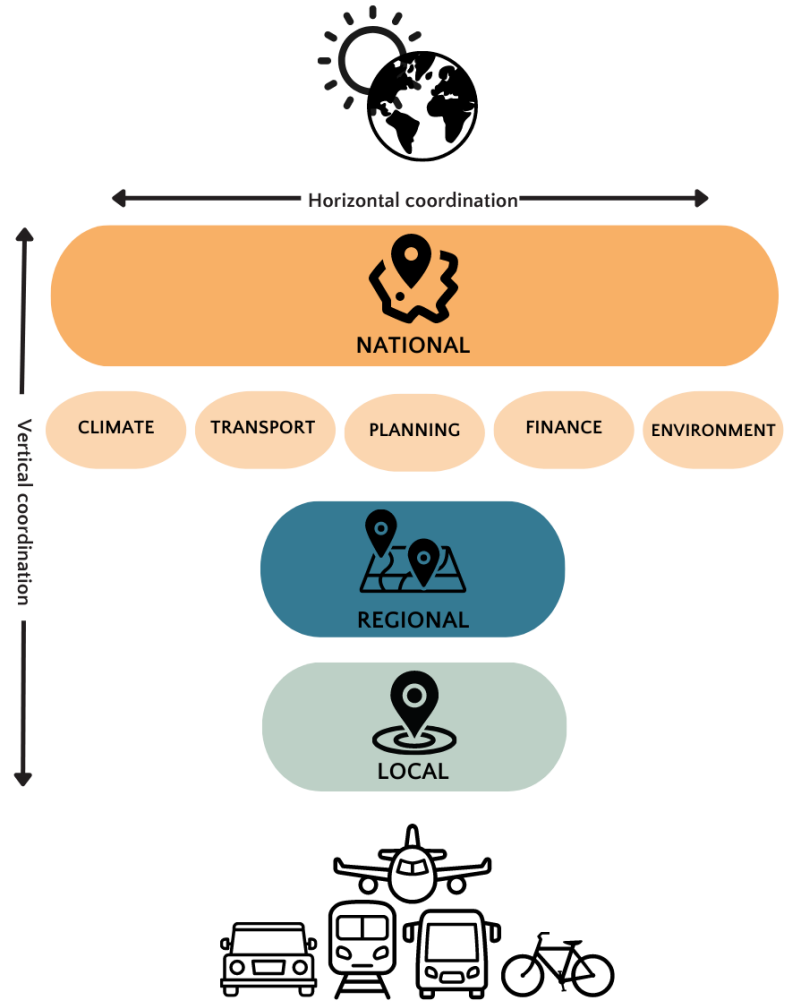


Fig. 2 The report will focus on the coordination of efforts to decarbonise transport across authorities with the main emphasis on vertical coordination.

2 National and Local Action – Key Issues

This Chapter reviews the strengths and weaknesses of arguments for nationally and locally-led approaches. It concludes that actions at both scales are important as is the interplay between them as actions can be mutually reinforcing or in conflict. If it is accepted that local action matters then the key question is how best to manage the interfaces between policy making across scales and this section concludes by reflecting on different approaches to steering this coordination.

2.1 Nationally-led approaches

There are strong arguments for nationally-led approaches to decarbonisation policy. These take various forms:

- First, the costs of mitigation in different sectors vary and, therefore, a whole of government approach can balance out where action should be taken earliest (Faehn et al. 2020);[1]
- Second, some of the instruments for change such as taxation and regulation are very often only available at a national scale or are dominated by national choices. Measures such as changing taxes to encourage better environmental outcomes impact on different aspects of welfare and may lead to perverse or unintended outcomes without wider compensatory policies (Fosgerau and Jensen, 2013).[2] The compensatory measures may best be considered from a whole economy scale and also applied through national tools;
- Third, it is not yet agreed how to fairly allocate responsibility for some matters to a local scale. The presence or absence of a port, airport, power plant or other industrial cluster in a local area could be hugely distortive to the carbon budgets for an area in sectors over which little or no local jurisdiction is held (Wood et al., 2010); [3] and
- Fourth, and with particular importance to transport, whilst the majority of trips are very short and local for travelers, long distance trips and those by freight vehicles which cross multiple local boundaries form a very significant contribution to carbon from the transport sector and, therefore, to the scale at which carbon management is most effective (Marsden and Anable, 2021).[4]

These arguments are all evidenced and have significant merit. However, it is also well understood that national policies do not fall evenly across the population or across places. This is because of the long histories of different areas with different levels of income, industrial make up, transport systems etc.

For example, uniform national policies that exempt over 65-year-olds from fares on public transport overwhelmingly benefit those who have good access to public transport, which is typically the core of larger urban areas.

Figure 3 shows the relative levels of use of public transport for accessing work in Norfolk in England which shows that only the urban core of the largest town (Norwich, population 213,000) has significant bus use for work. This is a wider proxy for the quality of bus access and so there are large areas with little or no viable service.

Typically, it is left to local government to decide how to provide socially necessary bus services to provide access for those without a commercial service. The national policy must have a complementary adjustment which is best provided at a local level where need is understood.National policy might also fall unevenly because of the actions (and inactions) of local areas.

1 Faehn, T.; Kaushal, K.R.; Storrøsten, H., Yonezawa, H. And Bye, B. (2020). Abating greenhouse gases in the Norweigian non-ETS sector by 50 per cent by 2030: A macroeconomic analysis of Climate Cure 2030, Statistics Norway

2 Fosgerau, M. & Jensen, T.C. (2013) A green reform is not always green, Transportation Research Part C: Emerging Technologies, 30, 210-220

3 Wood, F.R; Bows, A;. and Anderson, K. (2010). Apportioning aviation CO2 emissions to regional administrations for monitoring and target setting, Transport Policy, 17, pp. 206-215

4 Marsden, G. & Anable, J. (2021) Behind the Targets? The Case for Coherence in a Multi-Scalar Approach to Carbon Action Plans in the Transport Sector, Sustainability 13(13) 7122

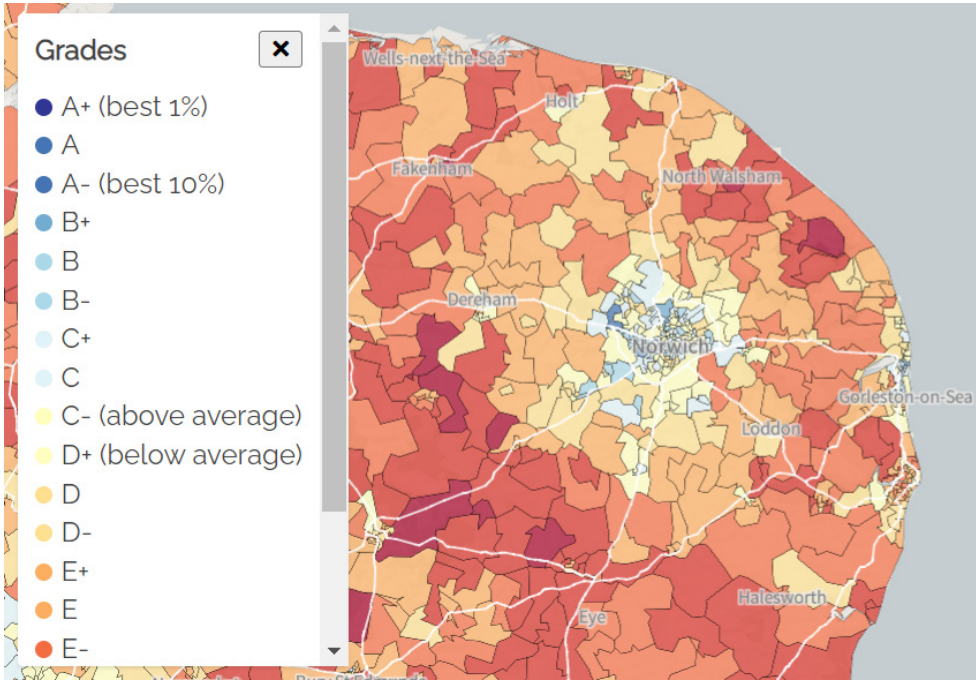


Fig. 3 Relative use of bus to access work in Norfolk (grading is best on comparison with national averages). Source: Morgan et al. (2021).[4]

In the UK, the national government has been subsidizing the provision of on-street charge points through competitive funds which councils can apply for. Whilst some charge points are provided on an entirely commercial basis, others require additional funding because they are either in areas of perceived low demand (and not of commercial interest) or there are significant electricity network upgrade costs to be paid.

Figure 4 show the total charge points per billion vehicle kilometers driven and those installed new in 2021. Three of the larger green areas correspond to London, Birmingham, and Glasgow. These are three cities that have low emission zones in place – so local enacting of powers permitted to the cities has driven uptake of EVs and the associated charge infrastructure. By contrast, there are large areas with relative weak infrastructure and little progress being made. These are particularly associated with more rural areas in England and Wales and outside of the larger cities where the local authority capacity to deliver change is also more limited (Fitzpatrick, 2021).[5]

What we see is that national policy is not being enacted in an even way. Sometimes local action is an accelerant of progress (e.g., through emission zones and parking charge regimes) and sometimes it is lagging. Working together across the national-local policy system will be necessary to understand who is best placed to effect change and what adaptations need to be made to enable it to happen at the required pace.

2.2 Locally-led Approaches

Not only Danish DK2020 municipalities have put climate on top of the agenda. It is estimated that over 2000 local governments across the globe have declared a climate emergency.[6] There is clearly a strong desire from local governments and their populations for action to be taken and for local areas to play their part. Some of the reasons advanced for this include:

- It has been estimated by the UK Climate Change Committee that local authorities have powers or influence over around a third of the CO_2 emissions in their area and, beyond this, reach to individuals and businesses such that they influence more than a half of all emissions (CCC, 2020).[7]
- Without levers applied locally then there will inevitably be gaps in the emissions reductions achieved and greater pressure for national levers to do more.
- Vagnoni and Moradi (2018) suggest that local government is an important level since it "… is the closest public organization to the citizens; local government is in a unique position to understand, inform, guide and lead local inhabitants,

5 Fitzpatrick, W. (2021) An assessment of the motivation and ability of local authorities in the North-West of England to meet the Paris Agreement in relation to terrestrial transport emissions, PhD thesis, University of Manchester

6 https://climateemergencydeclaration.org/climate-emergency-declarations-cover-15-million-citizens/

7 CCC (2020). Local Authorities and the Sixth Carbon Budget, Climate Change Committee, London.

4 Morgan, M; Anable, J; Lucas, K (2021). A place-based carbon calculator for England. Presented at the 29th Annual GIS Research UK Conference (GISRUK), Cardiff, Wales, UK. http://doi.org/10.5281/zenodo.4665852

businesses and industries". [8] This argues that local areas are better equipped to target local interventions and to form partnerships.

- The National Audit Office of the UK has observed that more integrated strategies with greater spending freedoms can deliver better value for money (NAO, 2021).[9] Where local authorities are reliant on national grant funding streams which are targeted at individual mitigation measures (e.g. housing insulation or charge point installation) then this does not build continuity within the organisations and becomes difficult to manage within the fixed timescales of the funding resulting in lower value for money.

The climate mitigation challenge is huge, and is the focus of the thinking in this report.

However, it is one of many challenges which local (and national) government is seeking to address. Research shows that local authorities are better placed to understand the potential for different interventions to meet wider local needs such as equity and economic development.

The locally targeted application of the right local policy mix has been estimated to require less than a third of the investment costs of uniform national policies and to save twice the amount of energy. More than this, the wider social benefits of a more localised approach could be almost double that of a national approach (InnovateUK et al., 2022).[10]

It is important, also, to recognise that local governments are quite diverse. In research in the UK, Marsden and Anable (2021) found three different approaches to setting carbon budgets at a sub-national level which could be found in one city. There were also widely divergent approaches to determining what was counted in carbon reduction commitments and what was excluded. For example, some authorities would consider only what happens inside their boundaries. Others would consider all emissions from their residents and others only look at the emissions from their own local government organization.

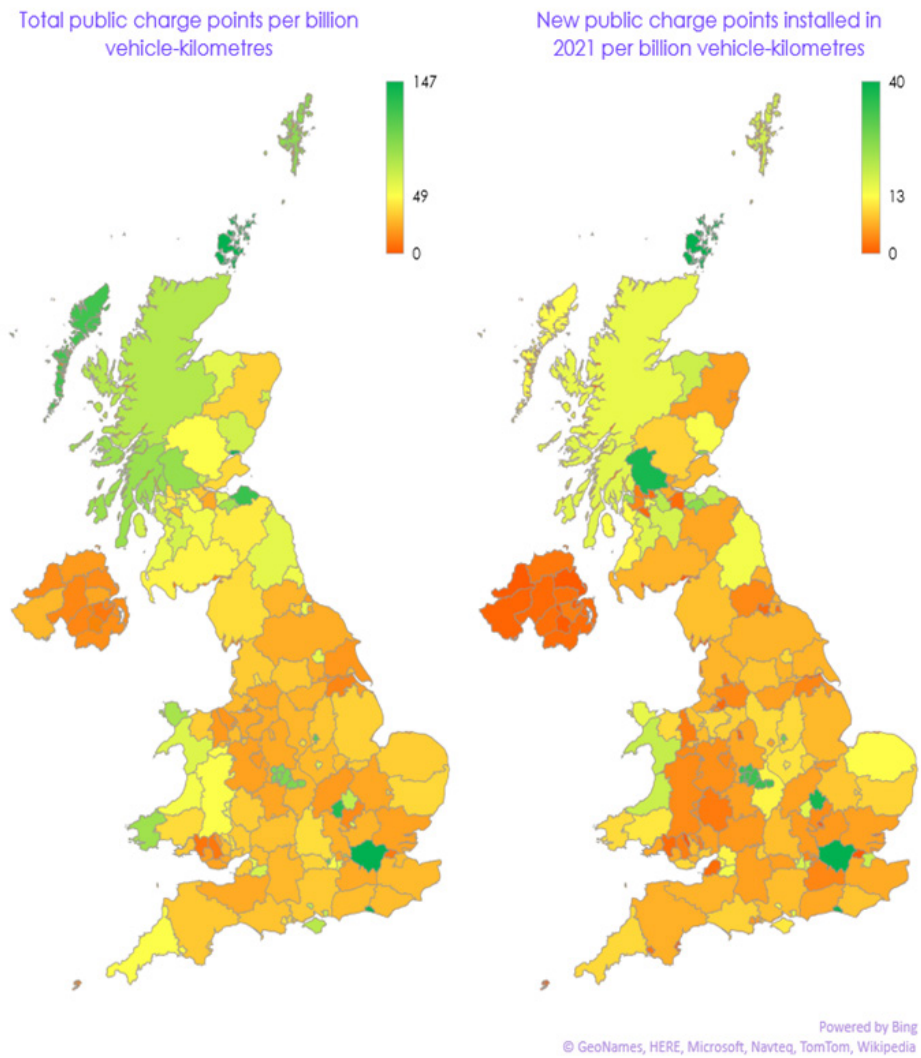


Fig. 4 Distribution of public charge points in the UK. Source: CCC (2022).[4]

8 Vagnoni, E. & Moradi, A. (2018). Local Government's contribution to low carbon mobility transitions, Journal of Cleaner Production, 176, 486-502 https://doi.org/10.1016/j.jclepro.2017.11.245, (p. 489)

9 NAO (2021). Local government and net zero in England, National Audit Office, Report HC 304, London.

10 Innovate UK, PWC, Otley Energy and University of Leeds (2022). Accelerating Net Zero Delivery: Unlocking the benefits of climate action in UK city-regions. https://www.ukri.org/wp-content/uploads/2022/03/IUK-090322-AcceleratingNetZeroDelivery-UnlockingBenefitsClimateActionUKCityRegions.pdf.

4 Climate Change Committee (2022) Progress in reducing emissions. 2022 Report to Parliament https://www.theccc.org.uk/wp-content/uploads/2022/06/Progress-in-reducing-emissions-2022-Report-to-Parliament.pdf.

The DK2020 initiative is providing a common framework for local authorities to develop their climate action plans (see chapter 5), so it is not always the case that coordination has to be enforced top-down. However, even well written local plans do not necessarily pay attention to pan-regional and national movements and priorities.

Coherence across local authorities as well as between local, regional, and national bodies is also important to achieving mutually reinforcing outcomes (see also NAO, 2021). The arguments for local action are as persuasive as those for national action. As noted above they already form a key part of some national government's strategic approach to delivering decarbonisation. However, this not a dichotomy between national and local with one being preferable to another.

This is particularly true of transport where some competencies are nationally held and others locally and where flows across boundaries matter. A key challenge is how to provide the right framework to enable clarity of responsibilities to be established and for funding and powers to follow accordingly where that is justified (CCC, 2020, previously cited).

2.3 Coordination across scales

Our review finds that coordination across scales is important. How best to organise that coordination remains to be determined. There are no universal answers to this question given the different institutional traditions and geographies which exist in different countries. Here, we nevertheless review the general options for coordinating mechanisms, sometimes referred to as modes of governance, before exploring how the issue of multi-scalar coordination is being managed in the UK, Sweden, and Denmark.

2.3.1 Informal Co-ordination

Informal co-ordination builds on the tradition of the soft infrastructures of planning, whereby problems are recognised to not be clearly understood and for the pathways for policy to remain contested (Healy, 1997;[11] Frederiksson, 2011[12]). Knowledge exchange forums, professional bodies, academics and the third sector come together to agree on areas for progress.

Informal co-ordination is a key part of knowledge transfer within professional networks and so informal co-ordination is a part of policy making. The DK2020 initiative is a good example of such coordination. However, informal co-ordination does not necessarily resolve key conflicts. If, for example, local authorities want new powers or require access to greater or different funding types then this all needs to happen outside of the informal mechanism.

There are risks of well-intentioned strategies being developed which are divorced from the process for delivering change. Informal coordination often works on consensus too and this can permit difficult decisions to be avoided and may result in inconsistencies of approach if progress is only around the areas which people can agree on. Just leaving coordination to informal mechanisms is a risk. However, it is important to recognize that such coordination is a part of every-day policy making and so can be an asset in sharing knowledge and practice.

2.3.2 Formal Co-ordination

Formal co-ordination involves addressing the nature of the roles and responsibilities which different actors in the system have and providing a clear structure for how this coordination works. This ties up the development of strategy with the means for delivering strategy. Wallsten et al. (2022) describe a key attribute of formal co-ordination as leadership, with the setting of objectives, monitoring mode share changes, and the understanding of social, distributional and environmental impacts as key (drawing on Pangbourne et al. 2020[13]).

For climate policy, formal co-ordination means the clear establishment of the responsibilities of different tiers of government and organisations and an elaboration of the data and accounting arrangements (see Marsden and Anable, 2021, previously cited).

11 Healey, P (2007). Urban complexity and spatial strategies: Towards a relational planning for our times. Routledge, London

12 Fredriksson, C (2011). Planning in the 'New Reality' – Strategic Elements and Approaches in Swedish Municipalities. DOCTORAL DISSERTATION, Royal Institute of Technology, Stockholm

13 Pangbourne, K; Mladenovic, M; Stead, D; Milakis, D. (2020). Questionning Mobility as a Service: Unanticipated implications for society and government, Transportation Research Part A: Policy and Practice, 131, pp.35-49

2.3.3 Obligation

Obligation is a special case of formal co-ordination. Obligation is where there is some formalised mechanism which details the conditions which need to be met by lower tiers of government (or the private sector) to access funding or powers on offer from higher tiers of government. An example in the local transport climate domain is the Zero Growth Goals which have been established in Norway with the major cities and their surrounding local authorities. In order to access the grant funding from the national government, each area has to commit to a plan which allows their areas to develop with no net increase in vehicular traffic (Tønnesen et al., 2019).[14]

In the UK, local authorities were previously required to set targets for their local transport plans for eight national indicators. The funding available to the authorities to deliver the plan was linked to the ambition of the targets and, over time, the delivery against plan (Marsden et al., 2009).[15] Such arrangements are difficult to establish because it is often not clear exactly what kinds of outcomes could be achieved for what level of funding. It is also possible that the fixing of funding to a small sub-set of outcomes leads to the ignoring of other considerations which might otherwise have been seen to be important (e.g. improving health outcomes).

2.3.4 Tools of Coordination

Wallsten et al. (2022)[16] describe different governance tools which can be deployed to shape the relationship between national and local levels to facilitate the transition to a lower carbon future. These tools can all be applied, to a greater or lesser degree, across whatever type of coordinating mechanism is in place.

Howlett (2009)[17] breaks the tools into three broad categories: of information (e.g. knowledge sharing partnerships), authority (powers) and treasure (funds). Whilst it is often considered purely in the context of government-government relations it is possible to enable market actors through removing regulation or changing subsidy and taxes. The tools of coordination therefore, cover quite a broad range of different actions and these can take different formats.

Funding can be provided, for example, through grants which are attached to specific initiatives (e.g., public charge point provision) or grant funding allocated without conditions (as part of a formal coordination agreement). It could be permission to borrow rather than direct grants, which provides a greater level of flexibility and also responsibility than direct grant provision.

Similarly, legal instruments can provide the option for local authorities to adopt or they can require all local authorities to adopt. Many tools of coordination are already in place, which is a recognition of the relationship between responsibilities, resources and capacity to act across scales of government and between the public and private sector.

It is important to consider what the best balance of coordination and deployment of tools of coordination is for any given setting. For example, in Norway, much is agreed up front about the levels of ambition and the requirements for funding and freedoms that might be necessary to deliver on the goals. One would then expect far more limited intervention with specific initiatives and grant funding from the national level beyond that already agreed. We explore these trade-offs further in the case studies in Sections 3 to 5.

14 Tønnesen, A., Krogstad, J.R., Christiansen, P; And Isaksson, K. (2019). National goals and tools to fulfil them: A study of opportunities and pitfalls in Norweigian metagovernance of urban mobility, Transport Policy, 81, 35-44

15 Marsden, G; Nellthorp, J; Kelly, C. (2009). The likely impacts of target setting and performance rewards in local transport, Transport Policy, 16, (2), pp. 59-67

16 Wallsten, A; Henriksson, M; Isaksson, K (2022). The Role of Local Public Authorities in Steering toward Smart and Sustainable Mobility: Findings from the Stockholm Metropolitan Area, Planning Practice & Research, 37:5, pp. 532-546

17 Howlett, M. (2009) Governance modes, policy regimes, and operational plans: A multi-level nested model of policy instrument choice an policy design, Policy Sciences, 42(1):pp.73-89

3 Great Britain

3.1 National Climate Policy

The UK Government established a Climate Change Act which now commits the UK to achieving net zero emissions by 2050. As well as an end date, the Act provides an obligation to meet a series of five year budgets set along the route. Advice on the budgets is provided by the Climate Change Committee, an independent advisory body established through the legislation. The Government is not obliged to accept the advice of the Committee but has done so on every occasion. The latest budget agreed is the 6th Carbon Budget, which commits the UK to achieving a 78% reduction in UK territorial emissions between 1990 and 2035 (equivalent to a 63% reduction from 2019 levels).

The Climate Change Act was initially established in 2008 with an 80% reduction goal by 2050 and the budgetary pathway was not specified to the same extent it now is. Whilst this stimulated action across sectors, there was still space for different sectors to argue that they were difficult to decarbonise and therefore formed part of the 20% of residual emissions. Arguments were made that setting goals for individual sectors would be economically distorting. However, 2050 is now less than three decades away and all sectors of the economy need to act under the new net zero commitment.

Negative emission technologies and natural offsets are almost entirely focused on covering aspects of farming and aviation. Surface transport, for example, has an absolute zero emissions allocation. Each sector of Government in England now has a decarbonisation strategy which is brought together in a whole of government Net Zero Strategy.[1] Although each Department has its own strategy, responsibility for carbon targets is held across government through the Department for Business, Energy and Industrial Strategy[2] and there are no formal consequences for any individual Department falling short provided the overarching commitments are met.

Scotland and Wales have their own climate change legislation and goals, consistent with the UK Climate Change Act. Scotland has a more ambitious date of 2045 for reaching net zero.

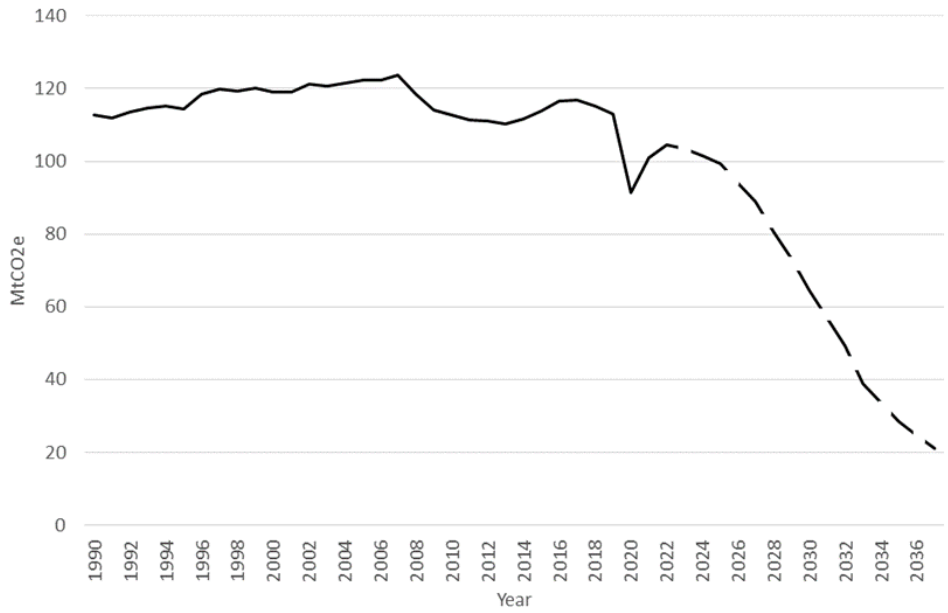


Fig. 5 Progress and Projections for CO_2 emissions from Surface Transport from the 6th Carbon Budget (dashed line reflects future anticipated pathway)

3.2 Transport Decarbonisation Strategy

In July 2021, the Department for Transport published its strategy for decarbonising transport. Transport is now the largest sector for emissions in the UK economy, accounting for 27% of emissions in 2019. It is the sector that had made least progress, almost static from 1990 levels before the pandemic (where reductions in travel demand make the current 'baseline' difficult to assess). For those action which are coordinated at a whole UK scale (e.g. aviation policy, vehicle emission standards), the document covers all of the devolved administrations.

1 The Net Zero Strategy was challenged in the UK High Court and found to not yet meet the requirements of the legislation for ambition or transparency
2 During the writing of this report, the Department has been split so there is now a Department of Energy Security and Net Zero which takes this responsibility

However, the provisions on local transport only apply to England.

The Transport Decarbonisation Plan is organised around six key themes:

- Accelerating modal shift to public and active transport
- Decarbonising road transport
- Decarbonising how we get our goods
- UK as a hub for green transport technology and innovation
- Place-based solutions to emissions reduction
- Reducing carbon in a global economy

Broadly, the themes describe a transition in vehicle technologies through electrification, the use of hydrogen, ammonia (in shipping) and increasingly sustainable drop in fuels.

The approach has resulted in phase out dates for the sale of fossil fuel vehicles in various categories from cars to light heavy goods vehicles. In parallel, there is an emphasis on improving alternatives to the car through national programmes on bus service improvements, zero emission buses and walking and cycling.

There are areas where there are clear innovation needs (such as addressing aviation emissions) or improving battery technology which form part of the connection to the technology, innovation and 'green growth' strategy. The global economy theme reflects the UK's role in international bodies on maritime and aviation where the strategy is one of influencing rather than being able to set policies independently.

Of particular importance to this note however is the theme on 'Place-based solutions'. The document states that "there is no uniform approach to decarbonisation and each place in the UK has its own unique role to play in ensuring that the UK meets its target of net zero by 2050. For transport, local and regional level organisations are often best placed to make the decisions that will deliver the practical changes required, as well as ensuring local communities and businesses are engaged." (p147).

3.3 Working Across Ministries

The Department for Transport is the main Ministry with responsibilities for the enactment of policies to tackle climate change emissions from the use of transport. However, as with all Governments, there are a range of interactions with other Ministries which are necessary to effect change. First amongst these interactions is with the Ministry of Communities, Housing and Local Government which has responsibility for the planning process. This involves setting housing targets for different parts of the country, agreeing the National Planning Policy statements which govern how the planning system should be enacted and setting out requirements for all new homes to have electric vehicle charge point provision.

It is well understood that integrated land-use and transport planning can reduce the need for travel and increase the proportion of journeys which are made by active travel and public transport. In the early 2000s, the Transport and Planning departments were merged in central government, although this did not last long, nor did it fully resolve the challenges of integrated transport and land-use policy (Marsden & Beecroft 2002)[3].

The national guidance identifies the opportunities for integration and encourages the siting of new developments in places which encourage this, through an agreed 'Local Plan'. However, despite the encouragement of sustainable development principles it continues to be the case that car dependent developments are being built in areas which are poorly accessible by public transport (Transport for New Homes, 2022[4]).

Whilst the management of the transport system sits with the Department for Transport, the responsibility for industrial strategy around the future technologies used to power transport sits within the Department of Business, Energy, and Industrial Strategy (although it is worth noting that in February 2023 this Department has been further divided). Decisions on vehicle standards are led from BEIS, but in conjunction with DfT. There is an interesting and long-standing cross-departmental body between BEIS and DfT called the Office for Zero Emission Vehicles which develops strategy and discharges funds related to stimulating the transition away from fossil fuels

3 Marsden, G & Beecroft M (2002). Crisis of darma? A summary of the response to the fuel crisis in the UK- pp. 259-298 In: G. Lyons, K. Chatterjee (Eds.), Transport Lessons from the Fuel Tax Protests of 2000, Ashgate, Aldershot

4 Transport for New Homes (2022). Building Car Dependency: The Tarmac Suburbs of the Future.

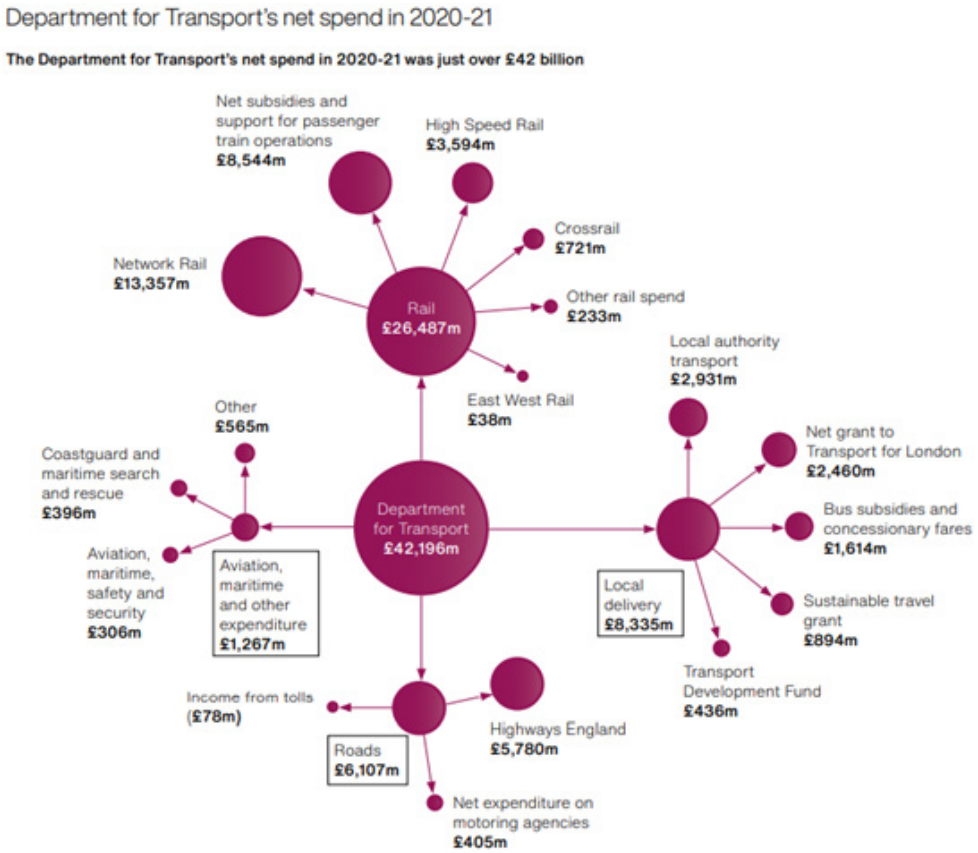


Fig. 6 Department for Transport Spending in 2020-21. Source: National Audit Office based on Department for Transport Accounts – NAO, 2021

such as zero emission bus grants, consumer purchase incentives and public charge point subsidy.

The divide between transport and energy also means that the transport system only counts the emissions of fossil fuel driven miles in its carbon accounting. The emissions associated with the electricity used to power EVs (the UK 2022 average carbon intensity was 182 g CO_{2e} per kWh) is counted in the BEIS energy accounts. Emissions associated with industry for the building of vehicles, steel and concrete production for infrastructure are also accounted for as industry emissions rather than 'transport'. This can be problematic as the claims being made about the benefits of new infrastructure on smoothing traffic flow and therefore reducing emissions can be more than offset by the emissions in constructing new assets, all of which also occur early in the carbon budget period (Marsden et al., 2022).[5] This is recognized in the Transport Decarbonisation Plan but how to deal with this in infrastructure decisions remains highly contested (with several court cases). The Welsh Government has reviewed its entire roads programme in the light of the climate imperative, establishing a series of principles for future decision-making (RRP, 2023)[6]. Only 17 of the 58 schemes which were in the initial roads programme have been found to be consistent with these new principles.

It is also important to recognize the role of HM Treasury, the UK's finance ministry. The Treasury publishes a National Infrastructure Plan and sets out the rules for assessing spending on government projects and programmes (The Green Book) which are then implemented within each Ministry. The allocation of Capital funding for projects and Revenue funding for on-going expenditure is a key tool in shaping what programmes and policies can be delivered. Every three years there is a Spending Review where Departments make a bid for their forward plan, although recently this has been an annual process because of Covid-19 and the war in Ukraine creating a less stable fiscal position. HM Treasury is also responsible for any tax changes at a national level and for deciding what freedoms it will allow for local authorities.

3.4 From National to Local Policy

The UK is formed of four countries. Overall governance is conducted by the UK Parliament which also sets policies for England. The devolved administrations of Scotland, Wales and Northern Ireland have varying degrees of responsibility for transport.[7] In this section the main examples draw on

5 Marsden, G., Lokesh, K. And Densley-Tingley (2022) Policy Briefing: Everything Counts: Why transport infrastructure emissions matter for decision makers, DecarboN8 report.
6 Roads Review Panel (2023) The Future of Road Investment in Wales: Advice from the Independent Panel Appointed by the Welsh Government,
7 A full description is available here.

experiences in England. Contrasts are also made with arrangements in Scotland where these are deemed relevant to Denmark.

3.4.1 National

Across the UK, local authorities have limited local tax raising powers and are therefore highly depending on national government for **funding** to deliver new transport initiatives. Figure 6 shows the spending split across different areas in the DfT for 2020-21. Spending on funding for decarbonisation often fulfils multiple purposes. For example, in expanding walking and cycling there is an expectation of lowering congestion and getting better health outcomes. Even in spending money on electric buses there are co-benefits to local air quality.

So, whilst some funds might be very specifically about decarbonisation (e.g., charge point provision), most are not and so decarbonisation is treated as part of wider transport strategies. The annual formula funding (£2,931m in Figure 6 or 7%) has been linked to the development of local transport plans. These are supposed to be produced every five years with a 15-year strategic vision. Whilst the role of these plans diminished in the previous decade, the Department for Transport will require authorities to develop a new round of strategic plans which set out their carbon budget for the area and what the quantifiable carbon reductions that can be achieved through the strategy will be (these are referred to as Local Transport Plans which are broadly equivalent to the EU Sustainable Urban Mobility Plans).

Whilst the guidance is subject to a consultation, there are indications that more of the decarbonisation funding will come through the allocations attached to each plan and less through competition funding. Every transport authority in England will have a decarbonisation strategy with some form of quantitative carbon reduction goal against which funding and the need for other regulatory changes will be assessed. This is an example of formal co-ordination. There are tensions still to be resolved.

The Transport Decarbonisation Plan identified up to 15 different competition based or ring-fenced funding schemes which are currently in operation. Part of the consultation is to agree how many of these should be consolidated into the annual block grant allocation. Competition based funding is a 'treasure' form of coordination, but to what extent does it need to exist alongside well formulated plans?

Finally, national government recognises that, particularly outside of the largest cities, the knowledgebase for transport decarbonisation amongst local authorities is quite weak. A new national toolkit has been developed to promote knowledge sharing and will be regularly updated which describes various options and cases studies, joining up other sources of guidance.

3.4.2 Regional

Regional government has a mixed history in the UK. In England, it is easier to talk in terms of 'sub-national' government as regional planning was disbanded between 2008 and 2010. There is one statutory sub-national body (Transport for the North) which exists to bring together decision-makers across the North of England and advise on infrastructure needs for the region.

It has developed a Decarbonisation Strategy which adopts a regional carbon budget and makes direct reference to the different pace at which more urban and more rural authorities will be able to decarbonise due to the different mode shift potential available to them. Other sub-national transport bodies exist but are not statutory.

There are no formal responsibilities for carbon reduction at a regional scale. The sub-national transport bodies each act as a major knowledge sharing hub as well as having convening power to discuss shared issues. Transport for the North has developed a strategic model for the whole of the North of England and has used this to develop a pan-northern charge point installation strategy for supporting longer-distance trips and freight transport.

In Scotland there are seven regional transport partnerships who have responsibility for developing an overall integrated transport strategy for their regions. This pre-dates the carbon targets and there is no formal requirement for regional target setting. Whilst the partnerships are responsible for running a limited number of transport services (e.g. Glasgow Metro), they have generally been found to be underpowered. They perform an important leadership and convening role with, for

example, the Highlands and Islands partnership successfully coordinating a bid for a rural Mobility as a Service app programme from national government.

3.4.3 Local

Until the publication of the Transport Decarbonisation Plan in England there was a resistance to considering formal national requirements for local authorities to set carbon targets and, within that to set sectoral targets. However, most local authorities within England had declared a climate emergency which generally involves a local commitment to reduce emissions in line with the goals of the Paris Agreement (although the interpretation and implementation of this was hugely varied)[8]. Many local authorities set formalized goals, although far fewer did so for transport.

The net outcome of the laissez-faire bottom up approach is a messy picture where most authorities do not yet have a transport target. Of those that do, some only look at emissions from their own activities and some look across their whole area. The national framework will move from informal coordination to formal coordination and should reduce these inconsistencies.

However, the informal approach has resulted in some innovations which reflect the perspective and opportunities at a local scale. Several authorities have identified the importance of rethinking their strategy in the light of the climate emergency to bring together transport and land-use (see Greater Manchester case study).

Bottom up strategies also enable a more joined up approach to integrating carbon reduction with other local agendas such as social inclusion, housing and economic growth (see Leeds Case Study). So, whilst the national framework will ensure a more consistent overall approach to setting carbon targets, there remains a strong local imperative to tailor this to best meet wider local goals.

Local authorities have formal responsibility for the delivery of large parts of the 'avoid' and 'shift' agenda which they have been exercising for air quality, congestion and safety management for decades. These powers are now also put to use for transport decarbonisation. In addition, greater emphasis is being given to local authority roles in supporting the transition to zero emission vehicles ('improve').

Their direct actions include allocation of roadspace for active travel, the provision of space for on-street charging infrastructure, traffic signal control, infrastructure construction and subsidising public transport services. Their principal pricing tool is parking charges but there are now five cities with low emission zones and Nottingham has a Workplace Parking Levy. They are also the land-use planning bodies responsible for strategic site allocation and specific planning site decisions. Most public transport services are determined by private sector operators and it is only evening, weekend and other non-commercial services which local authorities directly influence.

Local authorities are now required by the Department for Transport to work in partnership with bus companies in bidding for funds for electric buses and bus service improvements reflecting the need for interventions from both parties to achieve the desired outcomes. The partnership arrangements are set out in Bus Service Improvement Plans which are a condition of receiving funding.

> *Bottom-up strategies also enable a more joined up approach to integrating carbon reduction with other local agendas.*

The Climate Change Committee estimates that almost one quarter of the emissions reductions required between now and 2035 will come from mode-shift and demand reduction policies, most of which will be led locally. In addition, local authorities will stimulate EV uptake through low emission zones and electric vehicle charge infrastructure provision. Overall, the Climate Change Committee estimates that more than 50% of the climate mitigation effort will come from decisions made at a local and individual level.

Local authorities also play an important role as conveners of action amongst other organisations. This can be the wider public sector where, taken

8 Marsden, G; Anable, J; Lokesh, K; Walker, R; McCulloch, S; Jenkinson, K. (2020). 'Decarbonising Transport: Getting Carbon Ambition Right', Local Government Association: London

together, health services and local government can sometimes provide a large proportion of total employment.

They work with bigger businesses to coordinate corporate travel planning commitments which form part of planning consents for new buildings and changes in use of building stock. Even within the formal Local Transport Plan system there remains a mix of formal and informal coordination in play.

3.5 Cases

3.5.1 Integrating Spatial Planning

Fig 7. Themes in Greater Manchester Transport Strategy 2040

Greater Manchester Combined Authority is a grouping of 10 local authorities centred on the conurbation of Manchester. It has a directly elected Mayor. Transport for Greater Manchester is the executive body responsible for strategic transport planning and coordinating public transport investments and the management of a major highway network within the area.

It works with the 10 districts to deliver changes to infrastructure and traffic management under one unified strategy. The strategy has won professional body awards because of its treatment of integration across modes but also across the whole conurbation. It addresses different types of places and journeys and targets interventions accordingly.

So, in the connected neighbourhoods section there is an emphasis on local walking and cycling trips and 15 minute neighbourhood style accessibility changes. For trips into the regional centre of Manchester there is a more aggressive approach to mode shift and demand management. However, it is recognised that such an approach will be more difficult for movements across the city. Nine of the ten local authorities are also developing a joint spatial plan so that new development sites join up with the transport investments.

The strategy was part of a five-year funding settlement agreed between the Mayoral Combined Authority and the National Government. This also devolved some powers which Greater Manchester has used, bringing the public transport network back into a public sector managed process with route-based tendering to be used across the city. However, the decision to integrate spatial and transport planning was advanced without any requirement to do so and is seen to be important locally to joining up the goals for economic growth, decarbonisation and transport investment. This, it is hoped, will make Greater Manchester more competitive in seeking future investment from national government competitions.

3.5.2 Integrating Social and Economic Planning

Leeds City Council published its transport strategy in 2022. There was no national requirement at the time for Leeds to publish its strategy and, in the Local Transport Plan process, Leeds will submit jointly with four other adjacent areas as part of a West Yorkshire wide submission.

Leeds is the largest of the five districts in the West Yorkshire area and set a whole local area goal of zero carbon emissions by 2030. The Plan was a response to this imperative covering the transport sector and would be used as input to the wider area Local Transport Plan strategy.

The vision in the strategy is for Leeds to be “a city where you don’t need a car. Where everyone has an affordable, accessible and zero carbon choice in how they travel...”. It sets out three broad objectives which it seeks to achieve through the plan which, in addition to zero carbon (with a 2030 aspiration) includes inclusive economic growth and improved health and well-being.

The strategy recognises that 30% of households in Leeds do not have a car and that addressing decarbonisation only through an electrification switch would be too slow and also fail to address the structural inequalities in the city. There is an emphasis on creating a more integrated system

with more people choosing to access mobility on demand rather than being reliant on individualised car ownership.

This enables the Council to draw in resources from other national funding competitions beyond the Department for Transport to help deliver on its wider vision. The wider framing on health is being used to enable transport to support accessing funds for public health improvements for its cycling and walking ambitions which will also contribute to the decarbonisation goals.

3.5.3 Accelerating Zero Emission Bus Deployment

The Department for Transport has made funding available to assist with the transition to zero emission buses (which in the UK is almost exclusively electric). This covers some of the additional costs to operators over Euro VI diesel bus equivalent buses and costs to upgrading depots for smart charging. The City of York is a historic town in the North of England with a network of Park and Ride sites around its outer ring road.

As the owner of the Park and Ride sites, the City of York can specify in its tender documents the level of emissions of the bus fleet which bidders can put forward to compete. It has used this lever since 2014 when it adopted its first electric buses. It has subsequently secured funding from the national government Zero Emission Bus competition to transition the entire Park and Ride fleet and, more recently most of the local services by 2024. It has supported this through investment in the Park and Ride sites including the addition of hyper charging hubs supported with solar energy capture.

York has been particularly pro-active in pushing for adoption because there is a good fit of electric buses to the duty cycle of the services and because there are significant air quality benefits to be achieved in the narrow streets of the city centre. York is current refreshing its transport strategy in line with the national guidance but has continued to progress key investments in the interim, reflecting the need to make tactical progress as well as improving the overall joined up strategy.

The differential progress with the adoption of electric buses across local authorities shows the importance of local leadership and action. Here, York had a clear policy commitment, multiple policy drivers and, through the procurement process, a formal lever which could be applied to encourage the operator transition.

Park and Ride bus in York. Credit: First Bus, UK

However, this has also only been possible with national competition funding given the limited annual block grant allocations and the additional costs of shifting to electric buses in the early part of the transition from diesel.

3.6 Summary

In England, the carbon management system is aligning through a formal coordination process based on a requirement for every local authority to have a Local Transport Plan (SUMP). This is a pre-existing tool of formal coordination which the DfT had previously used quite intensively but, in the past decade, had somewhat let lapse. This approach is going to help harmonise what local authorities are doing in terms of how they approach accounting for carbon but provides freedom for locally relevant strategy choices.

A key question is how these will be resourced and whether the DfT will

pool funding and provide greater local freedom or continue to allocate funds through a series of more ad-hoc challenge funds. It is currently steering through the use of these funds (treasure), partly because of an absence of knowledge about what local authorities would do if given a large annual block of funds.

Again, the Local Transport Plans should help overcome this knowledge gap but, in a world where public finances are tight, it remains tempting for governments to allocate funds through competitions rather than spreading resources more thinly. UK local authorities have a relatively weak tax base and so the DfT has significant influence on the approach of local authorities through how they distribute resources.

National and regional bodies are also playing a role in stimulating innovation and sharing knowledge about existing innovations as many smaller local authorities lack the staff capacity to cover the wider range of demands which decarbonisation is placing on them.

The Committee on Climate Change (2020, previously cited) in the UK concluded, as part of establishing its carbon budget for the period to 2037, that for local authorities to effectively play their role there was a need for:

- "Framework: An agreed framework for delivery for Net Zero incorporating local and national climate action;
- Financing: Appropriate long-term financing to support local authorities in delivering Net Zero;
- Flexibility: Local operational flexibility about how local areas address climate change; and
- Facilitation: coherent policy and powers for the facilitation of delivery."

Comparing the bullets with the different modes of governing, the Committee is advocating a blend of formal co-ordination and enabling tools of coordination, particularly around funding and powers. There is a general acceptance that better value for money will be achieved through longer-term programmes with greater funding certainty rather than managing lots of initiatives through competition funds (NAO, 2021).

4 Sweden

4.1 Sweden's Climate Policy

In 2017 Sweden adopted a so-called National Climate Policy Framework. The main element of the framework is the Climate Act of 2018. The Act instructs Parliament to define overall Climate goals and prescribes various duties for the Government. The Act also instigates a Climate Policy Council to provide independent advice to Government. The climate goals are not spelled out in in the Act itself, but it has the clear role to safeguard the delivery of Sweden's climate commitments and goals.

The current long-term goal defined by Parliament is *net zero by 2045* including a minimum 85% reduction of emissions compared to 1990. There are interim indicative goals for the non-ETS-sectors of 63% reduction by 2030 and 75% by 2040. In addition, the framework includes a separate and remarkably steep goal to reduce emissions from *domestic transport* (except domestic aviation) *by 70% from 2010 to 2030.*

According to the Climate Act, the Government must deliver a comprehensive Climate Action Plan every four years, demonstrating how goals defined by Parliament will be fulfilled.

The first Plan was adopted in 2019, and the second one is currently in preparation for 2023. The government must also each year submit a status and outlook report on climate policy in connection with the budget process.

The Climate Policy Council delivers an annual review plus a four-year report corresponding to the Government submissions. Interestingly, the task of the Climate Council is not limited to review climate policy proper but includes how the full ensemble of government policies corresponds to the adopted climate goals. The Council (and others)[1] has for example found the Climate Policy Framework to be insufficiently embedded in the general government machinery and the Council has also regularly commented on and critiqued national transport policy (Klimatpolitiska Rådet 2019; 2022).

The Climate Policy Framework and the associated goals are still in force after the shift to a new right-wing Government in October 2022.

4.2 Transport Decarbonisation policy

Despite the separate 70% climate goal for domestic transport Sweden does not have a separate *climate strategy* document for the transport sector. The closest to a national decarbonisation strategy today is the 50-page+ chapter on transport (plus sections in other chapters) in the Government's first Climate Action Plan from 2019. [2] The transport chapter includes an extensive mix of discussions and actual policy actions in fields such as fuels standards, taxes and subsidies, vehicle regulations, infrastructure investment, and regional and urban transport planning. Background analysis to the Action Plan demonstrated that significant additional policies to deliver a drastic 8% annual reduction from 2019 onwards would be needed, but the plan itself did not include a full trajectory or timetable for how the government would deliver 70% reduction by 2030 or contribute to net zero in 2045.

The Action Plan (along with several other government policies) outlines a three-pronged strategy for transport:

- more energy-efficient vehicles,
- clean fuels/electrification, and
- 'a transport-efficient society'.

The latter is generally understood as reductions in traffic volumes and shifts away from cars to other modes, without reducing overall accessibility.

1 For example: Berndt, K (2018) Mycket prat men lite verkstad: Att förstå det klimatpolitiska ramverket med hjälp av idéer om metagovernance och särkoppling. Stockholms universitet Statsvetenskapliga institutionen http://www.diva-portal.se/smash/get/diva2:1268925/FULLTEXT01.pdf

2 Regeringens proposition 2019/20:65: En samlad politik för klimatet – klimatpolitisk handlingsplan [in Swedish]

While a new Action Plan is in preparation, the most recent forecast from the Swedish Environmental Protection Agency, Naturvårdsverket, has suggested that the 70% target is now within reach, as shown in the graph below. This optimistic outlook is mainly due to Sweden's extreme biofuel blending escalator (by far the steepest in Europe), adopted after the Climate Action Plan in 2019.

However, various policy documents have recognized major uncertainties about costs and effects of Sweden's strong dependency on biofuel in this strategy. Moreover, the 2045 neutrality goal would still not be met, even with aggressive biofuel policy in place. The targets are further exposed by a complete turnaround by the new Government, now aiming to limit blending mandates to the *lowest* level accepted by the EU. How this may impact the balance of strategies towards the transport goal is yet unclear.[1]

4.3 Horizontal coordination of transport decarbonisation

Since 2008 Transport policy in Sweden has been guided by the overall Transport Policy Objective "to ensure the economically efficient and sustainable provision of transport services for people and business throughout the country". The objective has two subgoals with several interim goals;[2]

1) the *functional* subgoal for accessibility which points to the importance of providing everyone with basic, good-quality accessibility

2) the *impact* subgoal which points to concerns for safety, the environment, and health

Following the 2019 Climate Action Plan the 70% climate goal for domestic transport has been incorporated in this framework as an interim target under the impact subgoal. [3]

This means that all national transport institutions and plans have become formally required to pursue and respond to the climate goal for transport. This explicitly also includes the statutory National Infrastructure Plans and accompanying Regional Infrastructure Plans with a 12-year horizon that Government formally renews every four years.

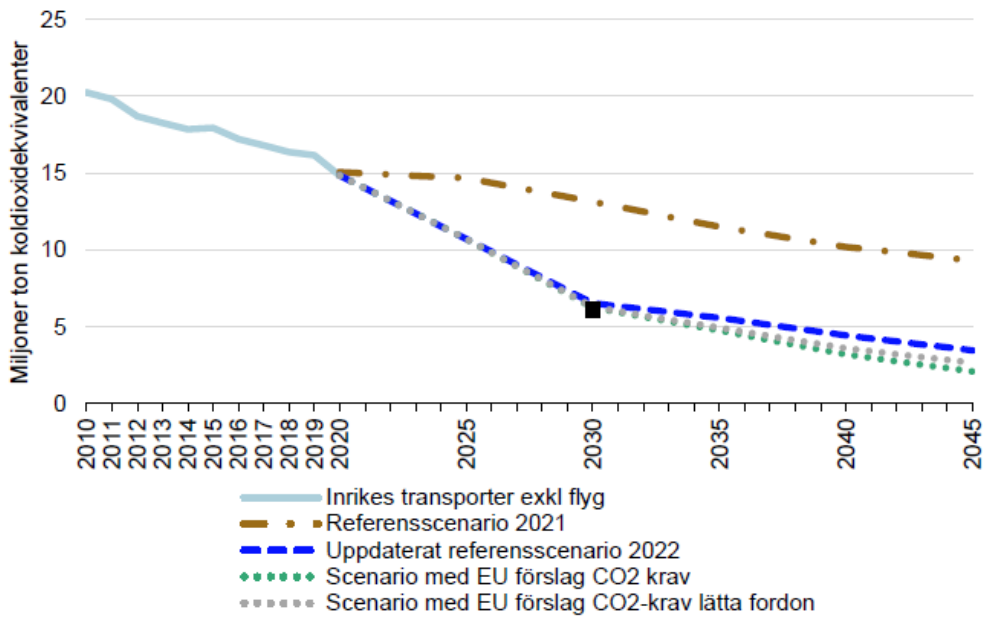


Fig. 8 GHG projections for Sweden. Blue is the recent forecast. Dotted brown before new biofuel escalator . Source: Naturvårdsverket (2022)

1 Naturvårdverket (2023) "När Sverige de nationella klimatmålen?" [in Swedish]
2 Government bill 2008/09:93 [in Swedish] Regeringens proposition. Mål för framtidens resor och transporter. p. 14
3 Transport Analysis (2022). Follow-up of transport policy objectives. Summary Report 2022:11

Another component of Swedish transport and Infrastructure policy that has been linked into the decarbonisation agenda is the so-called '4-step principle'. The principle installs a hierarchy of decisions on transport.

The first step should be to 'rethink' transport problems and possibly avoid them, while building new infrastructure is only the fourth and last resort (see Box 1). Following the Climate Action Plan, Government instructed the Transport Agency to apply the principle in preparing the National Infrastructure Plan, as a means to pursue the 'transport-efficient society', the third leg' of transport decarbonisation policy (see previous section). There is much controversy over this, however. [1]

To enhance inter-agency coordination for transport decarbonisation, Government has also incorporated a responsibility for climate in the formal operating instructions for all six key government agencies involved in transport policy and has further instructed them to collaborate. As part of this procedure the six agencies were requested to deliver a joint fossil-free transport strategy. [2] The completed strategy proposed around 90 actions, with a follow-up program. Some of the actions were implemented but the government as such never adopted the strategy. Inter-agency coordination continues on an ad hoc basis. In view of these actions several independent bodies have nevertheless critiqued what they see as limited horizontal coordination. The 'Climate Law Inquiry' of 2022 found it 'unclear' "*…how the national plan for transport infrastructure, the county plans for regional transport infrastructure and the Swedish Transport Administration are to address the need for a transport-efficient society*". [3]

The Climate Policy Council in its 2022 report also found that Swedish Infrastructure policy is not sufficiently adapted to the Climate Policy Framework. Among the recommendations from the Council include are that key agencies like the Transport Agency be instructed to prepare actual decarbonisation plans.[4]

Box 1 The 4- step principle[1]

1. Rethink
Here, it is investigated whether different types of interventions can be used to solve a certain identified shortage through reduced transport demand or by transferring trips and transport to more efficient modes.

2. Optimize
This step includes efforts in the form of planning and influencing to use existing infrastructure in a more efficient way. Bus lanes on busy streets are an example of one action within this step.

3. Rebuild
This step involves considering, if the need exists, limited remodeling. Example can be traffic safety measures such as center rails or load-bearing measures.

4. Build new
This step means that, if the need cannot be met in the previous three steps, consider new investments. Expansion of a road to motorway standard and expansion to double tracks on railways are examples of such investments.

1 Based on Trafikverket (2022)

1 It may be noted that the principle has so far not been widely applied (see for example Trivector 2021, in Swedish) while the Transport Agency itself has deemed steps 1 or 2 (= applying measures like spatial planning, modal shift, road user charging, etc.) mostly out of their scope (Trafikverket (2022) Proposal national plan for transport infrastructure 2022–2033 – Summary in English)

2 SOFT (2020). Samordningsuppdrag för omställning av transportsektorn till fossilfrihet – slutrapport. [in Swedish]

3 Slutbetänkande av Klimaträttsutredningen, SOU 2022:21, Stockholm 2022 (English Summary, p. 55)

4 Klimatpolitiska rådet (2022). Årsrapport, p 32. and p 88. [in Swedish]

4.4 Role of regional and local planning authorities

4.4.1 Regions

Sweden has 20 regions, which play significant roles in planning for spatial development, transport, and climate. The regions, also known as 'Län' were before fully controlled by central government agents, 'Länsstyrelser', but recent reforms have established politically elected regional bodies that have taken over many functions from the nationally appointed bodies, which remain.

The regions are directly involved in both climate and transport planning. In 2008 the government instructed all its 'Länsstyrelser' to adopt *Regional Energy and Climate strategies*, jointly with regions and municipalities. These strategies typically include targets and scenarios also for transport energy and GHG emissions. The strategies must be aligned with infrastructure and other plans, and they must be regularly reviewed. They are however non-legally binding and hence more informal coordination mechanisms.

4.4.2 Case: Regional Transport Infrastructure plan

Each region is legally required to prepare a regional Transport Infrastructure Plan serving as parallel complement to the National Infrastructure Plan. The Regional plan must also pursue the Transport Policy objectives and follow the 4-step principle. Most of the funding for regional plans comes from the state, and the Swedish Transport Agency is the key implementing body of the plan. Regions also typically serve as the Public Transport Authority for the respective area and its municipalities. The regions adopt a *Transport Supply Plan ('Trafikförsörjningsprogram*) and provide nearly all public subsidy for (non-national) PT.

An example of a regional plan is the 2022-33 Infrastructure Plan for *Gävleborg Län*[1] to the north of Stockholm. Sustainability, traffic safety, accessibility and green transition are overarching priorities. Among the goals in the plan are to have a fossil free vehicle fleet by 2030 and zero

Fig. 9 Gävleborg Infrastructure Plan

1 Regional infrastrukturplan 2022 – 2033 för Gävleborgs län [in Swedish]

emission 'in the long term'. The plan includes specified funded measures for roads, public transport terminals, bike routes and lanes, traffic safety measures, and unspecified pools for cycling and public transport initiatives etc. The budget is 1,06 Billion SEK (= 100 M €) of which roughly half goes to road projects. There are no measures for step1 and 2 of the 4-step principle ('rethink', and 'optimize') as these steps allegedly 'do not fall within what can be funded within the existing framework'. Also notably, the infrastructure plan makes no explicit reference to the regional Energy and Climate strategy adopted only two years earlier.[2]

Hence, the coordination of green transport actions is in principle possible through both convening powers and treasure at the regional level in Sweden. Yet, the case does not demonstrate that this option is necessarily always exploited to the fullest for moving transport decarbonisation forward.

4.4.3 Municipalities

Sweden's 290 Municipalities have the dominant role in spatial planning. Planning is regulated by the Planning and Building Act of 2010 (with subsequent revisions) providing the legal basis for regional and municipal spatial plans[3], together with other provisions. Municipalities adopt two levels of plans, 'Översiktsplaner' (Comprehensive Plans), that are overarching and non-binding, and 'Detaljplaner' (Detailed Development Plans) with binding regulation of land use and buildings. The municipalities are sovereign planning authorities. Yet, Comprehensive Plans must formally respect and reflect national and regional goals and policies, including sustainability, climate, and environment goals.

There are no formal requirements to set local climate goals or do climate action planning. Since the 1970'es there have been a requirement to adopt *municipal energy plans*, but according to the National Energy Authority the rules are considered outdated and not enforced.[4] However, recent changes to the Planning and Building Act in 2022 has introduced a more a strategic approach for the Comprehensive Planning, which is expected to also help underpin municipal climate planning.[5] Voluntary programs (similar to the Danish DK2020) organize municipalities in joint climate action planning initiatives, like 'Klimatkommunerna' with 50 members and 'Viable cities' with 23 municipalities and five government agencies.

There are also no formal requirements to do *a local transport plan*. Only 30% of the Swedish road network is municipal. Major new infrastructure will often be included in the regional (or the national) infrastructure plan, while the regional Trafikförsörjningsprogram take care of public transport (some of both may have municipal co-funding). Municipalities have nevertheless been widely encouraged to adopt voluntary 'traffic strategies'. Already in 2012, 30-40 municipalities had adopted such

2 Energi- och klimatstrategi för Gävleborgs län 2020–2030 [in Swedish]
3 Municipal spatial plans are mandatory; Regional spatial plans are voluntary, except in three regions
4 Energimyndigheden [Swedish Energy Authority] (2011). Aktualisering av lagen om kommunal energiplanering. Energimyndighetens ståndpunkt i regeringsuppdrag [in Swedish]
5 Energimyndigheten [Swedish Energy Authority] (2021) Energi- och klimatomställning i kommun och region. [in Swedish]

strategies, following a general concept of the so-called TRAST handbook.[6] The city of Lund will be referred to as a case in a following section.

4.5 National frameworks for local transport decarbonisation

In its Climate Action Plan and other policy documents Swedish Government has stated that *cities and municipalities will need to be empowered and supported*, since they are the key arenas for creating a more 'transport effective society', though measures such as spatial planning, parking regulations, provision for carpools, infrastructure for active and public transport, etc. [7] Various government bodies have repeatedly acknowledged that without stronger local level planning it will be difficult to curb car transport growth and reach the climate targets in an effective way.

There are several mechanisms in place to support local planning for transport decarbonisation, although hardly in the form of one integrated framework. Formal foundations include laws like the Planning and Building Act, Government policies like the 4-year Climate Action Plans, as well as prescriptions and budget commitments for the National and Regional Infrastructure Plans.[8] On top of this there is a multitude of strategic and practical guidance documents and support initiatives as well as dedicated funding for local 'green' transport, mobility, or climate actions, anchored in different government agencies and bodies. [9] Several previously existing programs and documents have in recent years been reviewed to further promote climate concerns, the 70% reduction goal, and the aim for a 'a transport-efficient society'.[10]

The national 'Council for Sustainable Cities' maintains the website 'Hallbara Stad' with a series of initiatives to support municipalities' sustainability efforts including transport, while the Swedish transport agency Trafikverket operates the knowledge-sharing 'Arena for a transport-efficient urban environment', and hosts an annual 'green Lights 2030' Conference reporting nationwide local actions and progress towards the 70% reduction target for transport.[11] On the financial side there are major subsidy programs like '*Klimatklivet*' offering government co-funding for to a wide range of climate investments for private public actors, including regions and municipalities[12], as well as the '*Stadsmiljöavtal*'-program targeting municipal transport action in particular (described in the following section).

It is noteworthy how much various government and non-government policies and guidance documents cross-reference each other instigating some degree of at least conceptual

> *"In its Climate Action Plan Swedish Government has stated that cities and municipalities will need to be empowered and supported.*

6 Wendle, Björn; Dahlen Eric & Söderström, Liselott (2012). Effekter av trafikstrategier. Trafikverket, Energimyndigheten och Sveriges Kommuner och Landsting, Stockholm

7 Regeringens Proposition 2019/20:65, from p. 121 ff. [in Swedish]

8 Also, In 2018 the government adopted an indicative goals for urban transport that the share of public transport, cycling and walking should increase to 25 % by 2025 (from 20 % in 2010)

9 For example Boverket [Swedish Housing Agency] 'Översiktsplanering för minskad klimatpåverkan' [in Swedish]

10 For example the widely uses 'TRAST' planning handbook has recently been replaced by: Sandberg, L & Wärnhjelm, M (2022) Handbok för trafikstrategiskt arbete. Tillgänglighet i ett hållbart samhälle.

11 https://bransch.trafikverket.se/om-oss/var-verksamhet/regeringsuppdrag-remisser-och-remissvar/Regeringsuppdrag/fossilfri-transportsektor--information-och-kunskap/arena-transporteffektiv-stadsmiljo/

12 Riksrevisionen(2019) Klimatklivet – stöd till lokala klimatinvesteringar, RIR 2019:1

and rhetoric framing across national, regional, and local planning efforts in the area of transport planning for climate mitigation in Sweden. For example, few policy documents in the area fail to refer to concepts like the 70% reduction target, the 'transport effective society' or the '4-step principle', and associated guidance.

This does not necessarily mean that planning and implementation is fully aligned to deliver transport and climate goals in practice, however. The Gävleborg example above indicated limited correspondence between for example the 4-step principle, the recent regional infrastructure plan, and the regional climate strategy.

A study by Lund et al (2020)[13] reveals that national goals are not necessarily always penetrating the local traffic strategies, and even when ambitious local climate goals and strategies exist, they are not necessarily delivered in practice, often due to a lack of political will. Goal conflicts are not always addressed, making the contribution of local plans to overall goal fulfillment sometimes unclear.

4.6 Stadsmiljöavtal

The 'Stadsmiljöavtal' (Urban Environment Agreements) is a large subsidy program designed to support local transport actions for a more sustainable urban environment. The program was initiated as a pilot in 2015 with inspiration from the related Norwegian model, and from 2018 onwards it has been incorporated as an element in the National Infrastructure Plans. The program now distributes around 1 billion SEK (100 M €) pr year for municipalities and regions and with the 2022-2033 plan it has been extended to 2027. It is administered by Trafikverket, the Swedish Transport Agency.

Through program calls municipalities and regions can apply for funding for investments that support public transport, cycling and urban freight, including for example BRT projects, cycle routes etc. Cycling was added from 2017 and freight from 2019. The measures should lead to energy-efficient solutions with low emissions of greenhouse gases and contribute to achieving urban environmental quality goals. The grants should also particularly support innovative, high-capacity and resource-efficient solutions. The program does not cover investments for car usage or parking, nor operational costs, and cost for planning efforts are also not eligible. Up to 50% of investment costs can be subsidized.

To obtain funding municipalities/ regions must also commit to 'Services-in-return'[14], that is, additional measures to be delivered by the municipality and region over the following several years. These measures can cover a much wider range of actions than the subsidized investments, including for example transit-oriented urban development or housing plans, speed limiting, car parking measures, cycling and PT initiatives, mobility management, broad traffic strategies, etc., if the measures can be argued to support the same goals of urban environment and transport effectiveness as the subsidized measures.

Applications for support must describe costs and expected impacts in regard to program objectives, including changes in modal split in the affected urban areas. There is no requirement to asses GHG- emission impacts. The application must include plans for monitoring and evaluation of results.

As the program works through applications and grants (and not negotiated agreements as in the Norwegian model) the government cannot control the specific outcomes in advance. However, through the requirement for a comprehensive approach and 'Services-in-return' the government has a significant lever to influence municipal planning and promote its objectives for a 'transport effective' urban society. [15]

4.6.1 Results and impacts

Since 2015 132 grants have been given, involving 390 measures and nearly 900 services-in-return. 80 municipalities and regions have been involved and around 8 billion SEK (ca 800 m €) have been granted[16].

According to an evaluation of the program's first four application rounds (the pilot period 2015-18) there is great variation in the context, size, and type of projects with the level of

13 Lund, E; Fredricsson, C; Hult, Å; Levin, K; Sanne, JM; Wennberg H (2020). Hur överförs nationella miljömål till lokala beslut i transport- och samhällsplaneringen? Forskningsprojektet Stafetten. Trivector Rapport 2020:40 [in Swedish]

14 Johansson. H (2018). URBAN ENVIRONMENT AGREEMENTS IN SWEDEN. CIVITAS Conference, October 2018

15 Isaksson Elias & Knaggård Åsa (2019). Kunskapsöversikt: Stadsmiljöavtalets politiska process. K2 WORKING PAPER 2019:10; and Lidström, Anders & Hertting, Nils (2021). Limited, fragmented and powerless: national urban policies in Sweden. In: A Modern Guide to National Urban Policies in Europe, Elgar Online 2021

16 Trafikverket webinar, Nov. 27, 2022

subsidy ranging from 380,000 SEK (35 K €) to 280 M SEK (26 M €) - a factor of nearly 800. Both large and small municipalities have applied (although by far the most has gone to larger ones). Construction of cycle paths was the most frequent investment followed by various measures to enhance public transport accessibility and service.

By far the most frequent return service was 'Detailed Development Plans' for new housing areas, nearly 150 of those were submitted, covering 50.000 new dwellings, indicating that the program supports the integration of urban and transport planning. Comprehensive urban traffic strategies were also frequently submitted and the same goes for walking and cycling projects.

Reported results indicate an overall increase in passenger km with public transport by 8.8%; with cycling by 6% and a decrease in car traffic km by 5.5%. A total reduction in CO_2-emissions around 12,000 tons/year is estimated. In the survey part of the evaluation municipalities report that the Stadsmiljöavtal grants have enabled some new measures that would otherwise not have occurred or (more typically) only occurred later, or in a smaller scale. Return services would mostly have been adopted anyway but sometimes much later or downscaled. Respondents report that working with the program has increased political awareness on transport and environment and enhanced collaboration within and across municipalities and regions.

However, according to the evaluators it is uncertain to what extent reported results can be relied upon due to multiple data collection and verification issues, and to other potentially intervening factors. In 2021 The Swedish Transport Agency declined to provide expected outcome figures for the extended program due to these uncertainties.[17] Nevertheless, the program is widely considered useful and fit-for-purpose.

4.7 Case – Lund

Lund is a leading city in sustainable urban mobility planning and practice in Sweden[18]. Zero growth in car traffic is among the green goals and transport CO_2-emission must drop by 2.5% per inhabitant per year. Lund municipality applied to the Stadsmiljöavtal program in 2015 and has received one of the largest grants for a 5.5 km tramline between the central station and theurban development district Brunnshög. The tramline had an investment budget of 746 MSEK (77 M €) and the obtained subsidy was 298 M SEK (40%). The tram project was delivered and started operations in December 2020.

The committed return services are extensive. They include a strategy for urban densification along the line, concentrated urban development in the destination area of Brunnshög, redesign of the central station terminal, changes to speed limits and parking norms, and various public transport and cycling measures.

The project and the return services are aligned with the municipal Comprehensive Plan, the Region Skane Trafikförsörjningsprogram,[19] and with *Lundamats*, Lund municipality's long-standing traffic strategy.[20]

The tram project in Lund has a long history behind it. The project was

17 Trafikverket 2021 Miljökonsekvensbeskrivning av förslag till nationell plan för transportinfrastrukturen 2022–2033. TRV 2021/79143, Borlänge, 2021 [in Swedish]

18 Scoring #1 now three times in a row (2018; 2019; 2020) in the informal annual Swedish Sustainable Mobility ranking SHIFT

19 https://utveckling.skane.se/siteassets/publikationer_dokument/trafikforsorjningsprogram_for_skane_2015.pdf

20 2016 LundaMaTs – hallbarhetsstrategin_som_haller

Fig. 10 Image and map: Wikimedia. Av Jorchr - Eget arbete, CC BY-SA 3.0 Av OpenStreetMap contributors - openstreetmap.org, CC BY 3.0, https://commons.wikimedia.org/w/index.php?curid=96006208.

conceived several years before the Stadsmiljöavtal program. It was preceded by a bus line, which was already envisaged and designed with a view to a future tramline. The preparation of the tram project was in part supported by the European Investment Bank. The EIB support would be withdrawn if an investment decision was not made sometime around 2015[21]. Hence the program did not *create* the project as much as *allow* it to materialize.[22]

It is not yet possible to report actual results from the project in Lund (trams and committed services). An early ex ante analysis found that the tram project alone would not be profitable in socio-economic terms. Interestingly, this is not among the criteria for Stadsmiljöavtal grants.[23]

The Lund application[24] did not quantify expected impacts. The project and committed services were altogether extensive, long term and therefore not completed at the time of the K2 evaluation. A recent report from Lund municipality in 2021 estimated a modest ex post reduction of around 410,000 car trips and 51 tons of CO_2 per year for the tram alone. We did not identify any attempt to assess the traffic or climate CO2-impacts of the whole package.

4.8 Summary

Sweden has ambitious *climate goals* including a steep reduction target of 70% 2010-2030 for the transport sector. Among the officially adopted strategies is the promotion of a 'transport effective society' targeting national and not least regional and local planning. However, what this strategy entails in practice and policy, for example to what extent it involves direct reductions in car traffic, is not universally agreed.

Many public agencies, committees etc. are engaged in providing conceptual and procedural framing for discourse on transport decarbonisation efforts at the local level, but a central driving actor has been called for. According to the Swedish Climate Policy Council and other observers, climate goals are still inadequately integrated in sectors and policies, and the strategy to reduce emissions through the *'transport-efficiency'* lacks an institutional home.

A key area is *infrastructure planning* which is formalized at both national and regional level. While infrastructure planning is now formally subscribed to climate goals and the 4-step principle, the plans are still locked into massive spending for infrastructure, and not yet adapted to cater to accessibility planning and 'rethink/avoid' strategies.

There are no formal requirements for *local municipalities* to adopt either climate action plans, or local transport plans, and among the many ideas for governance reforms we did not come across any proposal to make such plans mandatory.

Instead, government, agencies and others seem to have preference for conceptual and methodological guidance and financial incentives to support municipal planning and action within and across transport and climate. The large scale 'Stadsmiljöavtal' program has engaged many municipalities in providing for non-car transport investments. It supports a somewhat holistic approach though the requirements for return services that connect spatial planning with traffic strategies, green infrastructure, and mobility measures.

21 Lund Municipality: Application form for Stadsmiljöavtal 2015
22 Isaksson E & Knaggård Å (2019). Kunskapsöversikt: Stadsmiljöavtalets politiska process. K2 WORKING PAPER 2019:10 [in Swedish]
23 Hammes, J.J. (2021). Steering cities towards a sustainable transport system in Norway and Sweden. Case Studies on Transport Policy 9 (2021) 241–252.
24 Lund Municipality: Application form for Stadsmiljöavtal 2015

A city like Lund has used the program to help realize long-standing ambitions to upgrade the local public transport system and supporting this with measures across the avoid-shift-improve palette. However, it is not possible to document that this kind of program has yet delivered really significant reversal of transport trends or substantial GHG-reductions in a cost-effective way.

The *regional level* has a key role not least as potential coordinators of transport and climate planning across municipalities and the state. We did not review in detail the resources or mandates available for regions in this regard, and we did not come across examples of particularly strong or radical measures, or entirely novel integrated approaches, being promoted through regional level action at this point.

The current situation points to windows of opportunity for strengthening the governance of local transport decarbonisation in various ways. Opportunities include for example the preparation of the next Climate Action Plan 2023, proposed revisions to the Planning Act,[25] stronger mandates on climate goals, decarbonisation, and 'transport-efficiency' for transport infrastructure planning, as proposed by the Climate Policy Council and others, and also the possible installment of new coordinating bodies and procedures for large scale urban transport agreements, akin to the Norwegian system, as proposed by the Climate Law Inquiry[26] and the Government's own Transport Analysis Agency[27] .

The recent and significant shift in strategy away from strong reliance on biofuels will have huge implications for what is expected of behaviour change and electrification at a local scale. This underlines the importance of good national and local dialogue if consistent policies are to be developed.

25 As proposed by another public committee, SOU 2021:23 Stärkt planering för en hållbar utvek-cling. Betänkande av utredningen Samordning för bostadsbyggande, Stockholm 2021 [in Swedish]
26 Slutbetänkande av Klimaträttsutredningen, SOU 2022:21, Stockholm 2022 (English Summary, p. 55)
27 Trafikanalys (2022). Förslag som leder till transportsektorns klimatomställning [in Swedish] Rapport: 2022:14

5 Denmark

5.1 Denmark's Climate Policy

The Climate Act of 2019 defines Denmark's legally committed climate goals and provides the general climate policy framework. The goals of the Act include a target of 70% GHG reduction (1990-2030) and net-zero before 2050. The Act establishes that Denmark must be a global frontrunner. Yet, fulfillment of targets must also take into account cost-effectiveness, international competitiveness and employment.

The new majority government in power from December 2022 has committed to net-zero already by 2045 and 110% reduction by 2050, goals that are not yet legally bound.
The Climate Act reinforced the role of the independent Council on Climate Change and installed an annual climate policy cycle that is new to Denmark.

In February the Council on Climate Change submits its annual review of current government climate policies. The Council must comment if the government has 'convincingly demonstrated' that the targets defined in the Climate Act will be met. If not, the Act prescribes an 'Obligation to Act' for the government.
In September the Government must present its annual Climate Action Plan ('Klimaprogram'). In the Action Plan the Government must include further actions if the February verdict of the Climate Council was 'not convincingly demonstrated'.

That has been the verdict every year since 2021. Towards the end of the year, Parliament will debate to what extent it finds that the 'Obligation to Act' has been fulfilled through the Action Plan. It may decide to include additional policies as part of agreeing next year's National Budget.

5.2 Transport Decarbonisation policy

5.2.1 The Climate Action Plan and the Transport Roadmap

Domestic transport emitted 12.4 mio. ton CO_2e in 2020, corresponding to 28% of total national emissions. This represents an increase in transport emissions of 6% over 1990.[1]

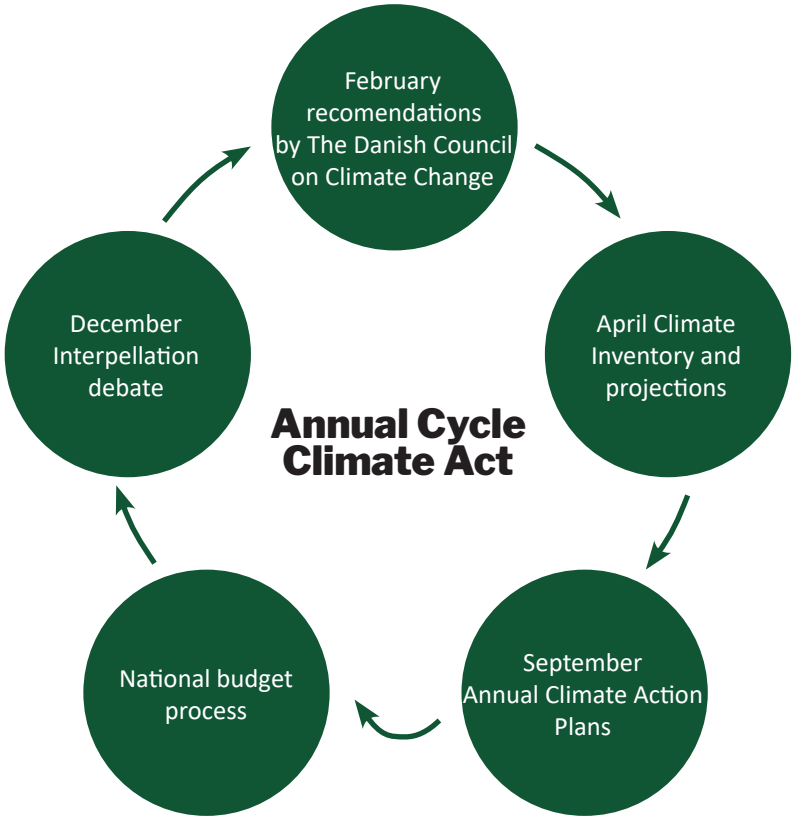


Fig: 11. The Danish Climate policy cycle.

1 Danish Energy Agency (2022). Klimastatus og -fremskrivning 2022 [in Danish]

Denmark does not have a separate decarbonisation goal or strategy for the transport sector, but the Government's annual Climate Action Plans include sections on major intervention areas, including transport. Besides summarizing adopted policies and their expected impact each intervention sector comes with a 'Roadmap' of initiatives the government is considering for steering towards overall climate goals.

Transport emissions 'peaked' around 2007, and are projected to decline further towards 2030 and beyond as a result of technology and market trends, and European and national policies, according to the most recent Action Plan from 2022 (fig. 12). Adopted national policies focus mostly on the technical transition towards electric and other alternative fuels and vehicles. The effect is hampered by significant projected growth in vehicle fleet and traffic volume (+15% 2020-30 for passenger cars), combined with slow fleet turnover.

Hence, transport emissions with adopted policies are currently set to decline by only *13% between 1990 and 2030*, compared to the overall goal of 70% for all sectors combined. The Transport Roadmap describes additional planned government initiatives the next few years in various stages of preparation, from pending policy proposals to possible additional measures, to analysis of technical reduction potentials. No commitment for further reduction of transport emissions is specified.

In its 2022 annual review the Climate Council advised Government to adopt additional measures to reach the national goals for 2030 and 2050, or risk becoming dependent on risky levels of negative emissions.[2] Also in 2022 the EU adopted stricter national targets in the Effort Sharing Mechanism. Most recently the new Danish government moved the Net-Zero goal up to 2045. Hence, pressure for action in transport will likely increase.

Yet, it is not clear how much more the sector must deliver or by when, considering cost-effectiveness vis á vis other sectors and the potential for negative emissions. There is currently no clear trajectory towards a decarbonized transport sector in Denmark.

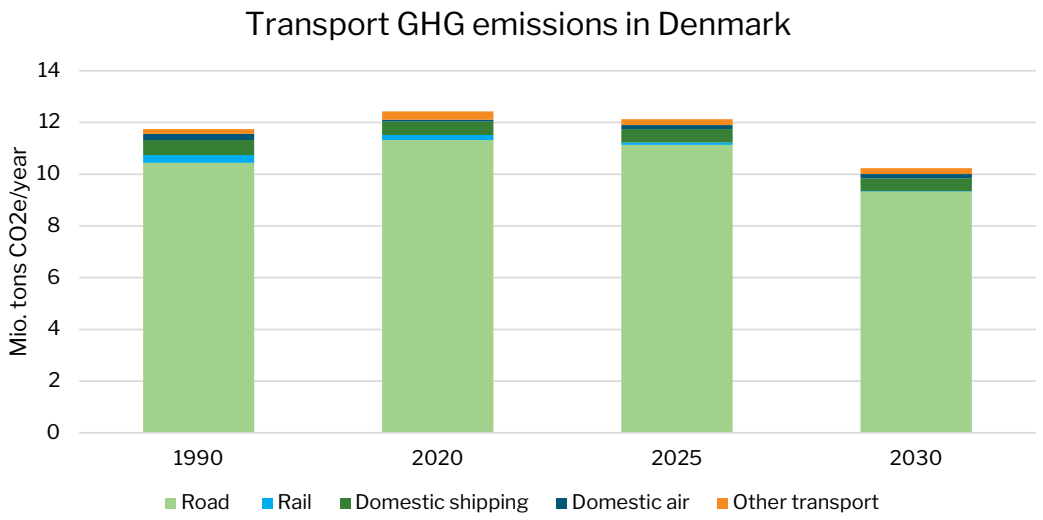


Fig. 12. Domestic transport sector emissions in Denmark in mio. tons CO_2e (Source: Klimaprogram 2022). Light green bars are road transport (92%).

5.3 Horizontal coordination of transport decarbonisation

Mandates and resources available to promote transport decarbonisation is spread over a range of ministries, agencies, and authorities.

'Avoid' measures through spatial planning is mostly the business of each municipality (see section 5.4). The national regulation or spatial planning has been shifted much around but is now placed in the Agency for Planning and Rural Districts under the Ministry of Church Affairs (to some surprise for observers).

As 'Avoid' measures are not much applied in current climate policy, the Agency's involvement in transport decarbonisation is limited. 'Shift' measures, including provisions for public transport, cycling, walking, car sharing etc. refer to laws and regulations anchored in the Ministry of Transport and its agencies, while parts of local implementation will involve municipalities and regions

2 Danish Council on Climate Change (2022). 'Statusrapport 2022. Danmarks nationale klimamål og internationale forpligtelser' [in Danish]

owing/managing local roads and transport agencies. 'Shift' is also often a topic in national infrastructure policy described in the next section. 'Improve' actions related to emissions from vehicles and fuels are shared between Ministry of Transport, Ministry of Environment (e.g., low and zero emission zones) Ministry of Taxation, and Ministry of Climate, Energy and Utilities.

In principle it all comes together through the annual Climate Policy Cycle described in section 5.1 and condensed in the annual Climate Actions Plan with its 'Roadmaps', in a whole of-government process orchestrated by the Ministry of Climate, Energy and Utilities, in coordination with other departments as necessary.

Over time specific responsibilities have shifted around, but in general it is the same set of Ministries and agencies that have been engaged in this area since the very first national interagency action plans for transport, environment and climate were delivered in the 1990, with the Council of Climate Change as the main recent institutional addition since then. In its annual Reviews and other reports, the Council regularly analyses short and long term challenges and recommend climate actions for key sectors including transport. However, as already noted there is not today an explicit government strategy or separate institutionalized process for transport decarbonisation.

5.3.1 Infrastructure planning and climate policy

National transport and infrastructure policy in Denmark follows a discretionary political scheme that is not formally constrained by climate or other objectives. The main components of transport policy are defined via political agreements among majority coalitions in Parliament.[3] The government (often a minority) will set forth a proposition. The proposition will be negotiated, and the results fleshed out in the agreement.

Two times over the last 20 years a major proposition to cover future national infrastructure investments has been put forward. A key discussion point is always the 'balance' between road and rail investments, now also

> *"By volume 95% of road infrastructure in Denmark is municipally owned and managed.*

with a reference to climate concerns. The latest such proposition from 2021 led to the agreement called 'Infrastructure Plan 2035'.[4] Several other transport agreements have been settled in recent years covering topics like public transport, green taxation measures, charging infrastructure, etc.

Following political agreement, key elements are codified in a legal Act and included in the national budget. Before legal adoption, an appraisal process is conducted, usually including CBA and Environmental Impact Assessment of each project. GHG emissions have become part of those appraisals, both in the CBA (via a shadow price) and in the EIA (as X tons emitted from construction, changes in traffic volume etc.).

However, since projects are sometimes traded into political agreements *even before* any appraisal is conducted, the assessment can become a mere formality. In other situations, appraisal results are prepared in advance of agreement and appraisal results will inform and may influence negotiations and priorities.

Yet, since there is no transport sector climate target or other formal benchmark, there is wide political discretion in how to interpret climate concerns and GHG calculations and how they weigh into infrastructure and transport policy decisions.

5.3.2 National and local infrastructure

By volume 95% of road infrastructure in Denmark is municipally owned and managed while only 5% is national/trunk. Yet national motorways alone have 1/3 of total traffic (Danish Road Directorate 2022).

For rail by far most of the network and service is state-owned. Anyway, as nationally funded projects often have strong local significance and impact, the Parliamentary negotiation process attracts much local and regional attention. National co-funding is also

3 "As a rule, legislation passed in the Danish Parliament pertaining to a sphere within the Transport Committee's remit is based on a political compromise." Danish Parliament: The Transport Committee [undated, accessed 10.01.2023]

4 https://www.trm.dk/politiske-aftaler/2021/aftale-om-infrastrukturplan-2035-aftale

regularly provided directly for the local/regional levels, either for specific local projects, like light rail or urban arteries, or through pools of support money.

The 2021 plan for example included three major projects that the government expects the relevant municipalities to co-fund, as well as several pools for areas like traffic safety, bicycle paths and EV-charging. Hence, what is 'national' interest and what is 'local' interest is not necessarily defined clearly in advance. Local and regional policymakers will often seek to influence the national policy process, just like national policy makers may seek to benefit constituencies in the trading in and out of projects and funding.

Overall, Denmark does not have a formalized system for joining-up national and local transport policies corresponding to for example the Norwegian 'Byvekstavtaler' or the Swedish Regional Transport Infrastructure Plans. Again, it is predominantly a topic for political agreement.

5.4 Role of regional and local planning authorities

5.4.1 Regional

Denmark is divided into five regions. The main tasks are health care/ hospitals, regional public transport, and strategic development planning. Regions have limited roles and do not own or manage roads.

By Law, Denmark has six *Public Transport Authorities*, partly matching the five regions. PTA's are jointly owned by the regions and municipalities located in their service areas. Bus and local rail services are delivered by private operators via multi-annual contracts with PTA's (competition for the market).

Some of the five regions have adopted voluntary transport or infrastructure strategies or plans.[5] These can be understood as platforms for political coordination across municipal borders in the region. All five regions have also engaged in climate action planning, not least by assuming supporting roles in the DK-2020 project (see section 3.4.4.)

5 Examples include *Infrastrukturstrategi Fyn 2017-35,* and '*Trafik- og Mobilitetsplan for Hoved-stadsregionen 2019' [in Danish]*

The largest region population-wise is The Capital Region with 1.8 mio. inhabitants including Copenhagen and 28 other municipalities. For this region a special National Planning Directive is in place. The directive instructs municipalities to plan according to principles of the original 'Fingerplan' of 1947 with later modifications. Key aims are to ensure that new housing, offices, retail etc. is located near exiting transport infrastructure, and keeping green 'wedge' areas free from development.

5.4.2 Municipal

There are 98 municipalities in Denmark. According to the OECD/EU definition only four of them include 'cities' proper. The main one is the 'Large Metropolitan Area' of Copenhagen. It has 664.000 inhabitants in the City of Copenhagen, and 1.8 mio. In the entire Capital Region. The next tier city municipalities after Copenhagen are Aarhus (355.000), Odense (206.000) and Aalborg (221.000).

Municipalities have formal self-rule and a substantial own tax base to fund local infrastructure, etc. Danes pay on average around 25% of income in local tax (SKM 2022). Municipalities also receive national tax block grants according to a complex formula (around 25% of their total expenditures).

Despite formal self-rule, central government retains overall control over the municipal economy. Main instruments for this include an annually negotiated 'investment ceiling' and an annual 'budget limit', for the combined spending of all municipalities (not each one individually). The limits are settled in annual agreements between central government and KL – Local Government Denmark, their umbrella organization. The general rule is that new obligations for municipalities must be balanced with economic compensation from the state.

5.4.3 Municipal planning

The Danish Planning Act requires all municipalities to have a '*Kommuneplan*', a Municipal Plan, which is a comprehensive land use and strategic development plan for the next 12 years, updated or confirmed every 4 years. The Municipal Plan defines the spatial structure and strategic goals of the municipality. It must incorporate planned national infrastructure. The plan sets binding parameters for district level planning ('local plans') and development projects. The Municipal Plan must be coordinated with 'sector plans' for heating, waste, sewage etc. which are key municipal responsibilities.
Municipalities decide *transport investments and regulations* in line with the 'Municipal Plan'. There is no requirement to adopt a separate 'sector plan' for transport. Several municipalities have nevertheless at some point adopted comprehensive transport or mobility plans on a voluntary basis (see Odense case later in this Chapter).

There is also currently no requirement for *municipal climate planning* (apart from some climate adaptation measures). Here the situation is special however, as nearly all (95 of 98) municipalities have entered the DK-2020 project and committed to voluntarily adopt comprehensive climate action plans. Due to the significance of the DK2020 project its key features are outlined in the following section.

5.4.4 DK-2020 Project

The DK2020 project is a partnership between the major Danish charitable association Realdania, KL – Local Government Denmark, and the five Regions. CONCITO is secretariat and knowledge partner for the project in collaboration with C40 Cities, the global climate association for megacities.

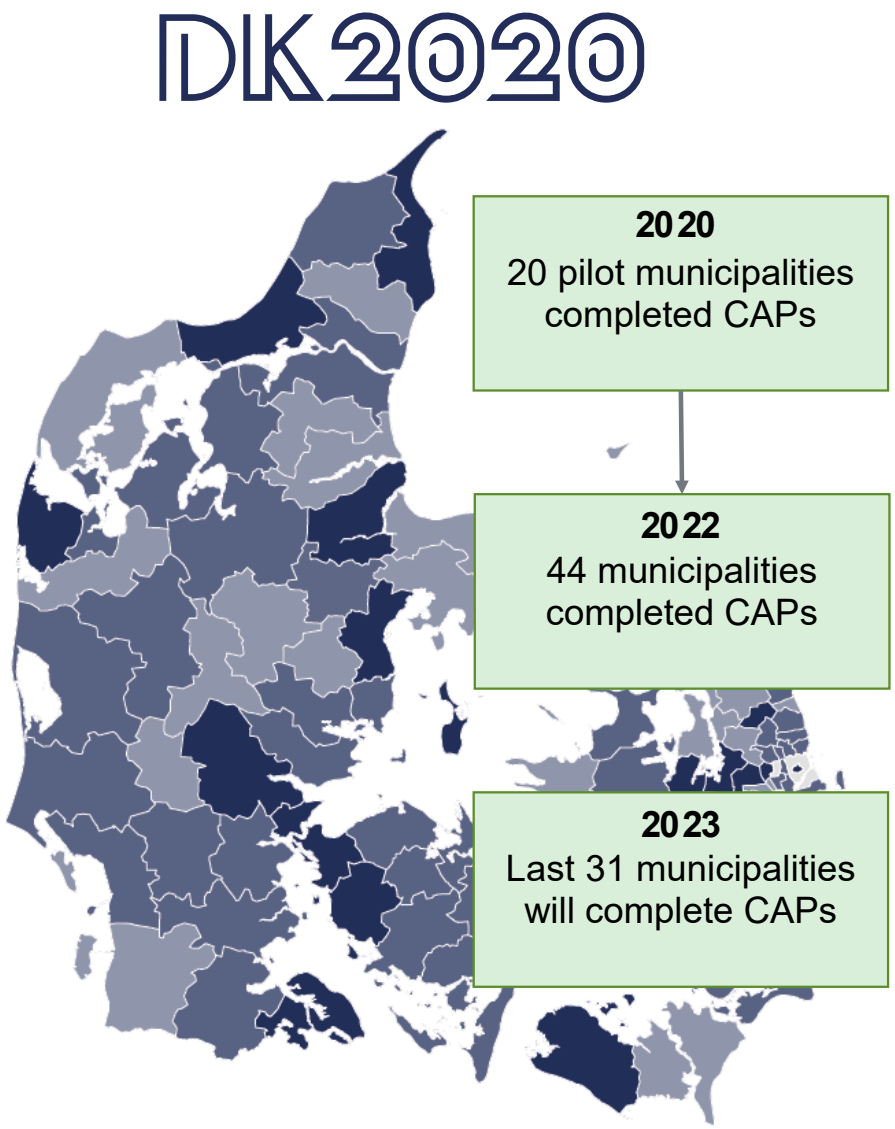
Following a pilot round in 2019-2021 with 20 municipalities, all Danish municipalities have since been invited to apply to join the project in two subsequent rounds. All municipalities but three have joined.[1] The entry point is a pledge to develop a Climate Action Plan for climate neutrality covering emission scopes 1+2, a plan for climate robustness and adaptation. In the pledge the Mayor/City Council must commit to net zero emissions by 2050 at the latest. The commitment includes,

- developing a Climate Action Plan with ambitious intermediate targets (for example 2030),
- addressing mitigation in all important sectors,
- integrating mitigation and adaptation measures,
- including local actors in the process for added value and just transition.

The politically adopted final plans are submitted to CONCITO and C40 Cities for review and approval. As per early 2023 nearly 60 DK-2020 plans are approved; all the rest are due within 2023.

Some important features should be highlighted,

- The effort is voluntary with only limited external support to develop the required plans.
- Participating municipalities must apply the same planning concept, an adapted version of the Climate Planning Action (CAP) Framework by C40 Cities. Municipalities thereby share features like end goals, scopes, and documentation, while free to select their own interim targets and priorities. This ensures a degree of comparability and mutual learning across.



Billedtekst. Figure 13: Danish municipalities committing to prepare and adopt Climate Actions Plans (CAPs), aligned with Paris Agreement objectives.

1 Copenhagen did not join since they are Denmark's only C40 city with an already developed and C40-approved plan. Two other minor municipalities could not fit the project into their strategy or budget.

- Emission baselines and plans can draw from an already existing national GHG inventory for each municipality, hosted by the Danish Energy Agency. Not all municipalities use this inventory, but it does further support consistency and comparability,
- Municipalities have committed to monitor, regularly review, and update their plans after adoption and approval, and to collaborate on implementation even after the end of the DK2020 project.
- *Practically all municipalities target transport as a key sector for intervention*, and most are planning for several transport mitigation actions.

For those reasons the project has likely created a momentum for local transport decarbonisation efforts over the coming years.

5.5 National framework for local transport decarbonisation

It has not been possible to identify any nationally anchored framework to comprehensively promote transport decarbonisation *at the local level*. What emerges from reviewing current practice is a series of more or less disjoint enabling government initiatives. In the following we briefly summarize our observations of how local action is reflected in key national policy areas before describing two alignment mechanisms, the *national funding pools* for local green transport and the '*Klimasamarbejdsaftaler*' (Climate Collaborative Agreements).

- The Danish *Climate Act* does not address local climate action. The most recent *Climate Action Plan* and Roadmap of 2022 lists some climate measures for the local level agreed in Parliament (like the ones described in the following two sections) but puts little emphasis on collaborative frameworks or partnerships with local authorities. The *Ministry of Climate, Energy and Utilities* who is responsible for national Climate Action planning manages legislation and individual support programs relevant for local energy planning, and low carbon transport, but it does not have single office or unit dedicated to local government/local climate action. government/local climate action.
- The *Ministry of Transport* is responsible for a broad range of the legislation, investments, policies, and pools that in various ways can enable (or constrain) local transport decarbonisation efforts. These include policy levers like traffic regulations, speed limits, road design rules, public transport service, support for EV charging infrastructure, green ferries, and more. The Infrastructure Plan 2035 has established some provisions for the local level, including selected local road and rail projects with state/local funding and several support pools (see the following sections). There is no (published) strategy for how these various levers could jointly support local decarbonisation, and there is no single office or unit dedicated to local transport decarbonisation or integrated/sustainable mobility planning.
- *Spatial Planning* has been shifted among ministries and agencies and has most recently been placed with the Ministry of Church Affairs. The Planning Act promotes comprehensive planning for growth and sustainability but does not (yet) refer to climate mitigation as a goal. The Planning Agency has responsibility for rules on the deployment of EV charging for new and existing building, whereas the agency provides limited guidance on planning for transport, infrastructure etc. A recent partnership initiative 'Plan 22+' will provide knowledge and tools for climate oriented spatial planning. An integrated planning approach for transport decarbonisation does not (yet) transpire.

While we see little evidence so far of a whole-of-government approach to local transport decarbonisation within or across agencies, it is noteworthy that the new Government taking office in December 2022 has announced a new initiative called '*Together for climate*' suggesting a partnership between central and local government, business, and civil society. It has also set forth to establish a National Energy Crisis Unit (NEKST) with inspiration from the national COVID-19 strategy. Few details about these initiatives have been released so far, and there is no mention if transport will be considered in any of them.

5.5.1 Funding pools for green transport

Danish Government has a tradition for pursuing policies via the allocation of funding pools for various purposes,

including local planning, transport, and urban environment. An early example was the 'Traffic and environment pool' in operation 1992-1995.

A key aim was to incentivize municipalities to adopt integrated sustainable urban mobility plans, setting targets for reduced energy consumption, air pollution, and four other environmental parameters.[2]

Several pools have since been established with regional or municipal authorities as the intended applicants. 2009 was the beginning of the annual co-funding pool for local cycle projects. Oher pots have focused on enhancements to public transport services, and more recently support for green energy infrastructure and vehicles has been targeted, although most are for private actors in the business and housing sectors.

Funding pools have been promoted as part of recent major policy agreements in Parliament on Climate Action and the Transport Infrastructure 2035 package in 2021. Here they are intended to support strategic elements in those policies like the promotion of low-emission means of transport or local alternatives to the car. For example the pool for green buses and service transport is an accompanying measure to the Climate Collaborative Agreements with regions described in the following section. It should be noted however, that the Infrastructure Plan also contains other, much larger pools for more conventional road and rail infrastructure.

The administration of pools for green transport are spread over at least four different agencies. Some are one-off and other are recurring over two of more years. Table 2 shows recent pools in this area intended for local authorities. Some have transport decarbonisation as a direct purpose, others more indirect.

The pools are generally popular as the budgets are regularly spent. Applications for pool funding need to fulfill certain eligibility and quality criteria, but none of the recent municipal targeted pools have been conditioned on the existence of a comprehensive mobility plan or a climate action plan, in contrast to the funding model of the historic 'Traffic and Environment pool'.

There is not a general agreement about the effectiveness of Danish funding pools for delivering the desired results or transforming transport. The evaluation of the formerly mentioned Traffic pool was mixed.

Like the more recent review of the Swedish 'Trafikmiljöavtal' (see chapter 4) the Danish pool was deemed to have raised awareness and competence to plan for greener transport locally, whereas measurable environmental results were less well documented. The Danish Road agency in its evaluation of the first five years (2009-14) of the Cycle pool for municipalities reported an increase of 22% of cycling on project supported sections, while only 3% of added bicyclists were found to be former car drivers.[3]

A recent critique of the cycling project pool from experts has been that it seems more focused on a balanced geographical distribution of projects than their effectiveness to enhance cycling (Rich 2022, In Danish). The new Cycling Knowledge center of the Road Directorate is currently reconsidering the scoping of the pool for the next three-year period. Other critiques of the Danish pool funding system include that temporary pools are cumbersome to work with, tend to produce excessive projects, and may induce stop/go policy.

5.5.2 Climate Collaborative Agreements

Since 2020 the Ministry of Transport has entered 34 individual Climate Collaborative Agreements with regions and municipalities. The initiative has come about as a soft way to implement parts of the European Clean Vehicles Directive.[4]

The key element of each agreement is a commitment by the municipality/ region to specific target dates for shifting to zero emission public bus fleets and municipally owned vehicles. The dates differ across geographies depending on route networks and existing contracting periods with bus operators, but several commit to zero emission busses already from 2021 onwards in all new urban bus tenders. By 2030 all busses will be zero emission. Each agreement includes additional commitments that are specific for the individual region or city. For example, for other public transport provisions, or other clean vehicles.

2 Flyvbjerg, B, et al.(1998). 'Evaluering af Trafik- og Miljøpuljen 1992-1995'. (English Summary)
3 Danish Road Directorate (2019). 'Evaluering af cykelpuljen 2009-14' [in Danish]
4 Clean Vehicles Directive

Topic	Target	Period	Funding	Main purpose
Green buses and service transport	Regions	2022-26 (5 years)	250 MDKK (34 M €)	Decarbonisation
Green inland ferries	Municipalities	2021	233 MDKK (31 M €)	Decarbonisation
EV charging on municipal lands	Municipalities	2022-23	98 MDKK (13 M€)	Decarbonisation
Bus accessibility	Municipalities and regions	2022 -23	100 MDKK (13.5 M€)	Public transport service
Cycle projects	Municipalities and Research bodies	2022	200 MDKK (27 M€)	More and/or safer cycling (overall)
Cycle projects	Municipalities and Research bodies	2023-2025	353 MDKK (47.5 M€)	More and/or safer cycling (targeted)
Shared EV-cars	Possibly including municipalities	2023-24 (exp)	100 MDKK (13.5 M€)	Decarbonisation and environment

Table 2. Green transport pools for local authorities. Sources: Political agreements and Agency websites.

Agreements entered so far cover 2/3 of all public busses and will reduce emissions by an expected 76,000 mio. tons CO_2 in 2030, according to the DoT, corresponding to 0.7% of total expected transport emissions.

The Agreements also include commitments from the Ministry of Transport to explore options for more local leverage. Among them are,

- providing legal authority for municipalities to financially support EV charging and other infrastructure for low emission vehicles (since delivered)
- a permanent low tax rate for electricity for e-bus fleets (since delivered)
- reconsidering the 'veto' role of the police in the design of local road projects (rejected)
- providing legal authority for zero emission zones (pending)

The agreements are also backed by a financial support pool for regional low emission bus procurement.

The Climate Collaborative Agreement model is a novel instrument in Danish local-central transport governance. It was originally (2020) stipulated that the program should extend to all municipalities and regions, while commitments could gradually be extended to other types of local transport and mobility measures.[5]

No updated strategy for the program has however been published and it remains limited in scope and finance for example compared to programs like Norway's 'Byvekstavtal' and Sweden's 'Stadsmiljöavtal'.

5.6 Case - Odense Mobility Plan

Odense, Denmark's fourth largest city (206.000 inhabitants) has a strong commitment to urban mobility planning with a priority for public and active transport. The City Council has recently adopted a DK2020 Climate Action Plan to deliver net zero emissions by 2030. A key element in the plan will be a comprehensive mobility plan that must contribute a reduction of transport emissions of 107.000 tons CO_2 compared to BAU in 2030. To reach this goal fossil fuel car km's driven must be reduced by 55% in 2030. [6]

Odense has a legacy of 'green' mobility actions to build on. From 1999-2002 it was the official National Cycle City with initiatives that raised cycling by 20%. The first Mobility Plan was adopted

5 Danish Ministry of Transport (2020). Klimasamarbejdsaftaler grøn kollektiv trafik (udmøntning af FL20) [in Danish]
6 Odense kommune (2022): Klimahandleplan 2023. [in Danish].

in 2008 and included the complete closure of a large throughfare in the city center. In 2014 it was agreed to build a light rail line co-funded between municipal, regional, and national government. Significant urban development is concentrated along the light rail corridor. The line was estimated to reduce car traffic in the city with 1%.[7] The latest comprehensive urban space and mobility plan from 2017 emphasized mobility behavior and the utilization of existing infrastructure, following the Swedish 4-step principles.

In 2020 the city entered a Climate Cooperative Agreement (see previous section) committing to having all buses be zero emission from next bus tender in 2027, plus measures like zero emission municipal vehicles and low emission transport in public procurement.[8]

In 2021 an independent Task Force commissioned by the municipality delivered ten recommendations to obtain a climate neutral Odense by 2030[9].

Two of the recommendations were for transport: A new traffic and mobility plan with priority to active and shared transport; and the introduction of zero emissions zones.

According to preliminary estimates speed reduction from 50 to 30 km/h within the whole Ring 3 zone area could deliver nearly half of the targeted reduction in transport emissions mainly by deterring car-based trips. The municipality has so far only decided to test a reduction to 40 km/h within the much smaller Ring 1 area. In Denmark the police often opposes proposals to lower local speed limits, a mandate that Danish local authorities have challenged on several occasions.

For the Zero Emission Zone the Odense Task Force estimated a potential to contribute to a reduction of around 92.000 tons CO_2 by 2030 if covering all of the Ring 2 area. At this point government has yet to provide legislation needed to allow Zero Emission Zones, and the municipality will need to decide if this instrument is to be deployed, considering still unknown conditions.

Odense, Illuminated bicycle bridge. Photo: Odense Municipality.

5.7 Summary

Denmark is so far relying mostly on 'improve' measures in its climate policy for transport, aiming to shift vehicles and fuels to low -and zero carbon technologies (mostly electrification). There is not a separate strategy for transport decarbonisation nor a trajectory towards zero. A debate can be seen emerging in society on the need for *a national mobility strategy*, which should also deliver climate objectives, but so far such a concept is not clearly reflected in official policy. While infrastructure planning is no longer ignoring the climate agenda,

7 COWI (2013) Odense Letbane. VVM og miljøvurdering. [in Danish]
8 Klimasamarbejdsaftale om grøn kollektiv trafik mellem regeringen og Odense Kommune, June 2020. [in Danish]
9 Task Force Klimaneutral 2030

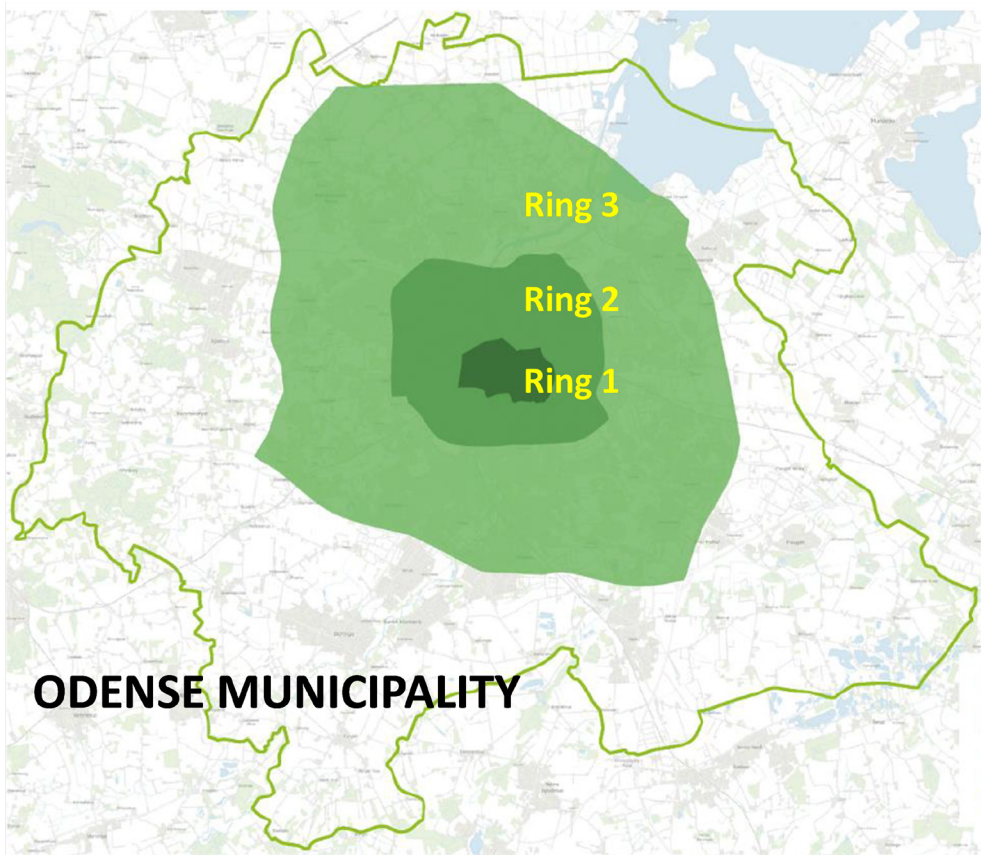


Fig. 14 Traffic ring areas of Odense adapted from: Task Force Klimaneutral 2030.

the processes of Climate Action Planning and Infrastructure decision making are still quite separate, in both policy and institutional terms.

Also, Denmark does not have a formal model for joining-up national infrastructure policies with local transport planning, corresponding to for example the Norwegian 'Byvekstavtaler' or the Swedish Regional Transport Infrastructure Plans. Nor did we identify a systematic framework to promote local transport decarbonisation. What emerges from reviewing current practice is like a series of more or less separate enabling initiatives, including co-financed infrastructure projects, individual funding pools, and narrow alignment programs like the Climate Collaborative Agreements. That municipalities like Odense are preparing ambitious mobility plans to deliver significant carbon reduction is not officially acknowledged or particularly encouraged from the central level.

There is formal coordination across levels where obligations are involved in seperate intervention areas like EV charging, or when EU regulation requires it, whereas coordination is entirely informal if not intangible in regard to the broader transport decarbonisation agenda. A preferred mechanism is the financial support tool, although it is not clear that these programs work effectively towards empowering municipalities to develop transformative planning or find the measures where they can contribute most effectively. It is interesting to note how local authorities jointly or individually are pushing for shifting some authority their way, for example with regard to local engagement in EV-deployment, Zero Emission Zones, and speed limits. Central government is responding, but it is not clear if a more strategic dialogue on the balance and alignment of authorities is emerging anytime soon.

It is likely that municipalities will ask for more leverage and government support not least in the transport area if they are to implement their DK-2020 plans and reach their climate targets, some of which stipulate climate neutrality already by 2030 or earlier. The local proactive approach seems currently not well aligned with the more reactive modus at the national level.

6 Discussion

There are both major similarities and differences among countries, in terms of the general transport decarbonisation strategies, as well as in terms of how national and local action is aligned. Even within each country a mix of different approaches and coordination mechanisms are in operation. Yet, despite historically dissimilar governance arrangements especially between the Great Britain and the two Scandinavian nations it still seems meaningful to discuss needs and models for alignment across contexts.

As for the overarching climate policy frameworks the three countries are broadly similar, with Sweden and Denmark somewhat assuming the British harbinger model. A legal Act mandates government to steer towards reduced emissions (targets or budgets) based on international agreements and ultimately pointing to a net-zero situation around mid-century. Government is required to report progress and propose policies to Parliament.

An independent Climate Policy Committee has important roles that vary across the three countries with the UK Council's proactive role to suggest 5-years budgets to Government standing out. In all countries the Councils offer extensive commenting and critique of government policy and action. Ambitions and priorities of national climate policy evolve over time and with changes in government, but it is clear that climate policy has become institutionalized and is central to national policy making.

As for transport, the sector contributes around 30% of total GHG emissions and therefore takes up prominent roles in overall decarbonisation policy in all three countries. The transport focus has a sharper edge in Sweden with its steep 70% reduction target by 2030 for the domestic transport sector, and the UK with its separately formulated strategy for decarbonizing transport, whereas in Denmark transport action forms a more indirect than strategic component of overall national climate policy.

Perhaps partly for this reason, and partly because of differences in specific policies (i.e., in Great Britain the broad six-pronged strategy and in Sweden the related three-pronged one, plus the extreme biofuel blending policy) the future trajectory towards zero emission transport also appears to be more vaguely outlined in the Danish case at this point.

However, in all three cases a need for further action beyond (or before) the technical replacement of vehicle fleets and energy sources can be foreseen, even if less recognized in Denmark, and in Sweden not yet fully reconsidered after the sharp turn away from the fuel blending-strategy in government policy.

Ministries are working together and coordinating policies as needed due to the multidimensional driving forces behind transport GHG emissions and the complementing fields of jurisdiction over regulatory and other instruments.

The dividing lines between which Ministry is responsible for which actions are different, to some degree, across our case study countries. However, co-ordination concerns remain important whether there is a separate transport decarbonisation strategy or one which is embedded in other policies.

There are no cases where all of the production emissions associated with new vehicles and infrastructure or where the relationship between transport and the energy system are treated in a single agency alongside considering emissions from vehicles in-use.

Again, here, coordination across agencies is critical to coherent strategies. Yet, the situation in Great Britain with the Ministry for Transport having the clear lead in decarbonisation may be contrasted with Denmark where other ministries contribute to climate plans by request from the Ministry for Climate, Energy and Utilities, and Sweden, which entertains an extensive discourse exactly about the apparent lack of central agency for decarbonizing transport and delivering the 'transport-efficient society'.

The more the climate debate moves into the domain of transport demand – its role, its management, its planning, its possible reconfiguration, the more

prominent this challenge becomes, it seems. In other words, a clearly formulated and led national direction for transport decarbonisation brings forward the need for explicit horizontal and vertical coordination.

As for central support and alignment to planning and action at the local level we can observe significant differences among the three countries, and their modes of coordination.

First of all, both in Great Britain and in Sweden, government has explicitly recognized an important role for the regional and local levels in transport decarbonisation. In the UK 'place-based' action is noted a one of the six prongs in the transport decarbonisation strategy, while in Sweden a similar commitment is found in the Climate Action Plan and other documents.

This is less the case in Denmark, or at least the role for local action is not expressed in the same clear and wholesale way, but rather in the form of specific minor initiatives, like several short-term specific pots of funding and the Climate Cooperative Agreements on low emission buses. This Danish position has been argued to reduce the risk of poorly targeted local interventions and market distortions. Research from elsewhere however, suggests that a piecemeal approach to local action may result in missed opportunities for action, poor connection with democratic processes and raise, rather than reduce, the risk of ill- coordinated and targeted action. We did not find evidence to suggest that the Danish approach to coordination is based on analysis of where municipalities could make the maximum difference to decarbonisation or where to obtain the most reduction per amount DKK invested.

We find that much *informal coordination* is going on in all three countries, emphasizing the use of information as instrument. In Denmark the DK2020 project is a prime example, although the role of central government here is indirect though the provision of certain basic data for climate and transport planning plus a recent merely symbolic acknowledgement of the initiative as such.[1]

Clearly there are numerous other ways and specific areas (e.g. EV charging) in which central and local government in Denmark are informally (and formally) coordinating actions. However, we do not observe anything near the same breath and depth in the provision of knowledge, guidance, platforms and toolkits for local transport planning with a view to climate mitigation and demand management in Denmark, as in the UK and Sweden in particular.

We can also observe that the approach, with mostly informal coordination and limited central commitment only to some degree helps municipalities define, quantify, and implement adequate decarbonisation measures, while it also seems to leave regional coordination wanting, even if Regions in Denmark do engage in strategic planning for low carbon mobility with their (limited) authority and resources.

Within Great Britain, England applies formal coordination via the instrument of the statutory local transport plans (LTP's). The government is currently preparing revised conditions and guidance for the next round of these plans, which will likely require local carbon budgets.

The LTP instrument has a long history where the degree of central direction and obligation linked to co-funding has shifted over time. It will be interesting to see how much this next round will promote long-term planning as a key

> *A clearly formulated national direction for transport decarbonisation brings forward the need for explicit horizontal and vertical coordination.*

1 Noted in the annual Budget Agreement between the state and municipalities for 2022. Regeringen og KL (2021). 'Aftale om kommunernes økonomi for 2022', p. 11.

mechanism for allocating treasure. The example of Greater Manchester indicates merits of a longer-term settlement releasing both funding and authority from central government, and leading to a wider agreement where land use and transport is planned in parallel over a larger region, or 'functional urban area' in the terminology of European SUMP's.

In Denmark and Sweden EU regulation currently under negotiation will likely soon require the largest cities to develop Sustainable Urban Mobility Plans of a similar kind to the LTP's. Here a question is to what extent national authorities decide to use this opportunity to develop a formal coordination model.

In Denmark, at least it is clear that any centrally imposed requirements would release a request for financial compensation by local authorities.

Ideally, this could be worked out via the annual joint budget negotiations. This would however require that both central and local authorities recognize planning for sustainable low carbon transport as a key joint priority.In Sweden, Regional Transport Infrastructure plans involve significant formal coordination between national/regional/local levels.

However, it seems so far mostly to be a model for delivering traditional types of investments, rather than a means to expedite strategies for decarbonisation.

The model of the 'Stadsmiljöavtal' in Sweden can be seen as a form of coordination via obligation more to that effect. It is voluntary for municipalities to apply for government funding through the program, but if they do, obligations follow, not only to report on the implementation of investments and their impact on transport activity but to provide additional planning and transport measures, customized to increase the effect and value of the national funding.

This supports the idea that 'placed-based' action can be a way forward to effectively implement locally legitimized decarbonisation strategies. The program is also open for supporting such plans jointly by two or more municipalities, akin to the Greater Manchester example. However, it remains to be demonstrated that such programs can directly release, or 'snowball' their way to substantial CO_2 reductions.

Summing up, there are actions at a local and national level (and sometimes regional) to decarbonise transport. These actions relate to the remits, powers and funding available, but they also represent a democratic demand for elected officials , at every scale, to take action. Local priorities and actions may earn legitimacy though local democratic processes. Many of the policies that impact on decarbonisation are also being deployed to some degree to tackle congestion, air quality and health concerns.

So, the question is not whether there should be any coordination, but how best that should be organised. At one extreme Denmark has not formalized any process for strategically advancing this coordination, instead acting through ad hoc negotiations on matters such as EV charge points and low emission zones. Co-ordination is occurring more through bottom-up initiatives such as DK2020, although these are underpowered. At the other end, Norway has agreed long-term funding settlements tied to zero traffic growth goals. The UK and Sweden offer slightly different approaches with some potential lessons for Denmark, although nowhere is far along the ladder of progress yet. In Great Britain more consolidation of funding and freedom to spend on locally derived strategies is set to follow the new formal coordination via LTP's that is being prepared.

This would move away from the initiative by initiative funding approach in place today, which is more similar to Denmark. Sweden seeks to establish funding agreements which bring local and national together but with wider changes to policy also enacted as part of the agreements. Whilst not as strategically comprehensive as the UK, the Swedish version is more in the negotiated agreement mould of Norway and Denmark.

This study did not have as its purpose to uncover the maximum possible, let alone optimal, level of local action to obtain zero carbon transport by any specific future date, but we can note that a potential is recognized to exist. How this is unlocked is dependent on the approach to coordination and alignment taken by central government. The study has not been able to empirically establish which approaches lead to more rapid progress or better value for money. However, it is evident that local and national actions can either be in lock step with each other and offer better outcomes and value for money or in conflict and be counterproductive.

The more comprehensive the strategic coordination is the better the alignment should be.

How the delivery of those aligned strategies is realised is inevitably to be most strongly influenced by the existing frameworks for agreeing resourcing and powers between national and local tiers. We have drawn on other investigations of the benefits of more comprehensive settlements of funding as compared with more piecemeal initiative by initiative funding. They suggest that there are benefits to local capacity building, lower delivery costs and better value for money with more comprehensive packages, although this bears further testing.

7 Recommendations

This study has been fueled by a strong momentum, and some frustrations with local planning and action in the area of transport, mobility and climate, not least in Denmark.

The study suggests that besides the informal coordination to be continued via bottom-up initiatives like the DK-2020 project and Plan 22+, a central government committed to deliver a climate neutral society could likely make a difference by supporting local action and enhancing forms of coordination between levels.

The following recommendations are mainly targeting the present Danish context although hopefully resonating with experience from Great Britain, Sweden and other countries. Based on this scoping study we do not put forward 'grand solutions' requiring major institutional reforms or releasing massive spending in the scale of for example the Norwegian 'Byvekstavtaler'.

We highlight the following four points for the consideration of Government, local authorities and professional bodies in the area.

1. Develop a clear national strategy for transport decarbonisation involving passenger and freight transport and pointing all the way towards climate neutrality, to help reduce uncertainties experienced by citizens, business, and local authorities,

2. Explicitly recognize the potential and role of municipal and regional bodies in helping transport decarbonisation, encouraging place-based strategies to avoid, shift, and improve transport, including both actions that underpin and implement national measures as well as measures that employ unique levers enabled by local conditions, resources, mandates, and democratic engagement,

3. Consider a national support program for Sustainable Urban Mobility Planning, which could be differentiated across a spatial typology, for example a) Copenhagen region, 2) the 3-5 next level cities (= e.g. EU Urban nodes), and 3) smaller towns and municipalities. Include in the support program elements like customized national guidance, platforms and fora of exchange, connected to initiatives like European NetZeroCities and national DK-2020 and Plan22+,

4. Explore the prospects of consolidating national funding streams from separate short-term pots of money and individual transport infrastructure investments into longer-term unified support packages with a view to delivering low carbon sustainable urban mobility outcomes aligned with spatial planning strategies.

Besides these recommendations it seems that further international research, exchange, and dialogue on this subject could be worthwhile. The imperative to rapidly decarbonise exists across countries and every country faces the challenge of delivering this change in a dynamic and uncertain context with significant multi-level governance and coordination challenges.

One guiding question could be as formulated by the International Transport Forum in its preparations for next year's 2024 Summit on Greening Transport, "*What are the necessary policies to ensure smooth governance between local, regional and national levels, and thereby foster sustainable urban planning and mobility?*"

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