LATVIAN JOURNAL OF PHYSICS
AND TECHNICAL SCIENCES
2025, N 4

DOI: 10.2478/lpts-2025-0027

TRANSPORT POVERTY: AN URGENT ISSUE IN THE FUTURE OF THE EU CLIMATE AND ENERGY POLICY

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Transport poverty, defined as limited access to affordable, safe, and efficient mobility, is an emerging policy concern with growing relevance to energy, climate, and social equity agendas. While energy poverty is already recognised as a critical challenge in sustainable development, the interlinkages between energy and transport poverty remain insufficiently explored. This paper examines the structural relationship between both forms of poverty, particularly focusing on the role of energy costs in limiting mobility options for vulnerable populations. We argue that transport poverty should be considered a dimension of energy poverty, especially taking into account rising fuel prices, declining access to public transport, and uneven infrastructure development. Using a qualitative policy review combined with a statistical analysis of long-term mobility trends and household expenditure data in Latvia, we identify key patterns of transport exclusion and their overlap with energy vulnerability. The results show a strong correlation between energy cost inflation and reduced mobility, particularly among low-income and rural households, with declining use of public transport further reinforcing structural inequalities. The study also explores future risks and opportunities, including the growing role of electrification, synthetic fuels, and renewable energy in reshaping the transport landscape. Policy implications are discussed, focusing on decentralised, locally adapted solutions aimed at mitigating transport poverty and enhancing inclusive mobility in the context of broader decarbonisation goals.

Keywords: *Energy poverty, mobility inequality, public transport access, sustainable mobility, transport poverty.*

1. INTRODUCTION

Transport poverty, according to policy planners and researchers, manifests itself in limited access to accessible, affordable, safe, and efficient transport, which affects people's ability to participate in public life, access education, healthcare, work, and other basic needs [1]. Transport poverty is often fundamentally linked to social and economic inequalities, as access to transport is an essential prerequisite for ensuring an individual's mobility in the labour market, providing access to critical services that affect quality of life, preventing threats to an individual's quality of life in cases where the need to use transport services is linked to an individual's state of health, and reducing the risks of social exclusion for such groups in society as families with minor children, persons with disabilities, as well as elderly persons. As outlined by policymakers and researchers [2], transport poverty is not merely a logistical or infrastructural challenge, but a socio-economic phenomenon closely tied to systemic inequalities. Individuals experiencing transport poverty often face a compounding disadvantage, as the lack of mobility can reinforce or exacerbate existing vulnerabilities, such as unemployment, poor health, and educational underachievement. Transport is not only a means of movement but also a key enabler of inclusion and opportunity within modern society. The negative consequences of transport poverty disproportionately affect specific social groups, including low-income households, families with young children, people with disabilities, and elderly individuals. These populations are often less mobile, more dependent on public transport, and more vulnerable to increases in fuel prices, service cuts, or the absence of suitable transport options. In many rural and peri-urban regions, spatial isolation further compounds transport exclusion, creating "mobility deserts" where access to even basic services is severely constrained [3].

In such contexts, mobility becomes a determinant of social inclusion or exclusion. The inability to travel can lead to missed employment opportunities, delayed medical treatment, interrupted education, and deteriorating social networks. As a result, transport poverty contributes directly to broader patterns of deprivation, economic immobility, and geographic inequality. Furthermore, there is growing recognition of the intersection between transport poverty and energy poverty, particularly in regions where private vehicles are the predominant mode of mobility. The rising costs of automotive fuels and vehicle maintenance disproportionately impact economically disadvantaged households, forcing them either to allocate a significant share of income to transport or to reduce travel altogether, thus falling deeper into a cycle of exclusion and constrained opportunity [4], [5]. Addressing transport poverty, therefore, requires a multi-sectoral approach that includes not only transport infrastructure planning and social policy but also energy pricing strategies, spatial planning, and environmental sustainability. Without such integrated action, the structural barriers limiting mobility will continue reinforcing existing inequalities and hindering progress toward equitable and resilient societies.

Recent studies highlight the growing need to examine transport poverty in conjunction with energy poverty, acknowledging that both phenomena often affect the same vulnerable social groups and exhibit overlapping structural drivers. Conceptually, this intersection is underpinned by three main factors: the mutual influence of energy prices and transport costs; shared socio-economic determinants in affected populations; and the feedback effects of energy poverty mitigation strategies on mobility and transport affordability. A critical link arises through the cost structure of mobility, which is strongly dependent on global energy markets. An analysis of the transport services sector reveals that fuel price volatility, particularly crude oil and refined automotive fuel, remains a dominant factor influencing transport affordability. Buljan and Badovinac (2023) demonstrated that the 2021–2022 energy shock led to significant increases in transport service prices across EU countries, with the highest impacts observed in states with weak modal diversification and high fossil fuel dependence [6]. Latvia, as a net energy importer and with limited low-carbon public transport coverage in rural areas, is particularly exposed to such shocks. Although the correlation between crude oil and other energy prices, such as natural gas and electricity, has declined in the past decade, it remains statistically significant and policy-relevant. Luo and Ye (2024) confirm that electricity prices, while decoupling from oil in many markets, still exhibit time-varying and asymmetric responsiveness to oil price fluctuations, particularly during crisis periods [7].

This coupling implies that rising household energy burdens often translate into increased transport poverty risks, especially for car-dependent and off-grid communities. The inflationary pressures on transport fuel prices directly affect low-income groups' mobility, particularly in Latvia's peripheral municipalities, where alternative transport modes are limited. Furthermore, Savickis et al. (2020) highlight the importance of linking natural gas and biomethane strategies in transport with energy affordability and accessibility goals [5]. Looking ahead, structural changes in both the energy and transport sectors are likely to intensify this interconnection. On the one hand, the electrification of mobility is accelerating across the European Union, supported by policy incentives and falling battery prices. On the other hand, synthetic fuels, including hydrogen and its derivatives, are gaining technological maturity and are expected to complement electric mobility, particularly in heavy-duty, long-haul, and aviation sectors [8]. However, these transitions carry risks of new exclusion mechanisms. If the deployment of electric mobility and hydrogen infrastructure prioritises urban, high-income, or early-adopter populations, the affordability gap may widen for others. In this context, the cost of electricity as a transport energy vector becomes increasingly relevant. As Luo and Ye (2024) [7] point out, electricity price fluctuations – driven by geopolitical, regulatory, and environmental factors – can now have more direct implications for transport poverty than in previous decades. Transport and energy poverty should be treated not as isolated policy concerns, but as interlinked components of a broader socio-technical transition. Understanding their synergies and feedback loops is essential for designing just and effective decarbonisation strategies.

Transport poverty is a growing concern across the European Union, particularly as decarbonisation policies, rising energy prices, and spatial inequalities continue to affect mobility access for vulnerable groups. Although the concept has not yet been uniformly defined across all EU Member States, a growing body of literature and policy studies acknowledges its multidimensional nature – encompassing affordability, accessibility, and availability of transport services – and its intersection with social exclusion and regional disparity. According to a 2022 European Parliamentary Research Service report, transport poverty affects between 10 % and 25 % of the EU population, depending on how it is measured and defined [9]. Vulnerable populations – including low-income households, people with disabilities, older people, and residents of rural or peri-urban areas – are particularly exposed due to their limited access to affordable and efficient transport services. In France, transport poverty became a central issue during the 2018–2019 "Gilets Jaunes" (Yellow Vests) protests, which were initially triggered by a proposed fuel tax increase. Many low- and middle-income households living in peri-urban and rural areas argued that rising fuel costs disproportionately burdened them due to their dependence on private vehicles and the lack of viable public transport alternatives. The protests exposed the gap between national climate policies and local transport realities, leading to new discussions on mobility justice and equitable green transitions [10]. Although no longer part of the EU, the UK remains an important reference for transport poverty research.

The Joseph Rowntree Foundation found that around 1.5 million people in the UK were at high risk of transport poverty in 2020, with rural and suburban areas disproportionately affected [2]. In response, UK policymakers have explored targeted fare subsidies and mobility-as-a-service models, though challenges in coverage and affordability persist. In Central and Eastern Europe, countries like Hungary and Bulgaria exhibit high levels of transport poverty, particularly in rural regions where public transport systems have deteriorated post-transition. A 2023 review by the European Commission highlighted that in Bulgaria, nearly 40 % of rural residents reported difficulty accessing basic services due to transport constraints. In Hungary, the consolidation of regional bus routes has led to service gaps that significantly hinder access to employment and education for low-income and elderly populations [11]. Italy faces transport poverty challenges primarily in southern regions such as Calabria and Sicily, where low public transport density and high vehicle ownership costs create barriers to mobility. According to the Italian National Institute of Statistics, households in the lowest income quintile spend up to 15 % of their income on transport, well above the 10 % threshold often used to define affordability limits [12]. Germany has made significant efforts to address transport affordability through its 9-Euro Ticket pilot scheme in 2022, which allowed unlimited travel using local and regional transport for EUR 9/month. The programme was widely praised for increasing mobility among low-income users and reducing car usage, though long-term funding and structural integration remain unresolved. Early evaluations suggest that affordability-focused measures can directly reduce transport poverty risks [13]. Across the EU, transport poverty is shaped by a combination of rising fuel prices, inadequate public transport infrastructure, and spatial inequalities in housing and services. While high-income countries face affordability challenges and modal mismatches in urban-suburban transitions, lower-income Member States are disproportionately affected by structural underinvestment and accessibility deficits. These dynamics underline the need for context-sensitive, place-based policies that combine transport, energy, and social objectives.

Transport poverty in Latvia is an emerging but under-explored issue that has become increasingly relevant considering recent socio-economic developments and energy market shocks. Despite its growing importance, it remains largely absent from national strategic planning documents and public discourse. Nonetheless, structural evidence suggests that transport poverty poses a significant barrier to inclusive mobility, particularly for rural, low-income, and carless households. Latvia's demographic and territorial structure, characterised by dispersed rural settlements, population ageing, and regional depopulation, exacerbates the vulnerability of specific groups to transport exclusion.

Many inhabitants of smaller towns and peripheral regions lack reliable and affordable access to public transport and are thus heavily reliant on private vehicles. However, Eurostat data show that nearly half of Latvian households do not own a car, one of the highest rates in the European Union, especially among low-income households [14]. The long-term decline of Latvia's public transport sector has further deepened the accessibility gap. Between 1990 and 2024, passenger turnover in railway transport decreased more than sevenfold – from 144.5 million to 19.7 million passengers annually – while bus transport usage fell from approximately 500 million to 100 million passengers per year, reflecting a fivefold reduction [15]. This erosion of service availability and frequency, especially in rural areas, has not been matched by improvements in alternative modes such as shared mobility, cycling infrastructure, or integrated multimodal systems. For residents without private transport, especially in low-density and ageing municipalities, this decline has resulted in tangible reductions in mobility. The consequences are wide-ranging, including reduced access to employment, education, healthcare, and public services. Such constraints intensify social exclusion and reinforce territorial disparities, as observed in other Eastern European contexts facing similar transport-related challenges [16]. Further compounding the problem are high and volatile fuel costs.

According to the Latvian Energy Agency, household transport expenditures have risen disproportionately compared to income levels over the last decade, especially during the 2021–2022 energy crisis. This aligns with EU-wide analyses showing that energy price shocks directly increase transport poverty risks in countries with high dependence on fossil fuels and limited modal alternatives [6]. Moreover, studies have shown that low-income Latvian households often lack the financial means to maintain or replace older vehicles with newer, more fuel-efficient models, resulting in higher ongoing operating costs and reduced reliability [17]. This creates a mobility trap, wherein economically vulnerable individuals are forced to use outdated, inefficient, and ultimately more expensive means of transport. Given these conditions, Latvia faces a growing risk of institutionalising transport poverty as a structural form of exclusion. Without targeted policy interventions that combine public transport revitalisation, spatial planning reform, and affordability measures, vulnerable populations may become increasingly disconnected from opportunities necessary for social and economic resilience.

The goal of this study is to examine the structural interlinkages between transport poverty and energy poverty in the European context, with a specific focus on Latvia, to assess how climate, energy, and mobility policy reforms affect socio-economically vulnerable populations. To achieve this goal, the study pursues the following specific objectives:

- to define and contextualise transport poverty within broader frameworks of energy poverty, mobility inequality, and social exclusion in EU policy and academic literature;
- to assess the long-term decline of public transport use in Latvia, using historical data to illustrate structural accessibility deficits and regional disparities;
- to analyse the impact of rising energy and transport costs on household expenditure patterns, with a focus on vulnerable groups (low-income, rural, elderly, carless);
- to identify and evaluate policy instruments and localised solutions that can mitigate transport poverty in the context of energy transition and decarbonisation, particularly for under-served areas;
- to propose a conceptual framework linking transport and energy poverty as mutually reinforcing socio-economic constraints, supporting the case for integrated, multi-sectoral policy interventions.

2. METHODOLOGY

This study applies a mixed-methods approach combining policy analysis and secondary quantitative data evaluation to investigate the interrelationship between transport poverty and energy poverty, with a primary focus on Latvia and comparative insights across the selected EU Member States.

A structured qualitative review of key policy documents has been conducted to assess the treatment of transport poverty within national and EU-level policy frameworks. The analysis has covered:

- Latvian strategic documents, including the *National Energy and Climate Plan 2021–2030*, *Sustainable Development Strategy 2030*, and *Transport Development Guidelines*;
- European Commission strategies on decarbonisation and mobility, including *Fit for 55*, *Sustainable and Smart Mobility Strategy*, and related legislative instruments;
- reports by the European Parliamentary Research Service (2022) and other policy think tanks;
- academic studies on the socio-political dimensions of mobility exclusion [2], [10].

This review has focused on identifying policy instruments directly or indirectly affecting vulnerable transport users, including tax regimes, fare subsidies, fuel pricing, infrastructure planning, and social support integration. To support empirical insights, the study has utilised secondary data from authoritative sources:

- Eurostat: for passenger transport by mode, car ownership, fuel price indices, and regional statistics;
- the Central Statistical Bureau of Latvia (CSB): including historical rail and bus passenger turnover (1990–2024), household transport spending, and mobility indicators;
- the Latvian Energy Agency: data on transport energy consumption trends and energy price impacts;

- the OECD and European Commission reports: covering mobility disparities, income quintiles, and affordability metrics.

Data have been analysed to observe trends in:
- declining public transport use in Latvia;
- changes in private vehicle reliance by income group;
- household exposure to transport and energy expenditure burdens;
- car ownership disparities as a proxy for mobility inequality.

A comparative indicator table has been developed to benchmark Latvia against five other EU countries (France, Germany, Italy, Bulgaria, and Hungary). The figure includes:
- car ownership rates per 1000 persons;
- urban household access to public transport;
- estimated percentage of households in transport poverty;
- fuel expenditure as a share of household budgets.

The indicators have been selected based on availability, relevance, and their application in prior EU-wide assessments [6], [9].

A conceptual framework has been constructed to illustrate the dynamic interplay between transport poverty and energy poverty, emphasising shared cost traps and the role of spatial inequality. This model integrates statistical patterns with policy findings to highlight systemic feedback loops and exclusion risks. The framework supports the discussion on transport justice and policy intervention strategies presented in the current article.

3. COMPARATIVE ASSESSMENT OF TRANSPORT POVERTY AND ITS INTERSECTIONS WITH ENERGY POVERTY

Understanding the dynamics of transport poverty in the European Union requires not only a definition rooted in socio-economic exclusion and accessibility constraints, but also a comparative examination of how this phenomenon manifests across different Member States. As highlighted by the European Parliament [1], transport poverty is a multi-dimensional issue that arises when individuals or households are unable to access necessary transport services due to financial, infrastructural, or spatial constraints. Importantly, transport poverty shares numerous characteristics with energy poverty, most notably, the disproportionate burden on low-income and rural populations, and the link to structural underinvestment in critical public services [9], [18], [19]. To illustrate the national differences in the manifestation of transport poverty, Fig. 1 presents a comparison across six EU countries: Latvia, France, Germany, Italy, Hungary, and Bulgaria, using three key indicators: car ownership per 1000 inhabitants, public transport access for urban households, and the estimated share of households at risk of transport poverty.

As shown in Fig. 1, significant disparities exist between Western and Eastern EU Member States. France and Germany exhibit high car ownership (above 600 vehicles per 1,000 inhabitants) and near-universal public transport access among urban households. These factors correlate with comparatively lower estimated transport poverty rates (below 10 %) [9], [20].

In contrast, Latvia, Hungary, and Bulgaria present a much more precarious situation. Latvia, for instance, shows a car ownership rate of approximately 360 cars per 1000 inhabitants and public transport accessibility for around 65 % of urban households. In contrast, approximately 22 % of households are at risk of transport poverty. This aligns with Eurostat data on income quintiles and regional accessibility, further confirming a pattern of compounded socio-spatial disadvantage [8].

The disparities in Fig. 1 underscore the contextual nature of transport poverty. In wealthier Western European nations, transport poverty mitigation may revolve around enhancing affordability, reducing emissions, and promoting modal shift through multimodal integration and smart infrastructure. Conversely, for Eastern European Member States, including Latvia, the core challenges relate to deteriorating infrastructure, sparse public transport coverage, ageing vehicle fleets, and institutional undercapacity for long-term investment planning [17], [21]. However, transport poverty cannot be viewed in isolation. There is growing recognition within the academic literature that it is structurally and economically entangled with energy poverty. Figure 2 illustrates this interconnectedness by outlining key drivers of each poverty form, while also identifying overlapping vulnerabilities.

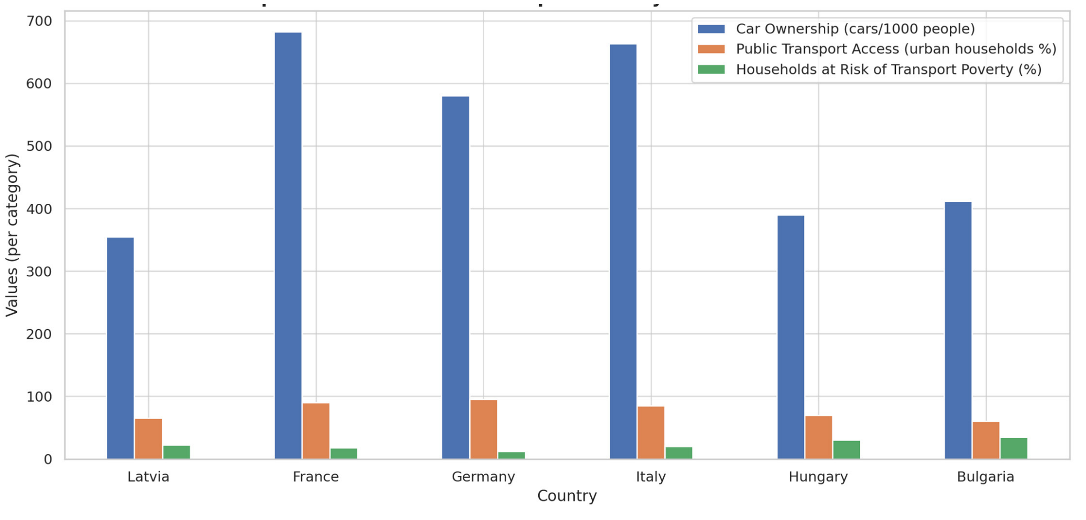

Fig. 1. Comparative indicators of transport poverty in the selected EU countries.

Figure 2 demonstrates that while energy poverty typically stems from high fuel prices, low incomes, and poor household energy efficiency, transport poverty arises due to limited transport infrastructure, high car dependency, as well as vehicle ownership and maintenance costs. Critically, shared vulnerabilities include rural isolation, income inequality, and policy neglect. These overlapping constraints form a reinforcing cycle that entraps households in multidimensional deprivation, as discussed by Kroics et al. [21] and Jasevics et al. [18].

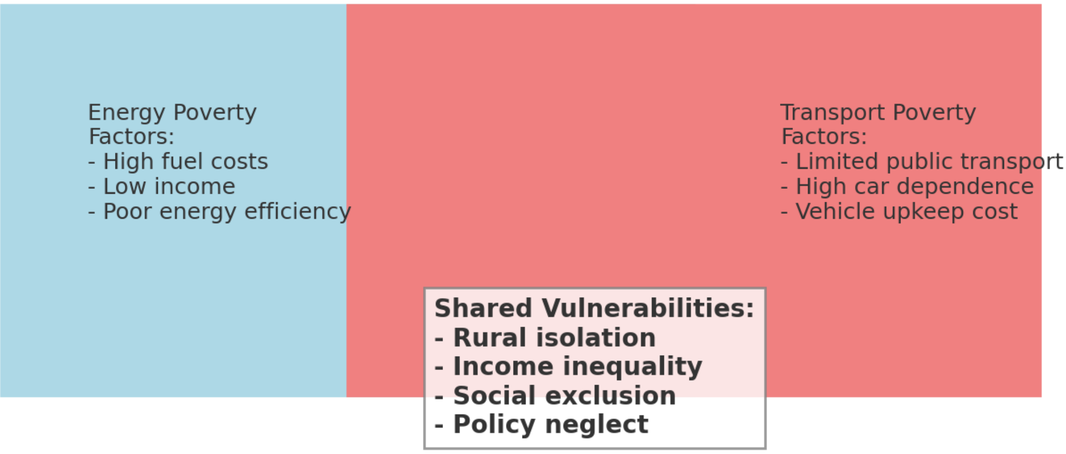

Fig. 2. Shared vulnerabilities between energy and transport poverty.

In Latvia, these interconnections are particularly evident. Recent studies have highlighted that nearly 30 % of rural households have trouble affording transportation to essential services such as healthcare and employment, exacerbated by the country's low-density settlement structure and declining public transport provision [5], [22]. The Central Statistical Bureau of Latvia (2024) reports a dramatic decline in public transport usage over the past three decades – rail passenger turnover dropped from 144.5 million in 1990 to 19.7 million in 2024, while bus passenger numbers fell from 500 million to 100 million in the same period. These declines suggest not only changing travel behaviour but also the erosion of viable mobility options for large segments of the population. This trend reflects a broader structural shift in the EU cohesion policy, where market-oriented transport liberalisation and reduced investment in rural infrastructure have failed to align with decarbonization objectives and the social inclusion goals of the European Green Deal [1], [19], [23]. In effect, households caught in the intersection of energy and transport poverty are increasingly excluded from both the benefits of the energy transition and the mobility required to participate in economic and social life.

To address this issue, research increasingly calls for integrated policy approaches that bridge energy and mobility planning. For example, the deployment of shared transport systems and electrified last-mile services, particularly in rural and peri-urban areas, has been identified as a promising mitigation pathway [8], [24]. Furthermore, hydrogen mobility solutions and improved access to electric vehicle charging infrastructure can provide long-term synergies, as explored by Backurs et al. [24] and Gorobetz et al. [22].

Comparative evidence reveals significant intra-EU disparities in transport poverty, which are strongly influenced by infrastructural legacy, regional economic structures, and governance capacity. The Latvian case illustrates how transport poverty can persist despite moderate car ownership levels, especially when public transport systems are under-resourced and energy costs are volatile. Addressing this challenge requires not only financial instruments but also planning paradigms that recognise the intertwined nature of energy and transport exclusion.

4. ENERGY COST TRAP IN THE TRANSPORT SECTOR

One of the most widely used indicators of transport poverty is the share of transport and mobility-related expenditures in a household's overall budget. This approach mirrors how energy poverty is typically measured, where households spending more than a set threshold – commonly 10 % – on energy costs are considered at risk. In the transport context, excessive expenditure burdens are particularly acute among low-income and rural households that lack access to efficient public transport or rely on outdated, fuel-inefficient vehicles. However, as with energy poverty, this cost-based metric has limitations. Households burdened by high mobility costs may respond not by spending more, but by reducing or forgoing travel altogether, making transport poverty a latent and underreported phenomenon. This coping strategy, while economically necessary, can lead to substantial negative impacts on well-being, including diminished access to employment, healthcare, education, and social participation [2], [3], [24]. In this way, transport poverty operates as a hidden driver of social exclusion and reinforces existing patterns of socio-economic disadvantage. The interlinkage with energy poverty further compounds the problem. In both cases, households may face systemic cost traps. For example, energy-poor households often lack the financial means to invest in home insulation or renewable energy technologies – expenditures that could reduce long-term costs. Similarly, transport-poor households may be unable to afford timely vehicle maintenance or replacement, leaving them reliant on older vehicles with higher fuel consumption, greater repair needs, and more frequent breakdowns [2], [17]. These conditions create a feedback loop wherein the inability to reduce costs through efficiency-enhancing investments perpetuates poverty and deepens vulnerability. Moreover, transport poverty is increasingly influenced by energy market dynamics.

A study by Buljan and Badovinac (2023) [6] found that the 2021–2022 energy price shock led to measurable increases in consumer transport costs across all EU countries, with disproportionate impacts in Central and Eastern Europe. Households in these regions already allocate a higher share of their income to transport and energy, magnifying their exposure to volatility. Additionally, Luo and Ye (2024) demonstrated that electricity prices remain partially coupled with global oil markets, especially during periods of crisis, and may affect future transport affordability as electric vehicle (EV) adoption grows. As electricity becomes a more prominent energy carrier in the transport sector, through EVs and synthetic fuels like hydrogen, the affordability and predictability of electricity pricing will increasingly shape transport poverty dynamics [7].

This energy cost trap also imposes opportunity costs. Households forced to reduce mobility due to fuel unaffordability may face reduced income potential (due to job inaccessibility), missed medical appointments, and educational disruptions – all of which have long-term implications for social mobility and public health [16], [23]. Taken together, these findings suggest that addressing transport poverty requires integrated policy solutions. These should consider not only the direct costs of transport, but also the broader structural barriers that prevent households from adopting more efficient, lower-cost mobility solutions, such as targeted investment in public transport, support for cleaner and more affordable vehicle technologies, and mechanisms to shield vulnerable groups from fuel and electricity price shocks.

5. CRUCIAL ROLE FOR PUBLIC TRANSPORT

Policymakers now recognise that the rise in transport and mobility costs disproportionately burdens lower-income and socially vulnerable households, primarily because these groups are often limited to affordable housing located on the periphery, far from public transport networks and lacking safe pedestrian or cycling routes. This spatial segregation forces reliance on costly private transport or severely constrained mobility, creating a socio-economic "infrastructure trap" closely tied to housing location, accessibility, and affordability [1], [9]. The absence of nearby public transport not only restricts daily mobility but also undermines access to essential services, employment, education, healthcare, and social networks, deepening economic and social exclusion [2], [16]. Moreover, transport-poor households may find it difficult to sell or relocate their property, as a lack of connectivity lowers real estate values and liquidity, reinforcing the poverty cycle. When public transport is scarce or inefficient, users often abandon it in favour of more expensive individual solutions or reduce travel altogether. This behaviour reduces system ridership, increases unit operating costs, and often results in higher fares, further alienating vulnerable users [3]. Such feedback loops, where reduced demand raises costs, which further depresses demand, can institutionalise transport poverty over time.

In the context of energy transition, the implications are twofold. Initiatives such as low-emission zones, electrification, and carbon pricing can inadvertently penalise transport-poor households who own older, less efficient vehicles or lack access to electric alternatives [4], [6], [22]. To avoid deepening inequalities, these policies must be paired with equitable public transport improvements and subsidy adjustments that prioritise underserved regions. Latvia exemplifies these challenges and possible responses. Rail passenger turnover declined from 144.5 million in 1990 to just 19.7 million in 2024, while bus usage decreased from 500 million to 100 million passengers annually during the same period [15]. Addressing this issue requires redesigning transport systems to become more compact and demand responsive.

Pilot schemes involving smaller vehicles on-demand, e-bike and car-sharing integration, and re-evaluation of redundant or overlapping routes have shown promise in improving access and cost-efficiency [17], [24]. Effective solutions necessitate close coordination between transport and social policy domains at the local level. Municipalities need granular data on household mobility needs and socio-economic profiles to design fare subsidies, multimodal services, and spatial plans that integrate housing with accessible transport infrastructures. This tailored approach echoes findings from Latvian research on hydrogen and rural mobility innovations, which stress the importance of local engagement and technology-driven solutions [4], [23]. Public transport must be viewed not just as a service, but as a social equity enabler. Without inclusive design and proactive support, mobility systems risk reinforcing spatial inequality and deepening poverty. Properly planned and subsidised public transport, responsive to local conditions and vulnerable groups, is essential for equitable mobility and sustainable development.

6. LOCALISED SOLUTIONS AS A KEY TO EQUITABLE TRANSPORT POLICY

Through major reforms in the areas of climate and energy – particularly those aiming to reduce emissions and fossil fuel dependency – European governments have introduced policy instruments that, although environmentally motivated, can inadvertently exacerbate transport poverty among vulnerable populations. Fiscal measures such as fuel taxation, vehicle levies, and carbon pricing mechanisms disproportionately affect low-income and peripheral-area households that often rely on older, less efficient vehicles and have limited access to public transit alternatives [1].

In the Latvian context, statistical evidence reflects a severe long-term decline in public transport usage. According to the Central Statistical Bureau, rail passenger turnover decreased from 144.5 million passengers in 1990 to just 19.7 million in 2024, while bus and coach services declined from approximately 500 million to 100 million passengers annually during the same period. This five-to-sevenfold reduction indicates a profound structural shift in travel habits, likely driven by urban sprawl, car-centric development, and public transport disinvestment. These data confirm that restoring public transport networks to pre-1990 service levels – especially at comparable costs – is no longer feasible, necessitating a paradigmatic shift in mobility planning. As illustrated in Fig. 3, there is growing consensus that the future of public transport must be reoriented toward "compact" systems tailored to the needs of specific groups, particularly those most affected by transport poverty. These include low-income families, older adults, persons with disabilities, and rural residents. In this context, the effectiveness of national-level, one-size-fits-all solutions is increasingly questioned. The complexity and local specificity of transport poverty demand an adaptive approach that reflects diverse regional contexts. National policies, especially those in taxation, energy transition, or emission control, often overlook the lived realities of peripheral and low-income populations. As a result, traditional policy instruments have begun to show diminishing returns, and public transport use has declined significantly in countries like Latvia. These challenges call for a shift toward localised, evidence-based solutions, guided by citizen needs and enabled by innovative mobility strategies.

The above framework (Fig. 3) illustrates how systemic pressures – ranging from climate policy to funding inefficiencies – cascade down to influence households directly. In turn, these pressures necessitate highly adaptable local policies. Whether through flexible routing services, equity-conscious fare systems, or expanding shared vehicle access, such models offer a resilient and socially equitable response to mobility challenges. Importantly, successful implementation will rely on real-time data, participatory governance, and integrated transport-social policy frameworks. To address this evolving reality, a set of adaptive and locally deployable strategies has been identified:

- Microtransit and On-Demand Transport: Maintaining large public transport fleets on underutilised rural or peri-urban routes is increasingly uneconomical. A shift to flexible, smaller-capacity vehicles, operating on demand, can offer cost-efficient service while meeting real user needs [25];
- Shared Mobility Options: Car-sharing, bike-sharing, and e-bike rentals are rapidly emerging as viable solutions for those in settlements with limited fixed-route public transport. Such systems also reduce the need for car ownership, which is often unattainable for households in persistent poverty ([5], [24]);
- Smart Public Subsidies: Evaluation of public expenditure must go beyond cost-per-passenger metrics and include equity, accessibility, and social impact. Resources should be directed toward routes and modes that benefit those with the highest transport need [2];
- Fare System Reform: While fare discounts for seniors or students are common, they may inadvertently increase base fares for others. Targeted support must be economically sustainable and designed to avoid burden-shifting [4], [5];
- Cross-sector Policy Integration: Long-term success depends on deeper collaboration between transport, energy, housing, and social policy actors. For example, mobility needs assessments at the municipal or even neighbourhood level can help tailor solutions that respond to real usage patterns and energy constraints [1], [19].

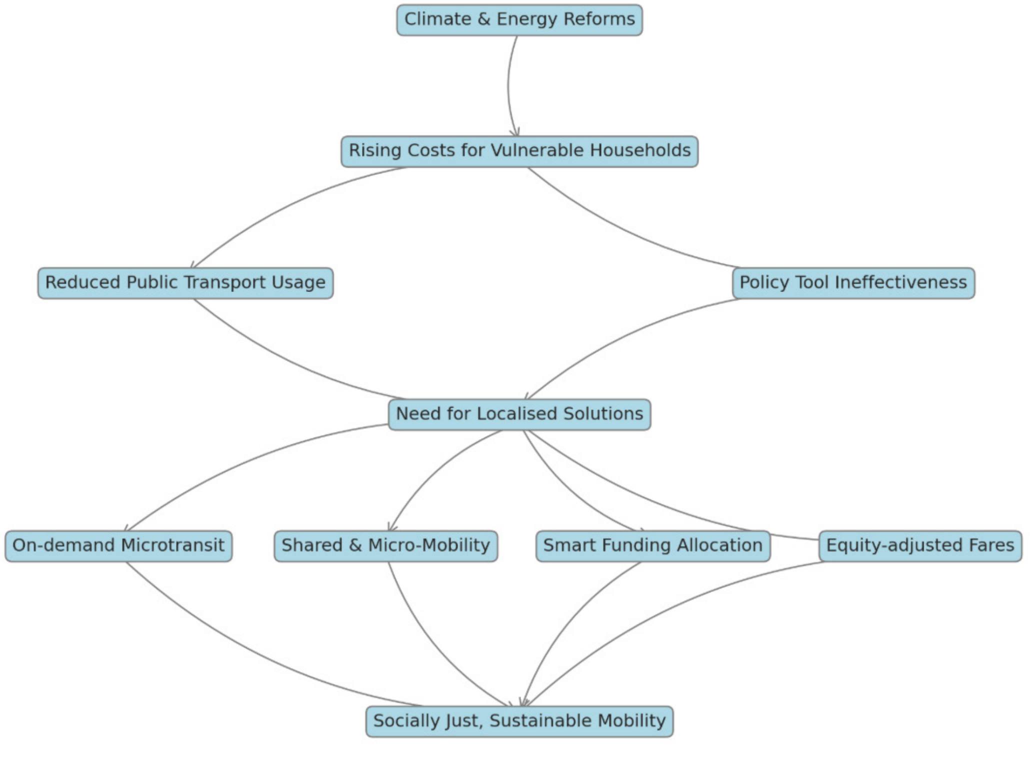

Fig. 3. Pathway to localised transport solutions.

Transport poverty, thus, is not merely a question of vehicle access or fuel price. It is a multidimensional phenomenon requiring locally grounded, socially responsive policy frameworks. The complexity of this challenge is further exacerbated by the energy transition, which, if poorly managed, could widen existing inequalities by shifting costs onto those least able to adapt [22], [24]. At the same time, it is important to be aware that each of these solutions requires ever closer cooperation of transport policy planners with social policy makers, including often looking for possible solutions locally – at the level of a local government or even a limited territory thereof, including in some cases also by accurately identifying potential users of services, studying their needs and mobility habits, as well as finding a solution that meets their needs.

7. CONCLUSIONS

This study has highlighted the emergence and intensification of transport poverty in Latvia and its broader relevance across the European Union, particularly under the current climate and energy transition frameworks. Using historical data from the Central Statistical Bureau of Latvia, we have identified a dramatic decline in public transport usage between 1990 and 2024: a sevenfold decrease in railway passenger turnover (from 144.5 million to 19.7 million passengers) and a fivefold decline in bus and coach transport (from ~500 million to ~100 million passengers annually). These trends underscore a structural deterioration in transport accessibility, especially in rural and low-density areas, coinciding with increased spatial inequality.

Eurostat data further reveal that nearly 48 % of Latvian households lack access to a private vehicle, which is among the highest rates in the EU. This figure rises sharply among low-income and elderly households, making them disproportionately vulnerable to transport exclusion. Additionally, data from the Latvian Energy Agency and recent EU-wide reports show that fuel and mobility costs now exceed 12–15 % of disposable household income for the lowest income quintile, surpassing the widely accepted 10 % affordability threshold.

The study identifies strong correlations between energy price shocks, such as those during the 2021–2022 crisis, and rising transport costs, particularly in countries with low public transport modal share and high dependence on fossil fuels. For instance, average fuel price increases of 35–40 % in Latvia during this period led to corresponding increases in household expenditure on mobility.

These conditions have created a “cost trap” where affected households cannot invest in energy-efficient housing or cleaner, more economical vehicles, reinforcing both energy and transport poverty. The research has also shown that low public transport density, especially in regions outside Riga, significantly reduces access to employment, healthcare, and education, thereby intensifying patterns of social exclusion.

To address these multi-layered challenges, the study proposes a conceptual framework that treats transport and energy poverty as interlinked phenomena. Key localised solutions include microtransit services, shared mobility schemes, targeted fare subsidies, and integrated transport-social policy coordination. International examples such as Germany's EUR 9 transport ticket and France's rural mobility schemes illustrate the feasibility and effectiveness of such interventions when properly funded and adapted.

Transport poverty is not merely a logistical or infrastructural issue but a critical barrier to inclusive development, social resilience, and fair climate transitions. For Latvia and other EU Member States, integrating transport poverty into energy, climate, and social policy frameworks is an urgent necessity. Without decisive action, the dual burdens of energy and transport costs will continue to marginalise vulnerable populations and undermine the equity of the green transition.

ACKNOWLEDGEMENTS

The research has been funded by the Latvian Council of Science, project "Mitigating Energy Poverty through Innovative Solutions", project No. lzp-2023/1-0214.

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