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Local-Level Challenges in Sustainable Mobility: Survey Results from the Baltic Sea Region

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***Abstract* – Transportation is a substantial source of greenhouse gas emissions; therefore, achieving climate neutrality requires focus on sustainable transportation. An assessment of the literature indicates that municipalities can successfully implement sustainable transportation legislation and encourage behavioural shifts toward lower-emission mobility options by tailoring solutions to their community's specific needs. This study examines travel patterns, reasons for mobility, and transportation mode choices in four European countries – Latvia, Estonia, Poland, and Sweden – using survey data from 1151 respondents in selected municipalities. Notably, Estonia and Latvia showed a stronger preference for cycling, while private car use remained dominant in all regions, contributing to environmental concerns. The survey also investigated the elements that influence travel mode choices, and the most important ones were distance, journey time, comfort, convenience, and public transit availability. The study also includes an assessment of respondents' willingness to support various policies, based on the Avoid–Shift–Improve approach. While the support for sustainable transportation policies varies by country, the findings show a widespread desire for improved public transportation, pedestrian-friendly urban planning, and remote work options to reduce commuting. Municipalities must also address issues such as housing and job disparities as well as a lack of efficient public transportation in rural areas. These findings provide guidance to policymakers aiming to promote sustainable mobility and reduce transportation-related emissions, with an emphasis on measures tailored to regional contexts.**

***Keywords* – ASI; emission reduction; EU member states; public opinion; sustainable mobility; transportation policy; travel patterns.**

1. INTRODUCTION

Transportation accounts for over 33 % of global carbon dioxide (CO_2) emissions from energy-consuming sectors and remains one of the most challenging sectors to impact. Furthermore, the most significant increase in emissions is observed in road transportation, which contributed almost 75 % of total transportation emissions in 2022 globally and 73.2 % in the European Union [1], [2].

The European Union's (EU) transport sector is also the most difficult to decarbonize, with emissions increasing rather than reducing, as planned by the Green Deal. The observed trend indicates that emissions from the transportation sector in 2022 increased by 26 % compared

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to 1990 [2]. In total, nearly 1044 million tonnes of CO_2eq were emitted in 2022, with road transport fuel combustion accounting for approximately 760 million tonnes, the largest emission source in the transport sector, followed by navigation (14.2 %), civil aviation (11.8 %), other transport (0.5 %), and rail transport (0.3 %) [2]. In road transport, passenger cars and motorbikes accounted for the majority of emissions (60 %), followed by heavy-duty trucks and buses (27 %), and light-duty trucks (12 %) [2].

The increase in transport sector emissions is influenced by several factors, including population increase and economic growth [3], [4]. Both factors increased the demand for transportation, leading to higher emissions. Urbanization and rising private vehicle affordability are two more factors contributing to an increase in vehicle numbers and associated emissions [3], [5]. It is also a significant factor because the transport sector is mostly based on fossil fuels [3], [4], [6]. Consequently, the proportion of internal combustion engine vehicles in the EU remains high, even though the average emissions per vehicle are decreasing, a trend that is primarily attributed to the transition to electric vehicles [7]. In 2023, electric cars accounted for 22.7 % of new car registrations and 7.7 % of new van registrations [8].

A municipality, as the lowest-level administrative division of local government, holds primary responsibility for devising and executing strategies tailored to its specific geographic location. Despite fundamental laws being adopted at the national level, it has the capacity to influence transportation sector emissions [9],[10]. For instance, they can improve the range of public transportation options, encourage citizens to be more environmentally conscious, or create an urban environment that is friendly to cyclists and pedestrians [11]. However, government regulations, available technology and their costs are frequently given more attention to research on transport infrastructure development, and stakeholder significance is frequently undervalued. For example, in the Estonian Energy Roadmap to carbon neutrality, it was identified that, while carbon neutrality is achievable in the heat and electricity generation sectors, it is not achievable in the transportation sector in 2040 for Estonia, even with significant investment [12]. Cooperation from all stakeholders, including government agencies that maintain order and justice, private companies that guarantee service availability, and local citizens who will be the end users of the established systems, are crucial to ensuring that the decisions made not only satisfy the majority but also achieve the objectives of decarbonization [13], [14]. For this reason, in addition to implementing best practices, the introduced innovations must be adjusted to the municipality's characteristics and the population needs to ensure meeting the municipality's climate neutrality objectives [11]. This suggests that to effectively manage travel demand, municipalities need to develop a clear transportation policy plan based on a thorough understanding of the specific travel habits of their citizens [9].

Municipalities have the potential to be agents of change and driving forces for the energy shift, but for this to happen, it is necessary to evaluate the effectiveness of various policies and their support in society [15], [16]. This signifies that to obtain noticeable results in the implementation of low-carbon mobility, it is essential to enforce policies that guarantee emission reduction and public acceptance [17], [18].

The avoid-shift-improve (ASI) framework is widely used to structure policies aimed at reducing transportation-related emissions and developing sustainable transportation. It emphasizes three key strategies: avoiding unnecessary travel, encouraging a shift to more environmentally friendly modes of transportation, and improving the effectiveness of current transport systems [19]. Studies have shown that combining all the mentioned strategies enhances their effectiveness.

While all three strategies are important, current energy and transportation policies frequently underrepresent "avoid" policies despite their potential [19] due to implementation complexities, societal resistance, and limited municipal control over land-use planning [20] According to research, citizens prefer and support visible infrastructure improvements (a shift measure) or technological improvements (improve measures) over policies that require significant changes in travel habits or patterns. This is because the implementation of mentioned measures, such as infrastructure improvements, is visible, and citizens can easily recognize tangible benefits [21] that can boost their sense of safety [22] and fairness [23]. Furthermore, large infrastructure projects are frequently associated with increased economic growth, as they can raise property prices, which can be recognized by citizens [24]. At the same time, citizens struggle to accept policies that require lifestyle and behavioural changes [25].

The literature suggests that assessing local residents' preferences is essential for determining the true effectiveness and acceptance of ASI policies, as well as providing municipalities with tailored insights required for successful implementation. This study aims to analyse travel patterns, reasons for mobility, and the choice of transportation modes in four European countries (Latvia, Estonia, Poland, and Sweden). The study offers a new contribution to the literature by analysing municipal-level mobility habits and policy choices in four Baltic Sea countries. Using survey data, this study seeks to evaluate public opinion on existing transportation policy measures, identify preferred policies, and highlight regional differences. The ultimate goal is to provide insights that will help policymakers to promote sustainable mobility and reduce transportation-related emissions. The survey was conducted within the framework of the interregional Interreg Baltic Sea region (BSR) project "CommitClimate" (Towards Energy Transition and Climate Neutrality in the BSR municipalities).

The rest of this paper is organised as follows. Section 2 contains an overview of the methodology and the characteristics of the respondents. The results are presented in section 3. Section 4 outlines the main findings, defines policy recommendations, and examines prospective future research.

2. METHODOLOGY

Within the research methodology a survey was conducted. The survey focused on public perception of municipal policies and initiatives designed to alleviate the environmental effects of the transportation sector. An online questionnaire was developed and disseminated as part of the international project across four EU member states: Latvia (Riga and Cēsis municipalities, as well as at the national level), Estonia (national level), Sweden (Jokkmokk, Pajala, Gallivare, and Kiruna municipalities), and Poland (Pałecznica municipality). The objective of the survey was to establish respondents' perceptions of how much their municipality fosters a greener way of life among its residents, as well as the changes that must be taken to achieve climate mitigation methods. One of the goals of the project is to raise residents' understanding and confidence in the importance of their behaviour and choices in the context of municipal climate neutrality.

In total, there were six sections in the survey; however, the current study includes data from the first three sections, which are explained in more detail below. The first section included questions regarding the respondents' characteristics, such as sociodemographic and household descriptions. The questions in the second section focused on respondents' travel patterns. In the third section, respondents were asked to evaluate the municipality's actions in the transportation sector and select the steps they would be willing to support in their

municipality to reduce the environmental impact of transportation. The results of the sections describing the energy sector (Section 4), waste management (Section 5) and respondents' opinions on environmental protection (Section 6) are not covered in this work.

The respondents were asked various questions, including rating questions that required them to assess their current condition with one answer and questions with one or more options, such as those regarding their most used transport mode. The respondents were also free to share their opinions on the survey topic. Such open-ended questions provide additional opportunities for respondents to highlight the most significant factors influencing transportation choices. In the policy evaluation section, respondents were asked to choose which of 20 policies they wanted to support the most. In addition, respondents had the option of suggesting their own policy instrument by selecting the 'other' option.

A total of 1151 answers were collected, including the results of 258 responders from Sweden, 500 from Estonia, 308 from Latvia, and 85 from Poland. The survey was conducted from December 2023 to January 2024. Representatives of the local government administered the survey both online and by distributing paper forms, whereas in Estonia, the survey was administrated by a third party. The questionnaire was distributed on local government social media platforms and official websites.

3. RESULTS

3.1. Characteristics of Respondents

Annex 1 describes the respondents' sociodemographic characteristics. This demonstrates that even though people of various ages participated in the study, the average age of respondents in Poland and Latvia was 42 and 43 years, respectively, which is younger than in Estonia and Sweden, where the average age was 51 and 52 years, respectively. Further analysis of the results will be based on two important parameters – the age group of the population and the place of residence – urban (that includes respondents from cities and suburban areas) and rural areas.

3.2. Travel Patterns

According to the results (see Annex 2), most respondents in Latvia and Sweden commute every day (75.6 % and 71.3 %, respectively). Similarly, in Poland, most respondents (64.7 %) commute daily. Meanwhile, only 37 % of Estonian respondents reported that they commute every day and 25.2 % chose to commute to 3–5 times a week.

Regarding the commuting causes (see Annex 3), results showed that the main purpose of travel in all four countries is going to and from work. Shopping was the second most common response, followed by recreation and entertainment. There is a major variation in Polish municipalities, where recreation and entertainment are less prevalent and accompanying travel are more common.

Annex 4 depicts the preferred transport mode and demonstrates that private road transport is the most popular transport mode in all countries. The findings also reveal that public transport usage is significantly lower in the Polish and Swedish municipalities compared to others. Residents of these municipalities complained more frequently than residents of other countries about the insufficient use of public transportation, citing the fact that it rarely arrives or does not run on the necessary routes as well as the fact that it takes too long to use. Furthermore, Annex 4 demonstrates that bicycle transportation is more popular in Sweden and Latvia than in the other municipalities studied. Private vehicles are more common in the

rural areas of Poland and Sweden, where public transportation is less accessible than in larger cities.

Table 1 shows the factors influencing respondents' choices. According to the results, most respondents prioritize comfort, convenience, and accessibility over environmental impact when choosing a method of transportation. Only 80 out of 1151 respondents (6.9 %) care about the environmental impact of their mode of transportation, with 42 from Swedish municipalities, 28 from Latvia, 9 from Estonia, and only one from Polish municipalities. The environmental effect factor was only 2 %, on average, across all nations (Table 1). Of all the factors mentioned, only 0.5 % of respondents' methods of transportation were impacted by government regulations and incentives.

TABLE 1. FACTORS INFLUENCING THE CHOICE OF MODE OF TRANSPORT

Factors	Latvia, %	Estonia, %	Poland, %	Sweden, %
Distance	19.9	19.8	22.1	21.3
Time	18.9	20.9	26.0	19.7
Comfort	11.5	18.0	19.0	12.5
Availability	11.9	13.9	13.6	16.4
Weather and season	13.1	10.7	4.7	10.5
Costs	9.1	7.7	7.0	5.3
Health and fitness	4.4	5.4	0.4	5.7
Safety	3.0	*no data	5.4	1.1
Impact on the environment	2.3	0.6	0.4	4.9
Traffic jams	4.4	1.5	0.8	0.1
Other	0.9	1.0	0.8	2.2
Government policy, incentives	0.6	0.5	0.0	0.4

* no data – the answer option "safety" was not included in the Estonian questionnaire

3.3. Municipality Rating and Policy Evaluation

Respondents rated their municipality's transportation initiatives on a scale from 1 (very poor) to 7 (outstanding). When the average rating was calculated, it was found that inhabitants of Latvia and Estonia offered higher ratings (3.96 and 3.97) than respondents from Poland and Sweden, who gave ratings of 2.98 and 2.83, respectively, out of a maximum value of 7.0 (see Annex 5). This could be explained by the fact that respondents in Poland and Sweden were largely from rural areas, where suitable public transit, infrastructure for active modes of mobility (such as walking and cycling), and service availability are more difficult to offer.

Respondents were allowed to back up their judgment by indicating what aspects of their municipality should be improved. The most notable issue was the municipality's current cycling and pedestrian routes being poorly shaped, as well as the poor condition of the public transportation system, failing to satisfy the demands of the community, and being expensive (Latvian and Swedish respondents). Residents of Latvia have also reported that road speed limits are often exceeded.

Overall, the assessment of the work of local governments varies both by place of residence and by age group. Urban residents rate the work of their local governments significantly higher than rural residents (on average 4.17 versus 3.31), which is most likely explained by better infrastructure, more visible improvements and more active communication between institutions and the public. In rural areas, lower ratings are especially observed in middle-aged groups, who are most often faced with problems with public transport, mobility and accessibility daily. In turn, young people and the older generation are generally more positive:

younger groups are more optimistic about future development opportunities, while older ones (especially in cities) recognize visible improvements in mobility and safety. This indicates that local government initiatives more often reach and are evaluated in urban areas, while in rural regions there is still a gap between policy and its practical impact. Table 2 shows the distribution of the results by age and place of residence across all countries.

TABLE 2. DISTRIBUTION OF THE RESULTS BY AGE AND PLACE OF RESIDENCE ACROSS ALL COUNTRIES

Age group	**18–24**	**25–34**	**35–44**	**45–54**	**55–64**	**65–75**	**75**	**Total**
Rural area	4.0	3.4	3.3	3.0	3.2	3.4	3.7	3.3
Urban area	4.1	4.3	4.2	3.9	4.0	4.3	4.7	4.2
Total	4.1	3.9	3.8	3.4	3.4	3.9	4.3	3.8

To improve the existing rating, respondents were offered twenty policies as well as the opportunity to propose their initiative. The results are presented in Table 3. When comparing the number of supported policies in other nations, it was discovered that, in Poland, each respondent chose an average of 2.8 replies, whereas in Estonia, Sweden and Latvia, respondents chose more support mechanisms, 3.9, 4.5 and 4.6, respectively). Furthermore, in Estonia and Sweden, respondents under the age of 45 chose one support measure more than those over 45.

TABLE 3. MOST SUPPORTED POLICIES BY RESPONDENTS IN THE TRANSPORTATION SECTOR

Policy type*	**Policy**	**Sweden**	**Poland**	**Estonia**	**Latvia**	**All respondents**
S	P.1. Improving public transport	**36 %**	**42 %**	**38 %**	**24 %**	**34 %**
S	P.2. Improvement of cycling infrastructure	**24 %**	**29 %**	**23 %**	**31 %**	**26 %**
A	P.3. Pedestrian-friendly urban planning	**21 %**	**19 %**	**18 %**	**23 %**	**20 %**
A	P.4. Promoting remote work options	**19 %**	**9 %**	**21 %**	**22 %**	**20 %**
I	P.5. Support for low-emission car purchases	10 %	4 %	**18 %**	10 %	**13 %**
S	P.6. Park-and-ride facilities	7 %	**9 %**	15 %	15 %	12 %
I	P.7. Electrifying public transport	13 %	3 %	16 %	9 %	12 %
S	P.8. Launching public awareness campaigns	**15 %**	**11 %**	10 %	12 %	12 %
I	P.9. Smart traffic management	2 %	5 %	15 %	**17 %**	11 %
I	P.10. EV charging infrastructure	11 %	5 %	12 %	8 %	10 %
I	P.11. Using data to optimize transport services	4 %	3 %	16 %	10 %	10 %
I	P.12. Navigation & route-finding apps	5 %	5 %	12 %	11 %	9 %
S	P.13. Car-sharing & ride-sharing promotion	11 %	5 %	7 %	9 %	9 %
S	P.14. Car-Free Days & Events	7 %	6 %	6 %	14 %	9 %
I	P.15. Speed reduction measures	6 %	5 %	10 %	9 %	8 %
I	P.16. Eco-driving training	6 %	5 %	5 %	6 %	5 %
S	P.17. Higher tax on polluting vehicles	2 %	5 %	5 %	6 %	4 %
I	P.18. Public education on transport & CO_2	5 %	3 %	3 %	5 %	4 %
S	P.19. Creation of low-emission zones	2 %	3 %	3 %	4 %	3 %
–	P.20. Other	5 %	5 %	0 %	5 %	3 %
S	P.21. Congestion tax	1 %	2 %	3 %	4 %	3 %

*A – avoid, S – shift, I – improve

The highlighted values show the five top rated policies in each country and for all respondents. The proposed policies were categorized by type using the Avoid-Shift-Improve approach. Table 3 shows that respondents from different countries have similar preferences for the policy instruments that they support the most. These include measures such as improving public transportation and cycling infrastructure (both from the "shift" policy category), pedestrian-friendly urban planning, and promoting remote work options (all from the "avoid" policy category). Support for improving public transportation infrastructure ranked first among respondents in three out of four countries (36 % in Sweden, 42 % in Poland, 38 % in Estonia, and 24 % in Latvia). Similarly, improving cycling infrastructure received strong support (this measure ranks first in Latvia with 31 % importance and second in Sweden, Poland, and Estonia with 24 %, 29 %, and 23 %, respectively). Among the next most popular measures, promoting remote work is particularly popular in Latvia (22 %) and Estonia (21 %). Meanwhile, pedestrian-friendly urban planning was consistently supported in all four countries (approximately 20 %).

At the same time, support for low-emission car purchases, park-and-ride facilities, smart traffic management, electrification of public transportation, improved electric vehicle charging infrastructure, and public awareness campaigns were among the top ten policy measures. Particularly notable is the comparatively higher support for measures, such as low-emission car purchases among respondents in Estonia (18 % compared to 13 % among all respondents on average), launching public awareness campaigns among respondents in Sweden (15 % compared to 12 % among all respondents on average), and smart traffic management solutions among respondents in Latvia (17 % compared to 11 % among all respondents on average).

Among the highly rated policies, Polish respondents lacked support for electrification-related initiatives, such as support for low-emission car purchases and electrifying public transport, which gathered less than 4 % approval compared to an average rating exceeding 12 % among all respondents. The promotion of remote work options received considerably less support from Polish respondents (9 % compared with 20 % among all respondents on average). Conversely, Swedish respondents exhibited greater scepticism regarding data utilization policies, as evidenced by smart traffic management, data optimization for transport services, and navigation and route-finding applications receiving less than 5 %, in contrast to an average rating exceeding 9 % among all respondents. Tax-related policies gathered notably low ratings across all countries, with support in Sweden being markedly inferior to that of other nations.

While country-level differences provide valuable insights, the analysis revealed that age and type of residence had a greater influence on the results than nationality alone. The results also indicated that the rural–urban divide was consistent across countries. Thus, rural residents prioritized practical accessibility of public transport and infrastructure for electric vehicles (EV). In contrast, urban respondents expressed greater approval for technology-based measures such as smart traffic management and data-driven optimization of transport services.

Respondent age also revealed a few correlations (see Annex 6). First, younger age groups (18–34) are more likely to support flexible and digitally oriented solutions, such as remote working options, micromobility and smart traffic management tools. This generation tend to see mobility as a personal choice and seems to be more open to innovations that provide freedom and efficiency in their daily travel habits. Middle-aged respondents (35–54) are more likely to choose measures with a direct practical impact, such as improvements to public transport or measures to reduce congestion. Although this group is not particularly supportive of formal educational measures, their responses indicate a desire for clear and practical

communication that emphasizes the true benefits of policy initiatives. Given that their lifestyle is heavily influenced by family and professional commitments, the convenience and reliability of the transportation system is especially important to them. Meanwhile, older age groups (55+) were more likely to support policies that improve convenience and accessibility (support for public transportation and safe active travel modes like walking or cycling).

Overall, age dynamics show that support for sustainable mobility goals increases with age, but motivation changes: younger groups respond more to innovation and flexibility, while older ones respond more to safety, convenience, and social justice. Across all demographic and geographic groups, restrictive fiscal measures such as congestion taxes or higher fees for polluting vehicles received the least support. This demonstrates that people prefer "carrot-type" measures, which make things easier to get to and provide better service, to "stick-type" measures, which limit behaviour or money.

4. DISCUSSION

The European Commission established the Sustainable Urban Mobility Plan (SUMP) to address mobility needs in a sustainable manner, while also incorporating sustainable transportation policies [26]. Although developing a SUMP promotes evidence-based decision making from a long-term perspective and facilitates the application of best practices to relevant policies, it presents challenges in balancing economic, environmental, and social considerations, particularly when transitioning from automobile-centric planning to sustainable transport policies [27], [28]. Municipalities face difficulties in obtaining adequate funding and stakeholder collaboration for SUMP implementation, highlighting the complexity of balancing diverse mobility requirements and policy goals.

The main contribution of this study is a comparative analysis of the mobility habits and attitudes of residents in different municipalities of the Baltic Sea region, which allows for a better understanding of the public perception and support for various transport policy measures. The results obtained provide insight into how public behavioural trends and priorities can be considered when planning and implementing transport policies at the municipal level, even if no direct statistical analysis of the relationships between the profiles of individual respondents and their choices is performed.

4.1. Factors Affecting Travel Mode Choice

Climate neutrality is a significant trend currently being addressed by municipalities. The transport sector is particularly crucial, as it frequently represents the primary source of CO_2 emissions in municipalities and necessitates a thorough decarbonization strategy. The results from Table 1 indicate that direct environmental and climate factors are among the least significant considerations for residents when selecting a mode of transportation – they were outweighed by distance, travel time, comfort, and availability. Thus, climate neutrality in municipal planning should result in better solutions in areas related to these factors.

Despite the widespread belief that prices are a major motivator for people's commutes, the survey results show that prices do not rank among the top five factors that influence people's choice of mode of transportation. As other authors point out, customers frequently choose private transportation due to the "cost of inconvenience" [29], [30]. For example, studies show that travel time is more important than travel costs when choosing a transport mode; therefore, people in places with longer public transport travel times prefer private transport [31]. Meanwhile, public transport is more likely to be chosen when its in-vehicle time is comparable or shorter than private cars [32], [33]. Another important factor to consider

is travel comfort, considering that higher-income people value travel comfort together with waiting times as barriers to public transportation use, according to studies [29], [34]. In addition, commuters' transportation options often depend on availability, which describes whether active or public transport options are available for the commuter [35]. Rural municipalities often struggle to build sustainable transport networks because of their low population density and per capita income [36]. Investments in infrastructure that improve accessibility can lead to better transport-mode decisions [37].

Our survey results are consistent with the other factors described in the literature that influence transport mode selection. According to survey data, weather and season are rated relatively high (10.5–13.1 % importance factor in three of the four countries). From a policy implementation standpoint, it should be noted that weather and season may limit active transportation modes under adverse weather conditions [38]. Health and fitness, which provide both mental and physical advantages to active transportation users, are frequently cited in the literature as the motivating factor [39]–[42]. At the same time, according to the survey results, its importance varies by country, ranging from 0.4 % in Poland to 5.7 % in Sweden. This suggests that policymakers and stakeholders can educate residents on public health, emphasizing the importance of active mobility in improving health. This approach may also allow the benefits of climate change mitigation to be realized through the lens of health promotion.

Environmental impacts, traffic congestion, government incentives, and other barriers are among the factors that influence travel mode choice. Traffic jams are closely related to travel time. It is possible that some respondents factored this in their travel time calculations. However, as [43] pointed out, because of their psychological impact, traffic jams may be viewed as a source of concern, causing some people to avoid cars or crowded roads. It should also be noted that the survey was conducted in a variety of locations, including rural municipalities; therefore, traffic jams may not be a current issue, as they are often local and time-specific, such as during peak hours.

The impact on the environment can be defined as a decision-influencing factor because environmentally conscious people prefer public transportation to cars [44]–[46]. However, according to the survey results from the respondents, this factor is of minor importance. This is consistent with the findings of other studies, which show that environmental considerations frequently play a secondary role unless they are linked to economic incentives or regulations [38]. These results indicate the possibility of mitigating CO_2 emissions from transportation by addressing environmental concerns. However, to achieve significant improvements, further efforts are required to increase environmental awareness, as the survey indicated low interest among locals in these matters. This was also demonstrated by policy evaluation, which found that public education regarding transport and CO_2 emissions was one of the least supported measures.

Lastly, the travel mode choice influencing factors are government initiatives, as the government has legislative, financial, infrastructure, and information campaign power to create a sustainable transportation system. The government influences people's opinions when it promotes the implementation of decarbonisation targets. Long-term planning is needed to maintain stability and public trust, as studies have linked faith in government to activism, support for government programs, and willingness to pay for broad climate and environmental policies [47]. Citizens' choices are also affected by their perception that policies affect their daily lives [47]. If they do not feel understood, they were less likely to support certain policies. The survey results showed that, among the factors influencing the choice of transport mode, government initiatives were rated the lowest. This is an interesting result that can be explained in several ways. First, respondents may have lacked awareness

because they were not fully aware of the existing government initiatives or did not consider them relevant to their daily transportation choices. Furthermore, such responses may reflect the respondents' assessment, emphasizing the possibility that government efforts are insufficient, poorly executed, or slow to produce tangible results, resulting in a lack of trust or interest in such initiatives. Furthermore, respondents may not fully understand the meaning of this term.

4.2. Insights for Policy Makers

These survey results provide valuable insights for policymakers. First, policies should aim to make environment-friendly transportation alternatives more competitive with private cars in areas that have the greatest influence on mode selection. This is demonstrated by both the residents' perspectives on municipal problems (e.g., pedestrian safety, public transportation availability, and quality) and the outcomes of the most highly rated policy measures. Among the "shift" policies, those aimed at improving public transportation and cycling infrastructure received particularly strong support, ranking among the top five in all the surveyed countries. This suggests that with appropriate infrastructure investments, there is a significant opportunity for modal shifts from cars to public transport and cycling. As the primary reason for residents' travel is work commuting, both public transportation and cycling infrastructure should provide this option. Efforts to improve public transport include increasing frequency during peak hours, increasing comfort and punctuality, and reducing the distance to stops [48], [49]. Although educational measures received relatively low public support, campaigns to encourage carpooling, public transportation, and remote work can help to reduce reliance on private automobiles. One strategy could be to target young adults and middle-aged groups for active transportation initiatives because they are more mobile and adaptable to new habits [50].

There is also great potential for "avoid" measures. Although the proportion of "avoid" policies was the smallest of the measures proposed, both measures ranked third or fourth among the most supported policies across the four countries. From a local government perspective, these approaches comprehensively represent broader policy interventions aimed at reducing travel demand, such as flexible work schedules (cooperation with employers), digitalization, compact city planning, and improved local accessibility, indicating a preference for urban environments that reduce the need for motorized transportation. The recognized prevalence of remote work highlights the need for enhanced digital infrastructure and regulations that promote long-term mobility, including that of remote workers.

The second important conclusion is that the population needs to be more aware of the societal and individual benefits of environmentally friendly transportation solutions (e.g., improved air quality and health benefits). The survey results show that neither the environment nor health is a significant determinant of transportation mode choice. This is also supported by respondents' preferences for related policy instruments. The least supported policies include raising taxes on polluting vehicles, imposing a congestion tax, educating the public about transportation and carbon emissions, and establishing low-emission zones. It could be argued that the least supported policies are due to their nature: they primarily represent the so-called "stick" approach, which puts additional burdens on users. At the same time, this demonstrates that respondents do not regard private car use as a significant issue that contributes to air pollution and congestion and should be addressed as a priority.

There is another factor to be considered in relation to these policies. All countries showed low support for measures that imposed direct restrictions or financial penalties such as congestion charges or increased taxes on polluting vehicles. This emphasizes the importance of carefully assessing the need and scope of such measures to avoid generating excessive

"pushback" from society [51]. According to the survey results, only a small proportion of respondents in all countries supported the establishment of low emission zones in their municipalities. This support was particularly low in rural areas, where the introduction of such solutions is unlikely to be necessary or considered a priority due to the low traffic intensity in cities. Simultaneously, policy documents in Poland and Latvia discuss establishing low-emission zones in cities to improve air quality while minimizing negative environmental impacts [52], [53]. A comparable situation exists for policies aimed at educating citizens. A small proportion of the respondents supported the creation of educational campaigns and seminars on transportation emissions. In contrast, policy-planning documents explicitly emphasize the importance of educating citizens about environmentally friendly and sustainable transportation. These examples highlight society's low support for the currently planned policy instruments. In conclusion, people's willingness to accept political decisions is frequently influenced by the perceived benefits of innovation. This highlights the importance of governmental bodies collaborating with individuals because enforcing overly strict regulations on an unprepared society can result in a "pushback" effect. Thus, increased social opposition to unpopular policies could push the target back by a decade, and when combined with the more difficult-than-expected implementation of key measures, the target would be missed [51].

The survey results confirm the challenge of decarbonizing the transport sector, which is based on several issues that must be addressed, such as infrastructure limitations, public resistance, and available funding, which may vary from municipality to municipality, considering geographical conditions, population density, and previous achievements in developing a green transport system. For example, the large disparity in family size, with Polish towns averaging 4.3 people per home versus 2.5–2.6 in other countries, demonstrates that transportation needs vary. Larger families may require more affordable family transportation options, such as family discounts on public transportation and safe, spacious options for group travel in rural and suburban areas. Prioritizing green last-mile options in rural areas, such as e-bikes or electric scooters, could help people living outside of cities bridge the transportation gap. Urban areas, on the other hand, may prioritize congestion reduction through policies that encourage public transportation use and reduce vehicle reliance. In general, municipalities should implement robust monitoring systems that use indicators such as modal shifts, travel satisfaction, and emission reductions to continuously assess and improve the effectiveness of their policies, allowing for timely adjustments to strategies.

5. CONCLUSIONS

This article describes the results of a survey in four countries of the Baltic Sea region with 1151 respondents. The purpose of the survey was to gain insights into the citizens' vision of the transport sector moving towards climate neutrality in the context of their current travel habits, the current situation in municipalities and the existing support for policy measures.

A review of the literature revealed that citizens' willingness to accept a political choice is typically influenced by the perceived advantages of the innovation. According to the study results, time and distance are the most significant factors influencing the type of mobility chosen by respondents from Latvia, Estonia, Poland, and Sweden, and the primary reason for citizens' movement in all four countries is going to and from work. Most respondents ranked their municipality's measures to promote transportation sustainability as average or worse. The main issues raised by respondents in the municipal transportation sector are the infrequent operation of public transportation and a lack of pedestrian and cycling pathways.

The most suggested measures, supported by 20–34 % among all respondents on average in all countries, were improving public transportation, cycling infrastructure, pedestrian-friendly urban planning, and encouraging remote work options to reduce the need for daily commuting to and from work. The increase of a congestion charge was the least popular choice. Comparing these results by respondent age group and type of residence, it was determined that the same response trends persist, indicating general support for structural and accessibility-oriented solutions over restrictive or educational measures.

There were differences between urban and rural residents, with the former being slightly more supportive of technology-based traffic-calming measures and remote work options (improve and avoid measures), whereas the latter were slightly more interested in the development of public transport and EV infrastructure (improve and shift measures). Respondents from rural areas were also more likely to support public information and education campaigns, which is likely due to their age. Analysing the responses by age group reveals that people aged 45 to 64 are slightly more supportive of such measures, and this age group accounts for most respondents surveyed in rural areas.

Municipalities should strategically employ the ASI framework, prioritizing investments in public transport and active mobility infrastructure (Shift), encouraging remote work and compact urban planning (Avoid), and meticulously implementing technological improvements (Improve) in areas where infrastructure constraints restrict efficient modal shift. To guarantee that the policies implemented are effective and acceptable, they must be regularly monitored and evaluated based on data. This will ensure that the policies are closely aligned with the expressed wishes of citizens and local needs.

The study highlighted actionable insights for policymakers in many areas of action to solve the transportation-related challenges reported by respondents.

5.1. Limitations

This survey attempted to provide policymakers at the municipal level with a broader picture of population mobility issues. As part of the Interreg BSR *CommitClimate* project, this activity contributed to a better understanding and justification of the assumptions used in climate neutrality modelling tools, recognizing the critical need to supplement technical calculation tools with a social and behavioural perspective. However, the study has some limitations. First, the study's findings are based on survey results from specific municipalities (except for Estonia). Each has its own unique characteristics (for example, geographical location or economic development), so surveying other municipalities in the same country will yield different results. At the same time, the survey demonstrates that it is possible to conduct analysis and collect data for future research in this manner and that other municipalities can learn from this experience to engage their residents. Second, the number of respondents in some territories is deemed insufficient. Future studies would require the development of guidelines for reaching the population (particularly in rural areas where Internet services and social media are less widely used or where the proportion of older respondents is higher). Third, because the survey is based on self-reported data, the results may be influenced by response bias, which occurs when participants fail to correctly represent their travel patterns or beliefs due to social desirability, misunderstanding, or recollection bias. Potential risks of sampling bias related to distribution channels, age group representation, and self-selection have been considered, but the data were not weighted because the level of coverage across municipalities was uneven. Although the survey was designed to reduce these biases, future research might integrate survey data with objective travel behaviour data (e.g., GPS tracking or trip diaries) to provide a more complete picture.

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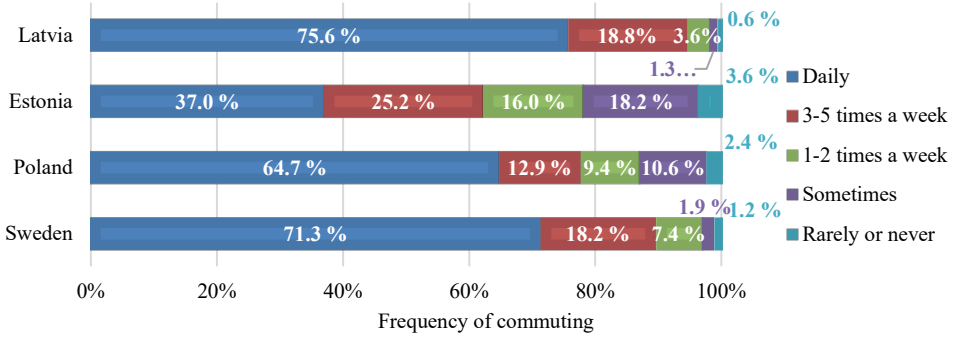
ANNEX

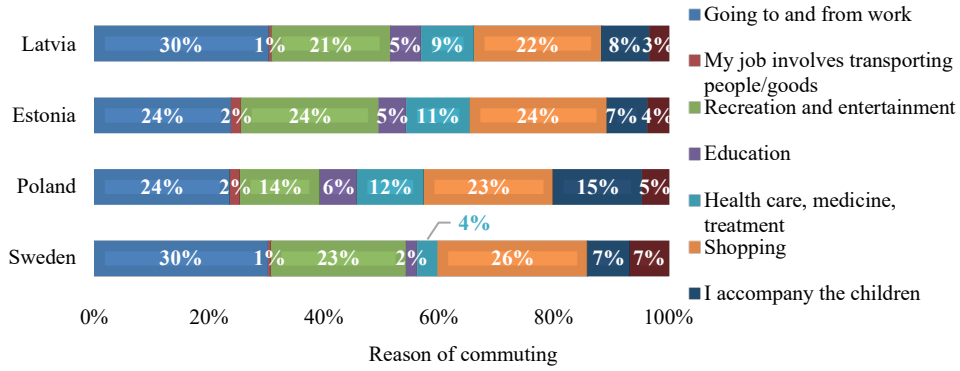
Annex 1. Sociodemographic information about the respondents

	Sweden	Poland	Estonia	Latvia	All countries
Respondent's age					
18 – 24 years	1.6 %	4.7 %	7.4 %	10.4 %	6.7 %
25 – 34 years	11.2 %	23.5 %	16.2 %	23.4 %	17.5 %
34 – 44 years	19.0 %	37.6 %	18.4 %	22.7 %	21.1 %
45 – 54 years	22.1 %	21.2 %	16.8 %	19.2 %	18.9 %
55 – 63 years	30.2 %	8.2 %	15.8 %	17.5 %	18.9 %
64 – 74 years	12.8 %	2.4 %	13.8 %	6.5 %	10.8 %
75 and more	3.1 %	2.4 %	11.6 %	0.3 %	6.0 %
Current employment status					
Full-time employee	79.5 %	60.0 %	51.2 %	79.2 %	65.7 %
Part-time worker	4.3 %	4.7 %	9.8 %	3.9 %	6.6 %
Student	1.9 %	3.5 %	4.6 %	4.9 %	4.0 %
Retired	11.2 %	8.2 %	24.0 %	6.2 %	15.2 %
Home duties	0.8 %	18.8 %	6.0 %	2.3 %	4.8 %
Other	2.3 %	4.7 %	4.4 %	3.6 %	3.7 %
Number of people in the household					
1	20.5 %	2.4 %	20.4 %	21.8 %	19.5 %
2	37.6 %	7.1 %	38.6 %	33.1 %	34.6 %
3	19.8 %	17.6 %	19.6 %	19.5 %	19.5 %
4	17.1 %	32.9 %	12.2 %	17.9 %	16.3 %
5	3.9 %	20.0 %	6.2 %	4.2 %	6.2 %
6	0.8 %	9.4 %	2.0 %	2.9 %	2.5 %
7	0.0 %	9.4 %	0.8 %	0.0 %	1.0 %
8	0.0 %	1.2 %	0.0 %	0.3 %	0.2 %
8 and more	0.4 %	0.0 %	0.2 %	0.3 %	0.3 %
Number of children and teenagers (<16 years) in the household					
0	66.7 %	24.7 %	70.8 %	62.7 %	64.3 %
1	17.1 %	24.7 %	14.2 %	21.1 %	17.5 %
2	13.6 %	40.0 %	10.2 %	13.3 %	14.0 %
3	1.9 %	8.2 %	4.0 %	2.6 %	3.5 %
4	0.8 %	1.2 %	0.4 %	0.0 %	0.4 %
4 and more	0.0 %	1.2 %	0.4 %	0.3 %	0.3 %
Housing location					
City	10.9 %	0.0 %	57.1 %	67.2 %	45.1 %
Suburban area	3.1 %	1.2 %	11.3 %	8.1 %	7.8 %
Rural area	86.0 %	98.8 %	31.5 %	24.7 %	47.1 %
Type of housing					
Private house	73.3 %	98.8 %	40.2 %	41.2 %	52.2 %
Apartment building with up to 9 apartments	10.5 %	0.0 %	8.4 %	7.5 %	8.0 %
Apartment house with 10 or more apartments	15.5 %	0.0 %	48.8 %	49.7 %	38.0 %
Another type of housing	0.8 %	1.2 %	2.6 %	1.6 %	1.8 %
Homeowner					
For you/your family member	73.6 %	95.3 %	90.8 %	75.0 %	83.1 %
Privately rented	7.8 %	0.0 %	7.0 %	22.4 %	10.8 %
Rented by the municipality	16.3 %	0.0 %	0.2 %	1.0 %	4.0 %
Other	2.3 %	4.7 %	2.0 %	1.6 %	2.2 %
Housing area					
Average value	*118*	*157*	*91*	*96*	*103.5*
Up to 50 m^2	3.5 %	2.4 %	19.6 %	22.3 %	15.4 %
From 50 to 100 m^2	31.4 %	15.5 %	47.8 %	44.0 %	40.7 %
More than 100 m^2	65.1 %	82.1 %	32.6 %	33.7 %	43.9 %

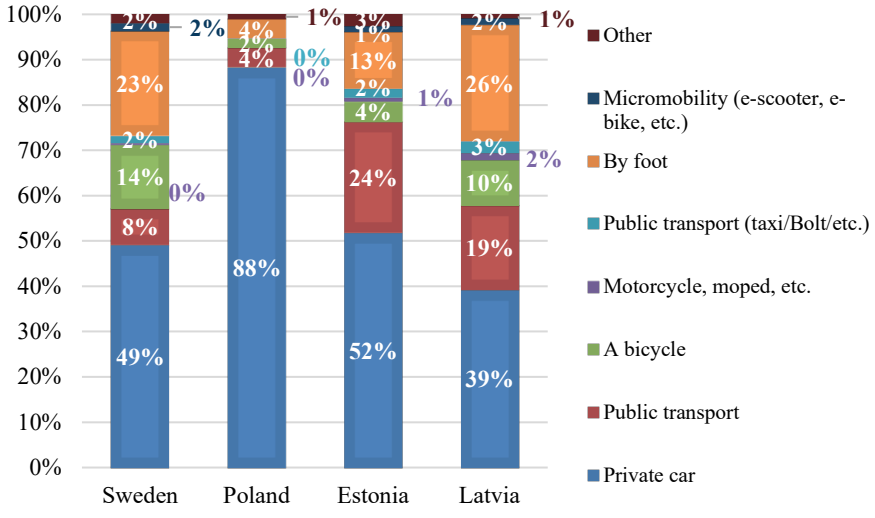
Annex 2. Frequency of commuting



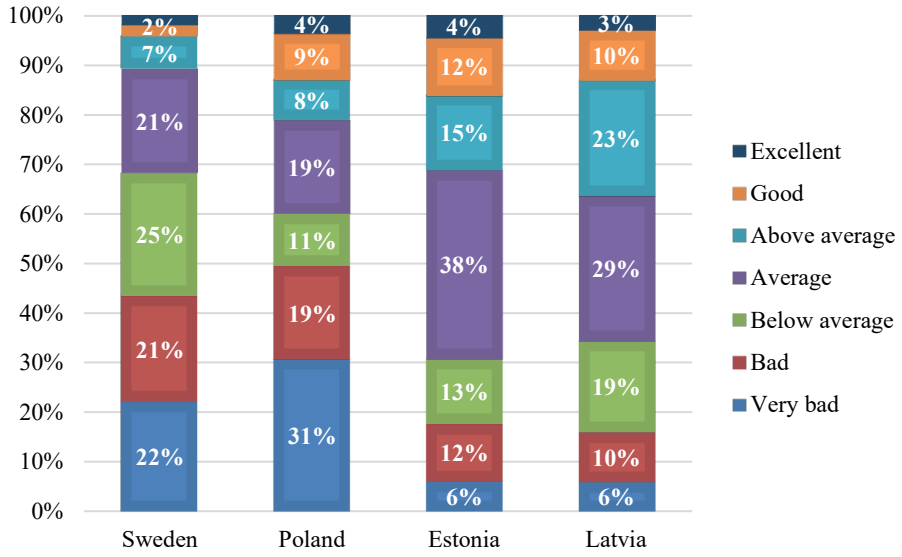
Annex 3. Comparison of the transportation causes



Annex 4. Respondents' preferred transport mode



Annex 5. Evaluation of the municipality by respondents



Respondents answer the question "To what extent the availability of services, infrastructure, municipal initiatives, etc. promote environmentally friendly movement in your municipality, what assessment would you give?"

Annex 6. Distribution of policy support across age groups in rural and urban areas

Policy Nr.	Age group of respondents from rural areas							Age group of respondents from rural areas						
	18–24	25–34	34–44	45–54	55–63	64–75	75+	18–24	25–34	34–44	45–54	55–63	64–75	75+
P.1	10	16	17	18	18	17	22	12	10	12	10	13	14	18
P.2	7	9	9	8	9	5	4	10	9	9	9	9	11	4
P.3	4	4	3	3	3	3	3	5	8	8	8	8	4	6
P.4	9	12	14	13	13	9	3	10	10	12	11	10	8	6
P.5	6	5	4	6	6	4	2	4	5	6	4	3	2	0
P.6	11	7	7	8	9	13	23	7	10	14	17	17	18	30
P.7	4	3	2	2	2	4	1	3	3	1	2	0	0	0
P.8	4	5	6	8	6	8	3	3	4	4	5	4	5	3
P.9	3	5	5	4	3	3	1	7	4	4	4	2	2	2
P.10	6	4	5	5	5	4	7	4	4	2	2	2	3	2
P.11	0	0	0	0	0	0	0	2	1	0	0	0	0	0
P.12	3	0	1	1	0	1	2	4	1	0	1	0	2	0
P.13	3	3	2	2	2	3	3	1	4	2	2	3	5	6
P.14	7	5	5	6	4	6	4	5	4	5	6	4	5	8
P.15	8	3	4	3	3	3	5	5	6	5	6	7	4	3
P.16	6	6	4	4	5	4	2	5	5	6	6	7	6	3
P.17	2	3	2	2	3	5	3	3	2	2	2	1	2	1
P.18	3	1	1	0	0	0	1	2	1	1	1	1	2	1
P.19	5	3	2	2	3	3	2	3	2	1	1	3	2	2
P.20	2	6	5	5	5	7	7	5	5	6	5	6	4	7

Respondents' support for policy measures by age group and place of residence.
(policy numbers correspond to those in Table 1).