Tested approaches for the collection of data on active modes and lessons learned

Experiences from the implementation and evaluation phase of local pilots

SUMPs for BSR - Enhancing Effective Sustainable Urban Mobility Planning for Supporting Active Mobility in BSR Cities

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Project note

SUMPs for BSR project supports cities shifting their planning practices towards people-centered sustainable urban mobility planning focusing on active mobility modes to fight the climate crisis. The project aims to increase the uptake of Sustainable Urban Mobility Plans (SUMP) as a strategic tool for sustainable mobility planning by developing tools and offering extensive capacity building for local authorities, especially in small and mid-sized BSR cities. A common framework on monitoring and evaluation for sustainable urban mobility planning will be developed to set up sound local processes suitable to smaller cities. Together with a unified model for testing and experimenting with innovative mobility solutions, it will help to evaluate the performance of the local mobility system and to provide crucial information for planning and decision making.

Contents

1. Introduction

The SUMPs for BSR project aims to increase the uptake of Sustainable Urban Mobility Plans (SUMPs) as a strategic tool for sustainable mobility planning for local authorities, especially in small and medium-sized Baltic Sea Region (BSR) cities. The focus is especially on the key topics of the project: the harmonisation of monitoring and evaluation approaches across borders for sustainable urban mobility planning, better recognition of active modes as key components of local mobility systems, and the promotion of small-scale experiments as a strategic mobility planning tool to promote active mobility. These topics have been identified as challenging for the cities in the need assessment conducted in the framework of the preceding seed money project and during the SUMPs for BSR project, both supported by the Interreg Baltic Sea Region Programme.

The SUMPs for BSR project enabled project partners – Cēsis (Latvia), Gävle (Sweden), Gdynia (Poland), Greifswald (Germany), Panevėžys (Lithuania) and Turku (Finland) from the Baltic Sea Region – to carry out small-scale experiments and data collection pilots. Current report focuses on data collection pilots, their outcomes and lessons learned.

Data collection pilots are crucial components for advancing active mobility measures in urban areas. These approaches allow cities to test, refine, and evaluate the impacts of new initiatives before committing to large-scale implementations, which is essential in environments where resources and public support may be limited. Data collection pilots provide the quantitative and qualitative insights needed to make informed decisions. Active modes of transport, such as cycling and walking, have often lacked comprehensive data to support their wider implementation, making it difficult for decision-makers to justify investments in these areas. Data pilots bridge this gap by supplying accurate, real-time information about the usage patterns, preferences, and challenges associated with active modes of transport. These pilots allow cities to evaluate the effectiveness of measures such as new cycling lanes, bicycle tracks or mobility hubs, and provide a clearer picture of their impacts on mobility, city environment, and emissions. Also, pilots give input to develop or implement cities´ strategical documents in a field of sustainable mobility.

Therefore, data collection pilots are vital tools for cities to strategically develop and implement active mobility measures. They help ensure that sustainable mobility interventions are grounded in solid evidence, minimize risks, and create opportunities for broader stakeholder engagement, all of which are crucial for the successful integration of active modes into urban mobility systems.

This document describes data collection pilots in the partner cities. While earlier report and case studies concentrated on preparation phase of pilots (Käger, M., Ling, K 2024), current report focuses on implementation and evaluation phase. Summary of implementation and evaluation phase of pilots is followed by separate chapters that describe the project partners´ pilots as case studies (deliverable 2.2 "Tested approaches for collection of data on active modes and lesson learned" of the SUMPs for BSR project). To support other cities in the region to pilot their ideas, the focus of the document is on the key elements of success and learning points from the implementation and evaluation phase of the pilots. However, as preparation is a key of success, several learning points come back to that phase as well.

2. Process of data collection pilots

The first year of the SUMPs for BSR project concentrated on developing city partners´ pilot ideas. This was done bearing in mind the lacking skills and capacities of cities to adopt SUMPs, to pilot different measures to reach goals, and to monitor and evaluate the impacts of the planned actions. To support partners in developing their ideas and in collecting learning points from the preparation phase, the process described in figures 1 and 2 was used.

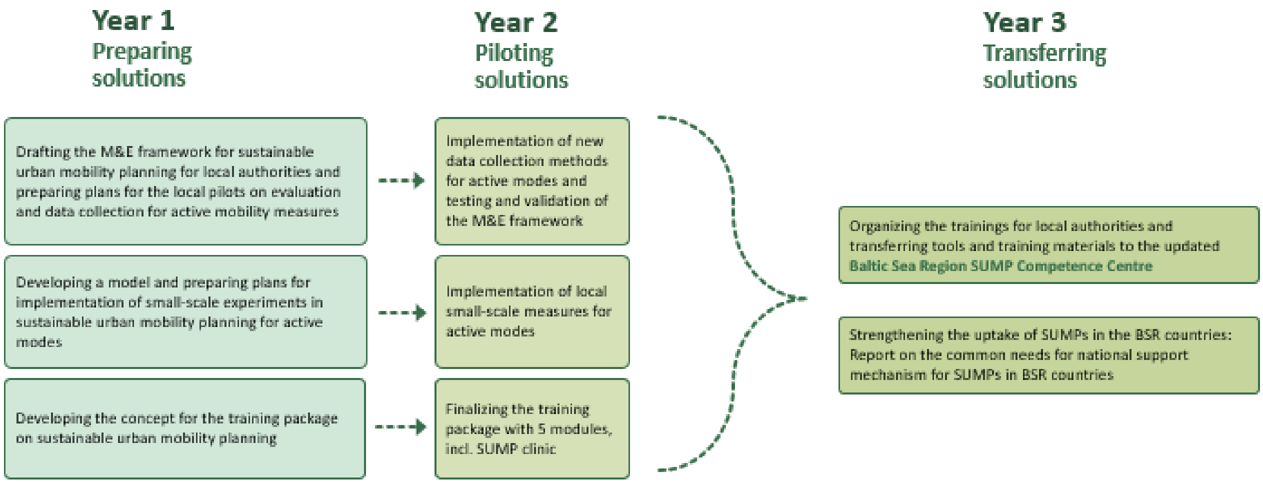

Figure 1. The process of the project

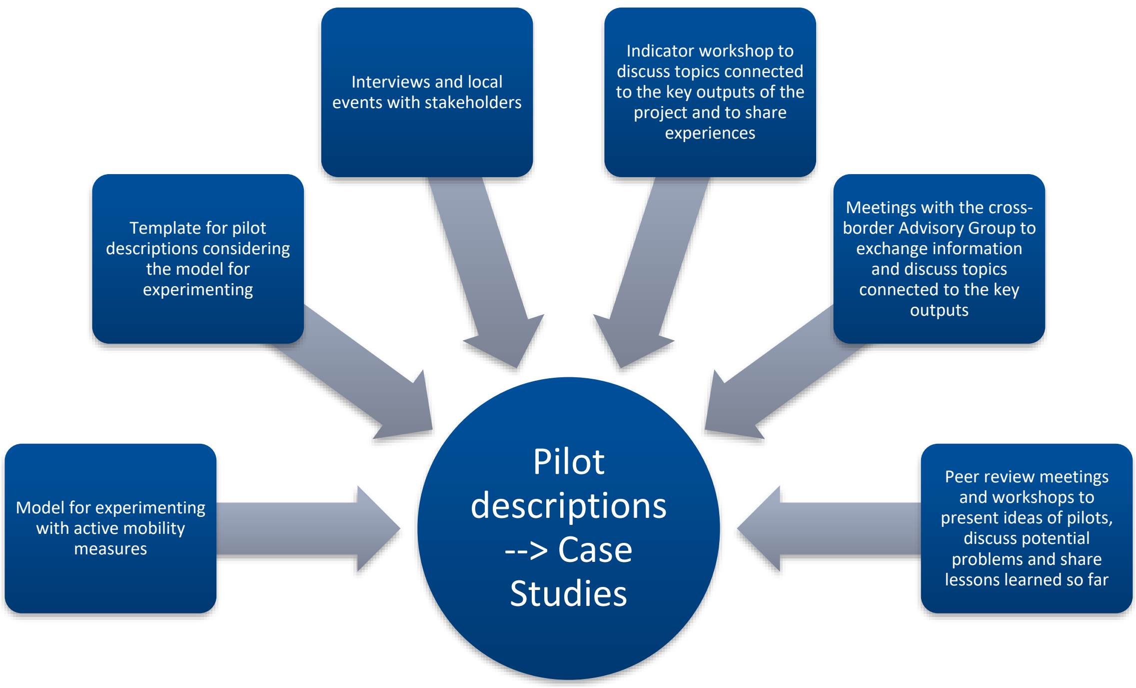

Figure 2. The process of developing and implementing pilots

The process for developing the pilots started based on the [Model for experimenting with active mobility measures](#) (UBC Sustainable, 2024). Pilot descriptions were modified continuously based on all activities carried out during the project. Peer review meetings were held to allow partners to share their progress, exchange ideas and solve problems together. Depending on the status of the pilot and the needs of the partners, peer reviews were held in bigger or smaller groups. In a preparation phase meetings had a specific topic, e.g. target groups, engagement, changing mobility habits and nudging, monitoring and evaluation of pilots, indicators, lessons learned. Some of the peer reviews were held face-to-face, some online through Teams.

One important part of the preparation and implementation phase has been changing experiences and providing feedback to each other's pilots. Partners have had time to ask questions from the partners and commenting on their descriptions, preliminary case studies or current state overviews during the meetings or between the meetings. Based on the feedback, partners modified their pilot descriptions and activities where appropriate. At the end of the implementation and evaluation phase, the pilot descriptions were summarised as **Case Studies concentrating on the learning points from the implementation and evaluation phase and on aspects that are critical for the success of data collection**.

3. Summary of data collection pilots

The following chapters present summary of pilots and case studies (see table 1 and chapter 4) that aim to give a short overview of the most important aspects of data collection pilots. The aim is to increase awareness about different data collection methods and aspects of success to strengthen the uptake and implementation of SUMPs in the BSR countries.

Table 1. Pilots of data collection

City, country	Content of the pilot
Cēsis, Latvia	AI-based mobility data collection
Gävle, Sweden	Data collection with mobile application
Gdynia, Poland	Collecting data on the transport behaviour of high school pupils through e.g. surveys, educational campaign, manual counting, and camera observations i.e. Intelligent Transport Systems (ITS)
Greifswald, Germany	Traffic counting with sensors, observation and surveys
Panevėžys, Lithuania	Using open data sources, surveys in the school communities and real-life laboratory and instrumental research
Turku, Finland	Creating a citizen panel and developing measuring focusing on cyclists and pedestrians

3.1. Objectives of the pilots

All pilots had a number of shared objectives that reflected their ambitions to use data collection as a means of gaining insights into the various modality modes in their municipalities. The common objectives include:

- **Closing gaps in active mobility knowledge by collecting new data** on how people move and travel (especially walking and cycling, and in some cases additional modes).
- **Strengthening municipal capacity to collect, analyse and use mobility data for evidence-based decision-making**, including building or improving the internal processes needed to work with the data.
- **Piloting and learning from specific data-collection approaches (often combining methods)** so the municipality can understand the feasibility and reliability of the data, and how the data can support planning and monitoring over time.
- **Collecting data to support mobility planning and mobility actions' evaluation**, including understanding patterns, barriers and infrastructure use in ways that can inform future measures and monitoring.
- **Engaging stakeholders into mobility analysis** by collecting their experience or engaging them in data collection.
- **Piloting new technologies or data integration methods.**

3.2. Pilots' activities

The municipalities implemented a range of pilots, each tailored to the specific needs and circumstances of their municipality. In general, the pilots can be categorized into five large groups based on the key approach they took to data collection (Table 2).

Table 2. Summary of data collection methods

Data collection method	Municipalities	Description
Fixed-location automated monitoring (AI cameras, counting stations, and sensors)	Cēsis, Gdynia, Greifswald, Turku	These cities deployed automated systems at selected locations to count and classify road users. This ranged from AI-enabled cameras and relocatable counting stations to sensors distinguishing different user types (including e-scooters in Turku).
Mobile/device-based tracking to generate trip and activity datasets	Gävle, Gdynia, Greifswald	This group used tools carried by participants (or mounted on bicycles) to capture movement or exposure-related information. Gävle used a GPS-based mobile app with visual analytics; Gdynia used an app-based competition to record cycling activity during the campaign; and Greifswald tested bike-mounted sensor devices (Bike Sense Box).
Manual observation, validation, and complementary measurements	Cēsis, Gdynia, Greifswald, Panevėžys, Turku	Several pilots used manual work to validate automated outputs or to collect data where automation was not used/feasible: manual observations/counts (including near schools), photographic documentation of bicycle parking use, repeated observation rounds to improve reliability, and environmental measurements such as noise (and reported air-quality measurement activity in Panevėžys). Turku used manual counts to monitor sensor data quality against existing counters.
Surveys, workshops, panels, and other structured qualitative input	Cēsis, Gävle, Gdynia, Greifswald, Panevėžys, Turku	Most pilots paired quantitative monitoring with qualitative inputs to interpret behaviour, motivations, barriers, satisfaction, or perceptions. Examples include city-wide school surveys and workshops (Gdynia), QR-based user questionnaires (Greifswald), surveys via school platforms (Panevėžys), and a multi-session citizens' panel plus end survey (Turku). In Cēsis, interviews were used mainly to interpret and validate machine-learning results rather than broad public engagement.
Competitions and behaviour-oriented campaigns	Gävle, Gdynia, Panevėžys, Turku	Some cases explicitly combined data collection with more competition-based engagement formats intended to motivate participation and/or active travel: Gävle used app-enabled visualisation and rewards; Gdynia ran a school cycling promotion campaign with an app-based competition; Panevėžys carried out campaigns encouraging active mobility in schools; and Turku's citizens´ panel format included site visits and dialogue with experts, with feedback documented after sessions.

3.3. Stakeholders and interaction activities

Across the six pilots, **the stakeholder engagement patterns followed a similar pattern**: the municipality typically involved multiple departments (for example, planning, traffic, IT, procurement, communication), while external parties were engaged where specialist capacity was needed (such as app providers, technical contractors and external experts). In parallel, each pilot identified their end-users or those most impacted by the pilots' activities (for example, residents near pilot sites, cyclists and other road users, employees, or school communities).

A common approach was to **work through intermediary organisations** to reach participants efficiently, for example:

- Gävle relied on **climate contract companies** as intermediaries to engage employees, with company representatives supporting information distribution and participation.
- Gdynia's engagement was anchored in **schools**, where administrations and teachers supported survey distribution and pupil participation.
- Panevėžys similarly centred engagement on **school communities** (students, teachers and parents), alongside municipal departments and NGOs.
- Turku broadened this model by asking **organisations representing different population groups** (such as children, immigrants, seniors, cyclists and entrepreneurs) to nominate participants for its citizens' panel.

As for the various interaction activities used, these were mostly 1) types of structured qualitative input (surveys, workshops, panels) and 2) competitions or campaigns (see more in Table 2). Many municipalities were also **in tight day-to-day contact with their stakeholders**, which mostly used digital and on-site mechanisms: email/newsletter communication and digital meetings via intermediaries (Gävle), email communication and coordination meetings with teachers plus field visits (Gdynia), emails and phone calls to school administrations (Panevėžys), and QR-code surveys and on-site notices at installations (Greifswald). Turku additionally used emails, phone calls and reminder messages to maintain attendance, and shared meeting summaries afterwards to confirm participants' comments were captured accurately.

Privacy and transparency considerations were also important for the pilots and several municipalities chose to inform the locals of the data collection activities, e.g. Gävle signing a data protection agreement and Turku informing the families near sensor sites and making the gathered data publicly available.

3.4. Evaluation and monitoring activities

In SUMPs for the BSR project, evaluation and monitoring activities had several layers:

1. At first, partners had to define their current gaps in monitoring sustainable mobility. Based on these gaps, the municipalities chose data collection methods as a pilot to test within the framework of the project.
2. Partners had to monitor and evaluate their activities using the chosen methods.
3. Partners also had to evaluate the data collection activities themselves to be able to adjust or modify them, if needed.
4. Partners had to analyse the data that was collected through the data collection pilots to practice data analysis and to evaluate the impact of these activities on sustainable mobility.

While all pilots aimed to fill in the gaps in existing data and evaluated their interventions, the approaches differed. After comparing the pilots and their outcomes, it is clear that three factors most impact the outcome of evaluation. These are:

1. **Monitoring changes in sustainable mobility must be built on existing gaps and predefined indicators**: start by identifying the specific data gaps and the planning questions the municipality needs to answer, then define indicators and only then, as a last step, choose tools and methods. This ensures that monitoring provides inputs into topics that are most relevant to your city.
2. **Data triangulation helps validate findings** (see more in the following subchapter): combine multiple methods (typically, a quantitative approach with a qualitative one) and explicitly plan how they will cross-check and validate one another.
3. **Making adjustments along the way is to be expected, so take notice**: monitoring activities carried out, engaging stakeholders and target groups proactively, and modifying activities based on the input received, are essential. This ensures that you notice on time if something is not working or is not giving you reliable information and you have the possibility to make needed modifications to have a successful project.

3.5. Success stories and best practices

There were many factors that made the data pilots successful, highlighting the best practices that can be replicated in the future. Broadly, these can be divided into three categories based on the approach taken or its multi-faceted impact on the municipality or participants:

1. **Establishing robust, replicable monitoring approaches** (notably through multi-method combinations and structured indicator use).
    a. Several cities reported that the pilots created unique value through **establishing monitoring approaches**, improving the municipality’s knowledge of monitoring, and generating data that can be used for decision-making.
    b. A clear common trend in best practice is **methodological triangulation**: combining multiple data sources to create a more “complete picture” and increase confidence in the results. This was a success in Gdynia (surveys + observations + AI tools), Greifswald (video + radar + manual counts + surveys), Panevėžys (surveys + repeated observations + measurements, structured through result/effect/impact indicators), and Turku (quantitative sensors complemented by citizens’ panel insights).
2. **Achieving effective cooperation with key stakeholder groups** (especially schools, residents, and participants/users).
    a. Another cross-cutting success theme is **strong stakeholder cooperation and purposeful communication to sustain participation and trust**. The case studies repeatedly point to the value of working through existing communities or channels: high survey participation and close cooperation with school staff in Gdynia; efficient use of the TAMO school platform and consistent outreach in Panevėžys; continuous dialogue with users in Gävle; and Turku’s citizens’ panel creating constructive dialogue, supported by regular communication and follow-up summaries.
3. **Increasing municipal capability and creating valuable assets** (skills, internal coordination, and in some cases permanent or reusable monitoring infrastructure) that can support ongoing SUMP implementation and evaluation.

3.6. Challenges and deviations

All cities experienced obstacles during planning and implementation of their data collection pilots. The tight scheduling, issues with technology, or administrative questions posed challenges that occasionally affected the implementation of the pilot. Broadly, these challenges can be divided into five major categories:

1. **Resourcing, internal coordination, and time pressure** (Cēsis, Gävle, Gdynia, Greifswald, Panevėžys, Turku) - Several cities reported that pilot activities competed with day-to-day workloads and required more staff time than expected.
2. **Technical stability, calibration, and real-life deployment** (Cēsis, Gävle, Gdynia, Greifswald, Turku) - Technology-related challenges were common, particularly at launch and where tools were still experimental. Issues with calibration or technology operations were fairly common across all cities.
3. **Procurement, permissions, and administrative overhead** (Cēsis, Gävle, Turku) - Practical administration and procurement steps were repeatedly emphasised as sources of delay, mainly due to them requiring much more time than expected.
4. **Participation and engagement constraints** (Cēsis, Gävle, Gdynia, Greifswald, Turku) - Engagement challenges appeared in different forms depending on the pilot model. In a few cases, the capacity to communicate hindered engagement, while in others, priorities for the participants lied elsewhere.
5. **Data usability: interpretation, integration, and missing context** (Cēsis, Gdynia, Greifswald, Panevėžys) - Even when data were successfully collected, cities reported challenges in turning outputs into clean, interpretable evidence. In a few cases, complementary data were missing or the time and effort needed to integrate other datasets proved more than expected.

3.7. Results and impact of the pilot

In five pilots, the most consistent result was **the creation of new, locally specific evidence on active mobility** (walking, cycling and, where relevant, scooters) in contexts where municipalities reported clear data gaps. The pilots produced datasets that municipalities could use to understand where and when people move, as well as why they choose (or avoid) active modes, through combinations of automated counting, app-based tracking, manual observation, surveys and structured discussion formats. Just one pilot was unsuccessful in collecting the needed data due to the lower app usage than expected.

In terms of impact on capabilities, the pilots most often report value in three areas:

1. **stronger planning capacity and internal know-how**
2. **clearer priority-setting for infrastructure and safety measures**
3. **more durable monitoring arrangements** (either as permanent equipment, continued sensor operation, or replicable monitoring methodologies)

Several cases explicitly note that the pilots were not designed to deliver direct behaviour change, but still strengthened decision-making by shifting discussions from assumptions to measurable patterns and user-reported barriers.

3.8. Sustainability, scalability and replicability

Most pilots **plan to continue their chosen monitoring approach** beyond the project period (if permitted by institutional capacity and availability of resources, where relevant). Moreover, several pilots **explicitly conceived their technological set-up sustainably** (for example, purchasing equipment rather than renting, integrating monitoring into routine municipal processes, or designing participatory mechanisms that can be run with modest resources).

All pilots consider their approaches scalable once practical preconditions (funding, staff, technical know-how and stakeholder cooperation) are met. Thus, scalability is rather a matter of **operational readiness**. Each pilot has mapped the scalability possibilities of their pilots, e.g. expanding the scope or integrating monitoring into routine processes.

In November 2025, the cities participated in a replication workshop, the aim of which was to map the replication potential of each data collection approach. The participants rated their approaches in groups based on various characteristics such as ease of use, affordability, necessity of engaging stakeholders, sustainability, etc. The results of these discussions are summarized in table 3, which highlights the advantages and disadvantages of each data collection method:

Table 3. Replicability potential of data collection methods

Method	Cities	Advantage	Disadvantage
Sensors, cameras and AI solutions	Cesis, Greifswald, Gdynia, Turku	Easy to set up, many providers, affordable to sustain, passive collection requires little stakeholder involvement	Previous knowledge: Which provider is the most reliable? What are the pros and cons of each technology? How to ensure the provider follows up on promises? Data analysis: Who has the expertise to analyse the data? Does analysis require additional/external experts or cooperation with other city departments?
Citizen engagement in data collection	Turku, Gävle, Panevezys	Flexible, requires little expert knowledge, low cost	Communication: How to communicate the need for participation? How to follow up with the participants? How to quantify the participants' contribution? How to build trust if it has previously been lost? Stakeholder engagement: How to engage people most effectively? How to handle dropping out of the process or lack of motivation?

In general, the learning curve for using sensors, cameras and AI solutions may be higher when there is not enough know-how in a team. However, once the necessary expertise is acquired, it is easier to continue with data collection at low cost.

In case of different face-to-face citizen engagement events and campaigns, the set-up or launching may be easier and starting cost may be lower but in the long run, it may be valuable to organise this kind of data collection periodically, not on a daily basis.

3.9. Lessons learned

Project partners´ data collection pilots provided several lessons to consider while planning any new data collection activities or data analyses. The main lessons learned of the pilots are as follows (see chapter 4 for detailed, case specific lessons learned):

1. **Start with clearly defined data gaps and indicators, then choose tools and methods.** Several pilots stress that tool selection should follow from a clear understanding of what is missing and what needs to be measured (e.g., Gdynia explicitly notes designing the pilot around defined gaps rather than selecting tools first).
2. **Put governance in place early: clear roles, responsibilities, timelines, and coordination routines are essential.** Internal coordination repeatedly appears as a determinant of delivery quality and pace, with pilots highlighting the need for defined responsibilities and communication channels (e.g. Cēsis, Gävle, Gdynia).
3. **Do the "groundwork" before procurement: technical audits and realistic timeframes prevent avoidable delays.** Pilots emphasise early technical and infrastructure checks (including power/connectivity where relevant) and allowing sufficient procurement time for technology purchases (e.g. Cēsis, Turku).
4. **Bring technical and analytical expertise in from the start and plan for iteration and calibration.** Cities note that effective implementation depends on early involvement of IT/technical specialists and, where needed, interdisciplinary capacity (e.g. Cēsis highlights IT involvement; Greifswald highlights the need for specialist competencies in data processing).
5. **Triangulation is important – combining methods to capture both "how much" and "why" is very important.** A consistent lesson is that no single method is sufficient on its own: pilots recommend combining behavioural/qualitative tools with technological/quantitative tools (e.g. Gdynia, Turku, Greifswald, Panevėžys, Cēsis).
6. **Plan explicitly for dataset integration and interpretation, not just collection.** Pilots caution that combining datasets is valuable but requires time, analytical capacity, and structured interpretation; they also stress that data collection only creates value if analysis is resourced (e.g. Gdynia, Turku, Cēsis).
7. **Use manual/observational methods where needed: they remain important for reliability and context.** Even when advanced tools are used, pilots underline the continuing role of manual counting/observation in certain contexts and in strengthening confidence in findings (e.g., read the Greifswald case study's notes on "manual methods still matter").
8. **Engage key intermediaries early and design participation to fit their realities (calendars, workload, channels).** School-based and community-facing pilots stress early engagement and practical enabling measures: ready-made materials, fit with institutional calendars, use of existing communication platforms, and engagement of the "right" local roles (e.g. Gdynia, Panevėžys).
9. **Communication is not an add-on: plan it early, sustain it throughout, and address stakeholder perceptions directly.** Pilots link effective participation and acceptance to early planning of outreach, professional materials, ongoing follow-up, and careful framing of messages (e.g. Gävle, Panevėžys).

10. **Incentives and recognition help sustain engagement, especially where participation must be repeated.** Where participation is voluntary and ongoing, small incentives or explicit recognition are described as helpful in maintaining willingness and attendance (e.g. Turku, Panevėžys, Gävle).
11. **Outsourcing can be useful for testing, but long-term monitoring needs internal capability and routine budgets.** Pilots note that outsourced services can work for short-term tests but are less sustainable for continuous monitoring; they also stress the need to build internal capacity and allocate recurring resources (e.g. Greifswald, Cēsis, Turku).

4. Case Studies of data collection pilots

To increase the capability of cities to collect and analyse data, increase the availability of reliable data, and understand the effectiveness of the small-scale experiments, each project city partner had a pilot concentrated on data collection. An overview of the pilots for evaluation and data collection for active mobility measures is presented in table 4 and these are covered in depth in the following subchapters.

Table 4. Pilots of data collection.

Name of the partner	Size of the city	Main data collection tool/method	Content of the pilot
Cēsis, Latvia	~ 15 000	Cameras with AI	AI-based mobility data collection
Gävle, Sweden	~ 104 000	Mobile app	Data collection with mobile application
Gdynia, Poland	~ 245 000	Manual counting, cameras, campaigns and surveys	Collecting data on the transport behaviour of high school pupils through e.g. surveys, educational campaign, manual counting, and camera observations i.e. Intelligent Transport Systems (ITS)
Greifswald, Germany	~ 60 000	Sensors, observations, surveys	Traffic counting with sensors, observation and surveys
Panevėžys, Lithuania	~ 85 000	Manual counting	Using open data sources, surveys in the school communities and real-life laboratory and instrumental research
Turku, Finland	~ 209 000	Citizen panel	Creating a citizen panel and developing measuring focusing on cyclists and pedestrians

4.1. AI-based mobility data collection in Cēsis Municipality

4.1.1. City profile

Cēsis is a historical town in northern Latvia, located in the Vidzeme region. With around 14,000 inhabitants and approximately 45,000 in the wider district, Cēsis serves as a **key regional centre** and a gateway to Gauja National Park. The city is known for its strong environmental and cultural identity, supported by ambitious local sustainability goals.

Cēsis has developed a **Sustainable Energy and Climate Action Plan** (SECAP) that sets clear targets for reducing CO_2 emissions and promoting sustainable lifestyles. The municipality aims to cut emissions by 50% by 2030 (compared with 2000 levels) and achieve carbon neutrality by 2050. Although a dedicated Sustainable Urban Mobility Plan (SUMP) is not yet in place, several ongoing activities and pilot projects contribute to the development of a more data-driven mobility strategy.

4.1.2. Objectives of the pilot

Like many small and medium-sized cities, Cēsis faces a **high dependence on private cars** for short-distance travel. Despite its compact layout, the city's cycling infrastructure remains limited and reliable data on active mobility patterns have been largely unavailable. This gap has made it difficult for the municipality to evaluate the use of existing infrastructure or plan new cycling routes effectively.

The **AI-based mobility data collection pilot** aimed to close this data gap by introducing a modern, automated system to monitor travel behaviour. The main objective was to collect detailed quantitative and qualitative data on cyclists, pedestrians and other road users across key locations in Cēsis and two neighbouring villages, Līvi and Priekuļi.

The pilot supported the municipality's **broader vision** of promoting sustainable and active transport, providing an evidence base in parallel with the small-scale pilot investments, such as installing roofed bicycle sheds and creating temporary cycling lanes, helping assess their impacts on travel patterns. The activity directly contributed to the goals set in the SECAP and supported the city's move toward data-informed decision-making.

4.1.3. Pilot activities

The pilot was implemented between March 2025 and March 2026. **Six AI-supported cameras** (figure 3) **were installed** in selected areas to record and classify different transport modes, including cyclists, pedestrians, cars, motorbikes, buses and heavy vehicles. The sites were chosen to cover routes leading to the bicycle sheds and key neighbourhoods.

Figure 3. AI supported camera. Source: Cēsis Municipality.

The main activities included:

- Analysing the existing data situation and identifying missing mobility indicators.
- Consulting relevant departments and experts on the choice of technology.
- Procuring and installing AI-enabled cameras and configuring the system for local conditions.
- Monitoring and analysing data before and after small-scale pilots.
- Preparing recommendations for future monitoring and evaluation.

Initially, the plan was to rent counting devices for a limited period. However, the team concluded that **purchasing cameras with AI software** would be a more sustainable and cost-efficient approach. The local IT department played a key role in identifying appropriate technology, integrating the software and customising it to recognise and categorise different transport modes.

Quantitative data were gathered through six automated cameras equipped with AI software that recognised and counted different types of road users. The cameras operated continuously, providing a time-sensitive dataset suitable for monthly trend analysis.

Indicators included:

- Counts of cyclists, pedestrians and vehicles passing selected points.
- Monthly variations in mobility flows.
- Comparisons of data before and after infrastructure improvements.

The **camera locations were strategically chosen** to correspond with areas where new cycling infrastructure was installed, allowing for direct links between the data and small-scale pilot. The municipality's IT specialists were responsible for configuring and maintaining the equipment, while the project team oversaw data validation and interpretation.

The data were shared with the Traffic Safety Commission, which used the findings to **address unexpected patterns** - such as the discovery that a city park frequently used by cyclists and pedestrians was also accessed by cars and tourist buses. This insight prompted discussions with the National Police about improved regulation in the area.

Although the pilot did not include a full impact assessment on user behaviour, it succeeded in establishing a **systematic and replicable framework** for future data-driven mobility planning.

The process also involved some **unexpected technical and administrative challenges**. For example, several lamp posts used for camera installation lacked sufficient power supply, requiring additional infrastructure works and permissions. Despite these issues, the municipality succeeded in creating a functioning data collection system that will continue operating beyond the pilot phase.

4.1.4. Stakeholders and interaction activities

The **primary target group** consisted of residents living near the pilot sites, particularly in multi-storey apartment buildings where new bicycle sheds were installed. These residents are expected to benefit directly from improved cycling infrastructure and the insights generated by the pilot.

The key **institutional stakeholders** were the planning, traffic and IT departments of Cēsis Municipality. Cooperation between departments was essential for procurement, data management and technical setup, though it often proved time-consuming due to competing workloads. The involvement of village managers - who were invited to the steering group during the project - also turned out to be valuable for site coordination and ensuring local understanding of the pilot's purpose.

Direct community engagement was limited as the pilot focused mainly on data collection rather than behavioural change. Citizens were not informed about camera locations to maintain data reliability and protect privacy. Nevertheless, the public response was neutral with no complaints received during the implementation.

4.1.5. Evaluation and monitoring activities

Aim of monitoring and evaluation activities was to understand how **reliable and comparable is the data collected by the pilot**.

Data reliability was checked by comparing machine vision counts with manual observations and running consistency checks to detect anomalies.

Missing information included environmental context (e.g., lighting, weather) that affects detection accuracy.

Interviews were conducted mainly to interpret machine learning results and validate findings, serving as a pilot for refining the approach.

Machine vision **settings were adjusted** to avoid errors like double-counting vehicles at intersections by redefining detection zones and calibrating sensitivity.

4.1.6. Success stories and best practice

+ Strong support from the **IT department**, whose technical expertise and problem-solving skills ensured successful implementation.
+ The decision to **purchase cameras** instead of renting them provided a lasting asset for the municipality.
+ The pilot created a solid foundation for **ongoing mobility data collection**, enabling continuous monitoring of cycling and walking trends.
+ The data generated are already **used by municipality and traffic regulators**. E.g. it was found that some areas for just pedestrians and cyclists were used also by heavy transport which was not known before the pilot.

4.1.7. Challenges and deviations

– **Delays in decision-making** led to postponed implementation and shortened data collection periods.

- Internal coordination between municipal departments was slow as project activities competed with regular workloads. There is a need to hire the project team (persons who work just with this project) and then the tasks would be done in time.
- Some installation sites lacked sufficient electricity, requiring **additional technical works and permissions**.
- The initial evaluation plan of small-scale pilot **lacked clear guidance** on data interpretation, requiring methodological adjustments during implementation of the data collection pilot (incl. what kind of data to collect and analyse).
- **Limited public engagement** due to privacy requirements and the technical nature of the pilot.
- **Difficulties in analysing the data collected** as there was a need to relocate some of the cameras and some cameras did not collect data due to road constructions.

4.1.8. Results and impact of the pilot

The pilot produced Cēsis' **first consistent dataset on active mobility**. This data provided valuable insight into how residents move through the city and where infrastructure improvements are most needed.

Key outcomes included:

- Identification of high-traffic cycling and pedestrian routes and areas requiring improved safety.
- Increased municipal understanding of how infrastructure use can be monitored over time.
- Recognition of unexpected mobility behaviours, such as motor vehicle access through pedestrian areas.
- A data-driven foundation for developing the city's future SUMP and related policies.

Although the cameras were not intended to influence behaviour directly, the pilot demonstrated how **automated data collection can strengthen municipal planning capacity** and support more sustainable decision-making.

4.1.9. Sustainability and scalability

The installed cameras and servers will continue functioning after the pilot, ensuring **ongoing data collection for mobility monitoring and policy development**. The data can be reused for multiple purposes, including project proposals, infrastructure planning and public transport management.

For long-term sustainability, Cēsis plans to strengthen institutional coordination and possibly establish a dedicated role or unit for **data management, analysis and integration** into planning processes.

Scaling up the system is both feasible and cost-effective. To extend coverage, the municipality would need:

- Additional funding for more cameras and data storage capacity.
- Reliable power connections at new sites.
- Clearer decision-making procedures and stronger managerial commitment.
- Training for municipal staff in data interpretation and AI applications.

- Greater involvement of residents and local communities to align future monitoring with public interests.

Given the **low cost and flexibility** of the solution, the model is replicable in other Latvian municipalities and similar-sized cities across the Baltic Sea Region.

4.1.10. Lessons learned

The pilot offered several **important lessons** for future mobility data collection initiatives:

- **Early planning matters:** technical and infrastructure audits should be completed before or in parallel to equipment procurement to avoid power-related delays.
- **Internal coordination is crucial:** municipal departments need clear responsibilities, timelines and communication channels to ensure progress.
- **Technical expertise is essential:** collaboration with IT specialists from the start ensures efficient installation and accurate data analysis.
- **Hybrid monitoring improves coverage:** combining fixed cameras with mobile counters or GPS-based tracking could fill existing data gaps.
- **Institutional learning takes time:** building a data-driven culture within the municipality requires patience, persistence and leadership support.

If the **pilot were repeated**, the implementing team would strengthen internal cooperation from the beginning, involve stakeholders earlier, and diversify monitoring methods to capture more variables such as weather or time-of-day patterns.

Overall, the Cēsis pilot proved that **even small municipalities can successfully adopt AI-based tools for active mobility monitoring**, laying the groundwork for smarter, evidence-based urban planning.

For more information about this case study, you are welcome to contact Cēsis Municipality: Ilze Sestule, Ilze.sestule[at]cesis.lv; dome[at]cesunovads.lv.

4.2. Active mobility data collection through a mobile application in Gävle

4.2.1. City profile

Gävle is a coastal city in east-central Sweden, located about 170 kilometres north of Stockholm. With a population of around 104,000, it serves as the administrative centre of Gävleborg County and an **important regional hub for business, education and transport**. The city has a long-standing commitment to sustainable urban development, demonstrated through its climate neutrality goal for 2030 and its participation in national and international projects that promote low-carbon mobility.

Gävle's urban structure and relatively compact size make it **well suited for walking and cycling**. However, like many Nordic cities, it faces challenges related to seasonal weather conditions and a continued reliance on private cars for short-distance trips. The municipality's transport planning is guided by the Traffic Strategy and the Cycling Plan, which aim to increase the modal split of cycling and walking, reduce car dependency, and create a safer and more inclusive transport system.

4.2.2. Objectives of the pilot

The pilot aimed to **strengthen Gävle's capacity to collect and analyse data on active mobility** - particularly cycling and walking - using digital tools. The city sought to gain a better understanding of residents' travel patterns, motivations and barriers to active mobility.

Through a **GPS-based mobile application**, the municipality monitored real-life travel behaviour among employees of local companies that had signed the city's climate contract. The pilot tested how digital tools could complement traditional data collection methods, such as tube counters and surveys, and how they could help municipalities track active mobility more accurately. Additionally, the aim was to see whether it may be easier or more reasonable to reach target groups through employers instead of finding users one by one.

Running from March to September 2025, the pilot also explored **whether digital engagement tools could promote behaviour change**. By allowing participants to visualise their travel activity and receive rewards for sustainable choices, the initiative aimed to encourage walking and cycling while informing the city's long-term strategy for sustainable transport.

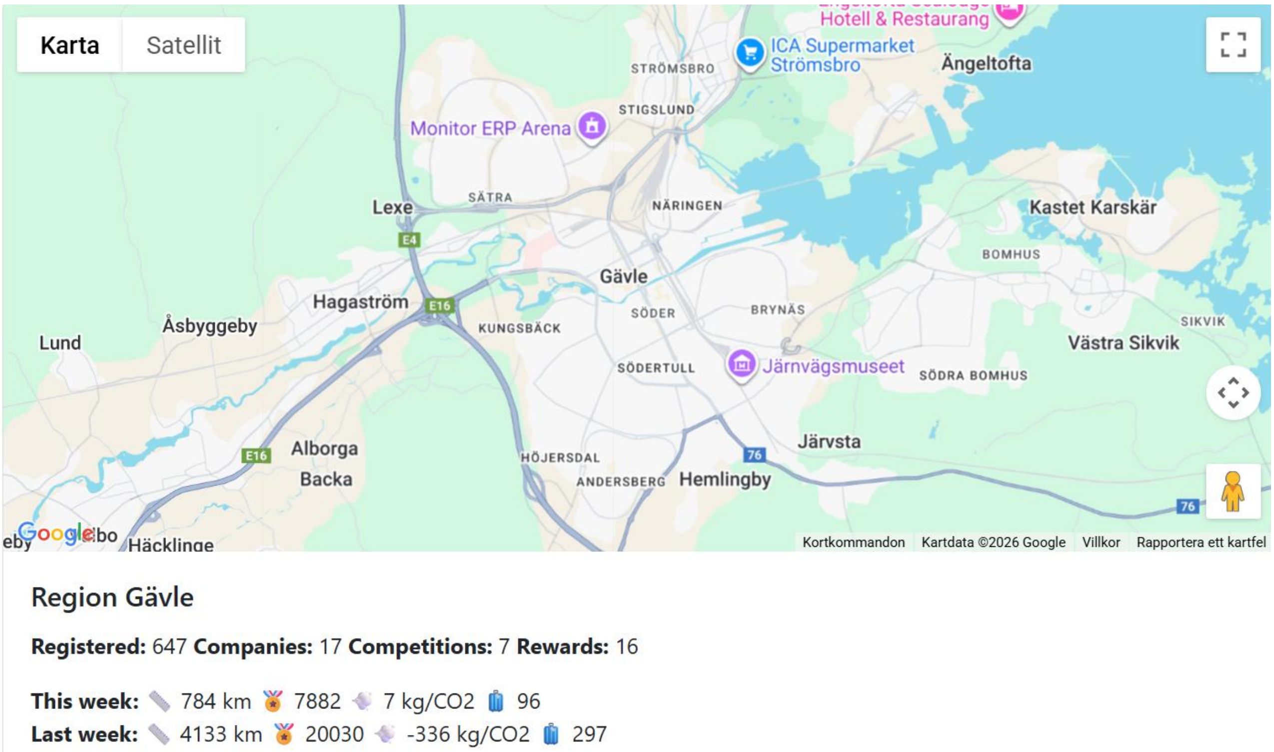

Figure 4. Overview from the app showing aggregated mobility data from the Gävle pilot, including number of participants, trips, travelled distance and estimated CO_2 impact over time. Source: Gävle municipality.

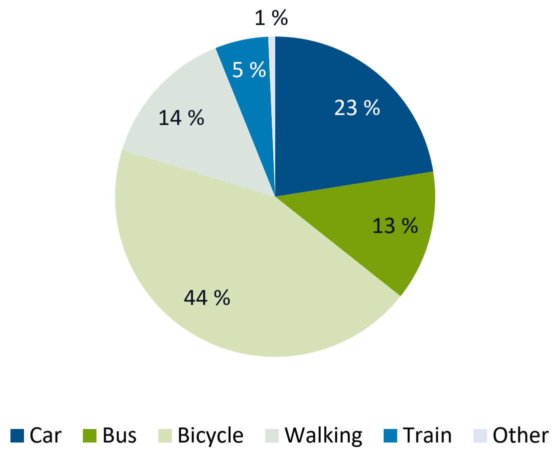

Figure 5. Distribution of transport modes based on data collected during the pilot, demonstrating how app-based mobility data can support environmental reporting and analysis of commuting patterns. Source: Gävle municipality.

4.2.3. Pilot activities

The pilot was planned and implemented jointly by Gävle Municipality and the app provider Kobla. **Key steps** included:

- Planning the data collection framework and identifying relevant indicators for active mobility.
- Selecting companies participating in Gävle's climate contract as target groups.
- Coordinating with Kobla to customise the app for Gävle's context and integrate it with the Grafana platform, which provided a heat map and visual analytics of users' trips.
- Launching the app campaign in phases, beginning with a smaller group of municipal employees to test the technical setup.
- Conducting complementary travel surveys to compare app-based data with traditional methods and assess the app's accuracy and usability.

The **main indicators** included:

- Number of participants and trips recorded
- Distribution of travel modes (walking, cycling, public transport, car)
- Changes in active mobility share over time
- Company-level participation and engagement rates

Early in the process, the **team underestimated the time and effort** required for setup, coordination and communication. Both the project manager and the app provider spent substantial hours adjusting the data collection process and refining the analysis framework. Despite these challenges, the pilot succeeded in testing a fully digital, real-time mobility monitoring system.

4.2.4. Stakeholders and interaction activities

The pilot primarily engaged **employees from companies that had signed Gävle's climate contract**, making them both participants and stakeholders. Companies acted as intermediaries, promoting the campaign among their employees and helping to distribute information about how to join.

Communication took place mainly through **emails, newsletters and digital meetings**, facilitated by company representatives. While some companies were highly active, others had limited capacity to support the campaign due to internal priorities. This affected participation levels across different workplaces.

Informal feedback was received from participants through emails and direct conversations. This feedback highlighted **issues with the app's usability** – such as battery drain, manual trip logging and occasional errors in trip classification, which were addressed in collaboration with the provider.

A **data protection agreement** was signed early in the process to ensure compliance with municipal and national privacy regulations. The municipality also learned that formal registration of such agreements was required internally, adding an additional administrative step.

4.2.5. Evaluation and monitoring activities

The pilot focused on quantitative data, complemented by qualitative insights gathered from short surveys included in the app to, informal feedback, and internal discussions. Mobility data were collected through the **mobile app**, which anonymously tracked users' travel behaviour, including distance, speed and mode of transport. At first, the app was tested on a smaller group of people to ensure that the app worked properly and that the data collected was accurate. Also, throughout the pilot, it was possible to adjust the automatically tracked travels and provide feedback on the reliability of the data collected.

Indicators were selected in collaboration with municipal planners and mobility experts, guided by the project's monitoring and evaluation framework.

Data from the app were analysed using Microsoft Excel and visualised in Grafana, allowing the municipality to **explore travel patterns and heat maps of popular routes**. Although the dataset was relatively small, it provided valuable evidence about daily commuting habits and the potential of mobile tracking for policy development.

By July 2025, **647 participants** had joined the pilot and data showed that **57%** of all recorded trips were made by walking or cycling. This demonstrated a clear interest in active mobility among participants and offered encouraging evidence for future campaigns.

4.2.6. Success stories and best practices

+ **Close collaboration** between the municipal project team and the app provider ensured rapid response to technical and communication issues.
+ **Continuous dialogue with users** helped identify problems early and maintain trust in the pilot.
+ The use of **visual data tools** like Grafana enhanced the municipality's ability to analyse and present mobility data clearly.

+ Despite a modest sample size, the pilot proved that digital data collection can **complement traditional methods** and provide real-time insights into active travel patterns.

4.2.7. Challenges and deviations

– The campaign started with a **smaller target group than planned** to allow for technical fine-tuning but it appeared to be too small test group.
– **Technical issues with the app** (battery use, trip approval, reward system, quality of translations) just after the launch discouraged some users.
– **Communication capacity was limited**, reducing overall participation and engagement.
– Some companies involved in the climate contract prioritised other sustainability activities, which **limited outreach** and resulted in significantly lower participant numbers as expected, jeopardising the success of the test.
– The classification of public transport as “non-sustainable” and inclusion of car trips **sent wrong messages about sustainability in opinion of** some participants.
– Administrative procedures related to **data protection** required more time and coordination than anticipated, e.g. while the municipality signed a separate agreement on protecting personal data, the contract also needed to be formally registered in the municipal system, which took additional time.

Despite these challenges, the pilot generated **meaningful learning outcomes** that informed both internal processes and the city’s broader digital mobility planning approach.

4.2.8. Results and impacts of the pilot

The pilot provided Gävle an opportunity to **test collecting mobility data digitally** and yielded several key results:

- Quantitative data on walking and cycling behaviour, filling an existing gap in mobility knowledge (Figures 6 and 7).
- A deeper understanding of how participants perceive app-based monitoring, rewards and gamification.
- Strengthened cooperation between municipal departments working on climate, transport and IT.
- New insights into communication needs and the effort required to engage companies and participants effectively.

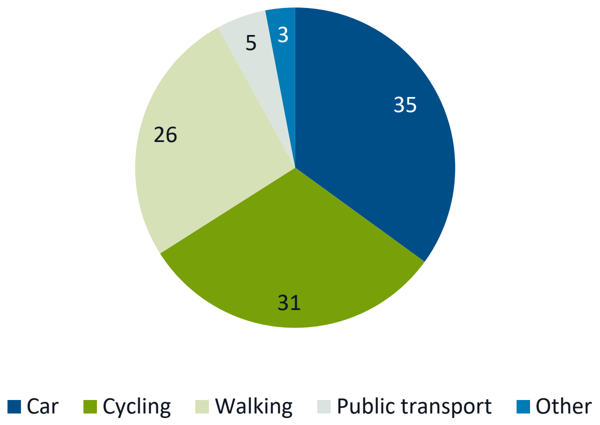

Figure 6. Quantitative mobility data collection in Gävle. Travel modes. Source: Gävle municipality.

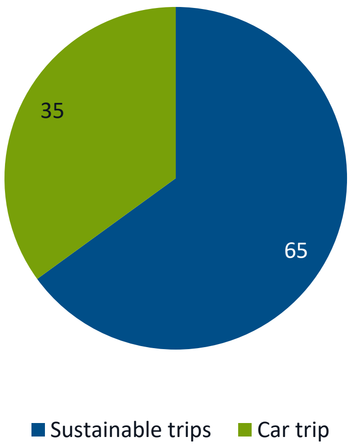

Figure 7. Quantitative mobility data collection in Gävle. Share of car trips. Source: Gävle municipality.

While the pilot's **direct policy impact was limited** due to its experimental nature and small sample size, it served as a valuable learning exercise. The experience will inform future campaigns aimed at encouraging sustainable commuting and expanding the city's data-driven approach to mobility planning.

4.2.9. Sustainability and scalability

Sustaining this type of initiative requires both **financial and institutional resources**. The annual license fee for the mobile app was approximately 20,000 SEK[1], with additional costs for setting it up, communication and promotion, which can be considerable. The project also required considerable staff time: ideally, there should have been at least one full-time project manager supported by a half-time communicator and a half-time data analyst.

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[1] Ca. 1830 EUR.

To make the initiative sustainable, Gävle would need **continued budget allocation** and strong cross-departmental coordination. Engaging retailers to provide non-monetary incentives and maintaining regular communication with participants were also key to keeping motivation high.

Scaling up the pilot would require **expanding participation beyond climate contract companies** to include schools, hospitals, universities and other major employers. Public campaigns could be tested for shorter periods to capture wider travel patterns. The value of scaling up the pilot and including alternative data sources lies in improving data accuracy, coverage and cost efficiency. Expanding participation beyond climate contract companies to other institutions allows for more representative sample of travel behaviour which leads to better insights for planning.

By comparing data across different periods and sources, the municipality can better evaluate trends and the impact of interventions making results more robust and reliable.

Alternative data sources, such as **mobile network data**, could complement app-based monitoring in the future. While mobile network data are less detailed and harder to interpret, they can provide broader coverage. A hybrid model combining both methods would enhance data quality and representativeness.

4.2.10. Lessons learned

The pilot offered several important lessons for Gävle and other municipalities considering similar digital approaches:

- **Technology matters:** A technically stable and user-friendly app is essential for participant trust and sustained engagement. As such, the app could be tested with a smaller number of test users before the official launch.
- **Communication is key:** Effective outreach and marketing require early planning, professional materials and ongoing follow-up.
- **Clear governance improves coordination:** Defined roles for project management, communication and data analysis are vital for smooth execution.
- **Stakeholder perceptions need attention:** Messaging about sustainability categories (e.g. public transport and car use) should be clear to avoid confusion.
- **Representative participation improves data value:** Engaging a broader demographic base increases the relevance of results for planning.
- **Feedback loops enhance learning:** Regularly collecting and responding to participant feedback allows continuous improvement during the campaign, not just after it.

If implemented again, Gävle would focus on **stronger technical testing**, **earlier communication**, **broader participation** and **more systematic monitoring**. Despite the challenges, the pilot successfully demonstrated the potential of digital tools for promoting and understanding active mobility, laying the groundwork for more data-informed transport policies in the future.

For more information about this case study, you are welcome to contact Gävle Municipality:

aregay_fkadu.kebede[at]gavle.se**,** farah.albukaai[at]gavle.se, gavle.kommun[at]gavle.se.

4.3. Gdynia school mobility pilot combining AI-based monitoring, surveys and an educational campaign

4.3.1. City profile

Gdynia is a coastal city in northern Poland and part of the Tricity metropolitan area, together with Gdańsk and Sopot. With a population of around 245,000, it is a **major transport and economic hub** on the Baltic Sea, combining a large seaport with a varied urban structure and extensive education network. The city adopted its first SUMP in 2016 and is currently updating it, with a strong focus on active mobility, public transport and safer school environments.

Despite progress in public transport and cycling infrastructure, **car traffic remains dominant** in many parts of Gdynia, particularly around schools during morning and afternoon peaks. The school mobility pilot formed part of Gdynia's broader transition towards evidence-based mobility management, combining behavioural research with technological experimentation.

4.3.2. Objectives of the pilot

The pilot aimed to close a critical information gap regarding **how upper secondary school students travel and what influences their choices**. At the same time, the city wanted to explore **how automated methods could support long-term monitoring of active mobility**.

More specifically, the pilot sought to collect detailed behavioural data on students' travel patterns, needs and barriers; to test AI-based tools for automated counts of pedestrians and cyclists near school areas; and to build an integrated evidence base combining survey results, workshop insights, app-based activity data and automated counts. The findings were intended to support the update of Gdynia's SUMP, guide future youth-oriented mobility campaigns and inform decisions on integrating automated monitoring into the city's ITS environment.

This approach positioned the pilot not only as a local campaign, but as a structured experiment in integrating behavioural and automated mobility data into municipal decision-making.

4.3.3. Pilot activities

The pilot started with a citywide **mobility survey** in upper secondary schools, followed by workshops to better understand the attitudes and expectations of students. In parallel, the city prepared the technical part of the pilot, testing an **AI-based camera** at a key intersection near several schools and later launching a broader automated monitoring service using relocatable counting stations. In the second half of 2025, a **cycling promotion campaign** in high schools complemented the research and monitoring activities and generated additional behavioural data through an app-based competition. The campaign was intentionally designed as both an engagement activity and a data-generation phase (app-based behavioural indicators such as registered trips, travelled distances and participation dynamics), complementing automated AI-based monitoring and survey evidence.

Citywide survey among high schools

In the first months of 2025, Gdynia carried out an online mobility survey in all upper secondary schools. The questionnaire asked students how they usually travelled to school, how often they cycled or walked, what barriers they perceived to active travel and what kind of improvements they considered most important. The survey reached several thousand students and produced the first citywide dataset focused specifically on this age group. It confirmed high levels of public transport use and walking but also showed that many pupils still arrived by car, either as passengers or drivers, and that **cycling remained relatively rare** despite existing infrastructure.

The survey also revealed that safety concerns, weather conditions and lack of convenient bicycle parking were recurrent reasons for not cycling. These insights helped the city to identify priority areas for further investigation and to design topics for the workshops and the school campaign.

Targeted work with selected schools

Alongside the citywide survey, the municipality selected a group of schools for more detailed work, including workshops and additional data collection. Eight schools hosted workshops where students **discussed their daily journeys, identified problem spots on maps and reflected on what would encourage them to travel more actively**. These workshops added qualitative depth to the survey findings and gave students a chance to influence the design of the upcoming campaign. In the pilot areas, the city also carried out on-site observations and manual counts to better understand the interaction between different modes near school entrances. This combination of survey, workshop and observation data produced a nuanced picture of mobility conditions around the participating schools.

AI-based monitoring

To address the technological side of the data gap, the city cooperated with the private company YUNEX to test an **AI-based counting system**. In spring 2025, an AI camera was installed at an intersection for two months (Figure 8). The camera automatically detected and counted different road users, including pedestrians and cyclists, and provided continuous hourly data via an online dashboard. This allowed the city to examine flows near participating schools and to assess whether machine-learning tools could reliably support active mobility monitoring in real urban conditions.

Figure 8. AI-based camera installed near school area (Aleja Zwycięstwa / Orłowska Street), spring 2025. Source: City of Gdynia, Sustainable Mobility Unit.

Following a successful technical validation phase with the test camera, Gdynia commissioned a five-month automated monitoring service based on four Automatic Traffic Measurement Stations. The stations were installed and maintained by the contractor from July to November 2025 and operated under a service contract that included installation, maintenance, structured data delivery (CSV and online dashboard) and the option of relocation upon request of the city (up to four relocations in total).

During the service period, the city prioritised continuous data collection in the initial locations to capture stable daily and weekly patterns. In a school-area context influenced by weather conditions, school timetables and seasonal variation, longer uninterrupted measurement periods were considered more valuable than frequent relocations. The service delivered 15-minute aggregated data on object counts, movement directions and object types, providing the city with a richer and more systematic set of indicators for mobility analysis and future planning (Figure 9).

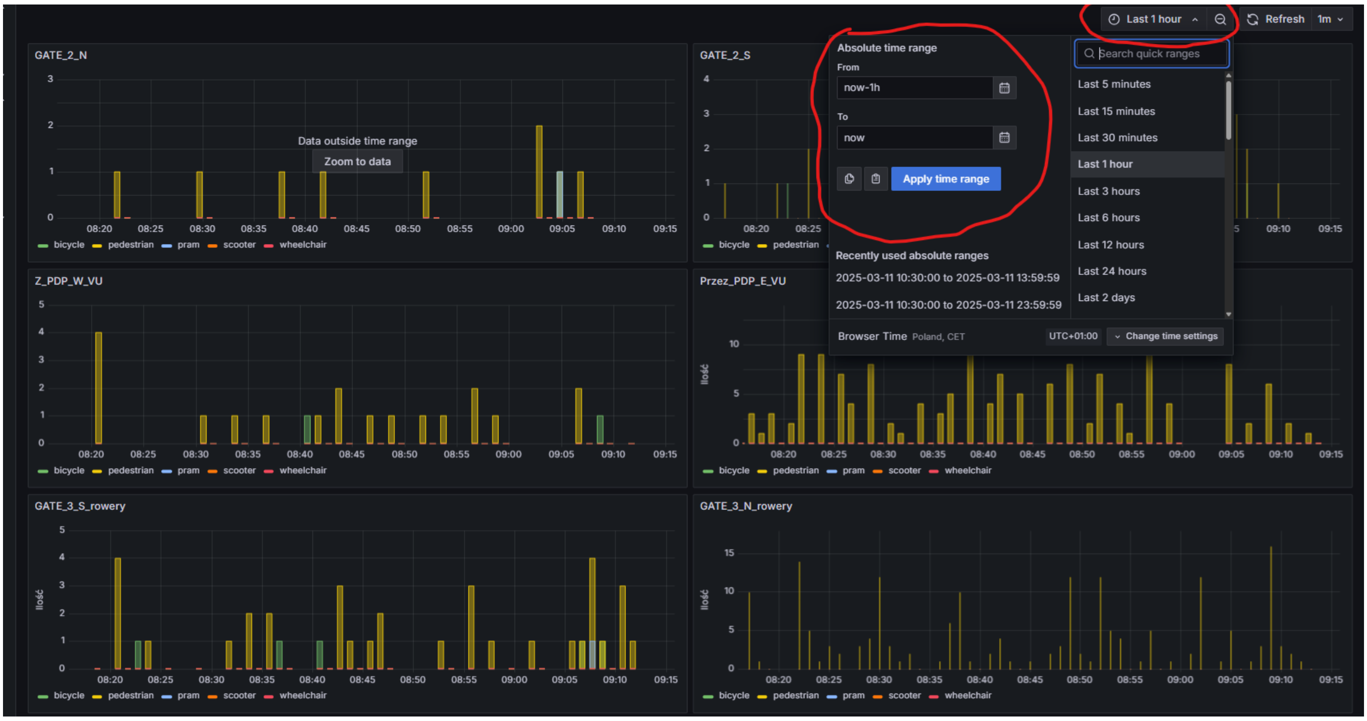

Figure 9. Example of AI-based monitoring output (15-minute aggregated counts). Screenshot by the City of Gdynia, 2025.

Cycling promotion campaign in high schools

In September–October 2025, Gdynia implemented a structured behavioural intervention in upper secondary schools under the slogan “Jak szkoła, to dwa koła” (“If school, then two wheels”).

The campaign followed a clearly defined project cycle: co-creation phase (January workshops in 8 schools), stakeholder engagement and ambassador preparation (spring 2025), material development and school coordination (September), implementation phase (October), and post-campaign evaluation (January–February 2026).

A total of **11 schools** participated in the campaign.

Quantitative outcomes

- 147 active participants registered in the cycling competition
- 355 recorded cycling trips
- over 27,600 kilometres cycled during October
- approx. 600 cycling breakfast sets distributed (weekly events over five weeks)
- 3 ambassador workshops (50–60 students per workshop)
- 40 participants in the joint group ride with the ambassador
- approx. 500 participants at the final event
- nearly 300 responses collected during the interactive evaluation quiz

Campaign components

The intervention combined behavioural incentives, social engagement and data generation: monthly cycling competition using the Active Cities app; weekly cycling breakfasts; three workshops with campaign ambassador AJ (Adam Modzelewski); creative contests (photo, film and art categories); and a bicycle service workshop initiated by the I Academic High School).

The **final event** at Polsat Plus Arena, gathering approximately 500 participants, including a prize ceremony and an educational cycling show.

Figure 10. School-led bicycle service workshop organised within the "School Initiatives" component (I Academic High School). Source: City of Gdynia, Sustainable Mobility Unit.

E-bikes

Two electric bicycles were purchased to support school experimentation. Although formal borrowing did not occur, one e-bike was used during the group ride as a demonstration tool. This indicates that future editions should include earlier communication and a structured borrowing mechanism to maximise usage.

4.3.4. Stakeholders and interaction activities

The pilot involved a range of stakeholders, including:

- **Gdynia's Sustainable Mobility Unit** – overall project coordination, survey preparation and data analysis.
- **Administrations and teachers of high schools** – support in distributing surveys, coordinating workshops and engaging pupils.
- **High school students and their families** – main data providers and participants in the campaign.
- **Gdynia's ITS Department** – technical supervision and data integration within the municipal ITS environment.
- **University of Gdańsk** – methodological support and interpretation of AI-based indicators.
- **Technical partners for contracting and installation**:

- *APR monitoring service* – installation, operation, maintenance and structured data delivery of four Automatic Traffic Measurement Stations, including data archiving in accordance with the public procurement contract. The service contract also included an option of relocation upon request of the city.
- *YUNEX* – installation and configuration of the AI-based test camera.

- **Gdynia Sports Centre** – provision and management of the Active Cities app used for the cycling competition and support in participant registration and activity tracking.
- **Municipal communication teams** – preparation of campaign materials and communication support.

Figure 11. Workshop with campaign ambassador AJ (Adam Modzelewski). Source: City of Gdynia, Sustainable Mobility Unit.

The clear division of responsibilities between municipal units, the Gdynia Sports Centre and the contracted monitoring provider ensured operational stability and transparency. Behavioural engagement (campaign and app-based data) was coordinated within municipal structures, while the technical monitoring service operated under a defined service-level agreement, including availability standards and full data ownership retained by the city.

Interaction activities included email communication with schools, coordination meetings with teachers, field visits related to monitoring and technical arrangements, and campaign-related outreach to students. Strong cooperation between the municipality and school administrations proved essential for achieving high survey participation rates and successful pilot delivery.

4.3.5. Evaluation and monitoring activities

Evaluation of the pilot including different data collection methods, was carried out by comparing **quantitative and qualitative data** received from different data collection methods:

- **Surveys and app-based cycling competition data.** The citywide survey provided a representative dataset on school mobility patterns. The targeted survey at High School No. 2 allowed for a more detailed local assessment of travel modes, perceived safety on routes to school, environmental conditions and infrastructure availability. App-based competition data complemented the surveys by providing behavioural indicators such as recorded trips and distances.

- **AI-based monitoring.** The AI camera and Automatic Traffic Measurement Stations provided time-stamped, aggregated data on mobility flows in monitored school-area locations. Although AI-based monitoring captures all road users (not students only), it delivered an objective temporal profile of active-mobility flows, including peak-hour dynamics and modal distribution. This enabled the team to interpret campaign-related behavioural data (app-based cycling activity) against broader movement patterns observed in the monitored environment.
- **Insights from workshops,** school coordinators, teachers and students were used to interpret quantitative findings and to assess behavioural relevance beyond numerical indicators.

Data quality and interpretation were supported through internal evaluation meetings, where automated counts were cross-checked against qualitative insights from workshops. This approach strengthened confidence in the findings and helped avoid over-interpreting AI-based results in student-specific terms. Combination of methods and data sources strengthened the triangulation and provided interpretative context for automated counts in school-area environments.

4.3.6. Success stories and best practices

- **Early engagement with school administrations**, direct communication with coordinators and alignment of the survey timeline with the school calendar resulted high survey participation.
- **Close cooperation** with school staff ensured smooth implementation and reliable data collection.
- **Combining** surveys, and AI tools created a well-rounded and evidence-based approach.
- The cycling promotion campaign added a **behavioural dimension** that complemented the technical analysis.
- The pilot helped establish a **replicable methodology** for school mobility monitoring in Gdynia.
- **Coordination of behavioural engagement, technical service delivery and multi-source evaluation in parallel**, increased the success of the pilot and strengthened the municipality’s internal project management capacity.
- The structured integration of behavioural data (app-based activity records), qualitative input (workshops and school feedback) and automated monitoring allowed for **systematic cross-validation** of findings and reduced the risk of over-reliance on a single data source.

4.3.7. Challenges and deviations

- AI monitoring required calibration and careful interpretation. As an experimental tool in real urban conditions, it **required cross-checking during internal review meetings to ensure reliability** and avoid over-interpretation of automated counts.
- Not all schools responded to the survey at the same level, requiring additional **follow-up communication and coordination efforts**.
- Perceived **safety concerns** reported by pupils pointed to infrastructure-related issues that extend beyond behavioural interventions and require longer-term spatial and planning responses.
- Combining, structuring, cleaning and analysing information from all data sources (including different data formats and levels of aggregation) required **additional analytical effort and external support**.

Despite these challenges, the pilot delivered a complete and internally validated dataset that can support evidence-based planning decisions.

4.3.8. Results and impact of the pilot

The pilot generated the most comprehensive evidence base to date of mobility patterns among high school pupils in Gdynia. Key findings included:

- A significant share of pupils walk or use public transport, while cycling remains comparatively limited – students are interested but mention the lack of infrastructure and safety concerns as barriers. The latter is also influenced by vehicle traffic around schools.
- Observations and AI data confirmed peak-hour congestion that helped to identify locations with potential for targeted improvement.
- The cycling promotion activities increased visibility of active travel and stimulated short-term behavioural engagement among participating students.
- The pilot demonstrated that behavioural activation and automated monitoring can operate as complementary systems: one influencing behaviour, the other measuring it objectively.
- The pilot strengthened inter-departmental cooperation between mobility planning, ITS and communication units, creating a more integrated institutional approach to school mobility management.
- The experience gained during the pilot contributed to building internal capacity in handling multi-source mobility datasets, including data cleaning, structuring and interpretation processes.

The findings directly support **Gdynia's SUMP update and provide an evidence-based foundation implementation** and inform future planning of school access routes, cycling facilities and awareness initiatives.

4.3.9. Sustainability and scalability

The use of a service-based automated monitoring model showed that cities do not necessarily need to purchase equipment to gain access to high-quality data. Instead, they can procure monitoring as a service, including installation, maintenance and data delivery, with clear contractual responsibilities assigned to the provider (installation, maintenance, relocations and data archiving). The service-based monitoring model significantly reduced the internal technical burden and allowed the municipality to focus on analytical interpretation and policy integration rather than hardware management. The behavioural and educational components relied on methods that are relatively **low-cost and adaptable** to different school contexts.

In terms of sustainability, the pilot showed that:

- regular school surveys and periodic campaigns can be integrated into the city's planning cycle;
- automated counting can form part of Gdynia's broader ITS and monitoring strategy if dedicated funding and clear responsibilities are secured;
- cooperation with schools and the Gdynia Sports Centre, including the use of the Active Cities app as well as other engagement formats, can support continued engagement with young residents;

- the monitoring service included defined availability standards (minimum 95% monthly system uptime), structured data archiving and full data ownership by the municipality, ensuring long-term institutional control and continuity of data use beyond the pilot timeframe.

Regarding scalability, the experience suggested that:

- the Automatic Traffic Measurement Stations, operated under a service contract, provide flexibility in future deployment scenarios without requiring capital investment in hardware; the same methodological approach could be expanded to more schools or repeated annually, creating a citywide school mobility monitoring model;
- other municipalities could replicate the combination of surveys, workshops, co-creation and automated monitoring, even if their resources are limited, by adapting campaign scope and duration to local needs.

4.3.10. Lessons learned

The pilot confirmed that **combining different datasets is essential to understand school mobility properly**, but also that doing so requires careful planning, adequate time and clear distribution of roles. It highlighted the value of schools as partners in both data collection and behaviour change, and showed that young people respond strongly to visible, social and meaningful activities. Key lessons included:

- start from clearly defined data gaps and analytical questions and design the pilot around them, rather than choosing tools first;
- combine behavioural tools (surveys, workshops, co-creation) with technological tools (AI counts, app data) to capture both “why” and “how much”;
- combine automated counts with short manual calibration checks during initial deployment;
- allow sufficient monitoring time per site (minimum 3–4 weeks) to avoid over-interpreting short-term fluctuations;
- involve schools early, provide ready-made materials and ensure that activities fit the school calendar;
- include students in co-creation, for example by letting them help shape campaign identity or select ambassadors, to increase relevance and participation;
- plan enough time and analytical capacity for integrating datasets from different sources and for interpreting results in a meaningful way. Define data architecture, formats and analytical ownership before launching field activities;
- use flexible and scalable monitoring tools, such as relocatable AI stations, and remain aware that student-specific patterns may require careful interpretation;
- use the results immediately in planning processes, such as SUMP updates, to secure long-term value and institutional learning.

The pilot confirmed that AI-based monitoring and school-centred campaigns can be powerful tools for promoting active mobility when they are **grounded in real needs and connected to broader planning processes**. If repeated, Gdynia would allocate more time at the start for indicator definition and data structures, stabilise internal coordination between units, extend the campaign duration, simplify communication pathways with schools and strengthen technical support for app-based verification.

For more information about this case study, you are welcome to contact the City of Gdynia: Justyna Suchanek justyna.suchanek[at]gdynia.pl; mobilnosc[at]gdynia.pl**.**

4.4. Traffic counting, observation and survey for active mobility in Greifswald

4.4.1. City profile

Greifswald is a university city located in northern Germany, on the Baltic coast of Mecklenburg-Vorpommern. With around 60,000 inhabitants, it is known for its **vibrant student community, historical architecture and strong environmental orientation**. The city's compact size and flat landscape make it ideal for walking and cycling, and active mobility already plays a significant role in everyday travel.

Greifswald has long been committed to **promoting sustainable transport**, with initiatives to expand its cycling network, improve pedestrian infrastructure and support multimodal mobility. However, one challenge identified by local planners has been the lack of reliable and up-to-date data to evaluate the effectiveness of active mobility measures. The data collection pilot was designed to address this gap by testing innovative methods for traffic counting and user feedback, while also examining how digital and manual approaches could complement one another.

4.4.2. Objectives of the pilot

The Greifswald pilot aimed to **improve the city's understanding of active mobility flows** and to evaluate the impact of small-scale infrastructure interventions. The main objectives were to:

- Test and compare different data collection methods, including AI-based video traffic counting, side radar detection and manual counting.
- Assess the effectiveness and utilisation of mobile bicycle parking units (Fietsvlonders) and covered bicycle shelters.
- Gather feedback from users through short surveys and QR code-based questionnaires.
- Pilot the use of the Bike Sense Box, a sensor device designed to measure overtaking distances, surface quality and particulate matter exposure.

Together, these methods were intended to **generate a more comprehensive picture of active mobility** in the city and support evidence-based decisions for improving cycling and walking infrastructure. The pilot is also aligned with Greifswald's wider strategic goals, strengthening cycling and pedestrian traffic, while contributing to national strategies such as the German National Cycling Plan 3.0 and the National Walking Strategy.

4.4.3. Pilot activities

The pilot was implemented across several locations in the city between June 2025 and February 2026, combining **four main data collection components**:

1. **Traffic counting at an intersection**: At the junction of Goethestraße, Bahnhofstraße, Gützkower Straße and Fleischerstraße, the city conducted a comparative test between an AI-supported video count and a side-mounted radar detection method. The goal was to determine whether AI technology provides added value in recording complex multimodal traffic flows.
2. **Monitoring of mobile bicycle parking units (Fietsvlonders)**: A relocatable bicycle parking platform was installed sequentially at three locations. Automatic counting was initially planned but proved technically unfeasible, so the city carried out manual photographic documentation and on-site observations of parked bicycles.
3. **Monitoring of covered bicycle shelters**: At newly installed shelters, traffic hoses recorded the number of cyclists entering and leaving, while photographic documentation assessed parking behaviour and surrounding conditions.
4. **Sensor-based data collection (Bike Sense Box)**: The city tested sensor devices mounted on bicycles to collect data on overtaking distances, vibrations and air quality. Greifswald was among the first municipalities in Germany to test this technology for traffic planning purposes.

Figure 12. Bike Sense Box in Greifswald's active mobility pilot. Author: Mario Pesch

Each component was designed to **contribute a specific dataset** to the city's broader understanding of cycling conditions and user experience. The pilot required coordination between several municipal departments, including urban planning, environment and monument protection, as well as collaboration with external technical partners for traffic counting and sensor calibration.

Indicators included the number of cyclists and pedestrians, modal split at intersections, rack occupancy rates and user satisfaction levels. All data were processed internally by municipal staff and compared with previous conventional counts. While the pilot did not aim to directly change travel behaviour, it laid the foundation for improved long-term monitoring of active mobility trends.

4.4.4. Stakeholders and interaction activities

The pilot engaged a **range of stakeholders**:

- **Municipal departments**, including the urban development office, the lower monument protection authority, the traffic and environment departments and the civil engineering office.
- **External experts and contractors**, responsible for conducting AI-based traffic counts and technical setup.
- **Cyclists and residents**, who contributed feedback via QR code surveys placed at parking facilities.
- **Businesses and local institutions**, which were informed about nearby installations.

During implementation, the team realised that involving **residents and media outlets** earlier in the process could have improved public awareness and acceptance, especially regarding the placement of bicycle parking facilities.

While no special permits were required, internal coordination was necessary to **ensure compliance with data protection and municipal procedures**. Information about the QR-based survey was displayed at each rack on Fietsvlonder, allowing users to provide quick feedback on satisfaction, comfort and possible new locations.

Overall, the project showed that **even limited communication channels**, such as short surveys and on-site notices, can be effective in engaging citizens when targeted appropriately.

4.4.5. Evaluation and monitoring activities

Evaluation combined both **quantitative and qualitative methods** to provide a full picture of mobility patterns and infrastructure use.

- **Traffic counting:** The AI-based system captured detailed movements of cars, cyclists and pedestrians, creating a visual heat map of trajectories through the intersection. This enabled the city to identify shortcuts taken by cyclists through green areas - a pattern that had previously gone unnoticed with conventional counting methods.
- **Fietsvlonder monitoring:** The number of parked bicycles was recorded manually at different times of day, supported by photographic documentation. The accompanying survey collected users' views on safety, comfort and preferred locations for additional racks.
- **Covered bicycle shelter monitoring:** Hose-based counters recorded arrivals and departures, complemented by photographs to assess parking order and safety improvements.
- **Sensor data:** Although the Bike Sense Box faced technical issues (e.g. occasional inaccuracy of sensors due to colours of cars, length of manoeuvres, or external factors), the test provided useful insights into the complexity of collecting accurate environmental and safety data with mobile devices.

All data were compared with previous conventional counts to assess accuracy and efficiency.

4.4.6. Success stories and best practices

+ The **AI-based traffic counting** provided a more precise and complete picture of cyclist behaviour, revealing patterns previously undetected by traditional methods (e.g. shortcuts).
+ **Combining multiple data sources** - video, radar, manual counts and surveys - created a robust methodology adaptable to different urban contexts.
+ **Collaboration across departments** ensured technical reliability and consistency in data collection.
+ The **Fietsvlonder concept** proved flexible and effective to identify high-demand areas for bicycle parking.
+ The hands-on approach improved **staff understanding of data-driven planning** and built internal expertise for future mobility monitoring.

4.4.7. Challenges and deviations

– Automatic counting at the Fietsvlonder sites proved **technically impossible**, requiring a switch to manual documentation.
– The sensor technology (Bike Sense Box) is tested as new source for collecting environmental distributed across the city (using bikes for collecting date). The challenge lies in the data processing chain, from data acquisition to visualization. Colleagues from departments such as geoinformatics must be involved.
– Manual counting was **labour-intensive** and depended on staff availability.
– **Limited public communication** about the pilot reduced citizen awareness and engagement resulting in a lack of feedback through questionnaire.
– Integrating diverse datasets from different methods required **additional time and internal coordination**.

Despite these issues, the pilot was implemented successfully and delivered valuable insights into the opportunities and limitations of emerging mobility data technologies.

4.4.8. Results and impact of the pilot

The pilot demonstrated that innovative and traditional methods can complement each other in mobility data collection. **Key results** included:

- Improved understanding of multimodal traffic flows at a complex intersection.
- Evidence that the covered bicycle shelter was highly used and appreciated by cyclists.
- Identification of unmet demand for bicycle parking in central areas.
- Confirmation that AI-based video counting provides richer insights with fewer privacy risks, as no personal data are stored.
- Validation with manual observation is valuable for smaller-scale evaluations.

While the pilot did not have a direct behavioural impact, it laid the foundation for improved long-term monitoring of active mobility trends. It strengthened also Greifswald's **capacity for data-driven planning** and supported the refinement of future infrastructure investments. The results have already informed discussions in the urban planning and traffic safety commissions, guiding decisions on where to expand cycling facilities next.

4.4.9. Sustainability and scalability

The municipality is now considering purchasing its own **AI-supported traffic counting equipment** to continue intersection monitoring independently.

Future scaling options include:

- Expanding AI-based traffic counts to other intersections.
- Introducing more mobile bicycle parking platforms to address high-demand zones.
- Collaborating with schools to integrate environmental and traffic data collection into educational programmes.
- Further developing the Bike Sense Box technology once technical stability improves.

Institutional sustainability depends on **continued cooperation** between the urban planning, environment and traffic departments. Building internal capacity for data analysis and allocating a small annual budget for maintenance and updates would ensure long-term success. In any case, the replication potential is high - similar methods could easily be applied in other small and medium-sized cities in Germany or elsewhere in Europe.

This solution has **high replicability potential**: it is easy to set up, there are numerous technology providers to choose from, and its upkeep is simple as well. The AI-based traffic counting can be deployed separately, or it can be combined with manual counting and a qualitative data collection as well to understand the user experience better.

4.4.10. Lessons learned

The Greifswald pilot offered valuable lessons for municipalities seeking to enhance their mobility data capabilities:

- **AI-based counting adds value:** It provides more detailed and accurate data while reducing privacy risks.
- **Outsourcing only works short-term**: The experience showed that outsourcing services such as traffic counting is effective for short-term tests, but less sustainable for continuous data collection. Additionally, when outsourcing, the credentials of the company need to be carefully checked (e.g. have their sensors been tested in real-life environments).
- **Manual methods still matter:** In some contexts, traditional counting and observation remain necessary and reliable.
- **Technical innovation requires flexibility:** Testing emerging tools, such as sensors, demands extra time and personnel. Additional factors such as placing sensors close together and how that can impact results also needs to be considered.
- **Cross-departmental cooperation is key:** Joint ownership and communication between departments improve implementation efficiency. Moreover, data processing may require

expertise in statistics, geodata, or programming, which means interdisciplinary cooperation is very important.

- **Early stakeholder involvement improves acceptance:** Engaging residents and local businesses beforehand helps avoid misunderstandings.
- **Iterative learning strengthens capacity:** The experience helped the city refine its approach and build confidence in data-based planning.

If implemented again, Greifswald would start with more thorough technical testing, increase communication efforts with citizens and allocate additional time for integrating and analysing data. Still, the pilot confirmed that a balanced combination of technology, observation and stakeholder feedback can deliver meaningful insights for promoting active mobility and improving the urban environment.

For more information about this case study, you are welcome to contact the City of Greifswald: Dr Stephan Braun and Karl Hildebrand at umwelt[at]greifswald.de**.**

4.5. Open data sources and school-based research for active mobility in Panevėžys Municipality

4.5.1. City profile

Panevėžys, the fifth-largest city in Lithuania, is situated in the northern part of the country along the Via Baltica highway. With a population of approximately 85,000, it serves as a **key regional centre for industry, education, and culture**. In recent years, Panevėžys has emerged as a leader in sustainable urban development in Lithuania, focusing on cleaner mobility, energy efficiency, and the revitalisation of public spaces.

The city adopted its **Sustainable Urban Mobility Plan (SUMP)** in 2018, setting out a clear vision to reduce car dependency, promote cycling and walking, and improve public transport services. Despite strong political support, a significant challenge remained: a lack of up-to-date and reliable mobility data to guide decision-making and monitor progress. The data collection pilot aimed to address this gap, supporting more effective SUMP implementation and monitoring.

4.5.2. Objectives of the pilot

The pilot aimed to enhance Panevėžys Municipality's **capacity to collect, analyse and utilise data for sustainable mobility planning**. Specifically, the objectives were to:

- Gather sufficient data to support monitoring and evaluation of the city's small-scale pilot involving bicycle and scooter rack installations at schools.
- Improve SUMP monitoring by filling critical information gaps on modal split, infrastructure use, and user perceptions.
- Provide actionable recommendations for future mobility data collection and evaluation processes.

Beyond the immediate pilot, these activities **contributed to broader municipal and national objectives** sustainable development goals outlined in the Strategic Development Plan 2021–2027 and the Lithuanian Sustainable Mobility Policy Framework. By integrating data collection into regular municipal operations, the pilot aimed to strengthen evidence-based decision-making and foster collaboration between local authorities, schools, and external experts.

4.5.3. Pilot activities

The pilot ran from May to October 2025, building upon preparatory work initiated in 2024. It was closely coordinated with the small-scale pilot project involving the installation of bicycle and scooter racks at ten schools, creating operational and financial synergies for efficient use of resources.

Key activities included:

- **Situation analysis.** Reviewing existing national and municipal data collection systems to identify gaps and overlaps.
- **Indicator development.** Defining a set of quantitative and qualitative indicators to measure the effects and impact of the pilot.
- **Stakeholder consultations.** Engaging municipal departments, schools, and NGOs to prioritise data needs and identify practical challenges in data collection.
- **Monitoring activities.** Conducting surveys, on-site observations and measurements aligned with defined indicators.
- **Evaluation and recommendations.** Analysing results and formulating proposals for future monitoring and SUMP evaluation.

To optimise resources, the pilot was **built on a deliberately simple and cost-efficient methodology**, relying on existing municipal capacity and requiring no special permits or costly technologies. Five municipal employees formed the core implementation team, responsible for coordinating the full pilot cycle; maintaining ongoing cooperation with schools and other stakeholders; consulting specialists from education, spatial planning, and infrastructure departments; and managing the project finances and expenditure. Their roles covered a wide range of functions, including communication with the public, organising engagement and awareness-raising activities, and ensuring that operational decisions were made in a timely and coherent manner. Task distribution across the team was clear and expertise-based.

To strengthen the evidence base, **external experts** were engaged to carry out tasks requiring specialised technical skills. They designed and administered surveys, conducted flow observations, processed and analysed pilot data, and provided professional insights that directly informed implementation choices and the final evaluation.

4.5.4. Stakeholders and interaction activities

Stakeholder engagement was a vital component of the pilot. The main target groups involved included:

- **Municipal stakeholders.** City officials and planners who use collected data to inform decision-making and future infrastructure development.

- **School communities.** Students, teachers, and parents from ten selected schools actively participated in surveys and observations.
- **Cycling and sustainability NGOs.** Local organizations contributed to awareness-raising and provided feedback on implementation.

During implementation, the team identified an important, previously overlooked stakeholder group - **school maintenance staff**. Their involvement proved critical for ensuring appropriate rack placement, addressing security concerns, and maintenance.

Interaction activities included:

- Workshops and seminars for municipal staff and stakeholders.
- Personal consultations with planners and decision-makers.
- Collaboration with schools to plan rack installations and data collection.
- Series of school-based campaigns *"Our School is Moving"* and *"Our School is Moving 2.0"* promoting active mobility and raising awareness among students and parents.

Feedback mechanisms were built into the monitoring tools, allowing schools to provide input via online questionnaires. Responses were largely positive, reflecting enthusiasm and willingness for continued collaboration. However, parents and teachers also highlighted challenges, such as inadequate bicycle shelters, insufficient rack numbers, and unsafe pedestrian crossings near schools.

4.5.5. Evaluation and monitoring activities

The evaluation and monitoring work aimed to understand how the two pilots in Panevėžys municipality performed and how the collected data reflected the real mobility behaviour at the selected schools. Monitoring covered both **quantitative and qualitative** aspects to obtain a complete picture of the pilot outcomes. The evaluation relied on three types of indicators:

- **Result indicators.** Number of installed racks and their observed usage levels.
- **Effect indicators.** Changes in modal share, bicycle and scooter usage and rack occupancy patterns.
- **Impact indicators.** Respondents' perceptions of safety, convenience, and satisfaction (Figures 13 and 14)), along with noise level measurements near the schools.

Data collection methods included:

- **Surveys disseminated via the TAMO online platform** – a universally used digital system in Panevėžys schools for daily information exchange between students, parents, teachers, and school administration. This ensured efficient and broad outreach, enabling the survey to reach both students and parents, providing insights into travel behaviour, some reasons for mode choice and perceived changes after the pilot implementation.
- **Noise and air quality measurements** - performed by specialists to gauge environmental impacts around pilot school entrances.
- **On-site observations and traffic flow counts** – performed by school staff and external experts, providing direct insights into traffic patterns and supporting the interpretation of survey findings.

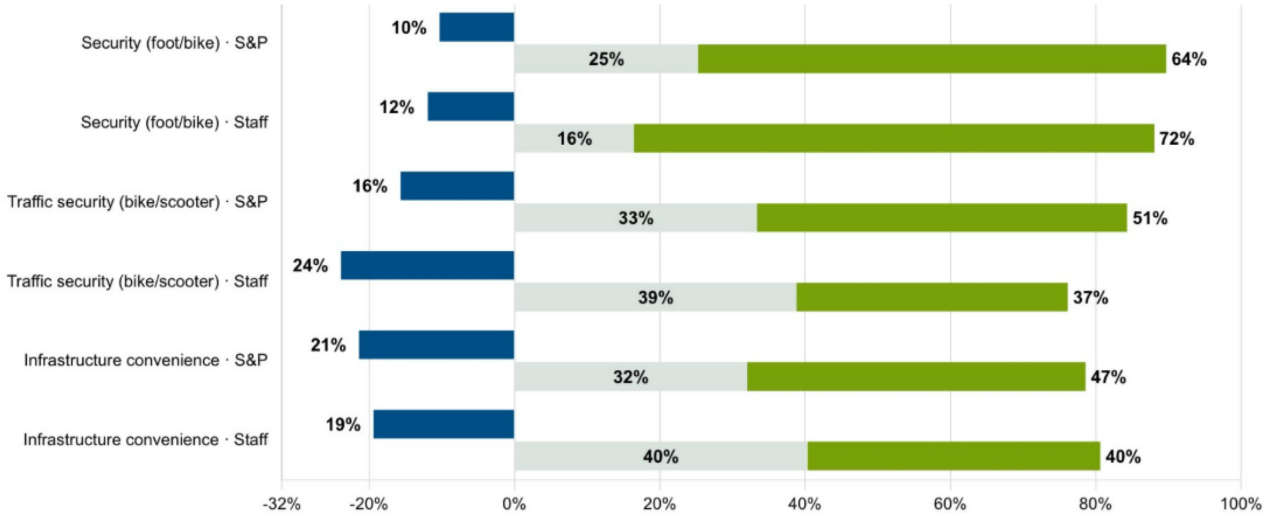

Figure 13. Initial assessment of topics connected to the pilot by students and parents (S&P) and staff (negative, 1-2, to the left; neutral, 3, at centre; positive, 4-5, to the right). Source: Panevėžys municipality.

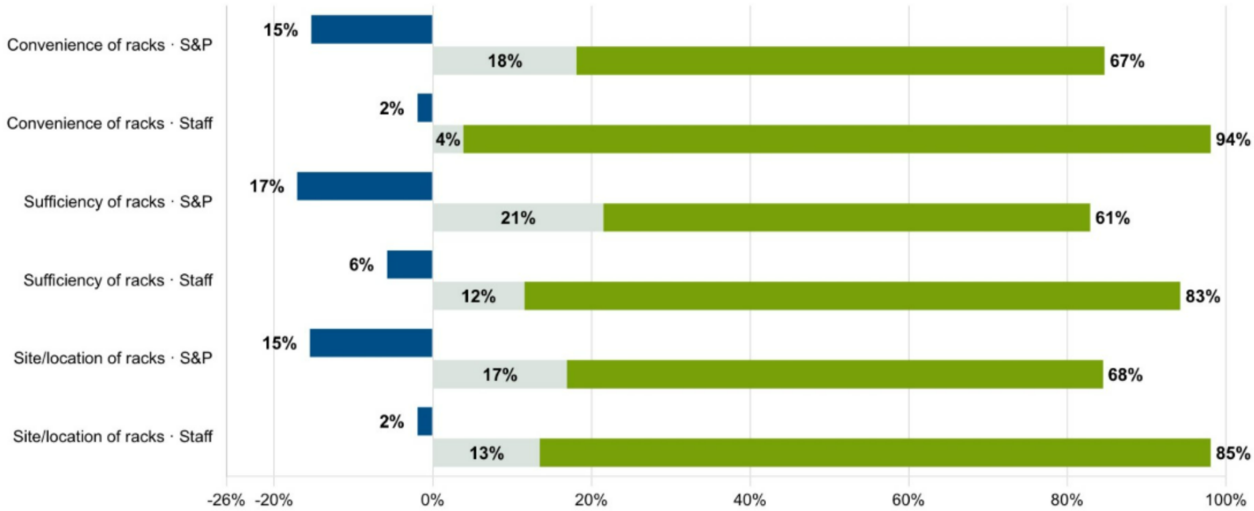

Figure 14. Initial assessment of topics connected to the pilot by students and parents (S&P) and staff (negative, 1-2, to the left; neutral, 3, at centre; positive, 4-5, to the right). Source: Panevėžys municipality.

To ensure data accuracy, and based on budget availability, the project team, school staff, and an external service provider relied entirely on manual data collection, as no automatic measurement tools were used in the pilots. Manual counts were carried out in the morning (before the classes), and repeated (four-time) observations helped verify the consistency of recorded data. When early observations revealed that some viewing points were unsuitable (due to limited visibility or changes following rack installation) these observation points were relocated to improve measurement accuracy.

All data were compiled and analysed by external experts using **standardised templates and monitoring tables**, enabling clear trend identification, cross-school comparison, and consistent interpretation across all pilot sites.

Figure 15. Installed bike rack near a school. Author: Gintarė Kliučininkienė.

4.5.6. Success stories and best practices

- **Efficient use of existing school communication platforms** enabled high survey response rates without additional administrative effort. With only minimal resources, the municipality successfully boosted **survey participation** by coordinating simple but consistent outreach: teachers briefly explained the survey's importance in selected classes, municipal representatives provided short presentations during staff meetings, principals and teachers received personalised thank-you messages recognising their contribution, parents were repeatedly informed through existing school channels (esp. TAMO online platform) , schools with low response rates were contacted by phone for friendly reminders, and high-participation schools were highlighted to the Educational Department—creating a supportive, motivating environment across the pilot schools.
- **Combining surveys of students and parents** provided a comprehensive view of mobility behaviour and perceptions.
- **Early stakeholder engagement**, especially with school communities, fostered ownership and trust in the process.
- The **flexible and resource-efficient approach** made it possible to achieve strong results with limited financial and human capacity.
- Coordination between schools, municipal departments and external experts created a **model for participatory data collection** in education settings and avoided later mistakes in data collection.
- Proactive **internal engagement** ensured strong cross-departmental support by regularly sharing key project updates and success stories, highlighting valuable contributions from colleagues in other units, and personally reaching out to departments with relevant links to participating schools.
- **Engaging external experts** for data collection and evaluation proved highly valuable, as their professional knowledge, structured methodologies, and independent perspective ensured efficient data gathering, improved measurement accuracy, and strengthened the overall reliability of the monitoring results.

4.5.7. Challenges and deviations

- **Minor adjustments** were needed after the first monitoring phase to ensure data accuracy (e.g. relocating observation points to count just vehicles related to particular schools and extending observation hours).
- **Limited access to secondary air-quality and noise data constrained the assessment of broader impacts**. However, noise levels were manually measured on school grounds four times during the pilots, ensuring at least a basic understanding of environmental conditions.
- **Secondary statistical data** from national and municipal sources (accident rates, car ownership, and public transport accessibility) were used only as contextual reference points to illustrate broader city dynamics. This minor deviation did not cause any issues, as these indicators were not essential to the core objectives of the pilots.
- Some schools faced **resource challenges** in assigning staff to conduct observations. However, the creativity and dedication of school and municipal colleagues made it possible to complete all required tasks and successfully carry out the pilots in all schools.
- Communication with multiple departments occasionally **slowed decision-making**.

In general, despite the described challenges, the implementation process was smooth and no major deviations from the original plan occurred.

4.5.8. Results and impact of the pilot

The pilot generated valuable evidence on mobility behaviour and infrastructure use in school environments. Data from ten schools included modal split, peak-hour traffic flows, noise levels near the schools, and bicycle and scooter rack occupancy, proving valuable input for decision-making and monitoring Panevėžys SUMP monitoring.

In addition, the pilot revealed variability in traffic patterns not captured by existing monitoring, highlighting areas for further investigation and potential opportunities for targeted interventions. It also identified data gaps and proposed recommendations for both further SUMP-related data collection integration of data from other projects and monitoring initiatives in Panevėžys.

The pilot results **enhanced understanding of active mobility trends and barriers,** informing the Traffic Safety Commission and other municipal bodies responsible for future infrastructure investment decisions.

4.5.9. Sustainability and scalability

The pilot demonstrated two ways to sustain monitoring:

Minimum scenario. Continue simplified data collection through schools and online surveys with minimal financial resources and management with existing municipal capacity.

Maximum scenario. Expand full-scale monitoring with on-site observations to more schools and public locations, requiring greater resources but yielding richer data for long-term planning.

To ensure **sustainability**, Panevėžys plans to:

- Integrate mobility monitoring into routine municipal processes.

- Seek external funding from national and EU sources to continue or scale up mobility monitoring activities.
- Build internal capacity for data analysis.
- Strengthen cooperation with schools and NGOs.
- Consider long-term service agreements with data providers.

The **model is highly replicable** and suitable for other Lithuanian as well as Baltic Sea Region cities, especially those with limited budgets or technical expertise due to its low cost and adaptable design.

4.5.10. Lessons learned

The Panevėžys pilot demonstrated that **meaningful mobility data can be collected with modest resources** by leveraging existing structures and partnerships. Key lessons included:

- Thorough **preparation** and **clear and consistent communication** ensure smooth implementation and data accuracy.
- Engaging schools, parents and maintenance staff fosters ownership and improves data quality.
- Using existing **school communication platforms** reduces administrative burden and accelerates participation.
- **Combining surveys with direct observations** and secondary data builds a comprehensive evidence base.
- **Delegating more responsibility to schools** can streamline processes and strengthen local ownership. However, offering small incentives, recognition, or expressions of thanks is important to maintain schools' willingness and readiness to actively participate in future surveys or questionnaires from the municipality.
- **Flexibility in data collection methods** is crucial to prevent misleading results and maintain reliability.

Overall, the pilot enhanced **municipal capacity** for evidence-based mobility planning. By linking infrastructure, data, and community engagement, Panevėžys created a practical model supporting its SUMP goals and offering inspiration for similar efforts elsewhere.

For more information about this case study, you are welcome to contact Panevėžys City Municipality:
Indrė Juodikė, +370 45 469 743, indre.juodike[at]panevezys.lt; administracija[at]panevezys.lt.

4.6. Citizens’ panel and mobility data collection in Turku

4.6.1. City profile

Turku is a vibrant coastal city in southwest Finland and one of the country’s oldest urban centres. With around 209 000 inhabitants, it is the heart of the Turku region and a **leading example of sustainable urban development** in the Nordic context. Turku is committed to becoming carbon neutral by 2029 and sustainable mobility plays a central role in this transition.

The city’s **Sustainable Urban Mobility Plan (SUMP)** and **Climate Plan 2029** outline clear targets for reducing transport emissions by 2029 and increasing the share of walking, cycling and public transport to 66% of all trips by 2030. To reach these goals, the municipality has invested in data-driven planning and citizen engagement. The data collection pilot combined technological monitoring with participatory methods to strengthen Turku’s evidence base for mobility policy and planning.

4.6.2. Objectives of the pilot

The pilot focused on **developing new ways to collect and use data on active mobility** while engaging citizens in the city’s mobility planning. It had two main components:

1. **A citizens’ panel**, which gathered residents’ experiences and opinions on mobility-related topics and provided qualitative insights for improving the SUMP.
2. **A data collection initiative**, which installed new sensors to measure pedestrian, cyclist and e-scooter movements at selected locations.

Together, these **activities aimed** to:

- Strengthen Turku’s capacity for data-driven decision-making.
- Combine quantitative and qualitative data sources for comprehensive mobility evaluation.
- Involve residents directly in planning and monitoring sustainable transport solutions.

The pilot contributed directly to **Turku’s climate and mobility goals** and supported the city’s commitment to the EU’s Mission for Climate-Neutral and Smart Cities.

4.6.3. Pilot activities

The pilot was implemented between April and November 2025 for the citizens’ panel (Figure 16) and from October 2025 onward for the sensor-based data collection (Figure 17). Planning began in autumn 2024, led by Turku’s Urban Environment Division in cooperation with traffic, IT and communication departments.

Citizens’ panel

Organisations **representing diverse population groups**, such as children, immigrants, seniors, cyclists and entrepreneurs, were invited to nominate participants. Five panel meetings were held throughout the year, each focusing on a **key mobility theme**:

1. Walkability and accessibility

2. Cycling and e-scooters
3. Public transport and the new trunk line network
4. Air quality and noise pollution
5. Digital mobility services

Figure 16. Pilot area in Turku. Author: Oona Uusitalo.

Meetings combined **site visits** with **discussion sessions** where participants could test mobility services, share observations and exchange views with city experts. The feedback was documented and summarised after each session. The feedback will be used to improve the city SUMP in the future.

Data collection through sensors

Two pilot locations were selected in collaboration with the city's traffic planning unit:

- The first sensor was placed near the new **mobility hub** close to a school.
- The second was installed by a newly opened **pedestrian and cycling bridge**, a major addition to Turku's active mobility network.

The **sensors were designed to distinguish** between pedestrians, cyclists and e-scooter users. Procurement was launched in May 2025, but installations were delayed until October due to supply chain bottlenecks and summer holidays. Despite these delays, both pilot components - the panel and sensor data - complemented each other, offering a holistic perspective on mobility in the city.

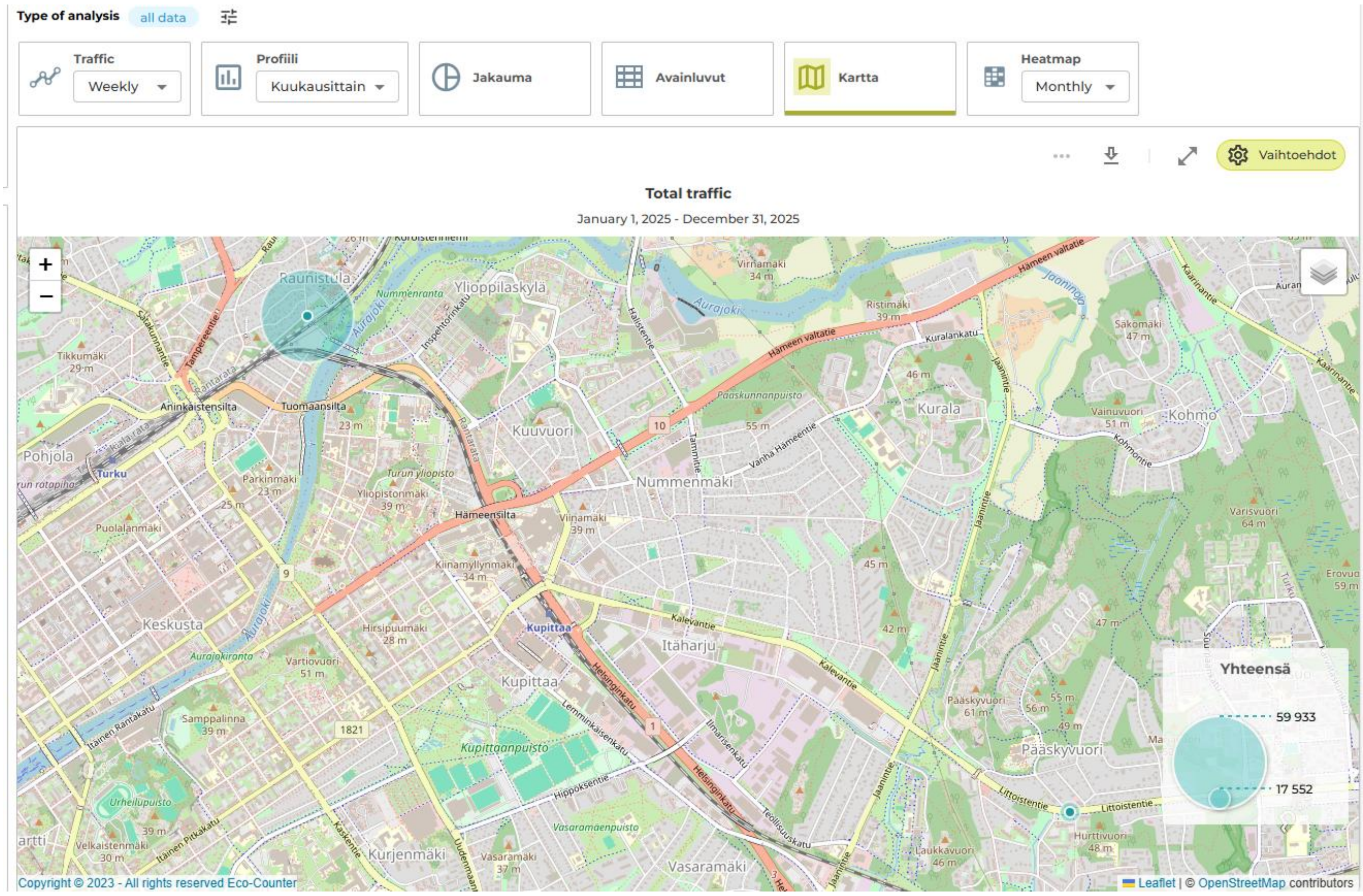

Figure 17. Screenshot from Eco-vision portal that shows the camera location and passers-by. Source: Turku municipality.

4.6.4. Stakeholders and interaction activities

The pilot involved a broad range of stakeholders:

- **Residents and local communities**, who participated in the citizens' panel.
- **Municipal departments**, including traffic planning, IT, procurement and communication.
- **Mobility operators**, such as Turku Region Traffic Föli.
- **Local schools and families**, especially those living near the new measurement sites.

Communication with panelists took place through emails, phone calls and reminder messages to maintain attendance. Meeting summaries were shared afterwards to confirm that participants' comments were recorded accurately.

Families near the sensor sites were informed in advance through local schools and signage was installed at measurement locations to explain the purpose of the data collection. The data itself was made publicly available via Turku's Service Map, allowing anyone to view real-time information on cycling and walking flows.

The pilot demonstrated that **transparency and open communication can strengthen trust** between the city and its residents, particularly when introducing new technologies in public spaces.

4.6.5. Evaluation and monitoring activities

Evaluation was conducted separately for the two pilot components.

Citizens' panel

The panel's outcomes were assessed through a **group discussion** after each meeting and a **web survey** at the end of the process. **Indicators** focused on:

- Participant diversity and attendance.
- Satisfaction with the meetings and topics.
- Perceived usefulness of the discussions for the city's planning.

Feedback showed that participants **valued the opportunity to interact directly with municipal experts** and appreciated the informal, open atmosphere of the meetings. Thematic discussions generated new ideas for improving accessibility and integrating e-scooter regulations into local policy.

Sensor data collection

Quantitative data were collected via the **new measuring devices**, which provided continuous information on pedestrian, cyclist and e-scooter flows. The city's IT department monitored the data quality through manual counts and cross-checks with existing Eco-Counter devices.

The pilot nearly **doubled the number of permanent counting points in Turku**, increasing coverage from three to five locations. This significantly improved the city's capacity to monitor active mobility trends and evaluate the effects of new infrastructure investments.

4.6.6. Success stories and best practices

+ The citizens' panel successfully created a platform for constructive dialogue between residents and municipal experts.
+ The panel's format, combining site visits and discussions, made mobility topics tangible and engaging.
+ Participants gained a better understanding of the city's mobility goals and became informal ambassadors for sustainable transport.
+ The data from new sensors provided real-time, reliable information that can be integrated into existing planning systems.
+ The transparent sharing of sensor data through Turku's public Service Map strengthened public trust and accessibility.

4.6.7. Challenges and deviations

- The **procurement and installation of sensors were delayed** due to high demand from the manufacturer and overlapping summer holidays.
- **Finding suitable locations** for the measuring devices proved challenging, especially since the bridge site was still under construction.

- Maintaining **consistent participation** in the citizens' panel required regular communication and reminders.
- Some participants **could not attend all meetings**, so email contributions were used to ensure inclusivity.
- Procurement licensing and data compatibility between systems required **more preparation than initially expected**.

Despite these issues, both components were implemented successfully and the city managed to keep the pilot within its planned timeframe and budget.

4.6.8. Results and impact of the pilot

The combined results of the citizens' panel and the data collection initiative strengthened Turku's capacity for evidence-based and participatory mobility planning.

Key impacts included:

- Improved understanding of pedestrian, cycling and e-scooter activity in the city.
- Greater insight into citizens' perceptions of accessibility, safety and convenience.
- Strengthened cooperation between departments and with residents.
- Enhanced data infrastructure for ongoing monitoring and policy evaluation.

Panel participants reported that they **gained a deeper appreciation** of how mobility planning works and felt motivated to share their new knowledge within their communities. City experts, in turn, valued the opportunity to test ideas and validate plans directly with users.

The new sensor data also allowed Turku to **move away from assumptions toward data-based policy design**. It supported validation of measures already included in the SUMP and provided a solid foundation for future updates.

4.6.9. Sustainability and scalability

Both components of the pilot - the citizens' panel and the measuring devices - are designed to continue beyond the project's duration.

Citizens' panel:

- The model can be sustained with modest financial resources, mainly requiring staff time for organisation and coordination.
- To ensure continuity, dedicated personnel will be needed to plan meetings, manage logistics and analyse feedback.
- Small incentives such as public transport tickets or tokens of appreciation proved effective for encouraging attendance.
- High replicability potential as it is overall very easy to implement and a flexible, low-cost method for engaging a wide range of participants

Data collection through sensors:

- Continued operation will require maintaining licenses, updating software and periodically servicing the devices.
- Better data analysis capacity is needed within the city administration to fully utilise the information collected.
- The network could be expanded to cover additional key routes and neighbourhoods as resources allow.
- The sensor network has high replicability potential as once the system is operational, it is fairly easy to maintain. The biggest driver for success is ensuring a smooth set-up process, which may require some prior knowledge on the technologies deployed and the tendering process.

Scaling up is both feasible and beneficial. The **citizens' panel model could be replicated** at the regional level, covering the Functional Urban Area (FUA) through coordinated participation. Similarly, the **sensor network could be enlarged** to provide comprehensive coverage of active mobility flows citywide.

4.6.10. Lessons learned

The Turku pilot offered several valuable lessons for future mobility data collection and citizen engagement:

- **Allow sufficient time for procurement:** Technical purchases often face delays; early planning helps mitigate risks. Additional research into available technologies and background checks on the providers may prove helpful in the procurement process.
- **Be a demanding customer:** Regular contact with the provider to ensure that they follow up on promises may be very important.
- **Careful selection of panel participants:** Ensuring diverse representation enriches discussions and prevents bias. Outreach should cover all residents' associations to ensure wide participation from the entire city. Moreover, it is better to invite more people as it is unlikely everyone will be able to participate. Regular communication and building trust are also very important in long-term engagement.
- **Offer flexible participation options:** Email feedback or hybrid participation helps maintain inclusivity. Continuously emphasising the value of the participants' contribution helps keep them engaged.
- **Combine data sources:** Integrating quantitative sensor data with qualitative insights gives a more complete picture of mobility trends.
- **Maintain transparency:** Publicly sharing data builds trust and encourages community involvement.
- **Allocate resources for analysis:** Data collection is only valuable when accompanied by systematic analysis and use.

If repeated, the city would **start procurement earlier and allocate more staff time** to coordination and data interpretation. Larger incentives could also help maintain high engagement in the panel.

The pilot ultimately showed that **combining technology and participation** can make mobility planning more responsive, transparent and people-centred, supporting Turku’s vision of becoming a climate-neutral and smart city by 2029.

For more information about this case study, you are welcome to contact the City of Turku:
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Abbreviations

Table 5. Used abbreviations in report

Abbreviation	Meaning
SUMP	Sustainable Urban Mobility Plan
BSR	Baltic Sea Region
AI	Artificial Intelligence
IT	Information Technology

References

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