Integrated system for the analysis of sustainable urban mobility

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Evidence from Italian cities promoting sustainable active mobility with gamification and economic incentives

Sustainable urban mobility is one of the most pressing challenges of our time. With increasing urbanisation and growing problems related to air pollution, traffic congestion and reduced quality of life in cities, it is becoming increasingly difficult to plan people-friendly cities. In response to these challenges, supported by studies and research in this field by the scientific community, administrations and companies are increasingly adopting policies aimed at **promoting sustainable modes of transport**, such as walking, cycling, using public transport or car sharing.

Within this context, the **SIAMUS** project — Integrated System for the Analysis of Sustainable Urban Mobility — emerges as a timely and necessary initiative. It builds a scientific foundation for understanding, measuring, and promoting sustainable travel behaviors, offering policymakers and private stakeholders tools to design effective interventions that respond to both environmental imperatives and citizens' mobility needs.

The SIAMUS project was developed to provide reliable data and indicators for sustainable urban mobility, integrating multiple research activities into a coherent framework. It builds on real-world evidence from Italian cities and on the experience of Pin Bike (https://www.pin.bike/), the patented system for certifying and incentivising sustainable travel. Through technical reports, impact assessment models, and guidelines, SIAMUS delivers scientifically validated insights that can guide both public and private investments. The aim is not only to measure outcomes but to create a replicable model of data-driven governance for urban mobility.

At the heart of SIAMUS lies **Pin Bike**, the patented system for certifying, monitoring and promoting sustainable urban travel (not only cycling, but also walking, other forms of micro-mobility, public transport and carpooling) using gamification techniques and financial rewards (bank transfers, payroll benefits, or vouchers redeemable in local shops: link.pin.bike/spot). By integrating GPS and Bluetooth data, Pin Bike provides anti-fraud certification of sustainable trips, enabling municipalities, schools, and companies to reward citizens' choices while gathering detailed datasets on mobility patterns. This dual function — incentivising behavior and generating knowledge — makes Pin Bike a cornerstone for sustainable mobility innovation. More than 30 European cities (Bari, Bergamo, Bolonia, Braga, Florence, Istanbul, Stockholm, Tallinn, Turku, Turin, etc.) have already adopted Pin Bike, that counts today on about 27k users who cycled almost 10M km, cut more than 1,5k tons of CO2 and earned more than 2M € (https://web.pin.bike/open/all).

https://www.youtube.com/watch?v=2BcYlOcZIhU

Evidence from 9 Italian cities

SIAMUS synthesizes the experiences from nine Italian cities where Pin Bike has been deployed since 2020. More specifically:

- 3 large city projects in the north (Bergamo), center (Florence), and south (Bari) for at least one year.
- 3 limited city projects in the north (Turin), center (Pescara), and south (Lecce).
- 4 private projects, 3 corporate Bike2Work projects (AUSL Bologna, Sant'Orsola Polyclinic, Municipality of Trento), and one Bike2School project (Formiggini High School in Sassuolo) for 4 years.

These initiatives targeted diverse settings, from municipal campaigns to corporate Bike2Work schemes and school projects, engaging around 7,000 users. The report highlights how financial incentives and gamification have produced measurable shifts in urban mobility, generating hundreds of thousands of sustainable trips and substantial reductions in CO_2 emissions.

The cities with the best results in terms of kilometers traveled, active users, and CO2 savings (Bari, Bergamo, Florence) demonstrate that sustained citizen participation can be achieved from north to south and across diverse topography, travel traditions, and availability of active and sustainable mobility infrastructure and services. However, even smaller projects, such as in the cities of Lecce and Pescara, in the San Salvario neighborhood of Turin, and in business and school communities such as those in Bologna, Sassuolo, and Trento, have achieved positive impacts and demonstrate that any context can commit to sustainability goals. This suggests that promotional campaigns are adaptable to different urban contexts and can generate benefits even in smaller communities.

The report also underscores the importance of demographic diversity and inclusivity. Data on gender, age, and travel purposes allow policymakers to identify which groups respond best to incentives and where targeted communication is needed. Beyond individual benefits, the initiatives also generated positive spillovers for urban economies by channeling vouchers into local shops and strengthening community ties. Collectively, the nine case studies demonstrate that gamified incentive systems can effectively combine environmental, social, and economic benefits.

Impact assessment

SIAMUS deepens the analysis by applying impact assessment models to the Pin Bike initiatives. Using a combination of stated preference (SP) and revealed preference (RP) surveys, the study examined both users' declared motivations and their actual travel behavior. This mixed methodology enabled researchers to capture not only measurable modal shifts but also the underlying psychological and social drivers of sustainable mobility.

The models confirmed that financial incentives and gamification dynamics were effective in reducing reliance on motorized vehicles and encouraging cycling and walking. For example, many participants reported a modal shift from car commuting to active travel, motivated by both economic rewards and the sense of community fostered by gamified challenges. The assessment also highlighted variations by context: initiatives were more effective in dense urban areas with short commutes, while longer distances limited behavioral change without supportive infrastructure.

Importantly, the impact assessment models provide a scientific basis for policy design. They demonstrate how urban authorities can predict the effects of incentive campaigns, estimate cost-benefit ratios, and optimize investments in mobility infrastructure. Beyond academic value, the findings offer actionable insights for municipalities, schools, and businesses — from managing peak-hour congestion to improving inclusivity in mobility plans.

Guidelines for public and private policies

SIAMUS translates the quantitative and qualitative insights into policy guidelines for municipalities, schools, companies, and private actors. SIAMUS highlights how financial rewards, gamification, and nudging can be combined to drive behavioral change. Incentives can take multiple forms — direct transfers to bank accounts, payroll benefits, or vouchers redeemable in local shops — allowing municipalities and employers to tailor them to local contexts. Beyond monetary incentives, psychological and recreational rewards, such as symbolic badges, rankings, or competitions, enhance motivation and foster long-term engagement. These measures not only promote cycling and walking but also collect valuable mobility data that can guide broader policy decisions.

Building on a series of use cases from Italian municipalities, schools, and companies that adopted Pin Bike between 2020 and 2024, SIAMUS further identifies key factors for success, stressing the importance of coordination, communication, and community engagement. Effective promotional campaigns require collaboration between municipalities, businesses, schools, and local associations, ensuring broad ownership and visibility. Clear communication strategies and active involvement of participants are critical to sustaining motivation and trust. Moreover, incentive campaigns are most effective when co-designed with local stakeholders, adapted to specific cultural and geographical conditions, and integrated into comprehensive mobility management strategies like SUMPs or corporate travel plans.

Finally, monitoring and evaluation are highlighted as essential for scaling up these policies. That is why SIAMUS has developed a general Open Data platform that collects information on all Pin Bike projects (https://web.pin.bike/open/all/7a3), enhanced with an Artificial Intelligence chatbot that allows administrations to query the database in natural language, obtaining insights even without specialist skills in data analysis. The chatbot's knowledge base covers all Pin Bike projects, while its AI-based system allows it to interpret users' natural language, converting it into database queries to obtain specific information that meets their requests. Robust monitoring systems like this allow cities and organizations to measure participation rates, kilometers cycled, CO_2 saved, and the economic circulation of incentives. These metrics not only validate the effectiveness of mobility programs but also provide evidence to optimize investments and adjust campaigns over time.

The policy options outlined in this toolkit are practical, scalable and adaptable. Each community can start from its current situation, integrating economic, psychological and recreational incentives in synergy with existing mobility policies, infrastructure and services. Setting goals and monitoring progress are a fundamental part of the process. Knowing where you started, measuring what is being done and sharing results helps to maintain momentum, build trust and show the real impact of policy choices. These incentive measures, even modest ones, can bring tangible benefits and trigger broader transformation.

What matters is to start: test, learn, adapt and scale up what works. Good practices and success stories do exist, but they must be actively translated into policies and interventions to make active and sustainable urban mobility a reality.

References

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