SUSTAINABLE MOBILITY: THE CASE OF COPENHAGEN

Aleksandar Šobot

University of Novo Mesto, Faculty of Business and Management Sciences, Department of Environmental Governance, Na Loko 2, 8000 Novo mesto, Slovenia, aleksandar.sobot@uni-nm.si

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Corresponding Author: Aleksandar Šobot, University of Novo Mesto, Faculty of Business and Management Sciences, Department of Environmental Governance, Na Loko 2, 8000 Novo mesto, Slovenia, aleksandar.sobot@uni-nm.si

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ABSTRACT

Climate change presents a significant global challenge, with transport contributing substantially to greenhouse gas emissions. This exploratory case study examines cycling-oriented mobility in Copenhagen through the Space, Culture, and Ambition dimensions used in the Copenhagenize Masterclass. Qualitative field observations were undertaken during the programme on 12–14 June 2024 and are contextualised using published municipal indicators. The observations describe separated cycle tracks, supporting facilities, everyday bicycle use, cargo bicycles, and orderly interactions at observed locations. Municipal data provide a separately identified quantitative context rather than measurements from the field visit. Together, these sources suggest that infrastructure provision, everyday cycling practices, and sustained policy support are mutually reinforcing. The study identifies practical planning considerations for other cities while acknowledging that the short observation period and absence of reported count data prevent statistical generalisation or causal evaluation.

Keywords: climate change, sustainable mobility, cycling infrastructure, Copenhagen, urban governance.

INTRODUCTION

Climate change is widely recognised as a critical global challenge, with the transport sector constituting a significant source of greenhouse gas emissions and urban air pollution. The European Green Deal identifies the achievement of climate neutrality by 2050 as contingent upon a fundamental transformation of urban transport and the adoption of sustainable, low-carbon mobility solutions. Among various transport modes, cycling is considered one of the most efficient, environmentally sustainable, and economically viable alternatives for reducing emissions, alleviating traffic congestion, and decreasing energy consumption, while also enhancing public health and overall quality of life [1, 2, 3].

The development of cycling-friendly cities requires more than the construction of bicycle lanes. Recent research indicates that effective cycling policies necessitate an integrated approach that combines high-quality infrastructure, supportive public policies, urban planning, behavioural change initiatives, and sustained political commitment. As a result, cities that have achieved significant increases in cycling rates have typically adopted comprehensive mobility strategies instead of isolated infrastructure projects [4, 5].

International research provides a broader comparative perspective. Pucher and Buehler show that cycling development in the Netherlands, Denmark, and Germany is associated with coordinated infrastructure, traffic calming, bicycle parking, public transport integration, and supportive land-use policies [6]. Their subsequent synthesis places cycling within a wider sustainable transport agenda and emphasises its environmental, health, and space-efficiency advantages [7]. These contributions support examining infrastructure, social practices, and governance together rather than treating cycle lanes as a sufficient intervention.

Studies from Slovenia, Istria, and Graz examine cycling in relation to commuting, tourism, and sustainable urban development [8, 9, 10]. These cases provide regional points of comparison, although their different methods and contexts do not establish the effects of measures in Copenhagen.

Copenhagen offers a useful case for examining how cycling infrastructure, daily travel practices, and public policy interact. Published municipal monitoring provides contextual indicators of cycling use and infrastructure [11]. These indicators must be distinguished by year, geographical coverage, and trip purpose; commuting shares cannot be treated as shares of all journeys.

The Copenhagenize Masterclass combines theoretical instruction with field activities addressing cycling infrastructure, user behaviour, and urban mobility policy. In this study, Space, Culture, and Ambition are used as organising dimensions for a descriptive case analysis, rather than as a validated quantitative index.

This study aims to analyse the principal characteristics of Copenhagen's cycling system using the Copenhagenize methodology and to identify insights to inform the development of sustainable mobility strategies in other European cities, particularly in regions where cycling accounts for a relatively minor share of transport.

MATERIALS AND METHODS

An exploratory, single-city case-study design was adopted. Previous work on Graz provides a comparative conceptual reference [10], while the Copenhagen observations are treated as a distinct, context-specific source of evidence.

The study was conducted during the Copenhagenize Masterclass in Copenhagen, Denmark, from 12 to 14 June 2024. This international educational programme facilitates knowledge transfer on sustainable urban mobility through the Copenhagenize methodology, which evaluates cycling development across three complementary dimensions: Space, Culture, and Ambition.

Field activities included observation of cycling infrastructure, cyclist-count exercises at selected urban intersections, and assessment of bicycle use and supporting facilities. The infrastructure topics considered included cycle track separation, continuity, signage, parking, and traffic organisation. Behavioural topics included the visible diversity of users, cargo bicycle use, responses to traffic signals, and interactions with other road users. The manuscript does not report numerical outputs from the count exercises, site-specific observation durations, or a complete sampling frame. Consequently, those exercises are not used to estimate traffic volumes, gender proportions, or compliance rates.

The Space dimension organised observations on track separation, route connections, and supporting facilities. Culture covered visible bicycle use and road-user interactions. Ambition addressed policy continuity and monitoring using the educational context and documentary evidence. The framework guided descriptive interpretation; it did not provide numerical scores for safety, equity, or social acceptance.

Observations were synthesised descriptively within the three analytical dimensions. No statistical testing or causal modelling was undertaken. The City of Copenhagen's Bicycle Account 2022 was used as a secondary documentary source to contextualise the observations [11]. Its indicators relate primarily to 2021 and 2022 and therefore do not describe conditions measured during the June 2024 visit. Published municipal statistics and the author's field observations are identified separately throughout the results.

RESULTS

Space

At the locations visited, physically separated cycle tracks and clearly allocated cycling space were prominent features. These observations illustrate how street design can reduce direct interaction with motor traffic, although this study did not measure collision risk or perceived safety. The observations concern the visited locations and do not constitute an audit of the entire network.

The infrastructure assessment identified route connections and supporting elements, including bicycle parking, signage, lighting, and dedicated traffic signals. Their practical significance lies in supporting different stages of a journey: reaching a destination, navigating intersections, and parking on arrival. These features suggest that cycling convenience depends on network continuity and supporting facilities together, rather than on isolated track segments.

The allocation of street space to cycling and walking was interpreted as a visible planning priority. However, the field assessment did not quantify modal equity, accessibility for people with disabilities, or differences between neighbourhoods. Such questions require a wider spatial audit and user-based evaluation.

Culture

A continuous flow of cyclists was observed at the intersections visited. This establishes the visible presence of cycling during the observation period, but the absence of reported counts and observation intervals prevents estimation of volumes or citywide modal shares. Everyday bicycle use and the transport of children and goods were prominent descriptive features of the visit; trip purposes were not independently verified through interviews.

Both men and women were observed cycling, and cargo bicycles were visible in family and goods-transport contexts. These observations indicate diversity in bicycle use but do not establish a statistically balanced gender distribution or the frequency of particular user groups. No demographic survey data are available for analysis.

Orderly movement and responses to dedicated traffic signals were noted at the observed locations. Clear markings and spatial separation provided a visible framework for interactions between cyclists and other road users. These findings are descriptive: no standardised conflict assessment or compliance-rate calculation was undertaken. They therefore cannot demonstrate that regulation compliance or safety is uniformly high across Copenhagen.

Ambition

Ambition concerns policy continuity and institutional support, which cannot be established through street observations alone. In this analysis, the governance dimension is therefore interpreted using the Masterclass context and published municipal monitoring [11]. The monitoring publication illustrates how policy objectives can be linked to reported indicators and investment, rather than evaluated solely through visible infrastructure.

The City reported DKK 0.84 billion invested in cycling initiatives over the preceding ten years and a target of 50% of work and education trips by bicycle by 2025 [11]. These are historical expenditure and policy-target figures, respectively; the target is not evidence that the share was achieved. This distinction is essential when interpreting political ambition.

Published municipal indicators

Table 1 provides selected secondary indicators [11]. The 2021 travel shares were affected by COVID-19 restrictions and must not be interpreted as June 2024 measurements. Infrastructure

categories are reported separately, without assuming that they can be summed into a non-overlapping network total.

Table 1. Selected published indicators. Source: City of Copenhagen, Bicycle Account 2022 [11], pp. 6–7 and 14–15. These are secondary data, not results of the 2024 field exercises.

Indicator	Reported value	Reference year
Cycle tracks	388 km	2022
Cycle lanes	33 km	2022
Cycling share of all trips to, from, and in Copenhagen	21%	2021
Cycling share of trips to and from work and education	35%	2021

DISCUSSION

The case suggests that cycling-oriented mobility is best understood through the interaction of infrastructure provision, everyday practices, and institutional support. The field material illustrates these dimensions, while municipal indicators provide a separately sourced quantitative context. Agreement between these evidence types is useful for interpretation, but it does not establish causal relationships or validate the field observations as representative of the city.

The regional studies on Slovenia, Istria, and Graz offer relevant comparisons for commuting, tourism, and planning [8, 9, 10]. The present observations complement these studies by describing the practical visibility of cycling infrastructure and everyday bicycle use in Copenhagen. Differences in study design and local conditions preclude direct estimates of relative policy effectiveness.

The findings are consistent with Pucher and Buehler's account of coordinated cycling policies in the Netherlands, Denmark, and Germany [6]. Their analysis suggests that network provision works alongside parking, traffic calming, public transport integration, and compact development. Copenhagen's observed facilities illustrate some of these elements, but their individual contributions were not measured here. The broader sustainable transport perspective [7] also supports evaluating cycling alongside other urban modes rather than in isolation.

For cities with lower cycling participation, the case suggests assessing missing network links, intersection design, destination parking, and connections to public transport together. These are planning considerations rather than tested prescriptions. Their suitability depends on local trip distances, topography, settlement patterns, resources, and user needs. A locally adapted assessment should precede investment decisions and include people who currently do not cycle.

The main limitations are the three-day observation period, selection of locations within an educational programme, absence of reported count results, and lack of a standardised sampling protocol. Gender balance, compliance, and safety cannot be quantified from this material. Secondary indicators refer to earlier years and include pandemic-related travel changes. No emissions reductions, health effects, or policy impacts were directly measured. Future work should report locations, observation intervals, weather, cyclist counts, and a transparent coding procedure, and repeat observations across seasons. User surveys and before-and-after evaluations would help assess whether interventions improve accessibility and increase cycling.

CONCLUSIONS

This exploratory case study organises observations from the Copenhagenize Masterclass around Space, Culture, and Ambition. The principal descriptive findings concern separated cycling space, supporting facilities, diverse everyday bicycle use, and the relevance of policy monitoring. Published municipal indicators add quantitative context while remaining distinct from the June 2024 observations.

The case supports considering infrastructure, user practices, and governance together when developing sustainable mobility strategies. It does not establish the causal effects of individual measures, quantify environmental benefits, or demonstrate that the Copenhagen approach can be transferred unchanged to other cities.

For Slovenia and other European contexts, the framework can structure an initial diagnostic assessment. Its practical value should be tested through locally collected data, explicit indicators, and monitoring of implemented measures.

DECLARATIONS OF INTEREST STATEMENT

The authors affirm that there are no conflicts of interest to declare in relation to the research presented in this paper.

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