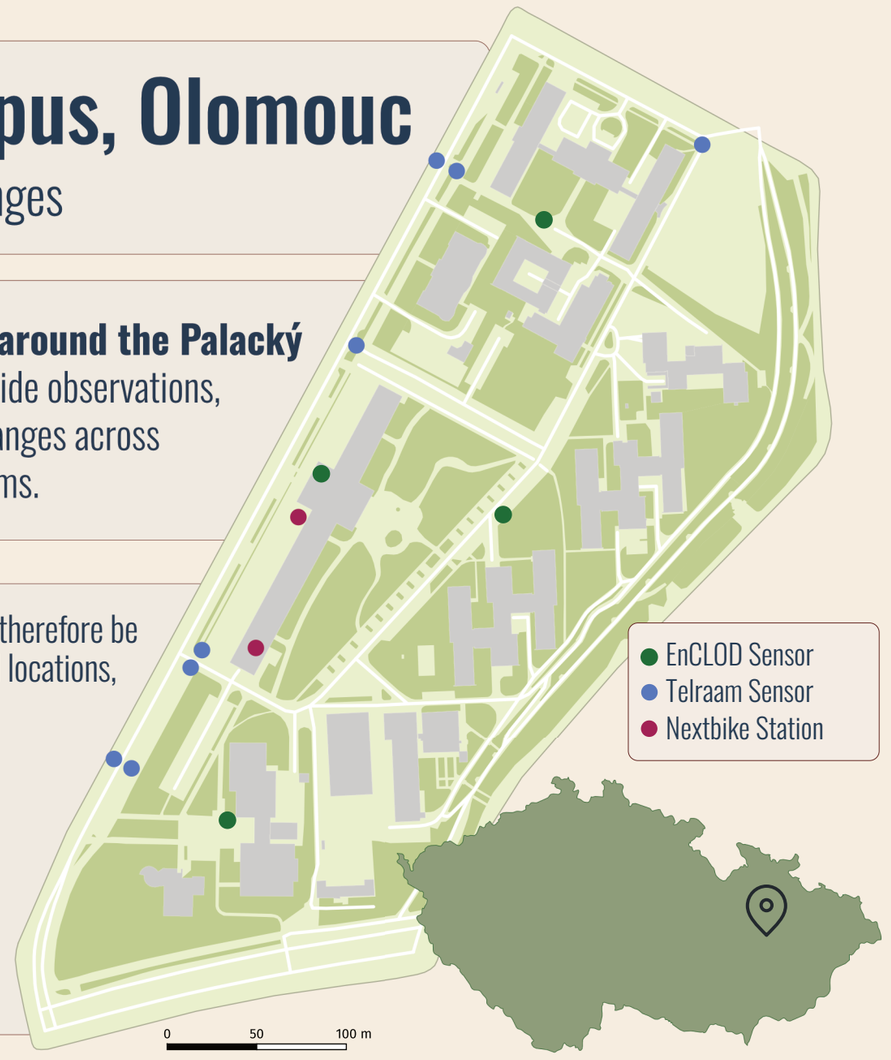
Understanding Mobility at the Envelopa Campus, Olomouc

A multisource analysis of when, where and how movement changes

How do university activity, weather and different monitoring systems shape recorded mobility around the Palacký University Envelopa campus? This study uses **several data sources**: motor-vehicle counts, multimodal roadside observations, shared-bicycle trips and weather records collected between **May 2025 and May 2026.** The analysis examines changes across locations, times of day, academic periods and weather conditions, as well as differences between monitoring systems.



Data Sources

Data availability and the transport modes represented differ between datasets. Results should therefore be interpreted within the context of each data source. EnCLOD and Telraam monitor selected road locations, while Nextbike records contain start and end points of journeys.

Telraam

Classifies detected pedestrians, bicycles, cars and large vehicles.

EnCLOD

Sensors recording motor vehicles passing monitored road locations.

nextbike

Journey start and end points. Displayed routes are modelled likely routes, not observed GPS trajectories.

Czech Hydrometeorological Institute

Temperature and precipitation data.

Mean daily counts by academic period

Sensor	Summer Exam Period (50 days)	Main Holiday (62 days)	Winter Semester (89 days)	Winter Exam Period (33 days)	Summer Semester (91 days)
Telraam: 17. Listopadu	-	-	5,992	8,069	8,752
Telraam: Šmeralova	-	-	1,459	2,110	2,612
Nextbike: All	26	21	23	-	-
Šmeralova South: In	905	649	972	813	889
17. Listopadu South: In	4,797	5,380	6,411	5,672	5,943
Šmeralova North: Out	311	199	335	246	307
17. Listopadu North: Out	4,212	4,856	5,642	4,967	5,172
Šmeralova South: Out	633	535	687	578	655
17. Listopadu South: Out	4,535	5,481	5,703	5,346	5,536
17. Listopadu North: In	4,602	5,358	5,694	5,272	5,483
Šmeralova Middle: Out	283	156	313	222	271

Annual Patterns

Šmeralova

Counts were more sensitive to university routines

17. Listopadu

Stayed active during non-teaching periods, suggesting it functions as a wider urban corridor

Faculty of Science Building

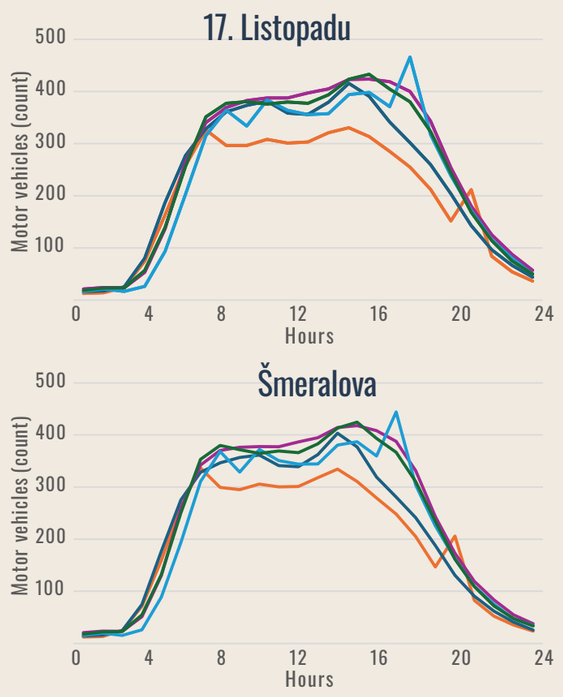
Note: Counts represent passages or trips, which aren't necessarily unique. The same traveller may be represented more than once across different journeys or locations.

24-Hour Patterns

The profiles reveal when movement is concentrated and whether locations follow distinct commuting or campus-activity rhythms.

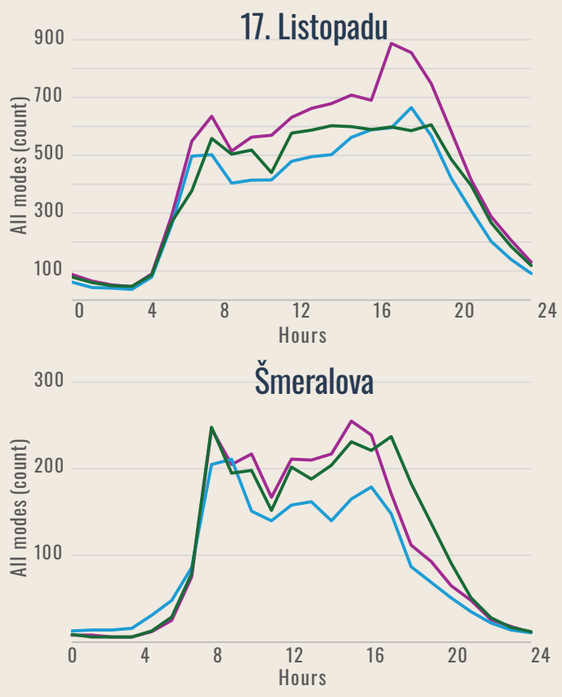
EnCLOD

Smooth curves throughout the day, likely due to cars using the area as a wider corridor



Telraam

Clearer AM and PM peaks, likely due to cyclists and pedestrian commuters



Morning and Afternoon Peaks

Peak times differed by sensor, direction and academic period. Morning peaks had wider time window, whereas afternoon peaks were more consistent.

06:15 - 10:00

Variable mornings

15:00 - 16:45

Stable afternoons

Afternoon peaks were more consistent than morning peaks, which varied more by sensor, location and academic period.

The view of 17. Listopadu from the north

The view of Šmeralova from the south

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Sensor comparisons show why the datasets should not be treated as directly interchangeable

EnCLOD and Telraam sensors monitor two same segments on the front and side of the Faculty of Science building, allowing for comparison of counts during the same time periods.

Disagreement wasnt consistent with higher traffic flows

At the front location, there was no clear relationship between sensor disagreement and traffic volume, while at the side location, disagreement decreased on busier days.

There were many periods when sensors disagreed by more than 30%

The front location experienced 109 extreme periods while the side experienced 14 extreme periods. The maximum disagreement was by 200%.

EnCLOD counted consistently higher

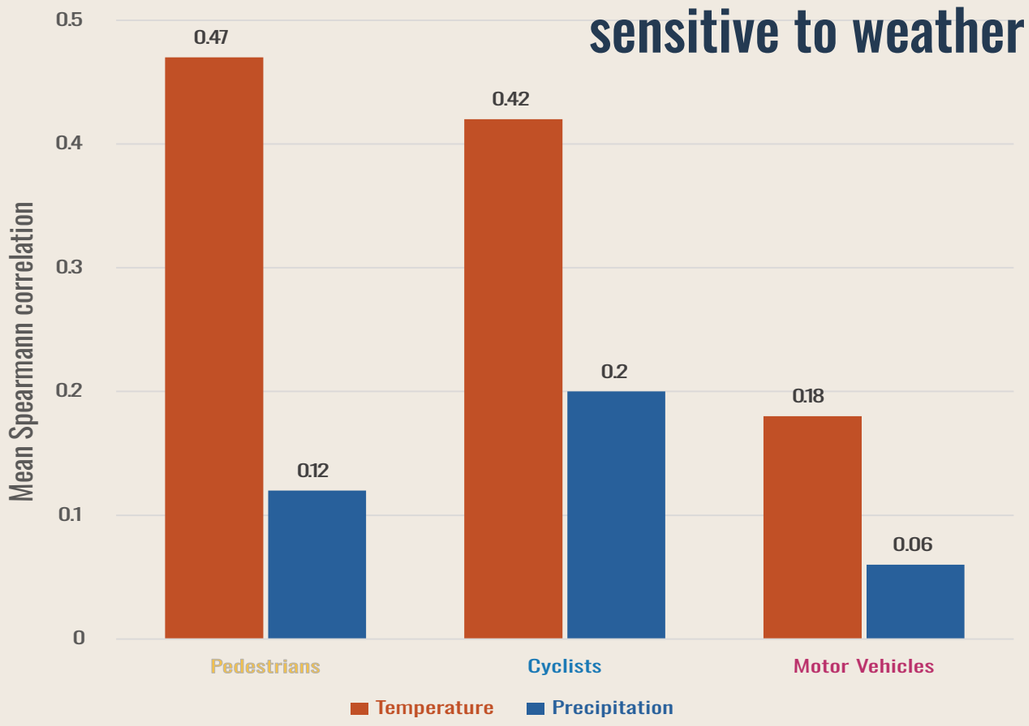
At both locations, EnCLOD always gave a higher count. For the front location, this was 33.2% and the side 9.7% of the time.

Longer aggregation periods don't consistently improve agreement

For the front location, longer periods reduced agreement, with the worst agreement experienced during terms, whilst for the side, longer periods increased agreement with the worst agreement experienced on days.

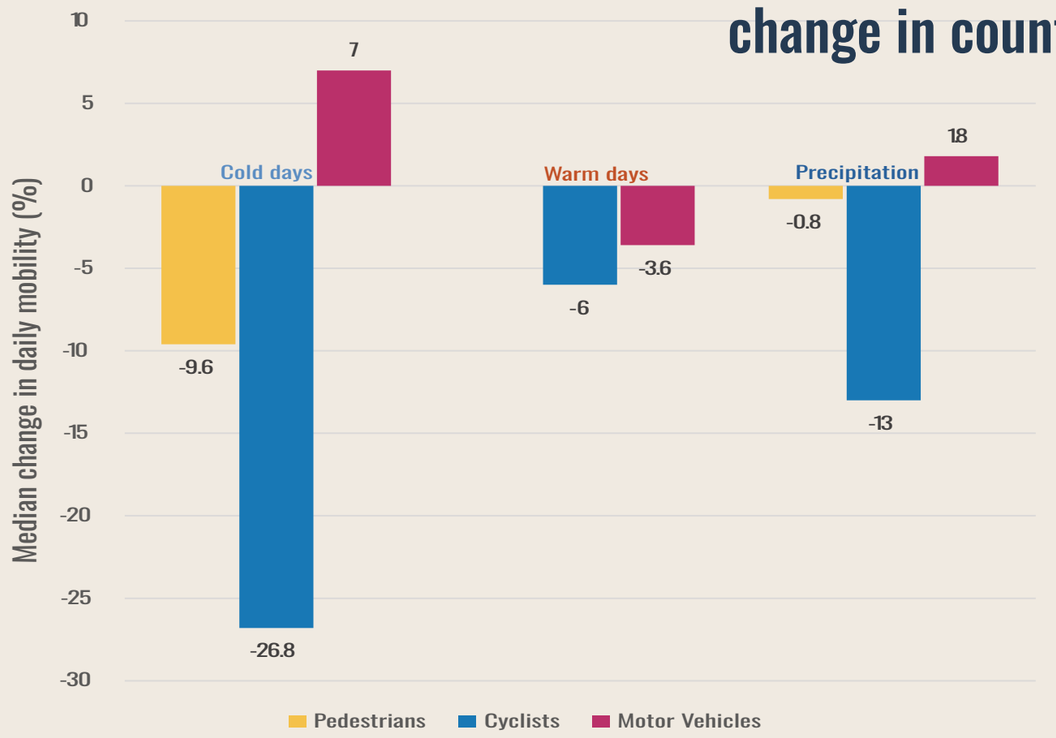
Weather conditions help to explain why mobility patterns vary

Active travel modes were most sensitive to weather



The higher the Spearmann value, the closer the correlation between mobility and weather changes. Temperature was the clearer influence for all three modes. Pedestrian and cyclist counts changed more consistently with temperature than with precipitation, while motor-vehicle counts remained comparatively stable.

Cold weather had the clearest effect on change in counts



Cold conditions produced a larger and more consistent response than precipitation or warm days. Every cyclist cold-day test was statistically significant, while the pedestrian decrease was smaller and not significant.

Academic terms give additional insight into why mobility patterns vary

Mobility around the campus was not explained by weather alone. Teaching, examination and holiday periods added information about why daily volumes changed. A generalised linear model showed that effects were strongest for pedestrians and weakest for cyclists.

Pedestrians

68.3 median ΔAIC, 100% improvement

Cyclists

32.4 median ΔAIC, 90% improvement

Motor Vehicles

7.4 median ΔAIC, 100% improvement

Unusual days were rare and mostly source-specific

Fewer than one in ten observations were shortlisted as deviations in every dataset. **0 dates** appeared in all three datasets, pointing to how deviations are a prompt to **investigate** and not necessarily indicative of an event or sensor error.

EnCLOD: 70 days

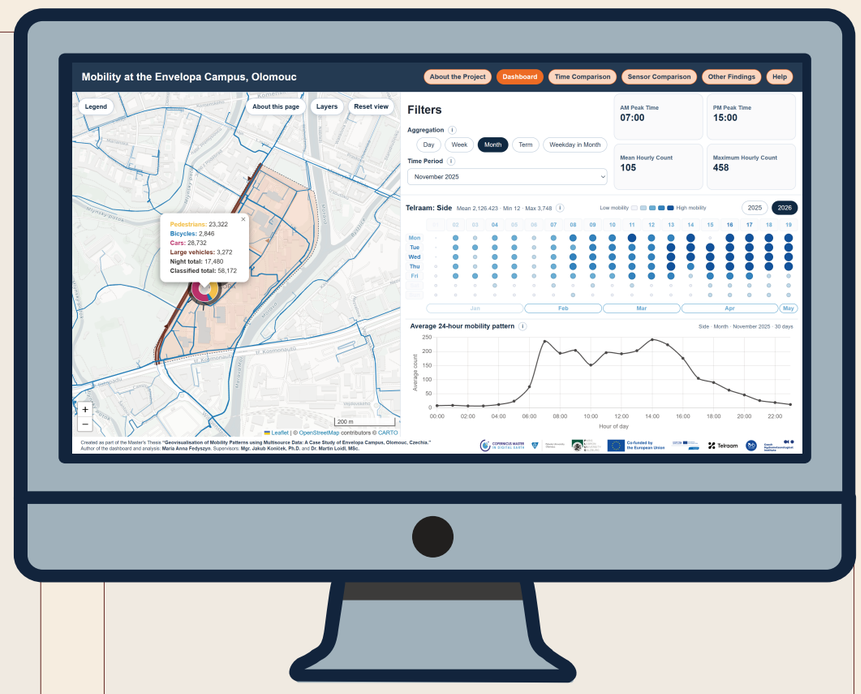
6.5% of all observations
20 were linked to known events or holidays

Telraam: 25 days

8.3% of all observations
6 were linked to known events or holidays

Nextbike: 11 days

5.4% of all observations
1 were linked to known events or holidays



Explore these findings within the **interactive dashboard** to gain a deeper understanding of mobility variability within the envelopa campus.
Access the interactive dashboard via the QR code, or at **mariaannaa.github.io/envelopa_dashboard/**

Main takeaway? No single dataset can provide a complete picture of mobility. Combining EnCLOD, Telraam, Nextbike and weather records for the Envelopa Campus revealed patterns in location, time, academic activity, weather sensitivity and sensor agreement that would not have been visible from one source alone. Because the datasets differ in transport modes, spatial coverage, recording periods and collection methods, they should be harmonised and compared carefully rather than directly combined as equivalent measurements. Overall, mobility at Envelopa is shaped by the university calendar, the function of each street, weather conditions and sensor characteristics - not by one factor alone.

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