

SENSOR NETWORK DATA ANALYTICS

EnCLOD

From Monitoring to Decision-Making

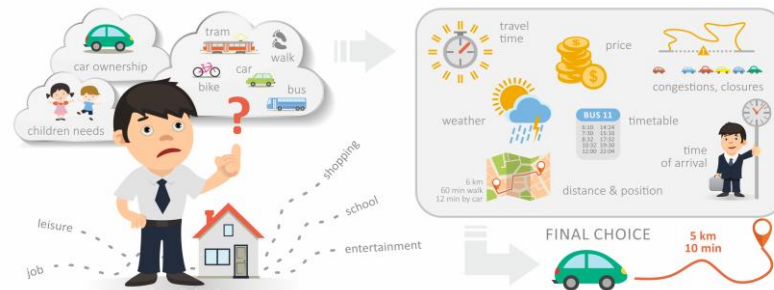
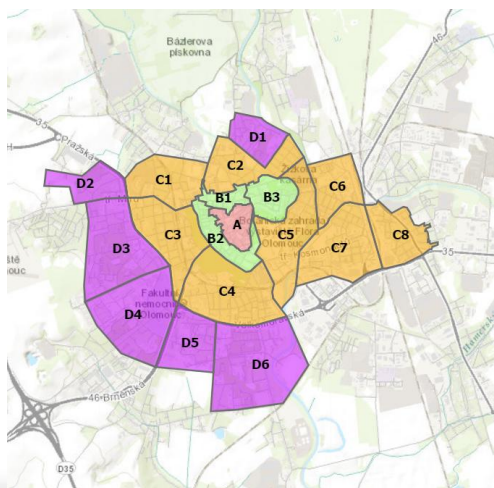


Olomouc | May 5th 2026

Jaroslav Burian

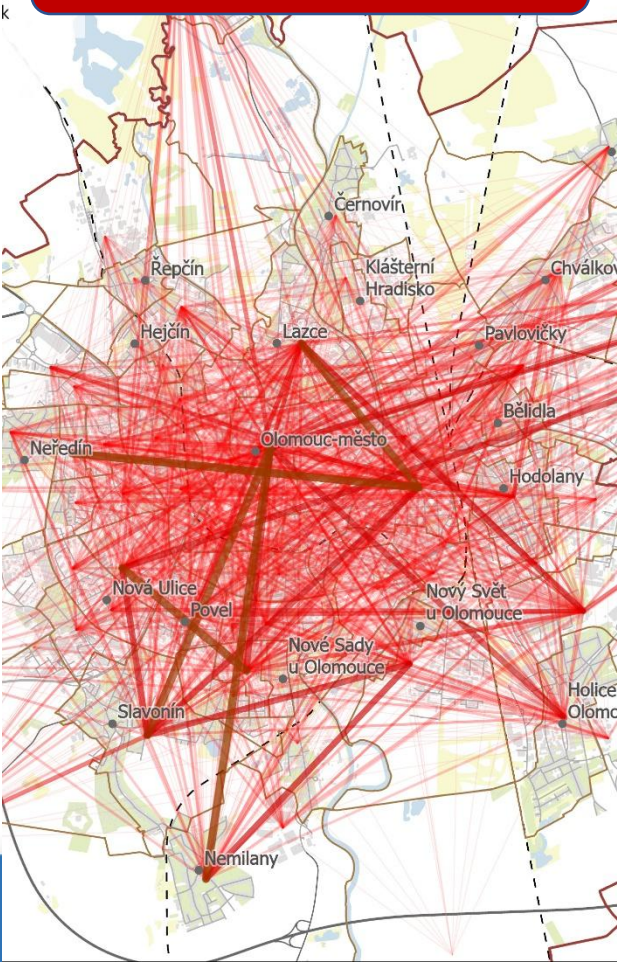
Context for the Pilot Action

- Lack of parking capacity
- Parking policy implementation
- Heat islands

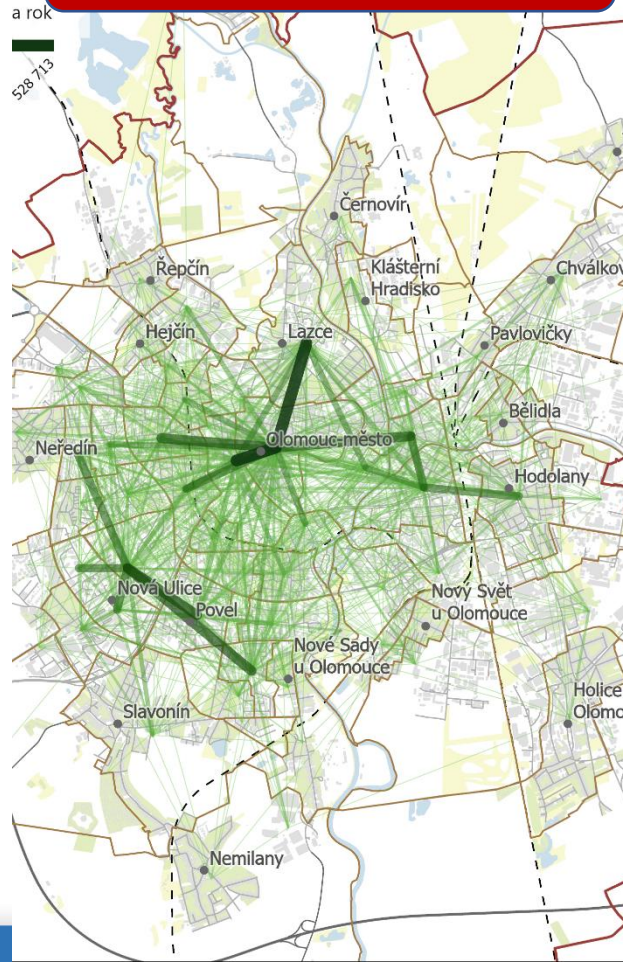


- Long-term cooperation with Olomouc City & Olomouc Region
- Project outputs
 - Sensor network – traffic/meteo
 - Microzoning
 - Open Data
 - **Data Analytics**
 - Hackathon
 - Digital Tool(s)
 - Part of Smart City/Digital Twin

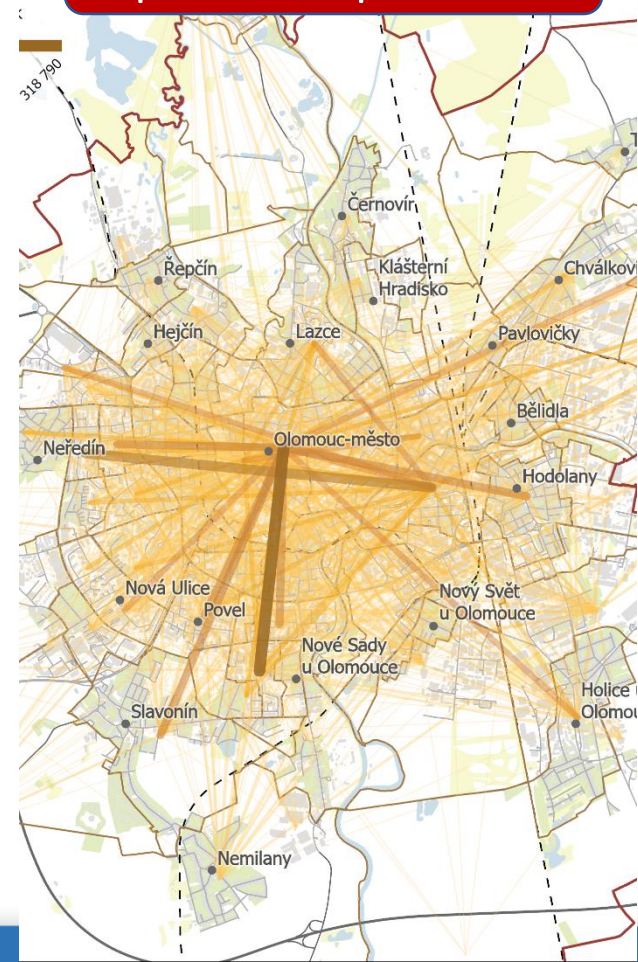
Census 2021
cars



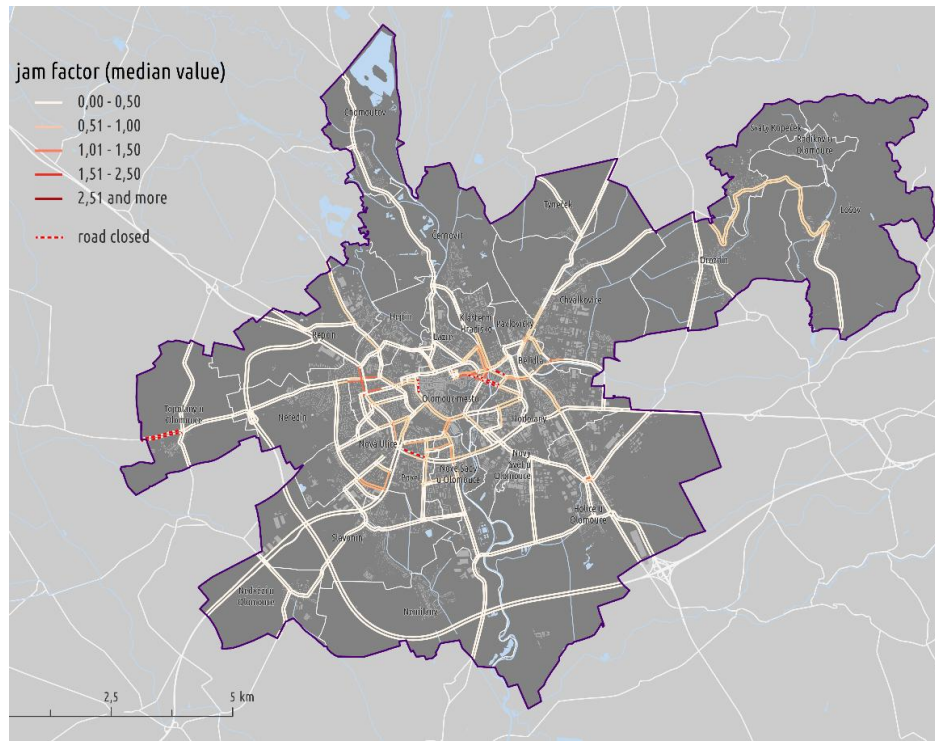
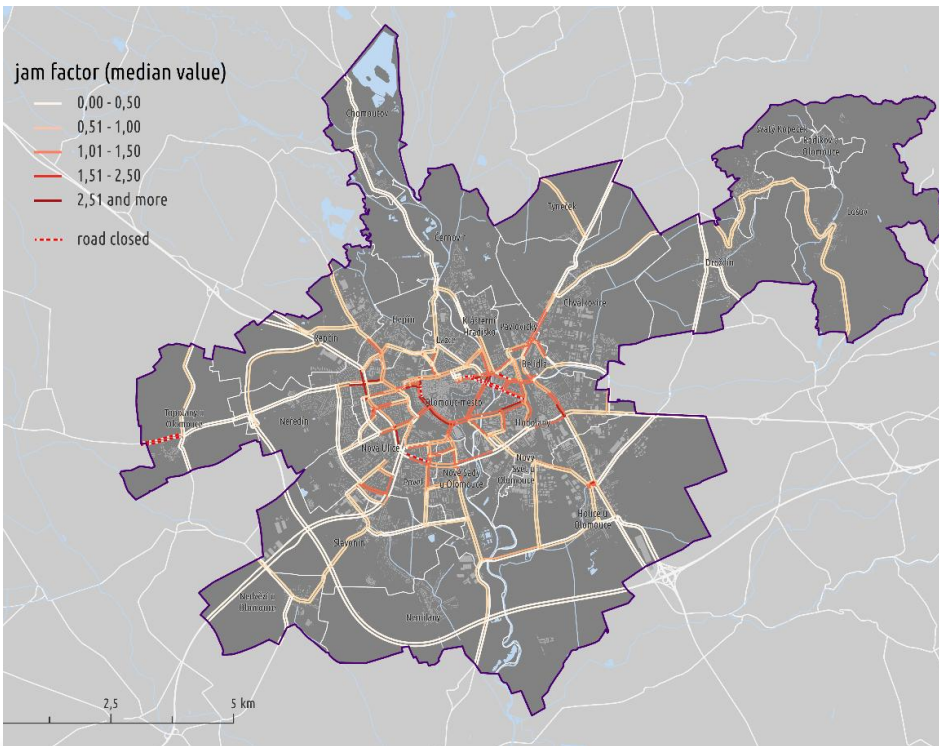
Census 2021
pedestrians



Census 2021
public transportation

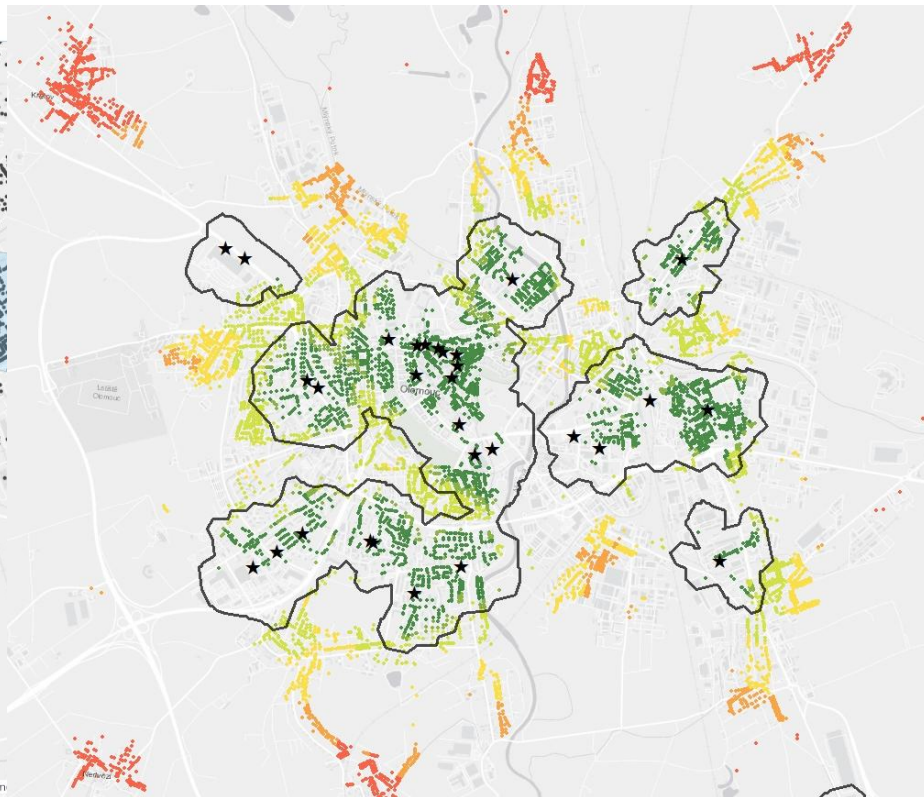
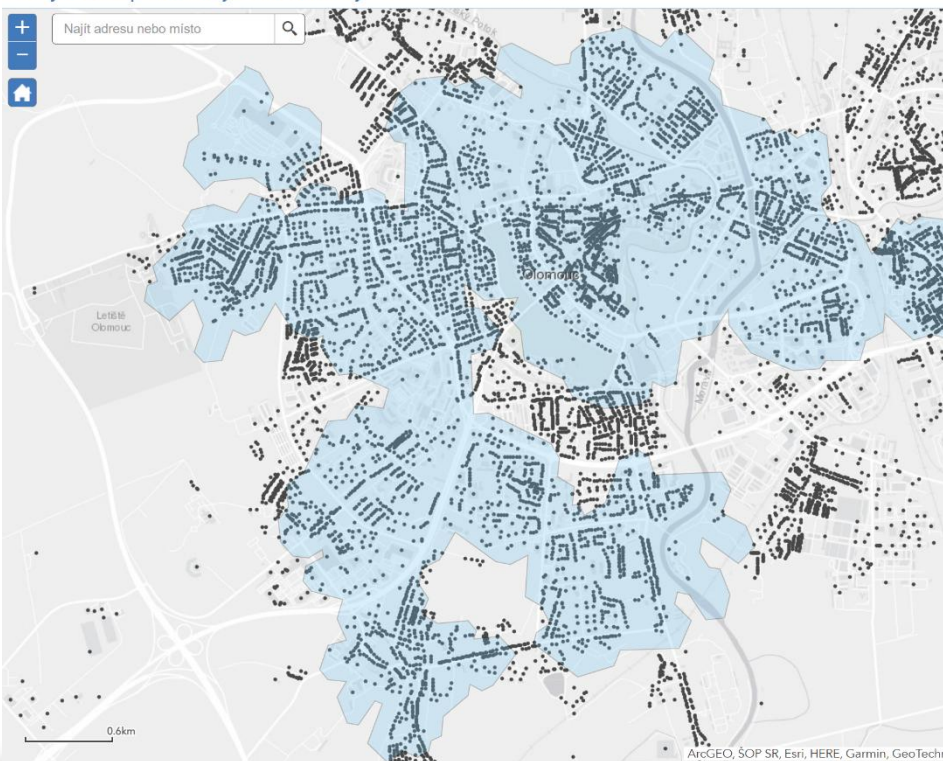


Traffic Jams Analysis – Floating car Data



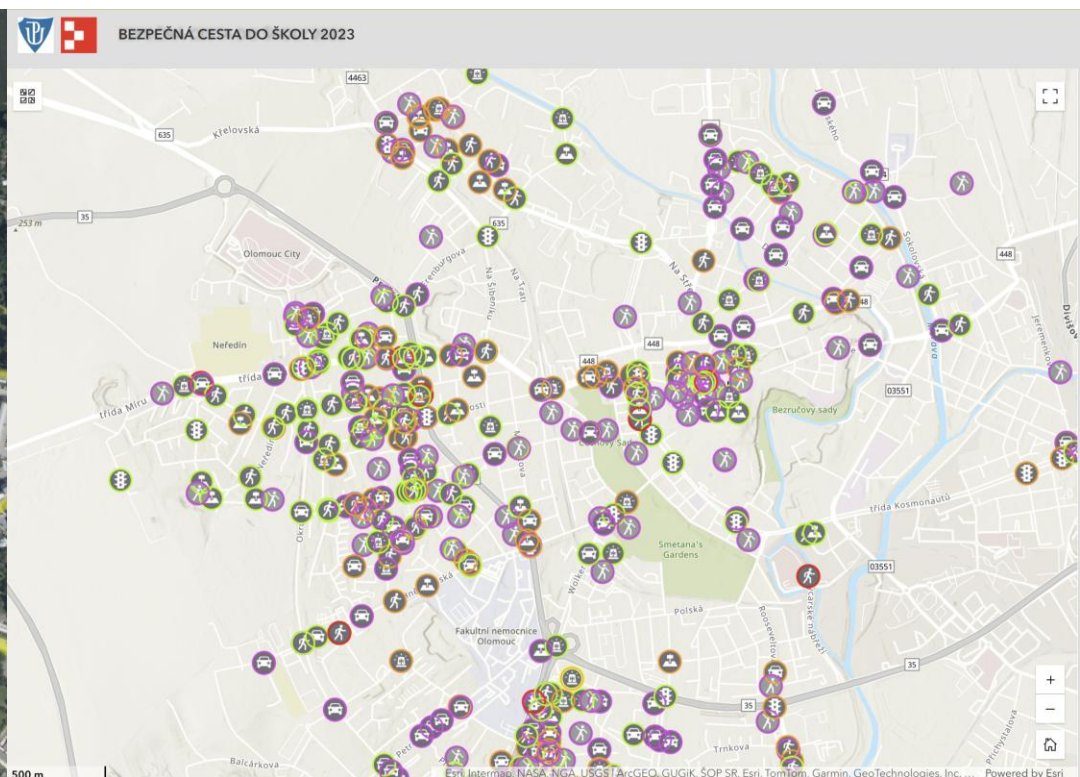
Public services accessibility

Analýza dostupnosti veřejné infrastruktury zóny dostupnosti veřejných infrastruktur

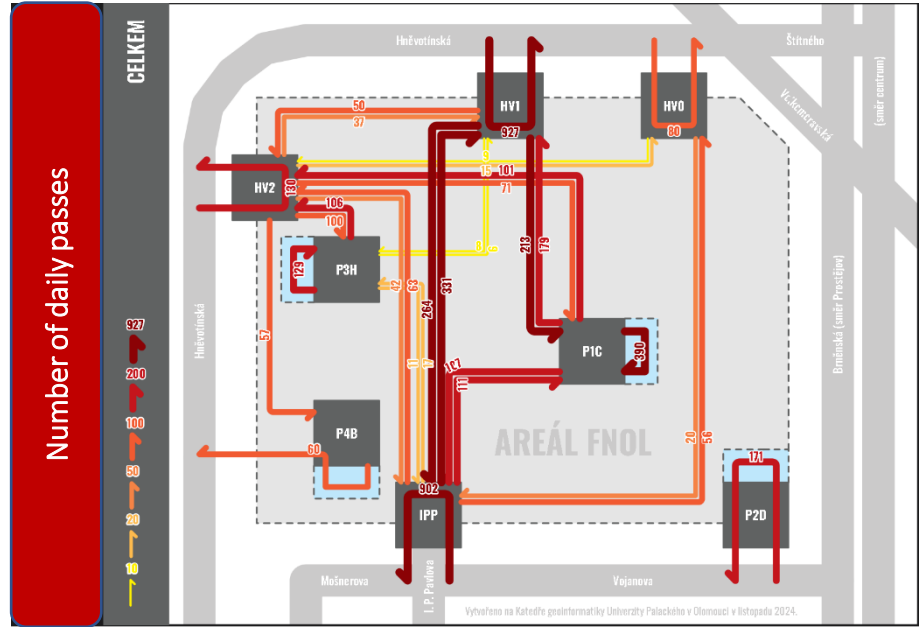
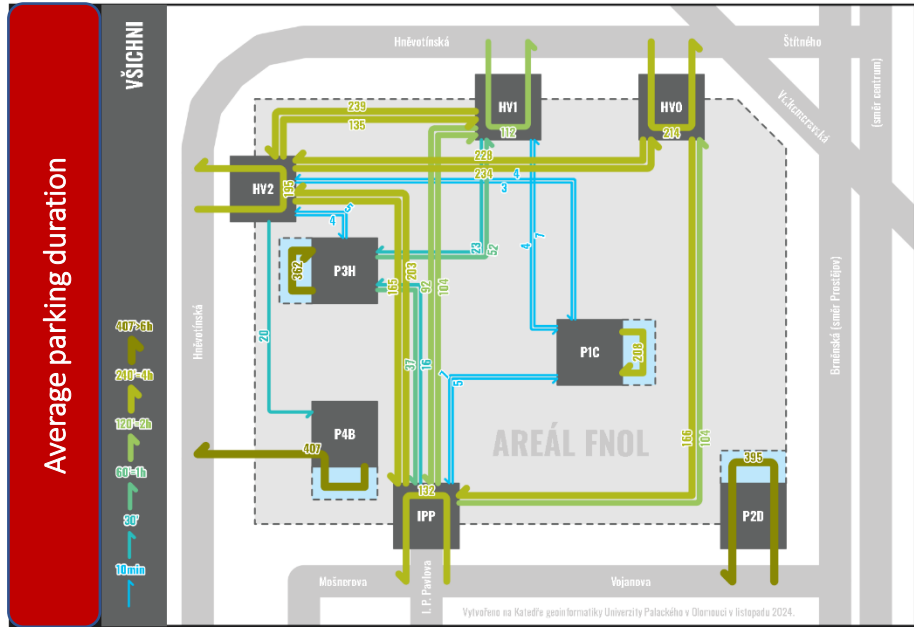


Safe route to school

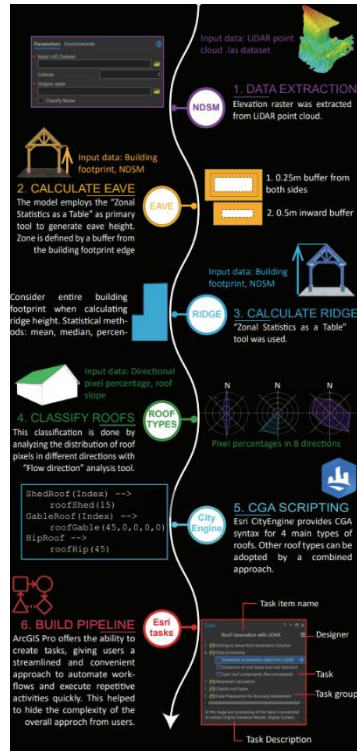
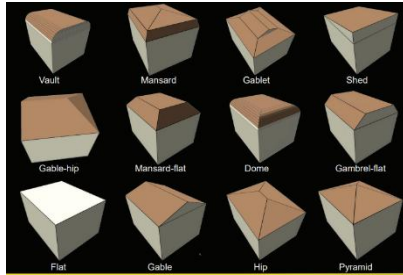
<https://arcg.is/Oa8X4i0>



University Hospital Parking



3D model of Olomouc city – laserscanning

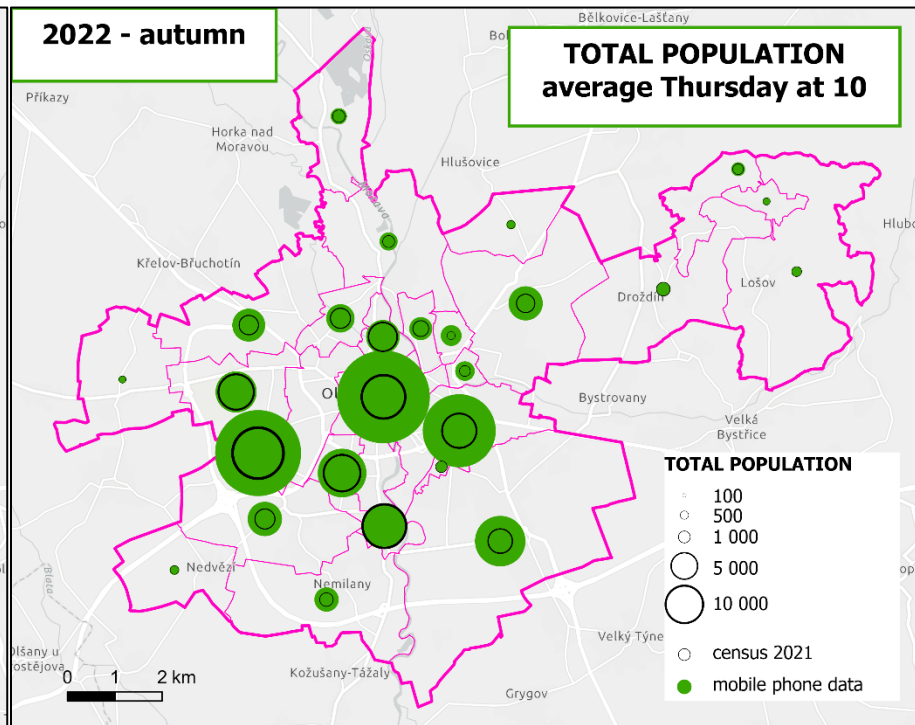
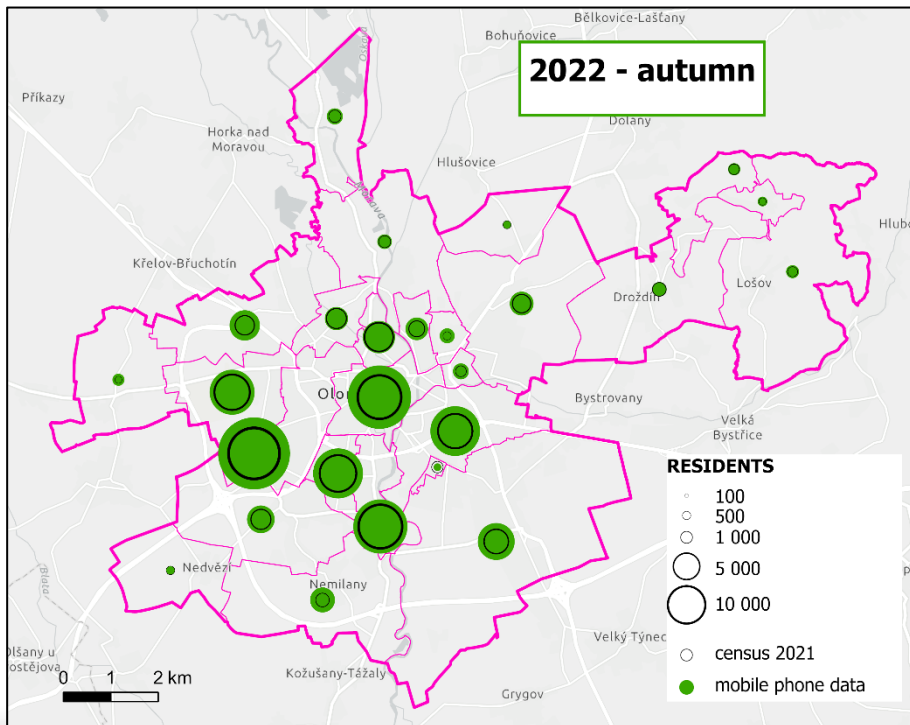


Mobile Positioning Data

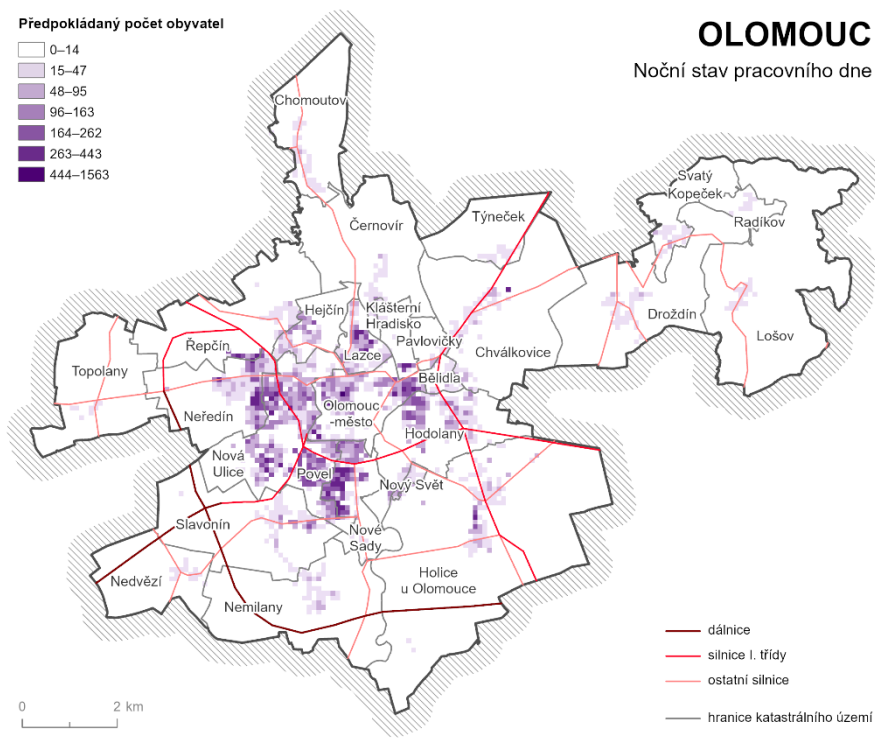
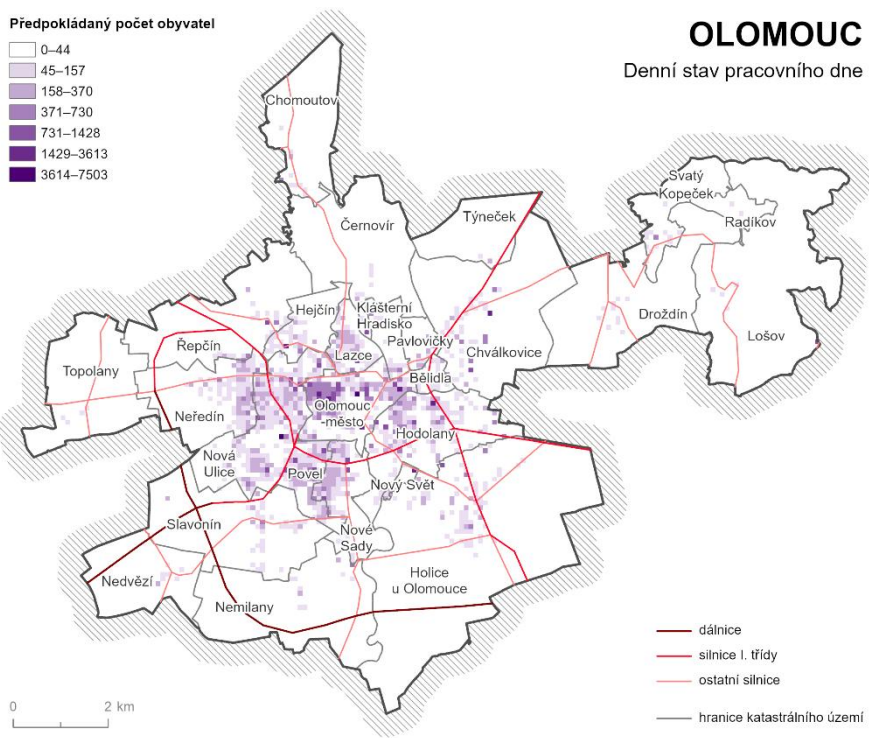
Residents Cenzus: **105,238**

Residents MPD: **128,180**

Total population MPD: **141,290**



Population during day vs. night



Examples from case studies

Parking „Billa,, + Legionářská

4 sensors, 2 profiles



UPOL Envelopa campus

4 sensors, 3 profiles



Residential areas Trnkova + Voskovcova

10 sensors, 6 profiles



Diploma Theses by Vendula Mráčková

Analysis of car traffic in selected locations in Olomouc



Analysis of car traffic in selected locations in Olomouc

based on sensory data

Vendula MRACKOVA

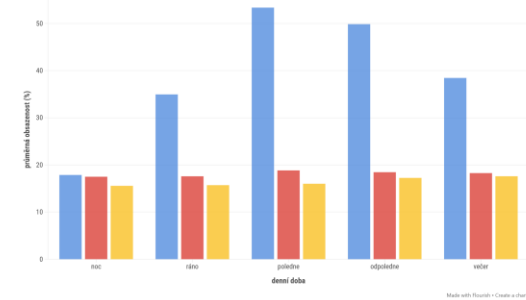
April 23, 2026

Cíle Projekt EnCLOD Univerzitní kampus Envelopea Parkoviště "u Billy" Parkoviště Legionářská Sídliště Trnkova Sídliště Vosk →

Průměrná obsazenost na Envelopě během dne (zimní semestr 2024)

23.09.2024 - 20.12.2024

pracovní den víkend páteční svátek



Select chart

Hourly average of a typical day on Envelope - entries and exits
Average occupancy by day type on Envelope
Average number of trips by vehicle type on Envelope (Semestrální PR)
Total number of trips by vehicle type on Envelope
Average occupancy per hour on Envelope
Average number of entries and exits by period of day on Envelope
Average number of entries and exits by day type on Envelope
Occupancy development at Envelope at the beginning of the winter semester
Occupancy development at Envelope at the beginning of the winter semester
Average occupancy at Envelope during the day (winter semester 2025)
Average occupancy at Envelope during the day (summer semester 2025)
Number of entries and exits by time of day on Envelope during graduation
Average occupancy by time of day on Envelope during graduation
Movement of passenger cars through individual sensors on the Envelope of Envelope
Movement of passenger cars through individual sensors on the Envelope of Envelope
Passenger car passes through individual sensors by day of the week on Envelope
Delivery passes through individual sensors on Envelope by day of the week
Truck flow passes through individual sensors on Envelope by day of the week
Passenger unclassified through individual sensors on the Envelope by days of the week
Comparison of average occupancy with extreme days
Number of entries and exits on the nearest day (September 13, 2024) coming

Dashboard Voskovcova

Vybrat datum
1. 9. 2024 - 30. 9. 2025

Celkový počet vjezdů

910 657

Podlejší aktualizace: nyní

Vjezdy dle typu vozidla



Podlejší aktualizace: před 1 sekundou

Průměrná obsazenost

97 %



Celkový počet vjezdů

890 470

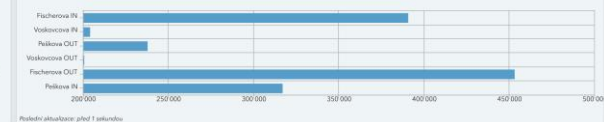
Podlejší aktualizace: nyní

Vjezdy dle typu vozidla



Podlejší aktualizace: před 18 sekundami

Počet vozidel na jednotlivých senzorech

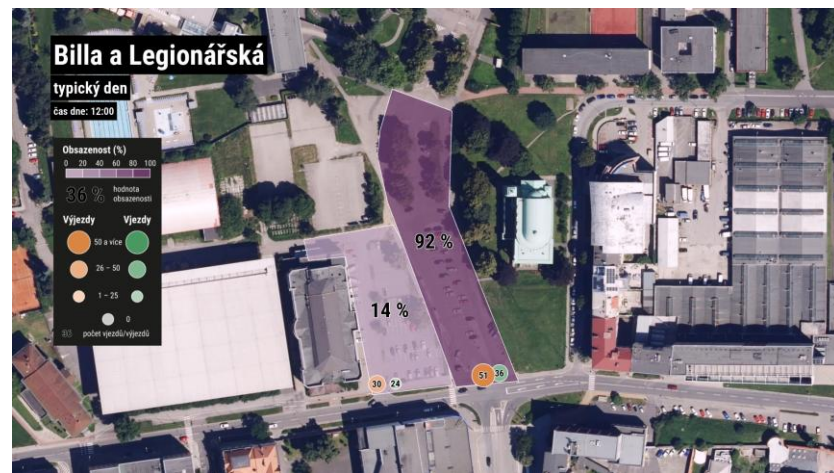
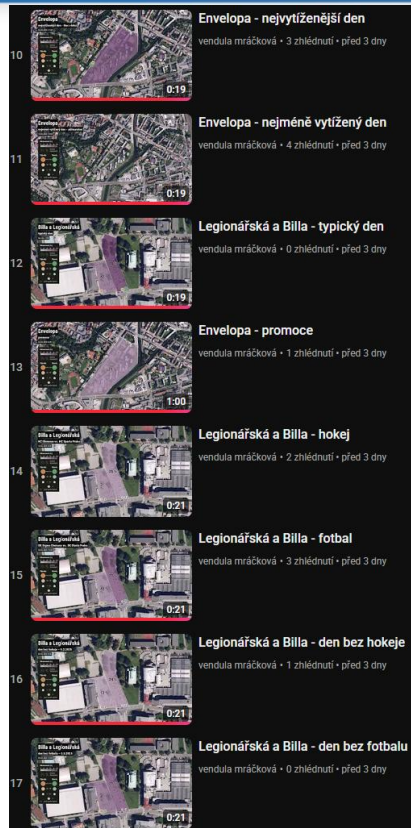
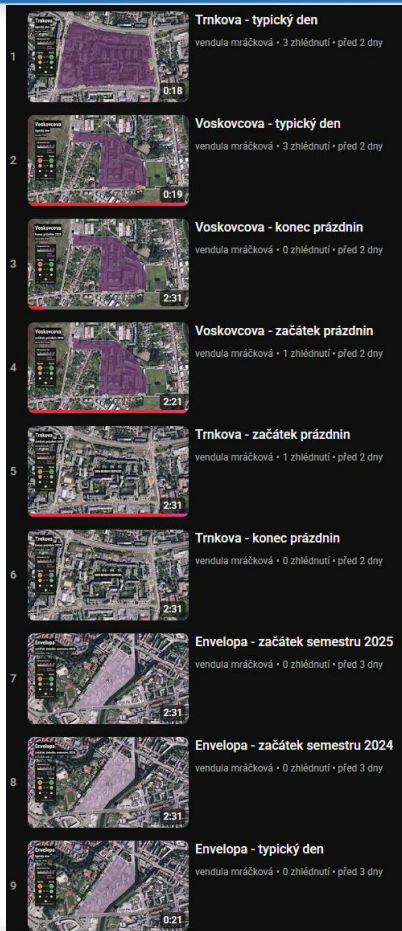


Podlejší aktualizace: před 1 sekundou



DEPARTMENT OF GEOINFORMATICS
Palacký University Olomouc | Faculty of Science

<https://storymaps.arcgis.com/stories/fec97626dd934ca682b2e01513a6352a>



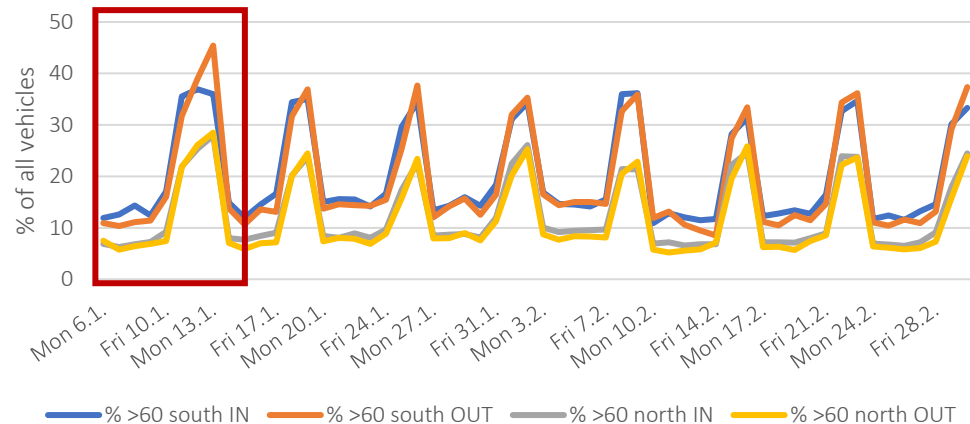
UPOL Envelopa Campus - 17. listopadu



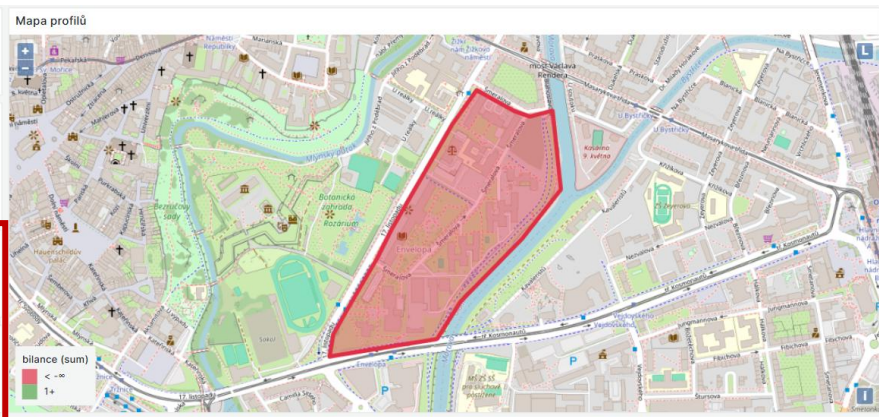
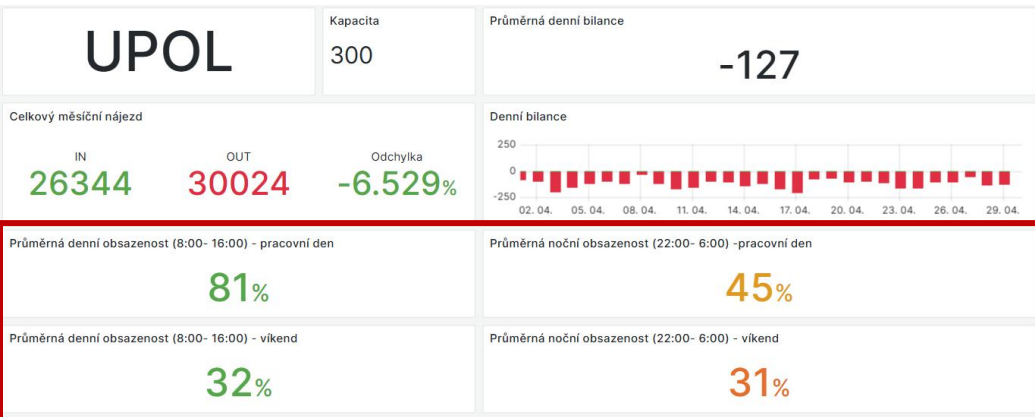
Speed limit exceeding

- Weekdays 5-15 %
- Weekends 20-45 %

Share of vehicles over the speed limit (17. Listopadu, days)



UPOL Envelopa Campus – April 2025

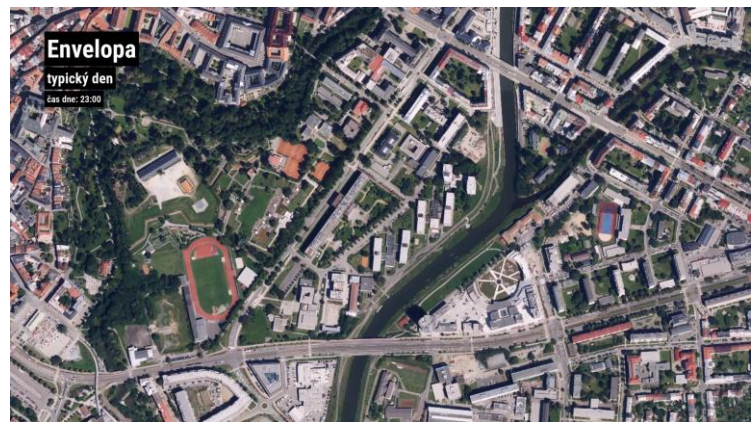


Průměrná denní obsazenost mezi 1 až 24

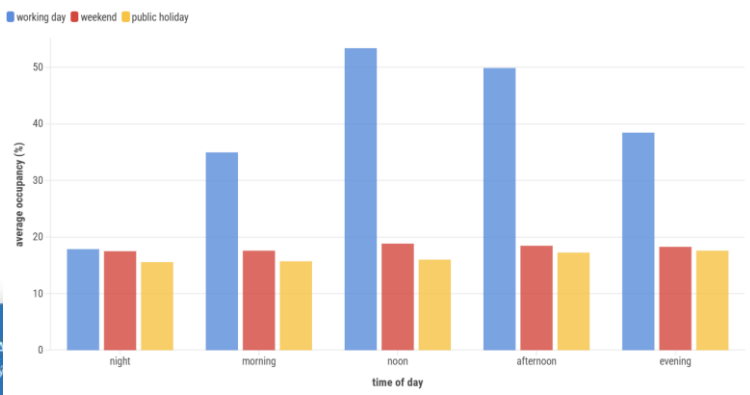


UPOOL Envelopa Campus

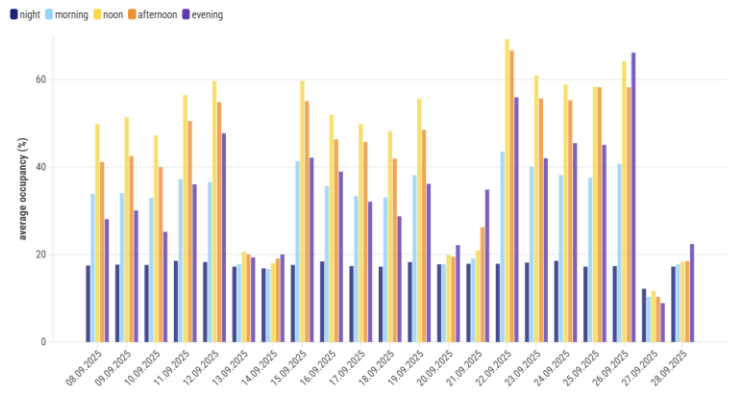
- Full capacity during the semester
- Free spaces during evenings, weekends and during summer
- Congestion during events and rain
- Resident vs. University Conflict
- Making free capacity available to the public ?



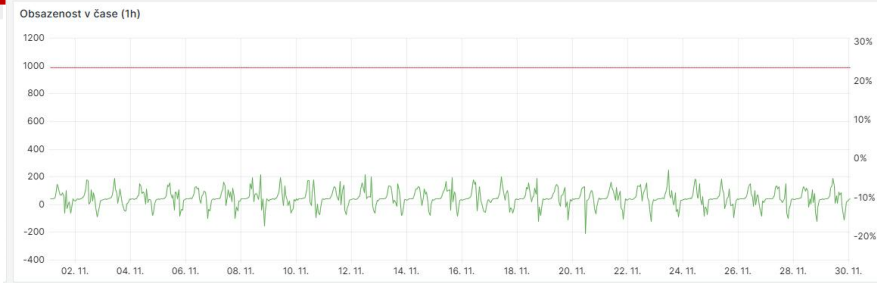
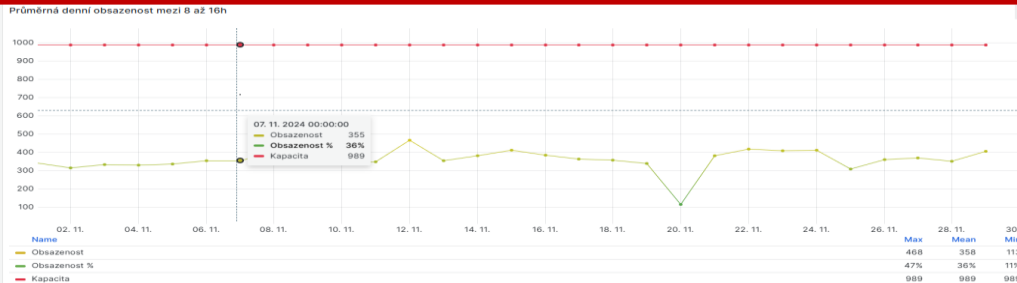
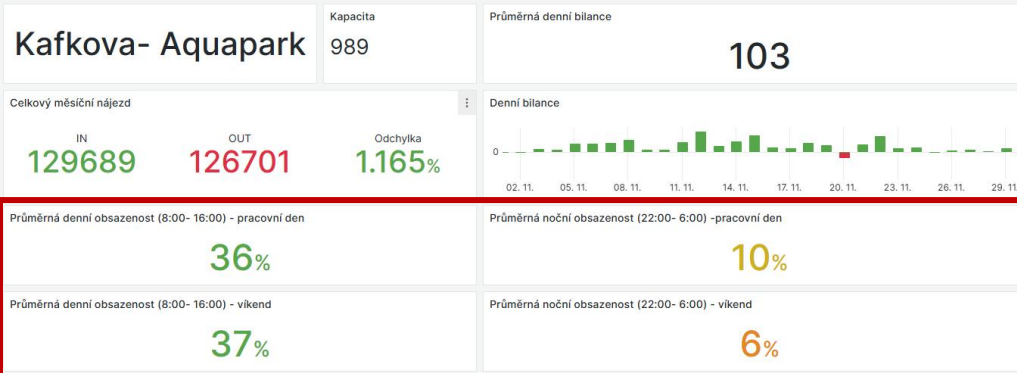
Average occupancy at Envelopa during the day (Winter semester 2024)



Parking occupancy at Envelopa before and at the start of the winter semester 2025



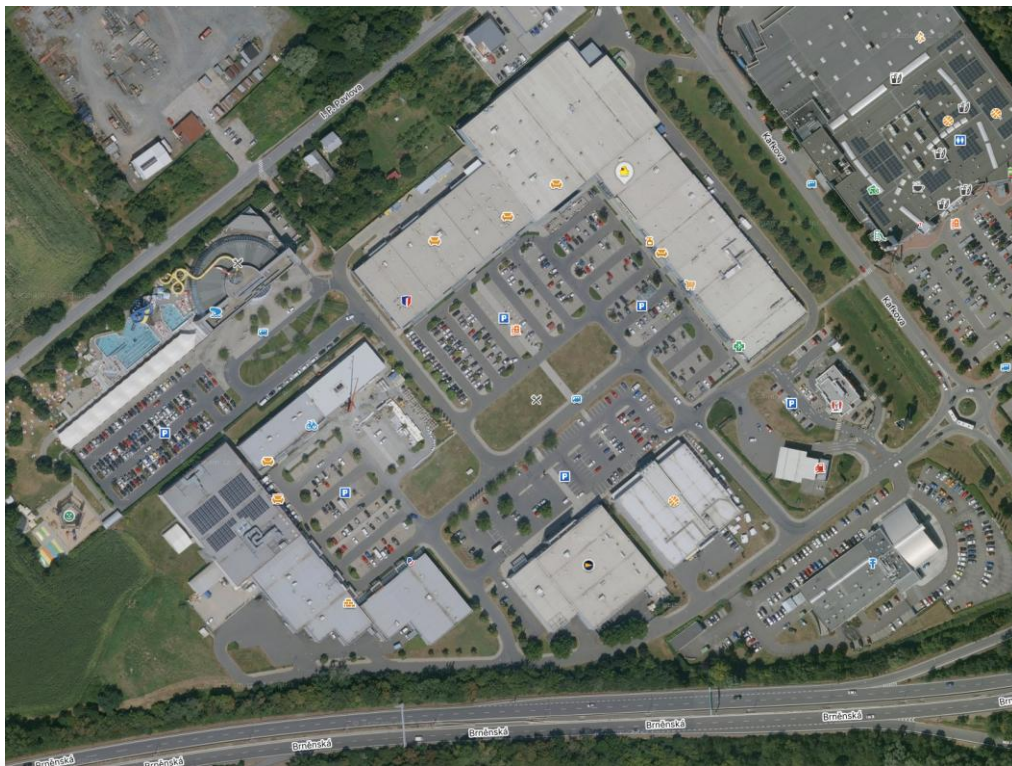
Shopping Center – November 2024



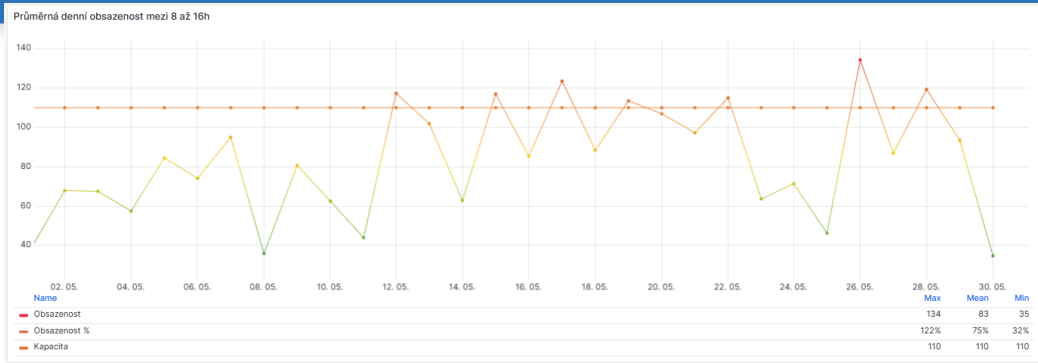
Průměrná obsazenost přes jednotlivé dny

weekDay\ho	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Ne	4%	4%	3%	3%	3%	4%	4%	5%	10%	23%	39%	51%	44%	48%	54%	56%	57%	47%	37%	28%	18%	13%	13%	12%
Po	4%	4%	4%	4%	4%	4%	5%	11%	21%	31%	34%	36%	32%	31%	30%	34%	36%	31%	27%	15%	5%	2%	1%	1%
Ut	4%	4%	4%	4%	4%	5%	6%	11%	18%	30%	36%	40%	39%	39%	41%	44%	42%	40%	33%	23%	12%	9%	8%	7%
St	4%	4%	4%	5%	5%	5%	6%	12%	21%	30%	39%	42%	44%	42%	38%	44%	41%	40%	32%	22%	11%	9%	9%	8%
Ct	4%	4%	4%	4%	4%	4%	6%	12%	19%	30%	39%	41%	40%	38%	37%	39%	40%	38%	31%	20%	9%	6%	5%	4%
Pa	4%	4%	4%	4%	4%	4%	6%	11%	19%	31%	45%	44%	48%	47%	47%	48%	50%	50%	47%	31%	18%	15%	13%	12%
So	4%	4%	4%	4%	4%	4%	4%	6%	11%	24%	41%	49%	48%	49%	57%	54%	55%	47%	40%	26%	16%	13%	12%	11%

Shopping Center – November 2024

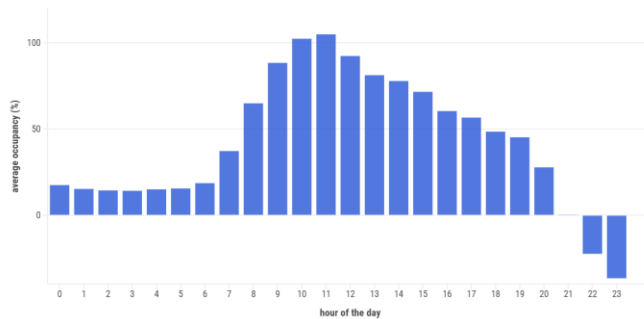


City Center

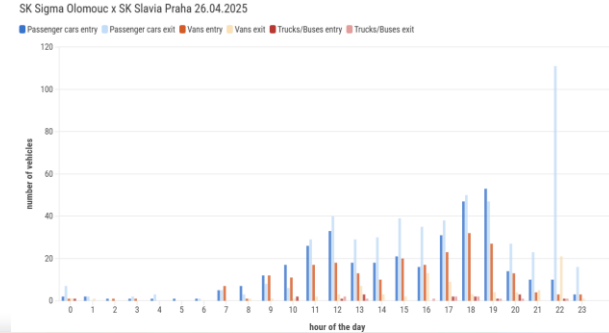


weekDay/hour	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Ne	19%	15%	16%	28%	47%	63%	65%	63%	54%	51%	47%	52%	54%	51%
Po	20%	32%	67%	102%	118%	122%	117%	80%	89%	89%	75%	67%	37%	34%
Ut	20%	35%	69%	102%	105%	112%	99%	81%	78%	64%	33%	12%	15%	11%
St	20%	31%	61%	89%	104%	108%	100%	80%	81%	69%	52%	36%	19%	18%
Ct	18%	24%	44%	67%	86%	94%	85%	73%	68%	61%	44%	37%	32%	35%
Pa	22%	33%	56%	78%	90%	87%	76%	53%	42%	33%	24%	13%	11%	22%
So	20%	23%	30%	50%	67%	78%	81%	79%	81%	76%	74%	71%	55%	44%

Average occupancy by class period at Legionářská

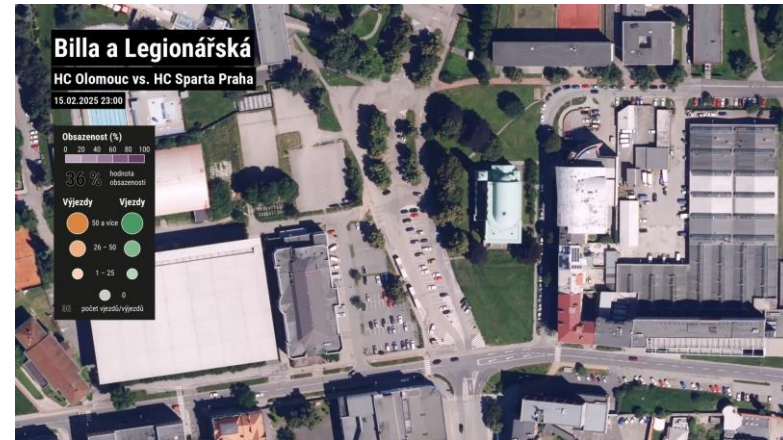


Number of entries and exits during a sporting event at Legionářská

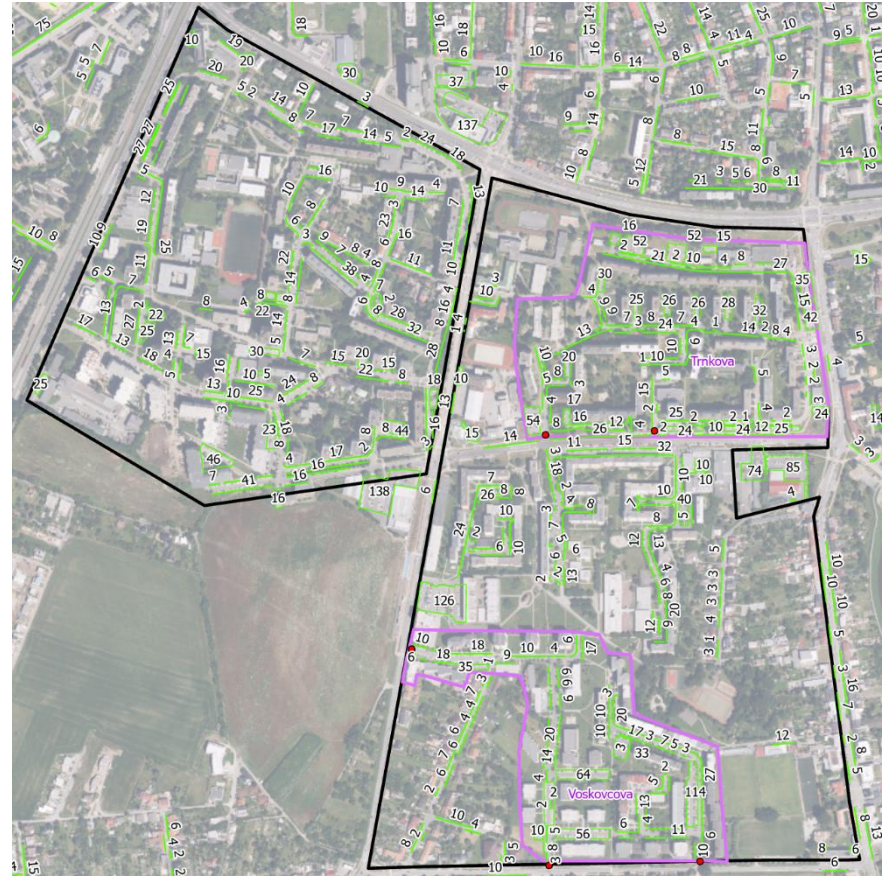


City Center

- Traffic peaks correspond to working hours
- Sufficient capacity during off-peak hours
- In the evenings and on weekends, a significant portion of parking capacity remains unused
- Extreme rush hour traffic at sporting events
- Collision of regular work traffic with sporting events
- Plan for construction of a new parking garage



Residential Areas - Night Survey



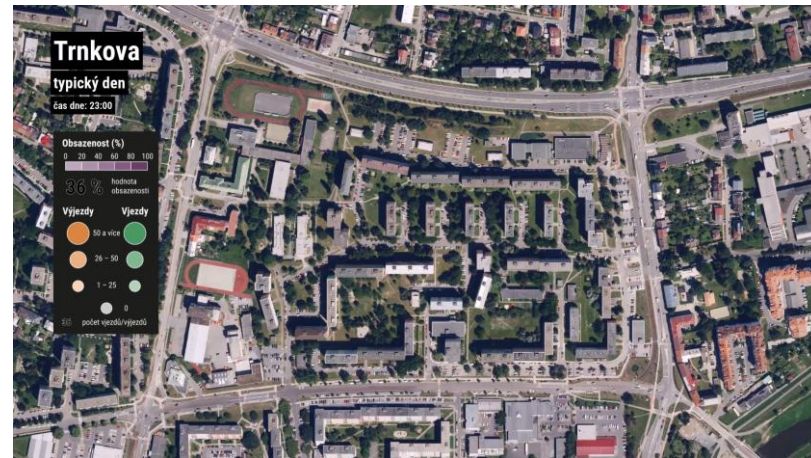
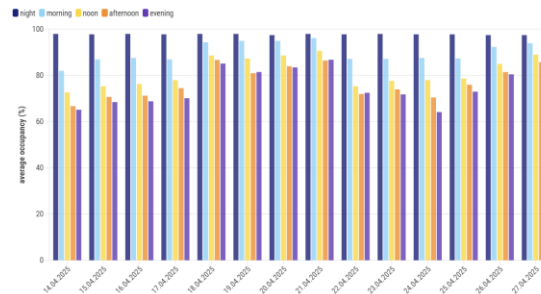
Residential Areas - Night Survey

Location	Capacity	E-cars	VANs	Cars	Illegally parked cars	Cars TOTAL
Kafkova-						
Aquapark	989	0	5	38	0	43
U Letadla	110	0	2	17	0	19
Bila	85	0	4	8	1	13
Flora	133	1	8	47	0	56
Tržnice	105	0	3	18	0	21
17. listopadu	123	0	4	62	0	66
Envelopa	377	0	4	78	1	83
Povel	2462	1	46	2220	23	2290
Nová Ulice	3085	3	98	2889	96	3086

Residential Areas

- Very high parking occupancy (minimum changes)
- Exceeding nominal parking capacity (illegal parking)
- Need for regulation of residential parking
- Construction of new parking capacity?
- Blocked roads (for emergency services)

Effect of Easter holidays on occupancy at Trnkova



Results & benefits

- Analysis of transport behavior
- Recommendations to improve the urban transport organization (parking regulation)
- Digital Twin & Smart City & Open Data
- **Enhancing governance Capacities of local authorities using Open Data**



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CENTRAL EUROPE



Co-funded by
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EnCLOD

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