

ANALYSIS OF THE IMPACT OF ENGINEERING MEASURES ON TRAFFIC SPEED CALMING

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THE PROBLEM OF SPEED IN TRAFFIC

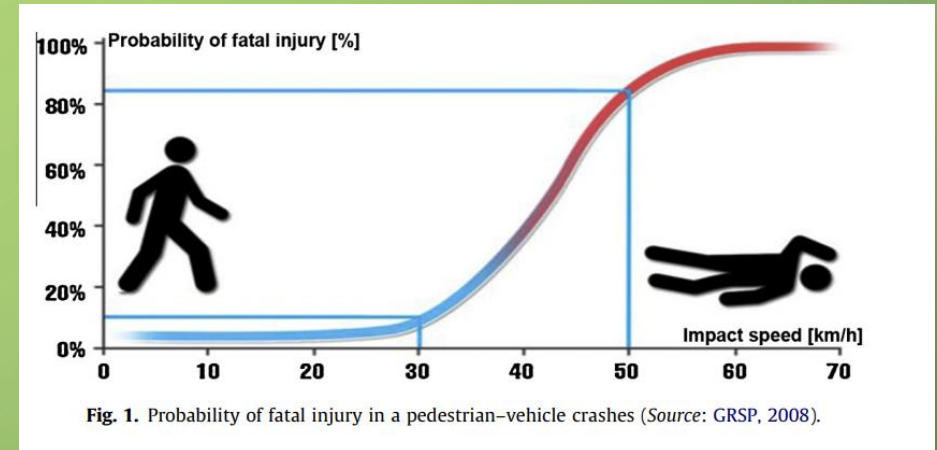
- The problem is most pronounced in areas with high speed dispersion, as well as in urban environments
- Speed primarily affects the likelihood of a traffic accident occurring, but also influences the severity of its consequences



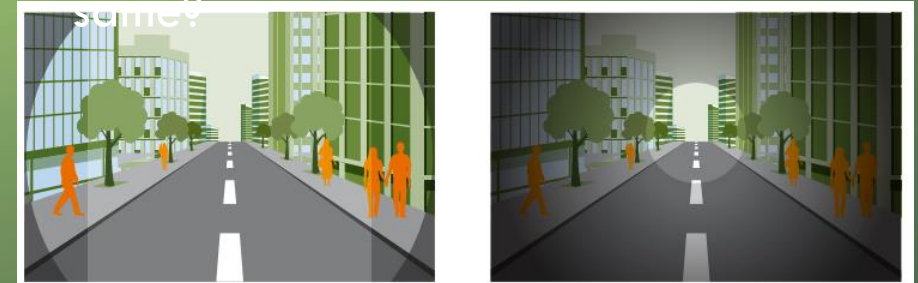
AN ANALYSIS OF TRAFFIC SAFETY PERFORMANCE INDICATORS IN MONTENEGRO



In 2023, the overall rate of speeding violations reached **58%**



30 km/h and 50 km/h are not the same?



TRAFFIC CALMING MEASURES

Vibro-acoustic strips



Small dot-shaped rubber bumps



Small plastic bumps



Speed cushions



Raised platform



Rubber bump on the road



Raised pedestrian platform

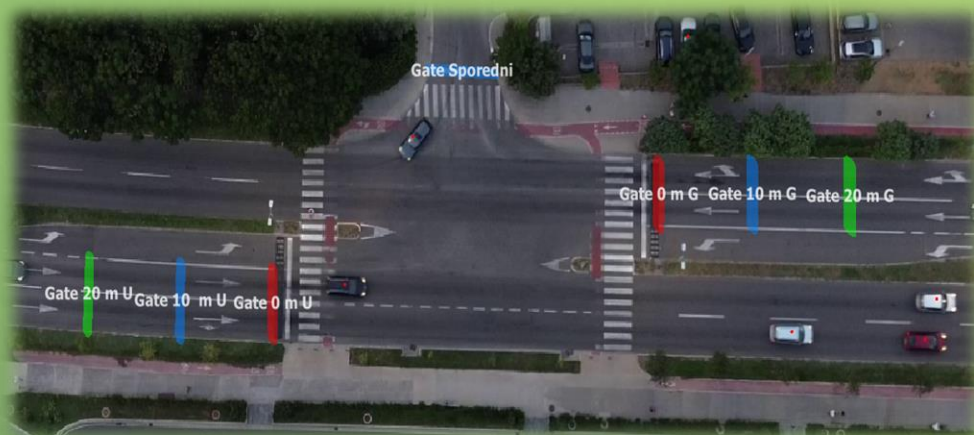


Damaged rubber elements



RESEARCH

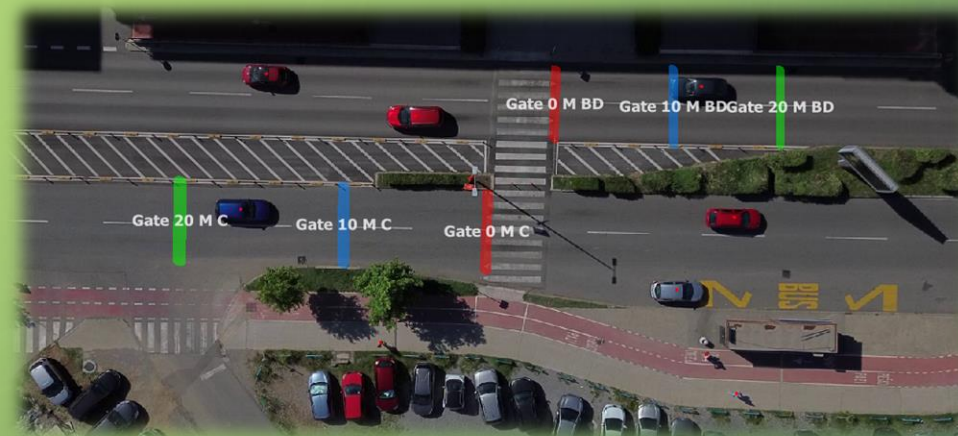
Location A – Boulevard of Montenegrin Commanders
Rubber Traffic Calming Elements
Height of rubber elements: 5 cm



Speed limit at locations:
30 km/h



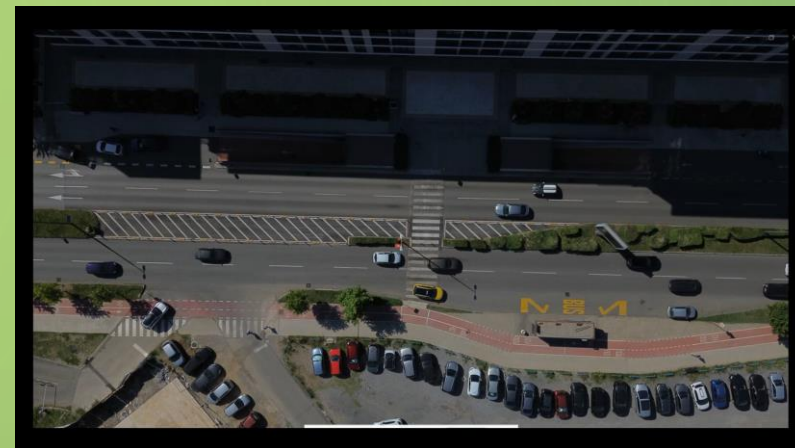
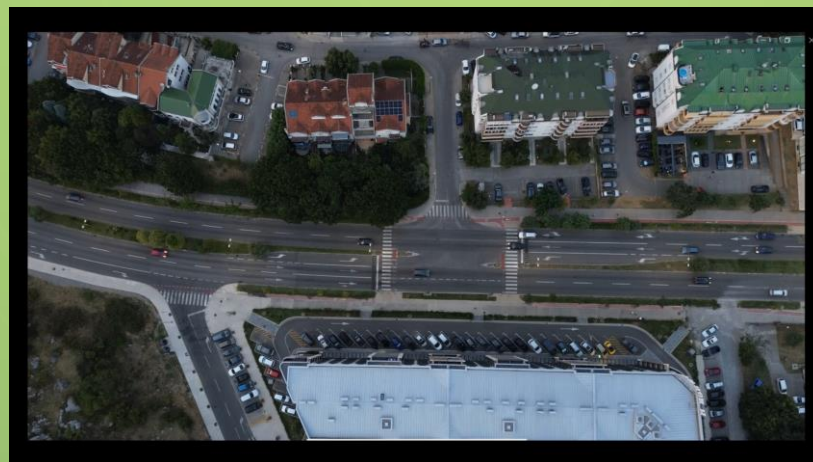
Location B - Cetinje Road
Asphalt Traffic Calming Platform
Height of the platform: 4 cm



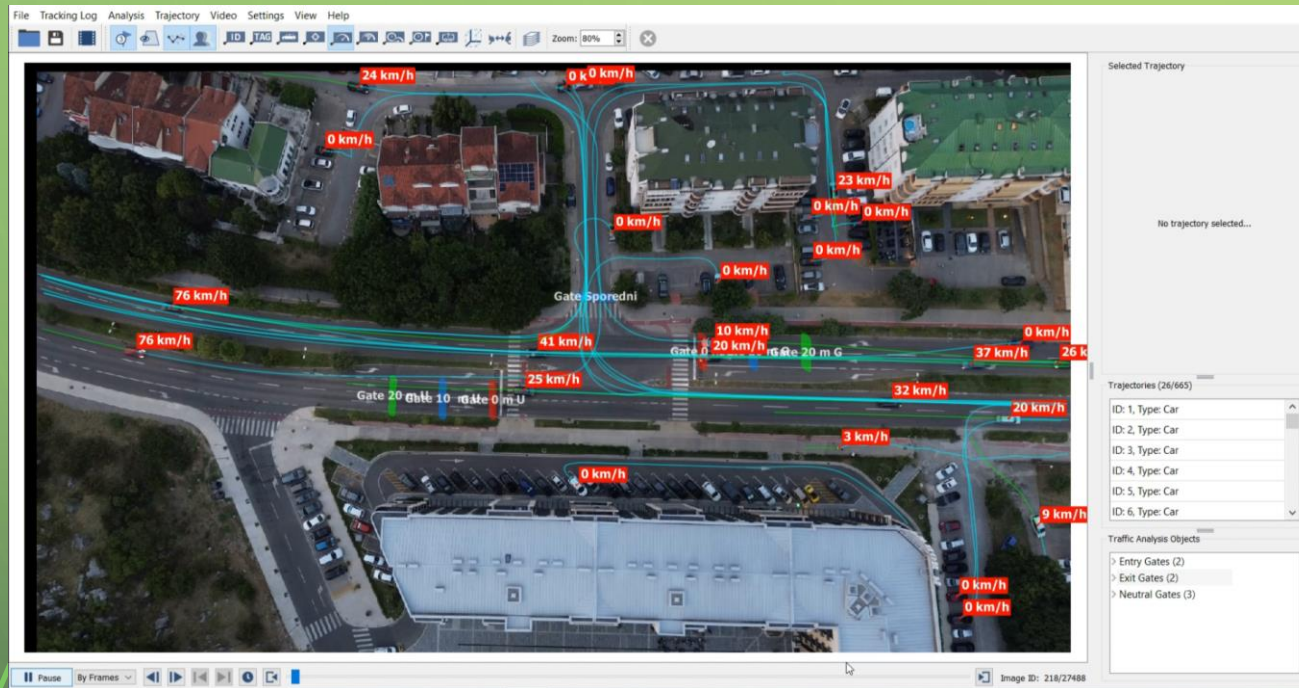
RESEARCH



Drone DJI MINI 3



DATAFROMSKY



Gate positions, a total of 6 intersections where data is recorded



STATISTICA



Data analysis

[illegible]

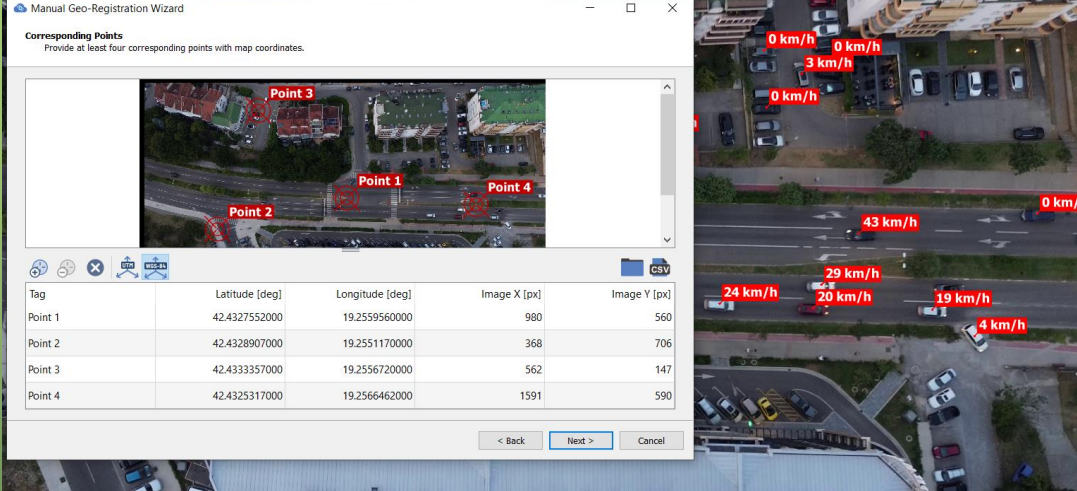
Device for georeferencing points



HOW TO OBTAIN VEHICLE SPEEDS IN KM/H

Manual Geo-Registration Wizard

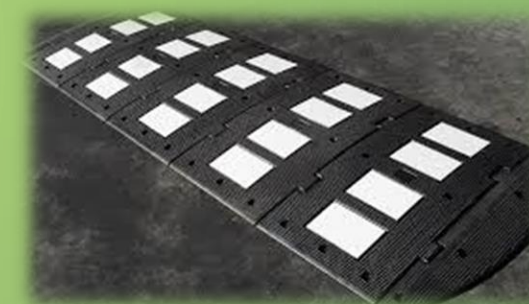
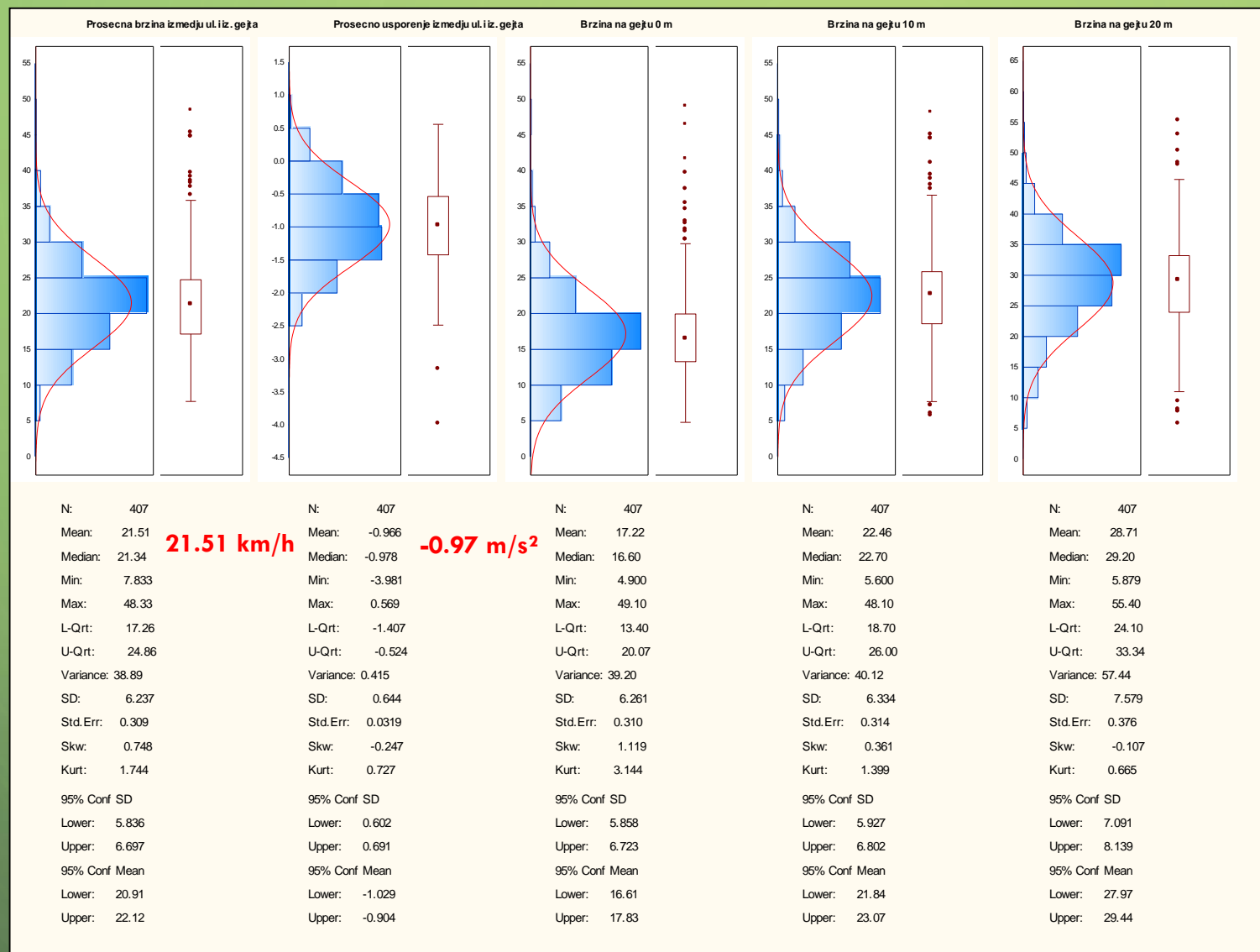
Corresponding Points
Provide at least four corresponding points with map coordinates.



Tag	Latitude [deg]	Longitude [deg]	Image X [px]	Image Y [px]
Point 1	42.4327552000	19.2559560000	980	560
Point 2	42.4328907000	19.2551170000	368	706
Point 3	42.4333357000	19.2556720000	562	147
Point 4	42.4325317000	19.2566462000	1591	590

< Back Next > Cancel

Speed labels from background image: 0 km/h, 0 km/h, 3 km/h, 0 km/h, 43 km/h, 0 km/h, 24 km/h, 29 km/h, 20 km/h, 19 km/h, 4 km/h.



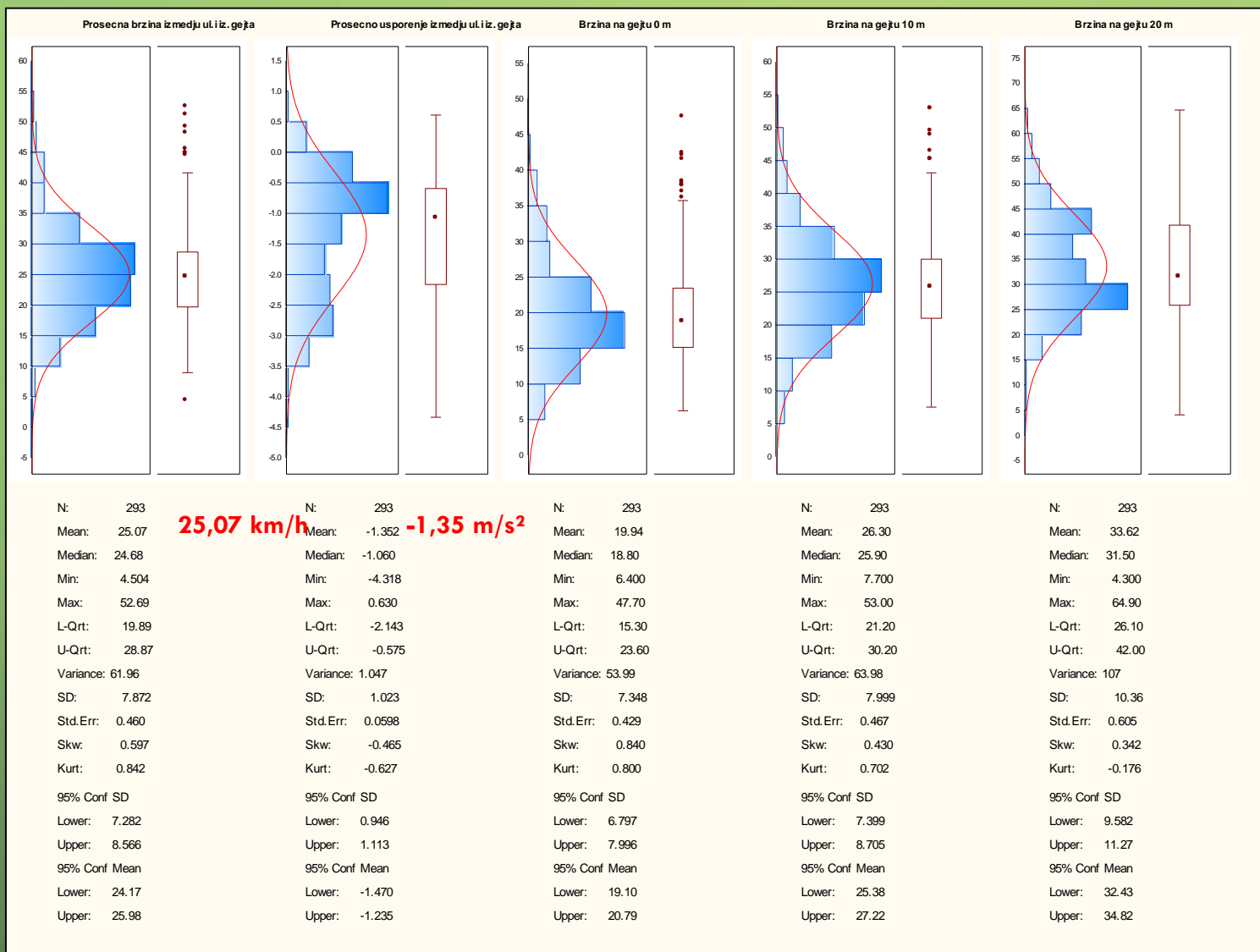
LOCATION A

Number of vehicles: 407

Gintaš-Union: 47,7%

Union-Gintaš: 52,3%

Distances of intersections
(gates): 0m, 10m and 20m



LOCATION B

Number of vehicles : 293

Budva-Centar: 47,5%

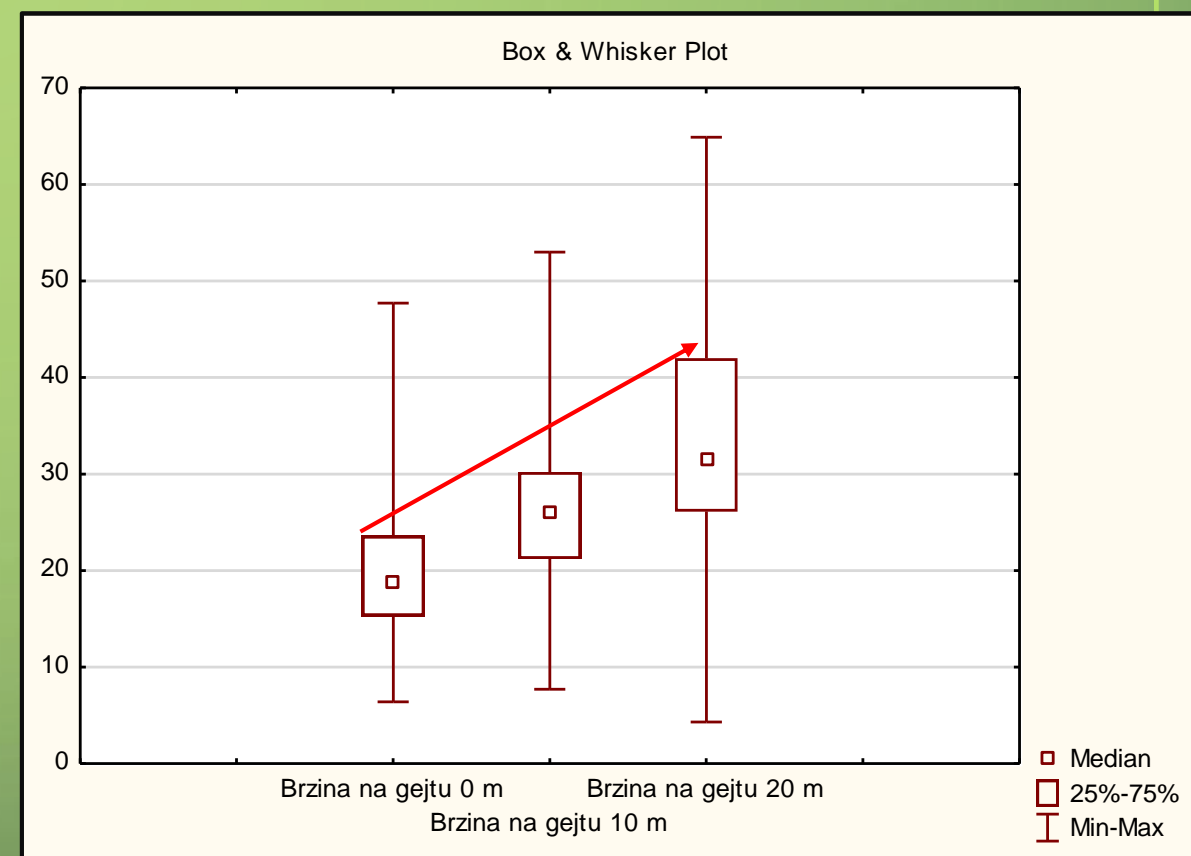
Centar-Budva: 52,5%

Distances of intersections
(gates): 0m, 10m and 20m

LOCATION A



LOCATION B



LOCATION A

Mann-Whitney U Test (w/ continuity correction) (Spreadsheet7 in Workbook1)					
By variable Smer					
Marked tests are significant at p <.05000					
Rank Sum Gintaš	Rank Sum Union	U	Z	p-value	Z adjusted
38436.0	44592.0	19521.0	-0.96135	0.33637	-0.96135

The p-value is
compared to
the defined
significance
threshold

Average speed between the entry and exit gates:

Gintaš-Union: 21.1 km/h

SD=5.8

Union-Gintaš: 21.9 km/h

SD=6.57

Speed at gejt 0m

T-tests; Grouping: Vrsta elementa (Spreadsheet7 in Workbook1)									
Group 1: Gumeni									
Group 2: Platforma									
Variable	Mean Gumeni	Mean Platforma	t-value	df	p	Valid N Gumeni	Valid N Platforma	Std.Dev. Gumeni	Std.Dev. Platforma
Brzina na gejtu 0 m	17.2195	19.9409	-5.2723	69	0.00000	40	29	6.26098	7.34791

THERE IS A STATISTICALLY SIGNIFICANT DIFFERENCE BETWEEN THE SPEED VALUES AT LOCATIONS A AND B

LOCATION B

Mann-Whitney U Test (w/ continuity correction) (Spreadsheet3)					
By variable Smer					
Marked tests are significant at p <.05000					
Rank Sum Centar	Rank Sum Budva	U	Z	p-value	Z adjusted
17003.0	26068.0	5068.00	-7.7804	0.00000	-7.7804

Average speed between the entry and exit gates:

Budva-Centar: 28.68 km/h

SD=8.06

Centar-Budva 21.8 km/h

SD=6.08

Location A

Average deceleration:
-0,966 m/s²

Average speed between
the gates 0m and 20m:
21,51 km/h

Average speed at gejt
0m: **17,2 km/h**

Exceeded the speed limit:
45,2%

Location B

Average deceleration:
-1,352 m/s²

Average speed between
the gates 0m and 20m:
25,07 km/h

Average speed at gejt
0m: **19,9 km/h**

Exceeded the speed limit:
55,6%

Summary

Higher at location B by
0,386 m/s²

Higher at location B by
3,56 km/h

Higher at location B by
2,7 km/h



INNOVATIVE SOLUTIONS

APPLICATION OF HORIZONTAL CURVES IN ROAD DESIGN



RESEARCH IN BAR, 2024



SMART TRAFFIC CALMING DEVICE



THANK YOU FOR YOUR ATTENTION

