Data-driven Road Safety: A systematic & replicable data to design model

Author: Andrea Colovini
Co-author: Erica Pallaracci, Francesco Filippucci, Filomena Demaio

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FRAMEWORK

This presentation outlines a key contributi
Sustainable Urban Mobility Plan (SUMP) d
Potenza, Italy, focusing on road safety. It
illustrates a structured methodology desig
drive data-informed and stakeholder-enga
decision-making for safety interventions.





POTENZA

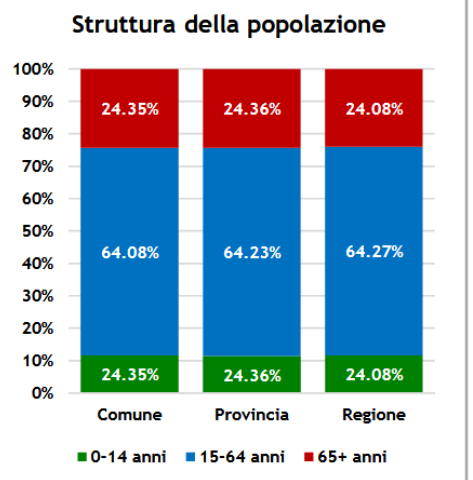
Let's take a stepback: where is Potenza?

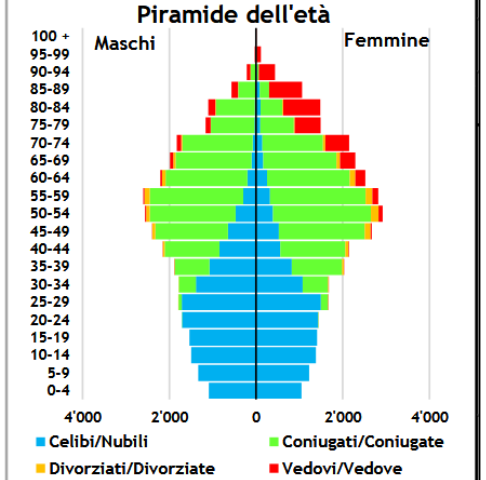
Potenza is the regional capital of Basilicata, located in southern Italy, and serves as the administrative center of the Province of Potenza.



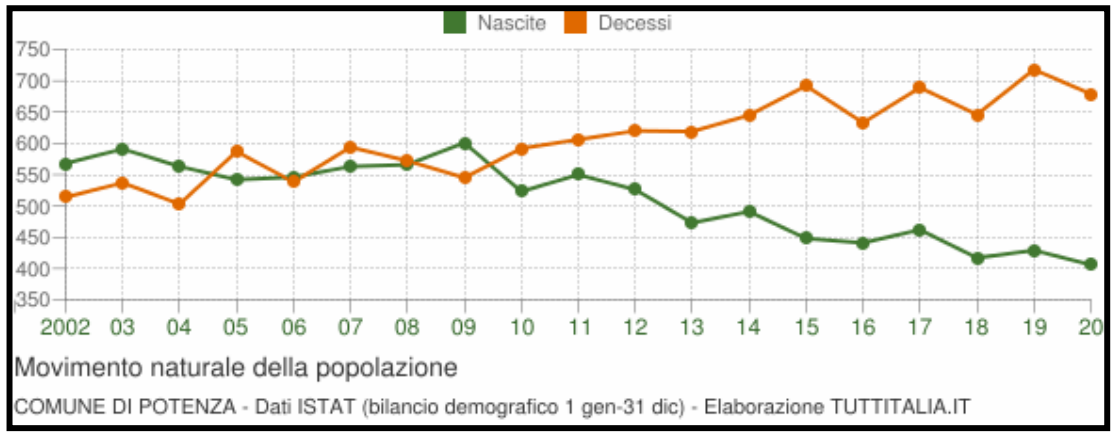
DEMOGRAPHIC TRENDS & POPULATION DYNAMICS

Abitanti (2021)	**65'420**	→	*pari al*	**18.56%**	*della provincia*
				12.00%	*della regione*
di cui stranieri (2021)	**1'699**	↑	*pari al*	**15.35%**	*della provincia*
				7.72%	*della regione*
Struttura della popolazione (2021 vs 2012)					
0-14 anni	**7'570**	↓	*pari al*	**18.83%**	*della provincia*
				11.91%	*della regione*
15-64 anni	**41'919**	↘	*pari al*	**18.51%**	*della provincia*
				11.97%	*della regione*
65+ anni	**15'931**	↑	*pari al*	**18.55%**	*della provincia*
				12.14%	*della regione*









WHAT IS A SUMP?

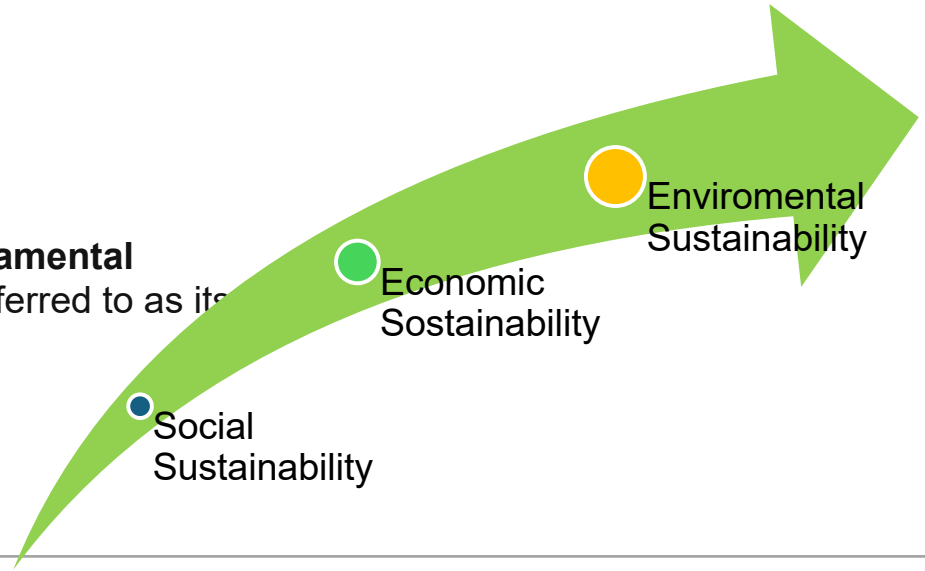
"Sustainable development is that development which allows the present generation to satisfy its own needs without compromising the ability of fu
generations to satisfy theirs"

Our common future 1987 i.e. Rapporto Bruntland

"Sustainable mobility means giving people the opportunity to move freely, to communicate and establish relationships without ever losing sight of the human and environmental aspects, today as in the future"

World Business Council for Sustainable Developmen

The 2002 Johannesburg Declaration reinforced the **three fundamental components** of **sustainable development**, which are often referred to as its "pillars."



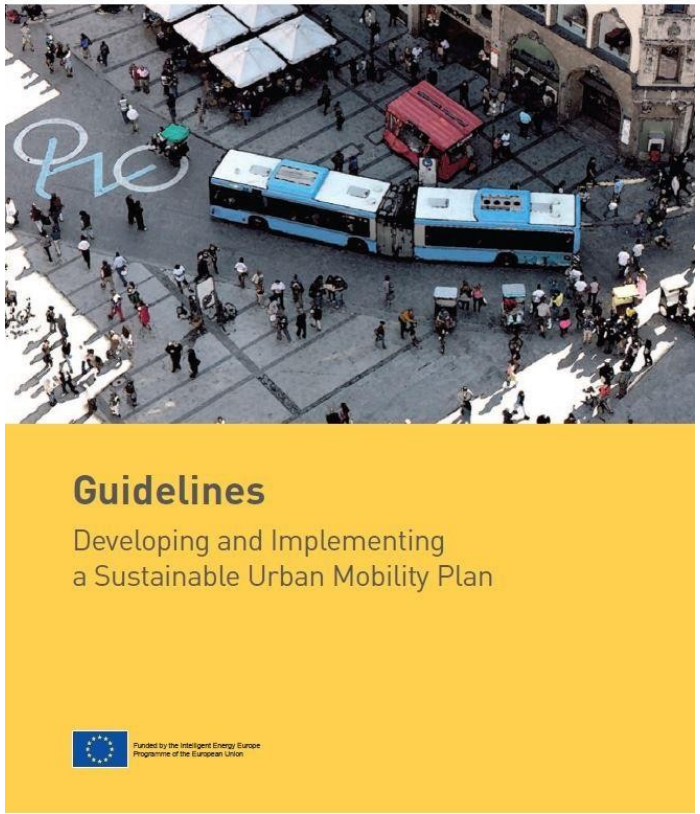
WHAT IS A SUMP?

The paradigm shift introduced by the Guidelines in the planning process establishes the SUMP as a strategic tool that adopts the principle of an integrated approach. It is based on finding a balance in the development of different transport modes, promoting and supporting the use of the most sustainable ones.

With the EGL, the need for urban planning that has **citizens** as its point of reference is recognized.

The fundamental aspect is that people are part of the solution: preparing a SUMP means precisely planning for **people**.

Italy adopted the Eltis guidelines with its own ministerial guidelines. The SUMP of the Potenza Municipality was developed following these guidelines.



THE SUMP OF POTENZA






A. Effectiveness and efficienc the mobility system	B.Energy and environmenta sustainability	C. Road mobility safety	D. Socio-economic sustainabi
a.1 - Improvement of the LPT (Local Public Transport)	b.1 - Reduction of consumption of traditional fuels other than alternative fuels	c.1 - Reduction of road accidents	d.1 - Improvement of social inclusion (physical-ergonomic accessibility)
a.2 - Modal rebalancing of mobility	b.2 - Improvement of air quality	c.2 - Significant decrease in the overall number of accidents with deaths and injuries	d.2 - Increase in citizen satisfaction
a.3 - Reduction of congestion	b.3 - Reduction of noise pollution	c.3 - Significant decrease in social cost resulting from accidents	d.3 - Increase in the employment rate
a.4 - Improvement of accessibility for people and goods		c.4 - Significant decrease in the number of accidents with deaths and injuries among vulnerable users (pedestrians, cyclists, children, and people over 65)	d.4 - Reduction of mobility expenses (related to the need to use a private vehicle)
a.5 - Improvement of integration between the development of the mobility system and the structure and development of the territory (residential settlements and urban forecasts for commercial, cultural, and tourist hubs)			
a.6 - Improvement of the quality of road and urban space			

THE SUMP OF POTENZA

Let's now turn to Block C, which covers road safety and the targeted actions to achieve our goals. This represents the core focus of today's presentation.

The primary area of intervention to achieve these goals focuses on street space and motorized private mobility. The SUMP's vision for Potenza rests on three fundamental pillars, each playing a direct role in enhancing road safety.

C. Road mobility safety

- c.1 - Reduction of road accidents
- c.2 - Significant decrease in the overall number of accidents with deaths and injuries
- c.3 - Significant decrease in social costs resulting from accidents
- c.4 - Significant decrease in the number of accidents with deaths and injuries among vulnerable users (pedestrians, cyclists, children, and people over 65)

STRATEGIC VISION FOR ROAD MOBILITY E TRAFFIC MAN

Intermunicipal Traffic & Byp Strategy

- **Highway Traffic Diversion:** Encourag intermunicipal traffic to stay on the main bypass (RA 6), postponing city exits downstream.
- **Strategic Transit Hubs:** Guide incoming flows to outer interchange hubs to minimize mileage and urban emissions in the compact city.
- **Modal Shift Incentives:** Integrate tariffs and services to shift private car trips to public transit from origin.
- 🛑 **Road Safety Focus: Removes heavy through-traffic from dense urban areas, significantly reducing collision risks in sensitive residential sectors.**

Road Hierarchy & Street Spa Redesign

- **Clear Road Network Hierarchy:** Explicitly differentiate arterial corridors (for transit/traffic) from local neighborhood streets.
- **Street Section Redesign:** Reallocate road space away from private cars toward active mobility (walking and cycling).
- **Traffic Calming:** Implement Environmental Islands (Isole Ambientali) and 30 km/h zones (Città 30).
- 🛑 **Road Safety Focus: Lower vehicle speeds and dedicated pedestrian/cyclist infrastructure protect vulnerable road users (VRUs).**

Parking Management as a Mo Catalyst

- **Regulated On-Street Parking:** Restructure parking supply and pricing to balance competing urban needs (residents, commuters, visitors).
- **Off-Street Garage Synergy:** Shift long-term parking to off-street facilities to clear curbside space.
- **Multi-Modal Equilibrium:** Leverage parking policy to foster shared mobility and active transportation.
- 🛑 **Road Safety Focus: Eliminates illegal/disruptive parking, restoring clear sightlines at intersections and crossing points.**

Multi-Focus Approach: Integrated Sectoral Plans

Urban Cycling Maste Plan



- Space reallocation
- Conflict minimization
- Network continuity

Accessibility and Barri free Plan



- Pedestrian hotspot
- Visibility and sightline
- Universal design

Urban Traffic Maste Plan

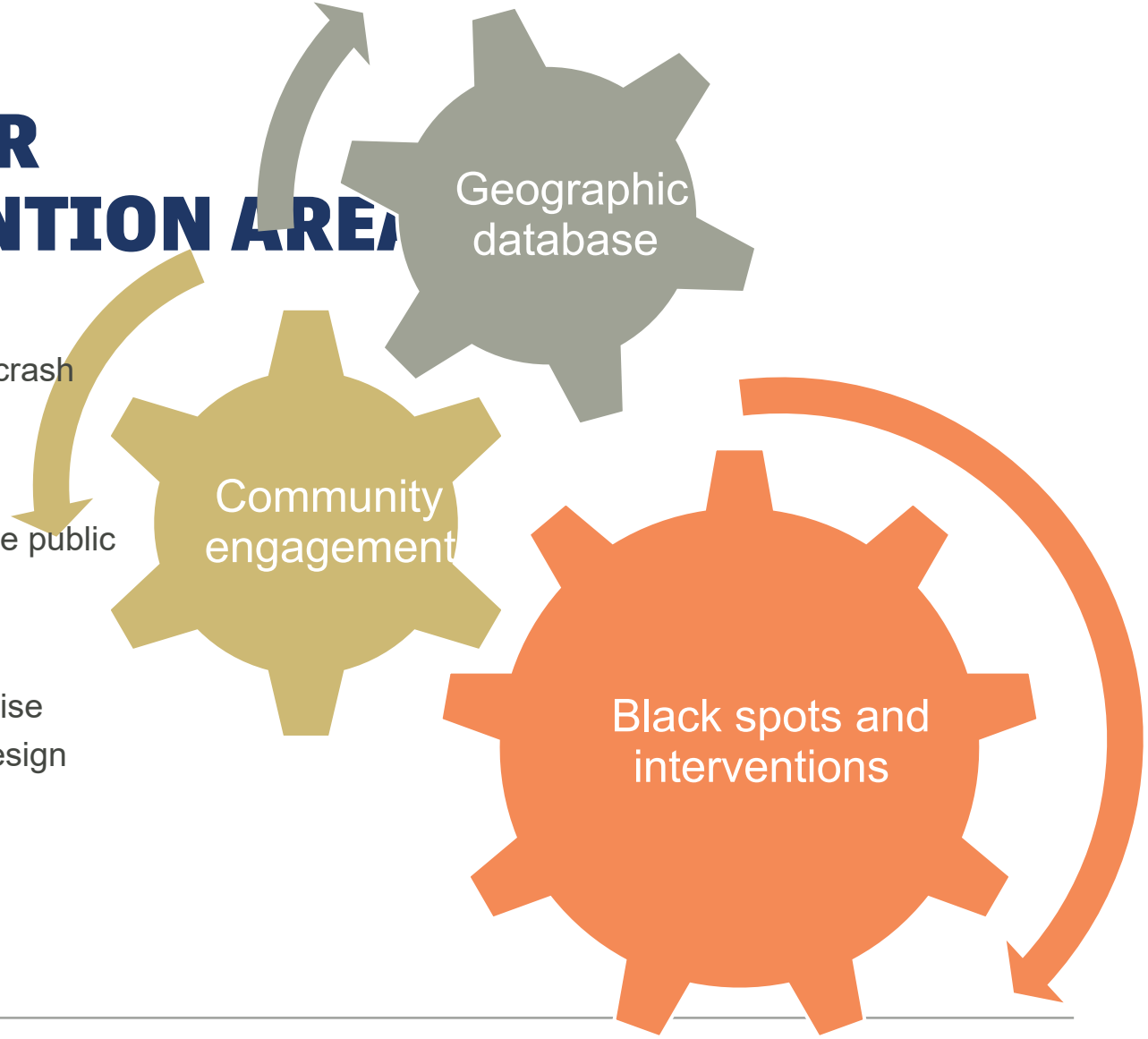


- Network hierarchy
- Speed reduction
- Junction safety

Developing this plans concurrently prevented isolated, conflicting solutions. Instead of treating road sa problem, safety measures were embedded across all mobility layers simultaneusly:
No strategic conflicts; unified GIS data model, maximized public investments

OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREA

- **Our Methodology: A Three-Pillar Approach**
- **1. Data-Driven Foundation:** In-depth analysis of road crash records, traffic counts, and spatial datasets within an integrated GIS framework.
- **2. Community Engagement & Communication:** Active public consultation and participatory decision-making to align technical findings with local community needs.
- **3. Blackspot Identification & Targeted Actions:** Precise spatial pin-pointing of high-risk nodes (blackspots) to design effective, targeted safety measures.



OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1 GEOGRAPHIC DATABASE

Database ISTAT + Database ACI



A

B

2

A

B

3

Up to 2024: 2'611'503 records for all Italy, each record is an accident

Main Fields:

- **Geographic fields**: Coordinates and description of the address
- **Severity fields**: Number of injured people and dead people
- **Involved vehicles**: Type of vehicles and pedestrian involved in the crash
- **Muncipality:** where the crash happened
- **Time coordinates**: Year, Month, weekday, hh:mm
- **Other fields**: Weather, pavement conditions, type of road
- **Nature** of the accident

OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1 GEOGRAPHIC DATABASE

- A
- B

2

- A
- B

3

Database ISTA + Database ACI

Other database (i.e. Population, traffic streams...) + Geographic databas (roads, schools, slop ..)

Aggregated analysis + Detailed analysi

OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1 **GEOGRAPHIC DATABASE**

A **Aggregated Analysis**

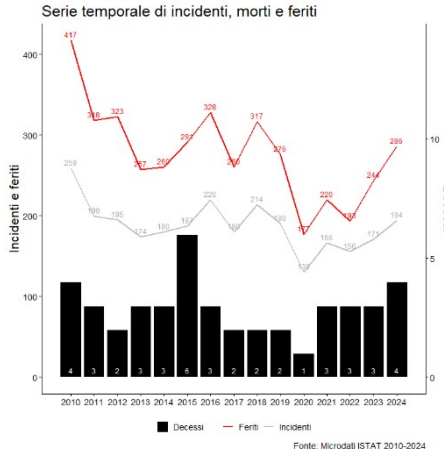
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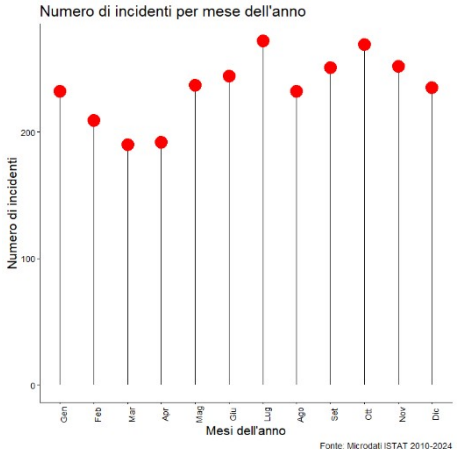
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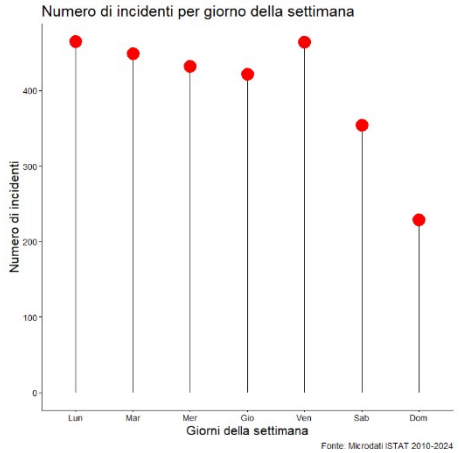
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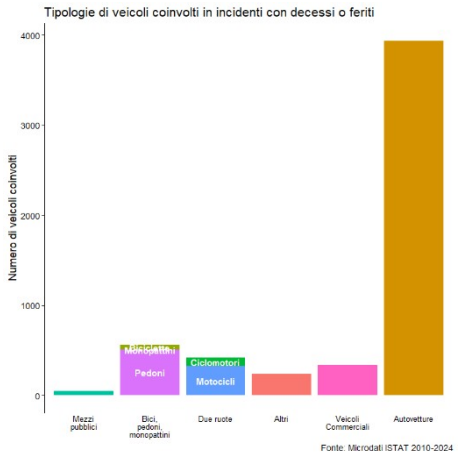
B

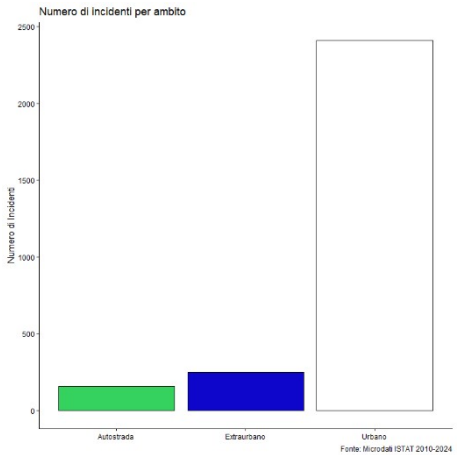
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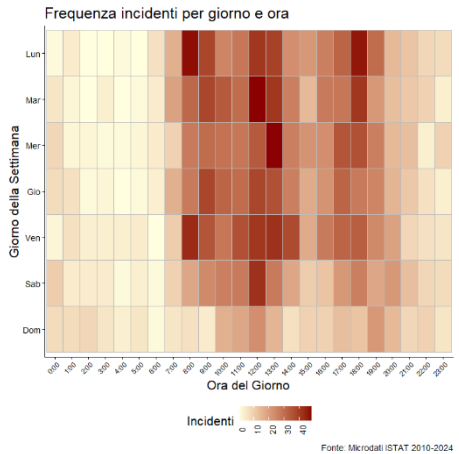












OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

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A **Aggregated Analysis**

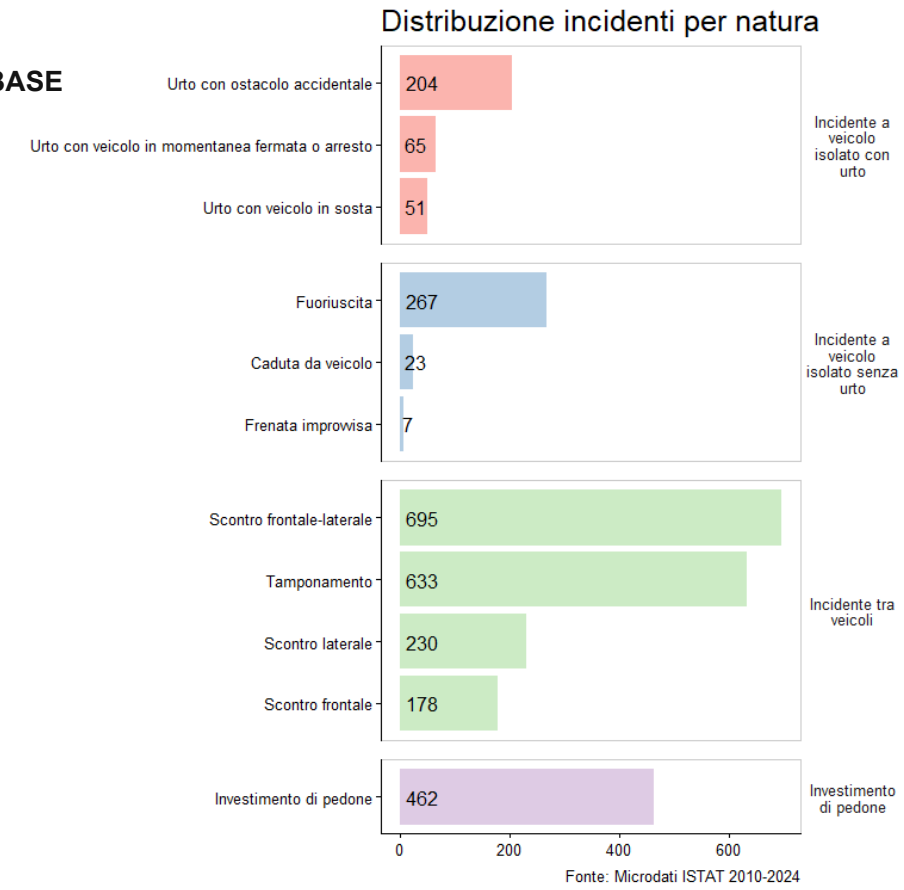
B

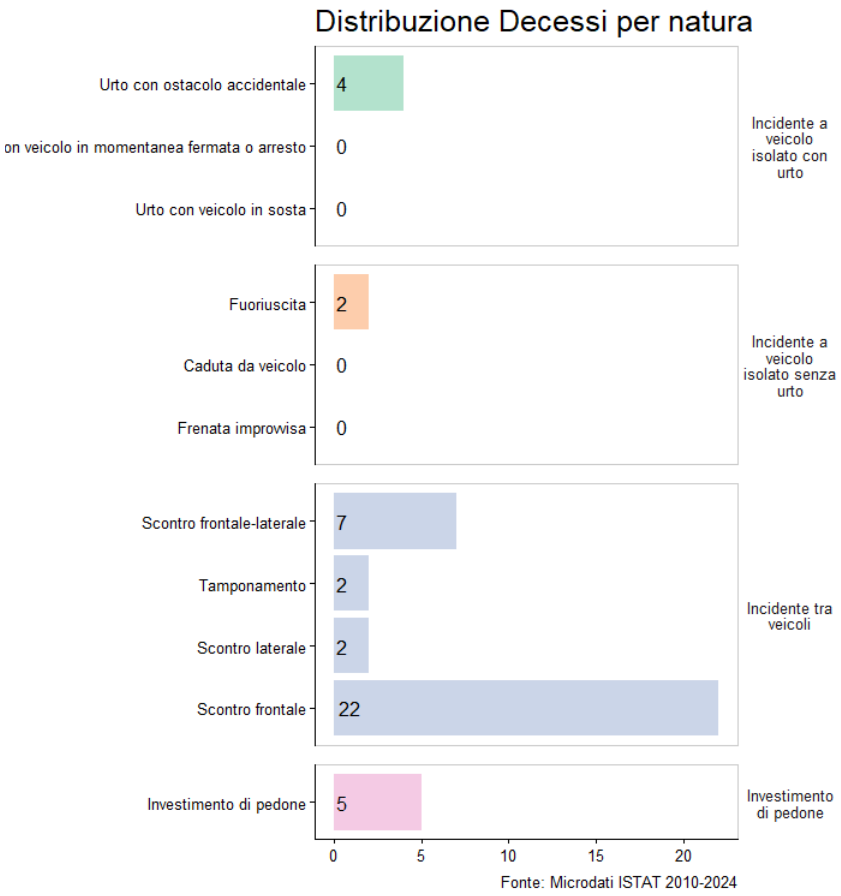
2

A

B

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1 **GEOGRAPHIC DATABASE**

A **Aggregated Analysis**

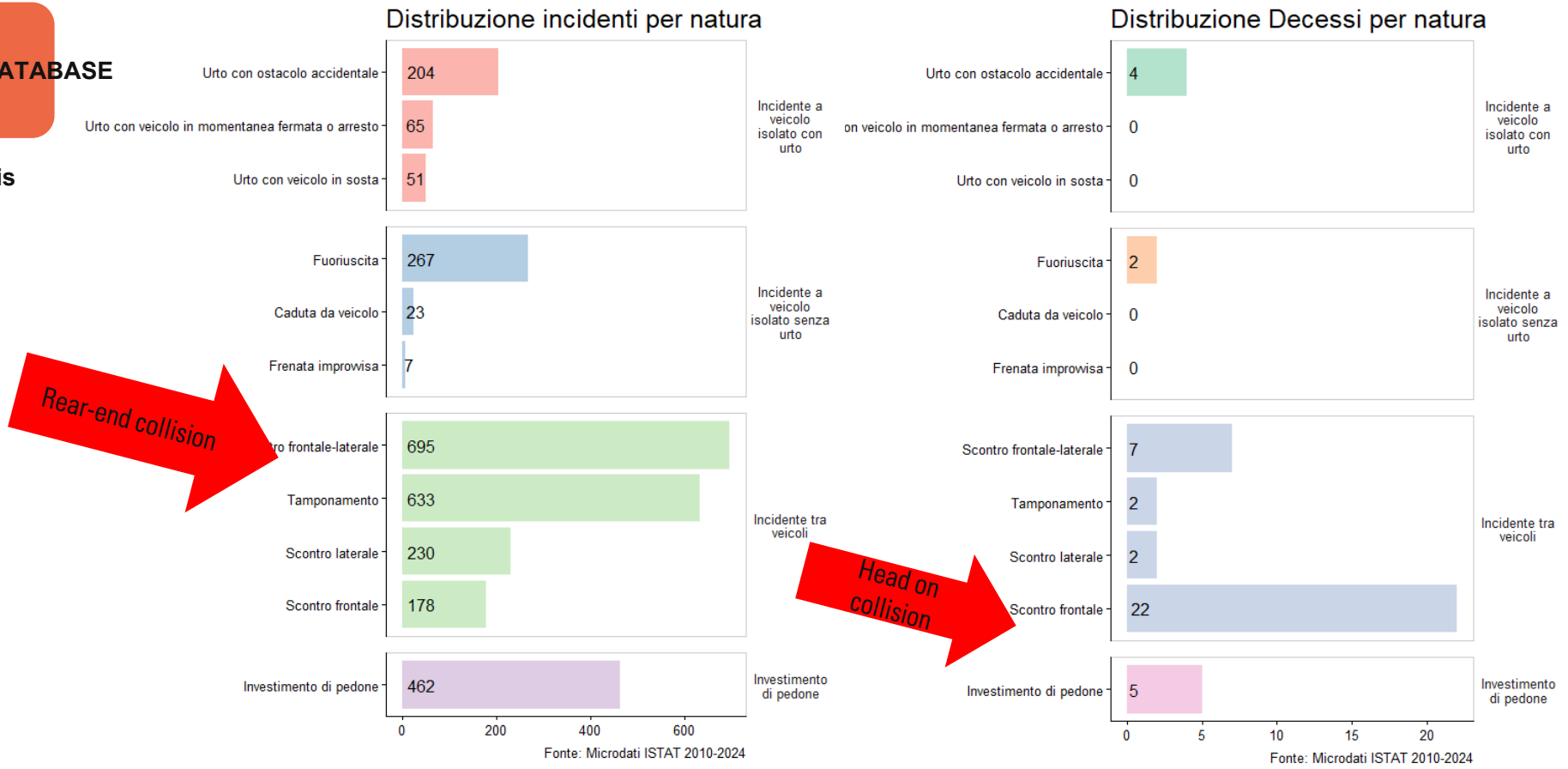
B

2

A

B

3



OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1 GEOGRAPHIC DATABASE

A

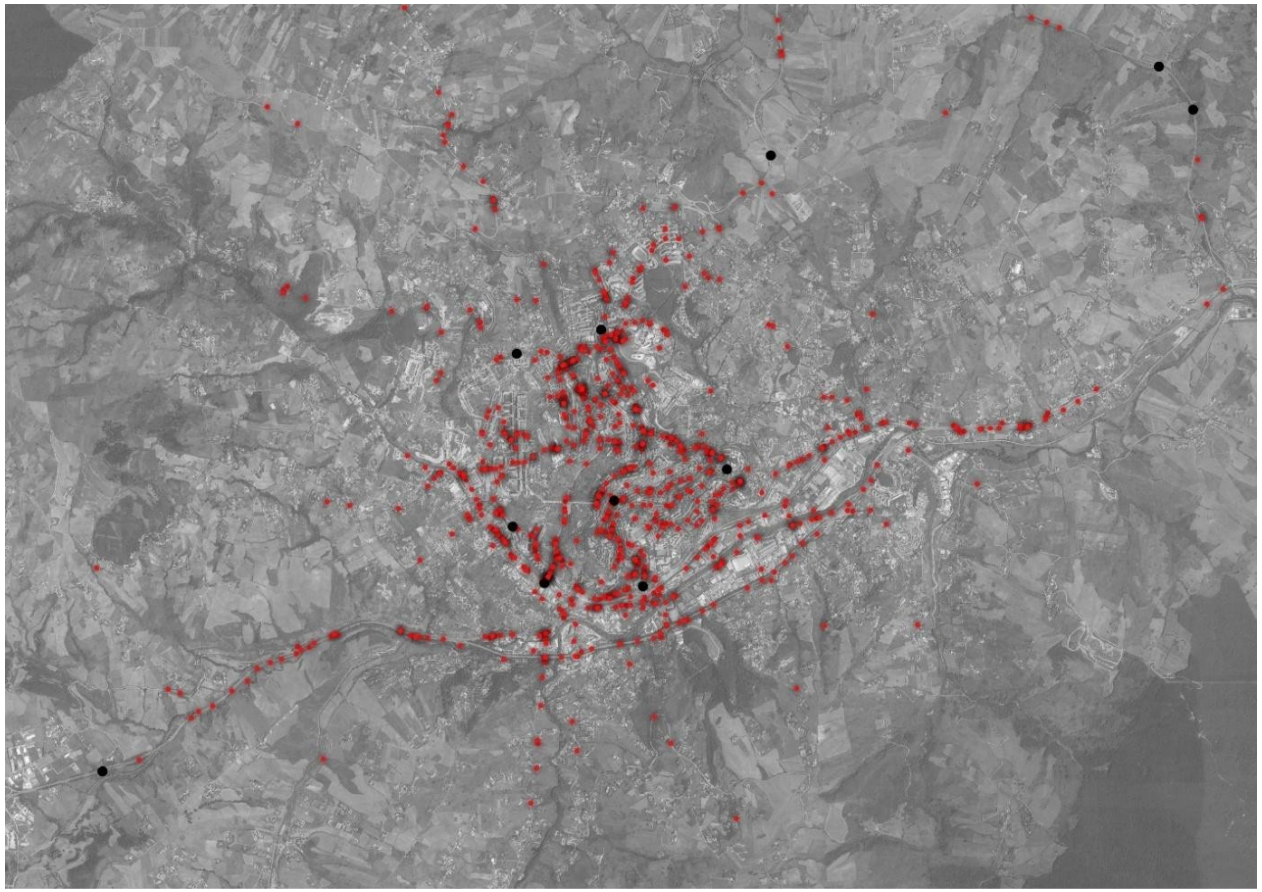
B Detailed Analysis

2

A

B

3



2015-2019
Source: ISTAT

Injured
Dead

OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1 GEOGRAPHIC DATABASE

A

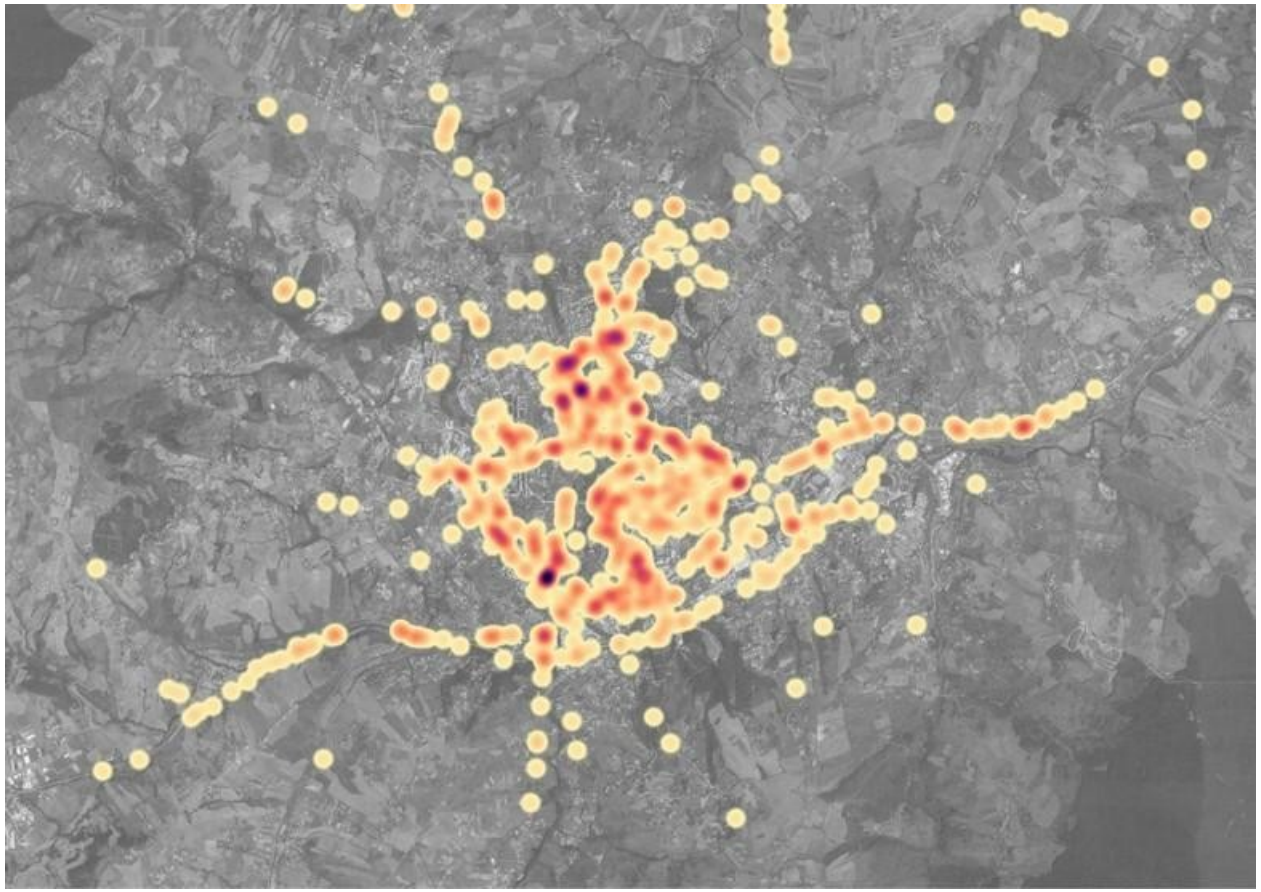
B Detailed Analysis

2

A

B

3



2015-2019
Source: ISTAT

OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1 **GEOGRAPHIC DATABASE**

A

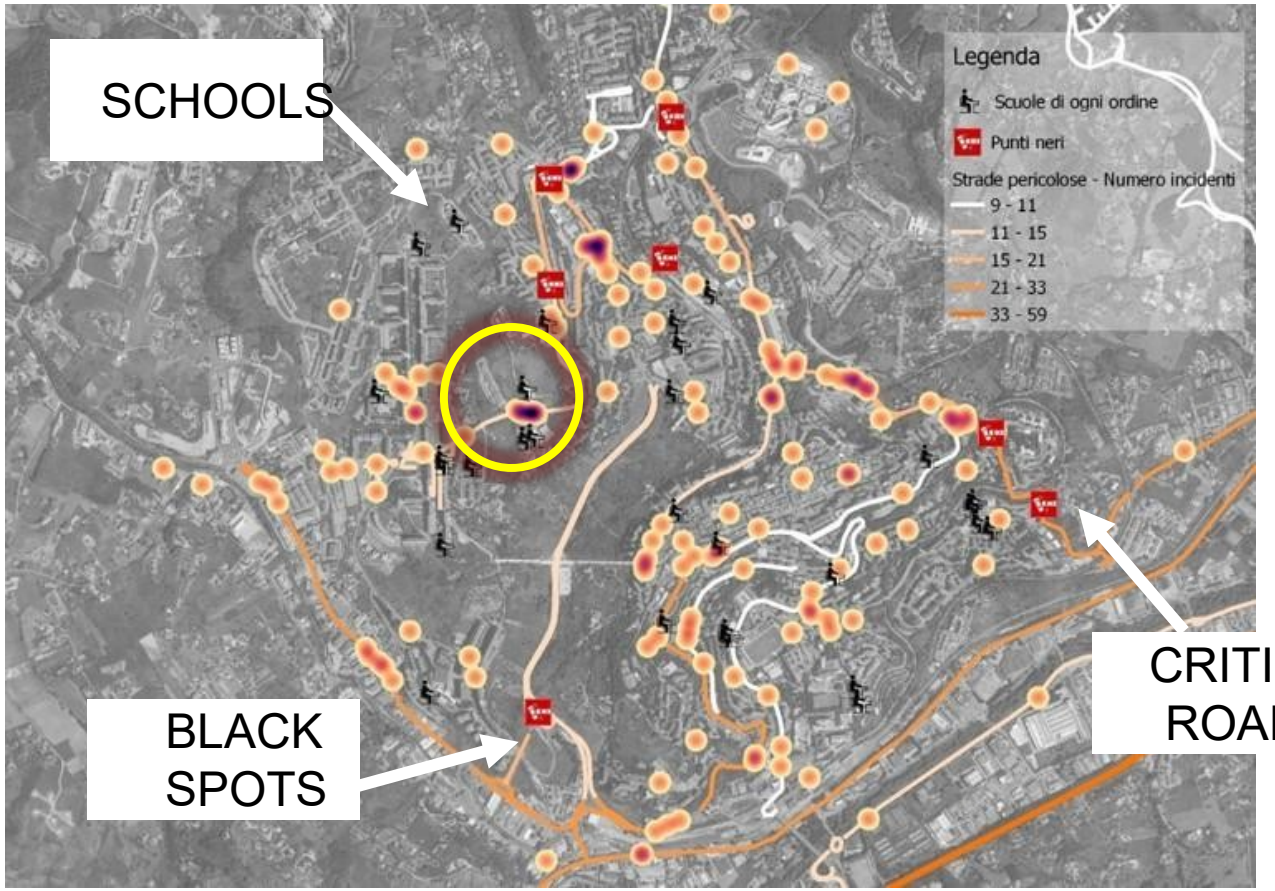
B **Detailed Analysis**

2

A

B

3



2015-2019
Source: ISTAT

TRAFFIC TRENDS & FIELD COUNTS

1 GEOGRAPHIC DATABASE

A

B

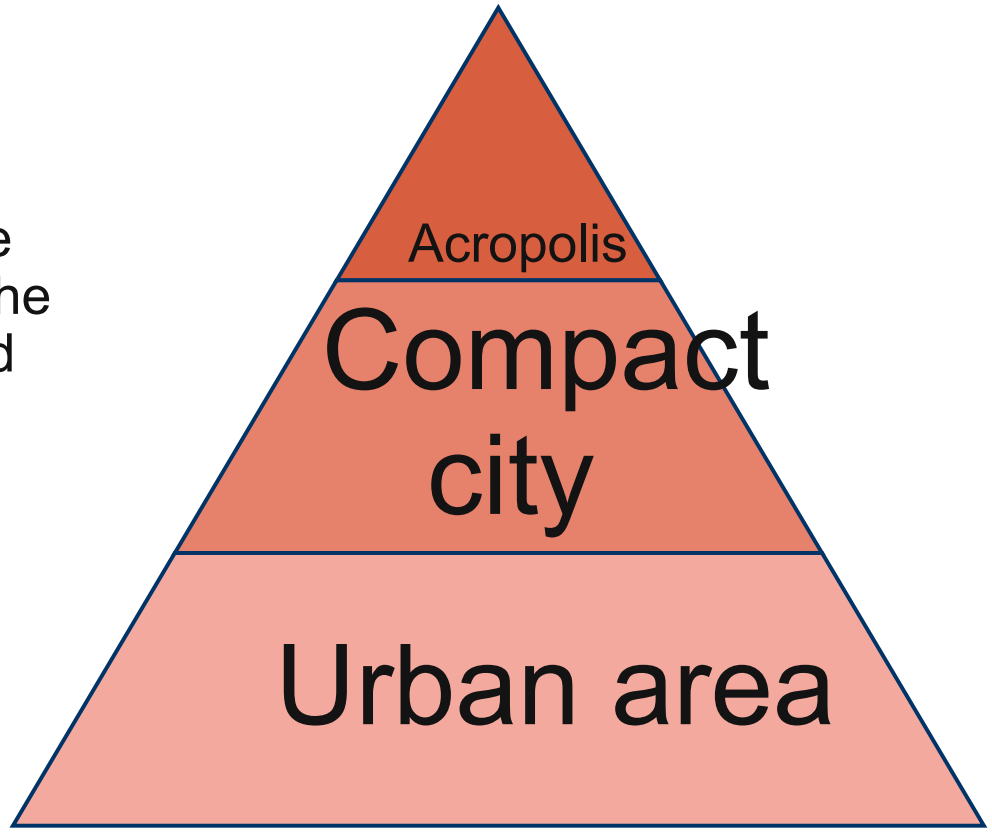
2

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3

To support the SUMP, traffic counts were conducted along three key screenlines: the Outer City Cordon, the urban Cordon and the Acropolis Cordon (the historical center).



TRAFFIC TRENDS & FIELD COUNTS

1 **GEOGRAPHIC DATABASE**

A

B

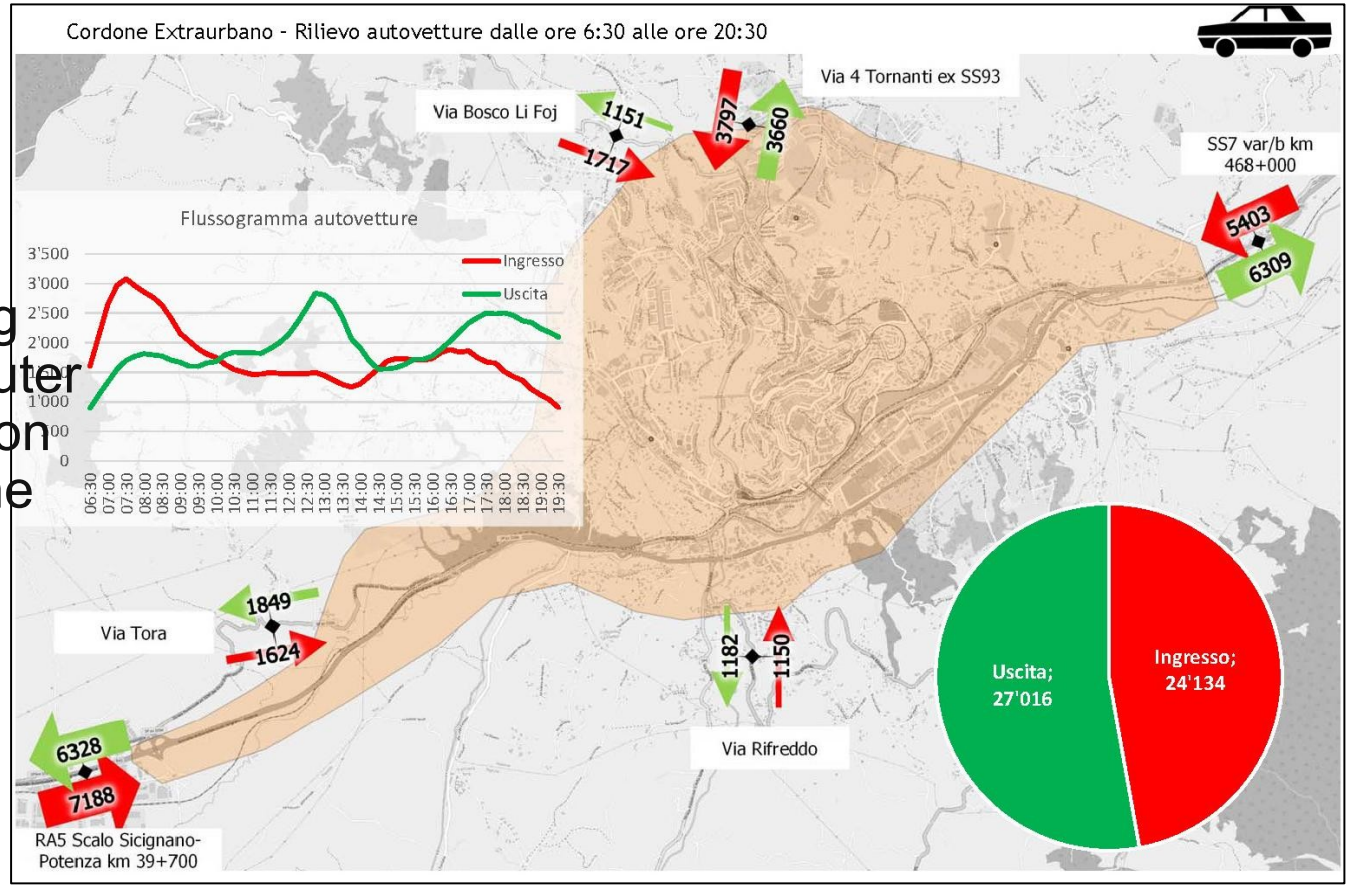
2

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3

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TRAFFIC TRENDS & FIELD COUNTS

1 **GEOGRAPHIC DATABASE**

A

B

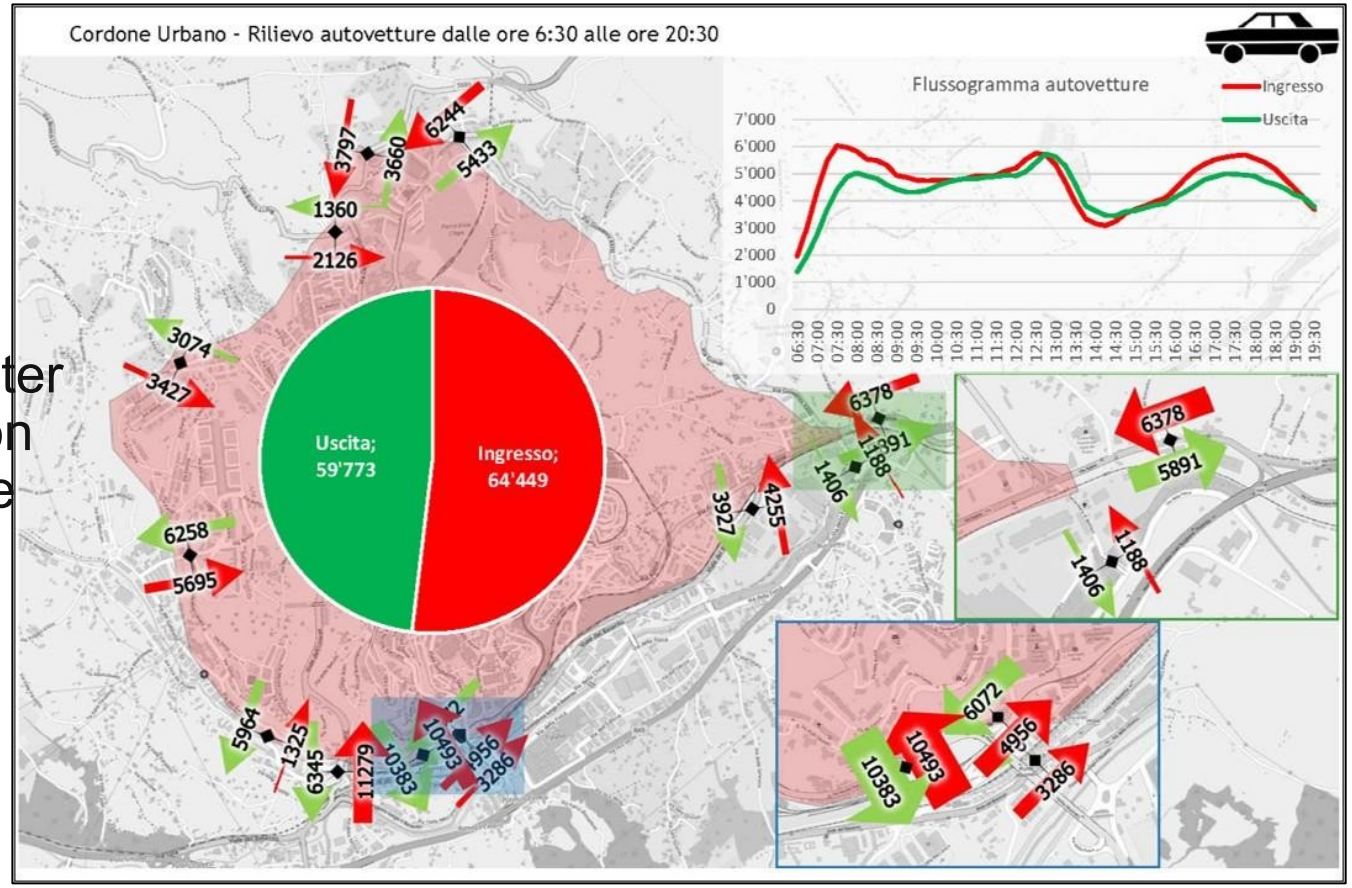
2

A

B

3

To support the SUMP, traffic counts were conducted along three key screenlines: the Outer City Cordon, the urban Cordon and the Acropolis Cordon (the historical center).



TRAFFIC TRENDS & FIELD COUNTS

1 GEOGRAPHIC DATABASE

A

B

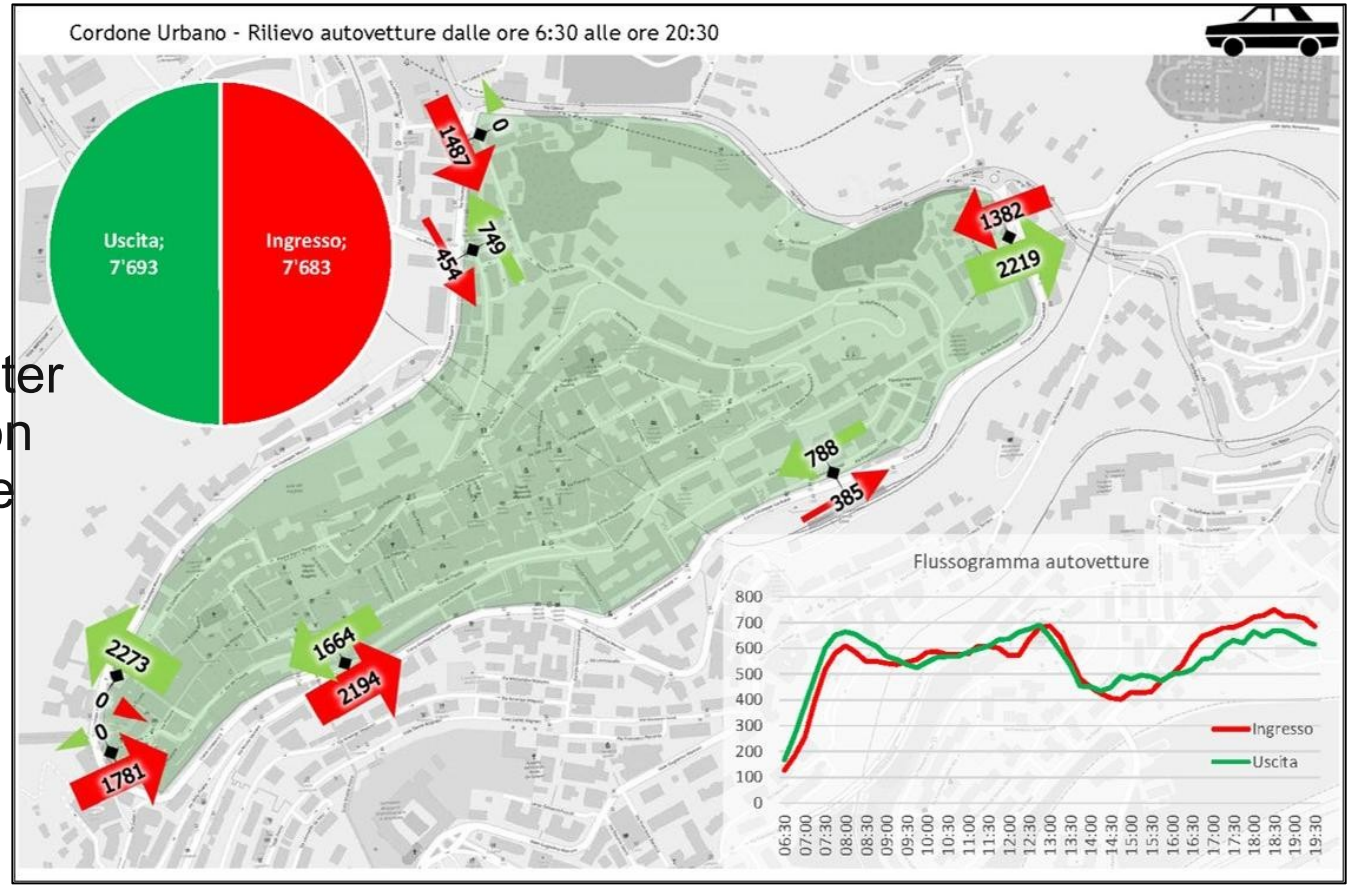
2

A

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To support the SUMP, traffic counts were conducted along three key screenlines: the Outer City Cordon, the urban Cordon and the Acropolis Cordon (the historical center).



DEMAND

1 **GEOGRAPHIC DATABASE**

A

B

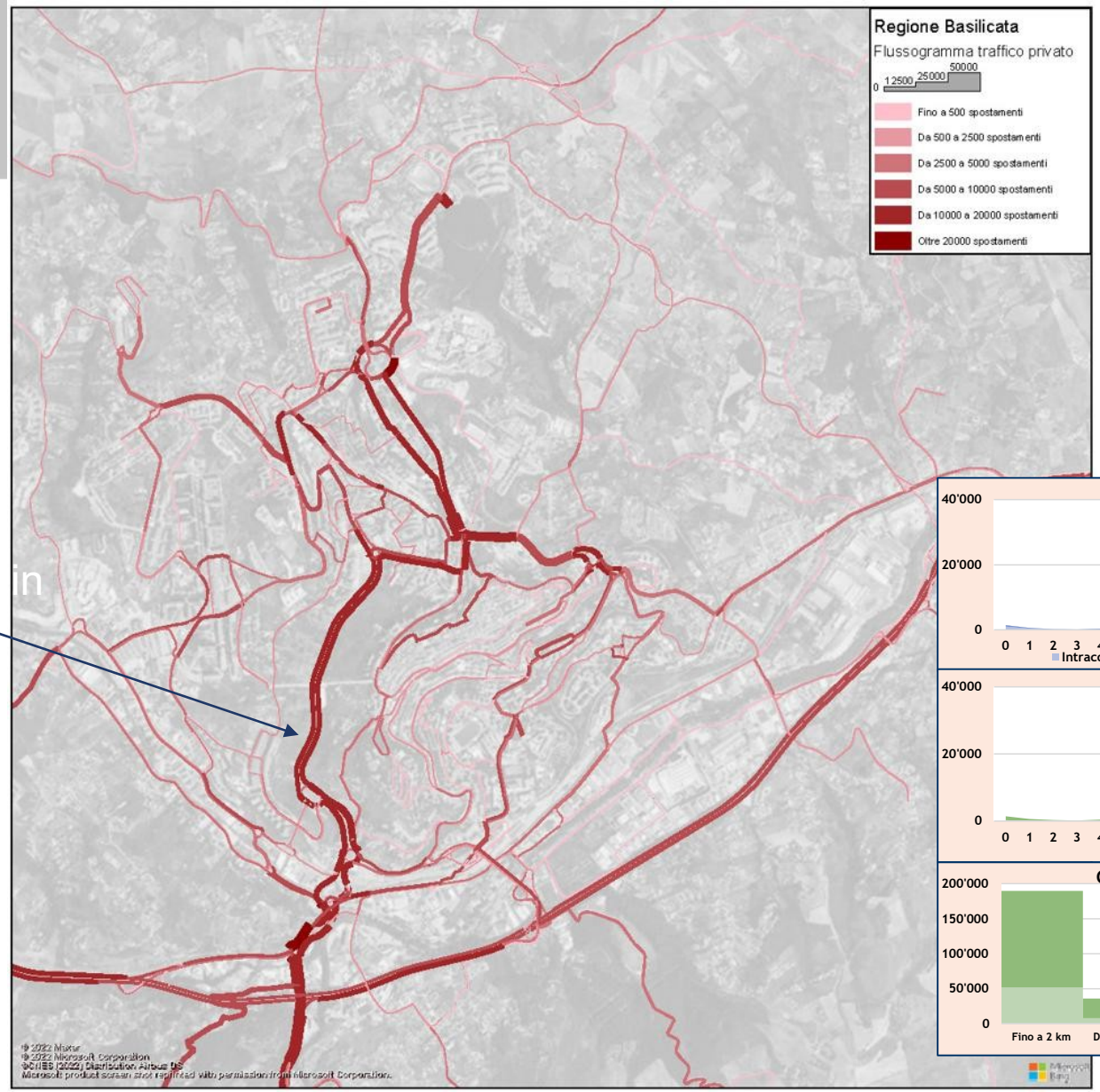
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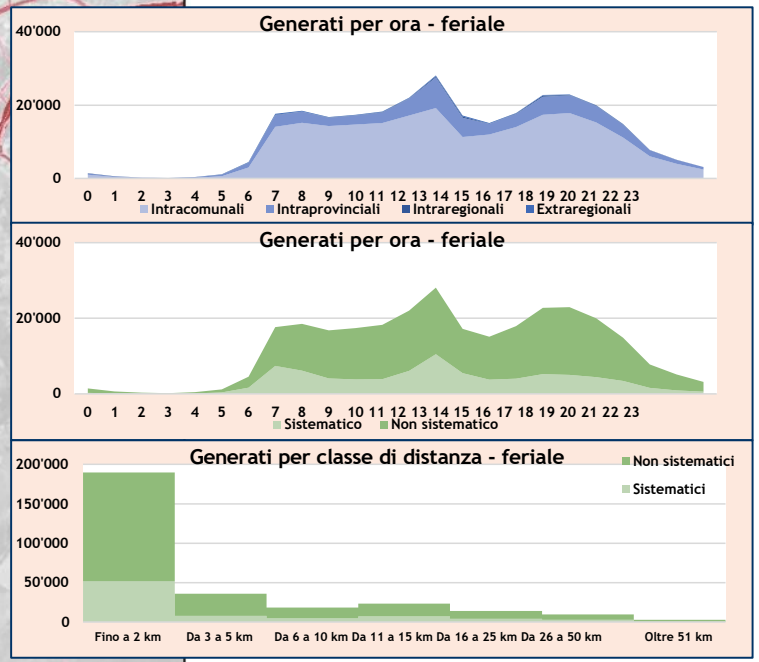
A

B

3

Identification of the main high-volume road arteries in Potenza





OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1

A

B

2 **COMMUNITY ENGAGEMENT**

A **Comunication**

B

3



OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1

A

B

2 COMMUNITY ENGAGEMENT

A Comunication

B

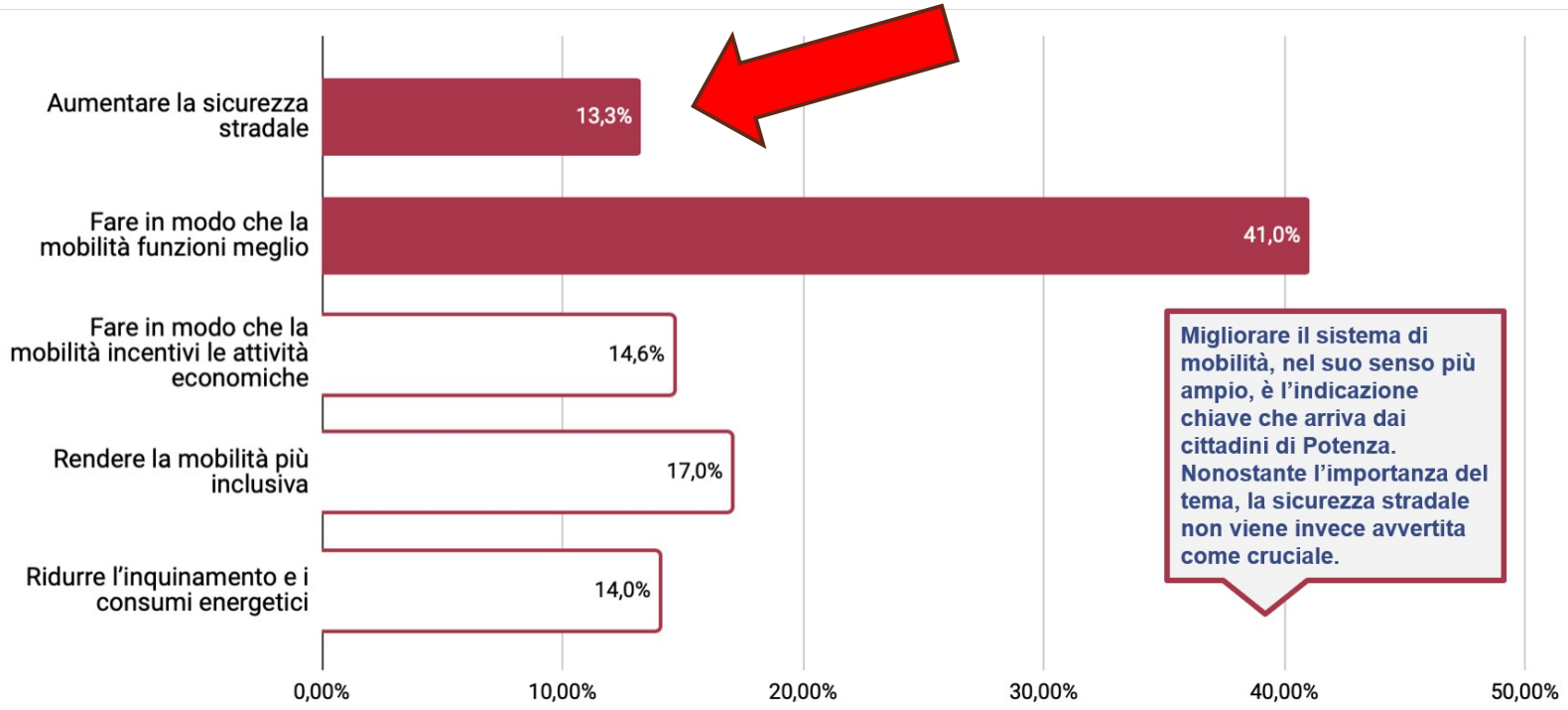
3



OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1
A
B
2 **COMMUNITY ENGAGEMENT**
A
B **Listening and co-design**
3

5. Proviamo a cambiare insieme le cose! Quali sono per te gli obiettivi più importanti che dovremo raggiungere con il PUMS? Seleziona max. 3 opzioni
totale complessivo



OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1

A

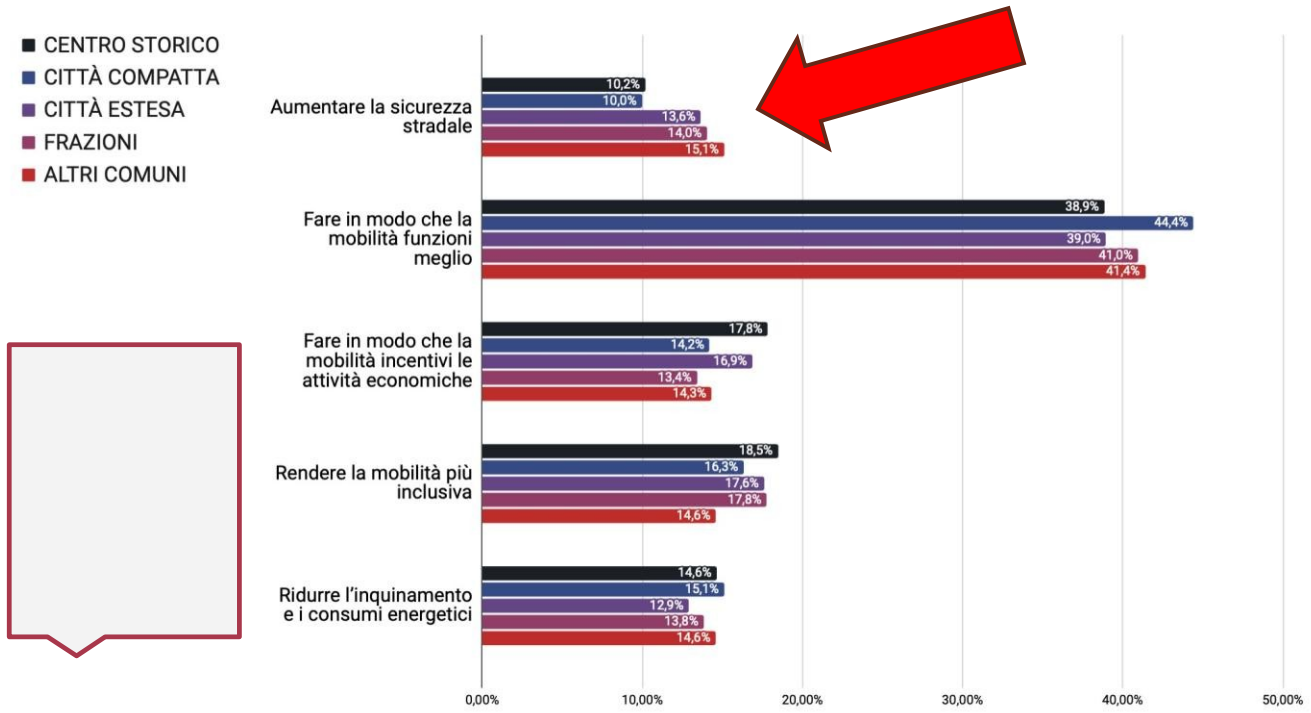
B

2 **COMMUNITY ENGAGEMENT**

A

B **Listening and co-design**

3



OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1

A

B

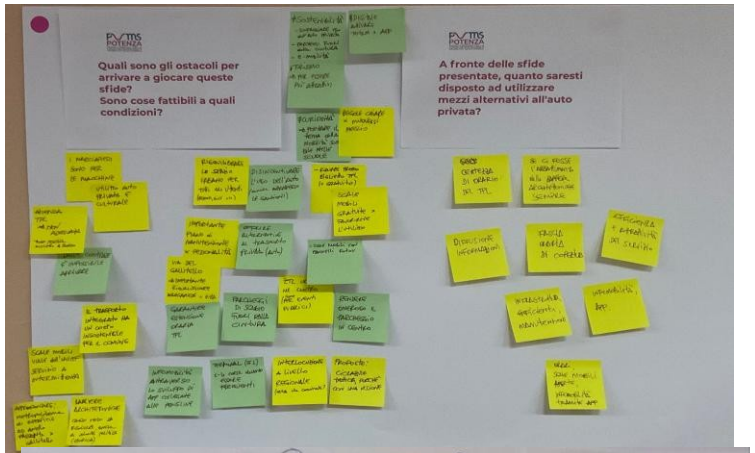
2 **COMMUNITY ENGAGEMENT**

A

B **Listening and co-design**

3









OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS



BLACK SPOTS & MEASURES

Level 1 Low cost/high impact

- Tactical urbanism
- high reflectance signage
- dedicated crosswalk lighting

Level 2 Geometric reconfiguration & interchange safety

- intersection upgrades
- safer PT stops
- compliant crossings

Level 3 Flow separation & vertical link optimization

- exploiting natural gradients to build elevated footbridges linking school entrances directly to PT stops
- physically separating flows and eliminating conflict points

OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1

A

B

2

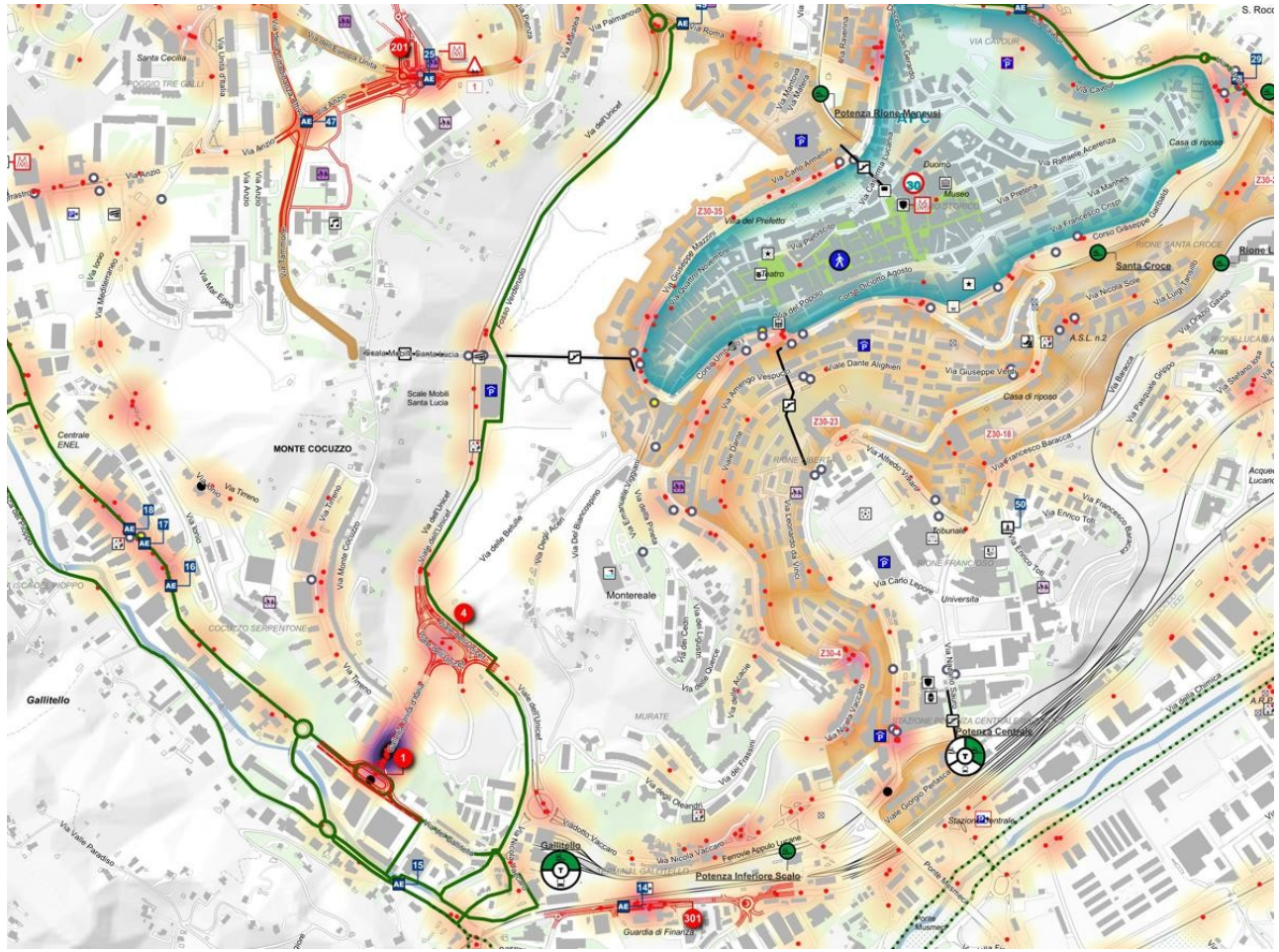
A

B

3

Level 1
Low cost/high impact

BLACK SPOTS & MEASURES



OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1

A

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2

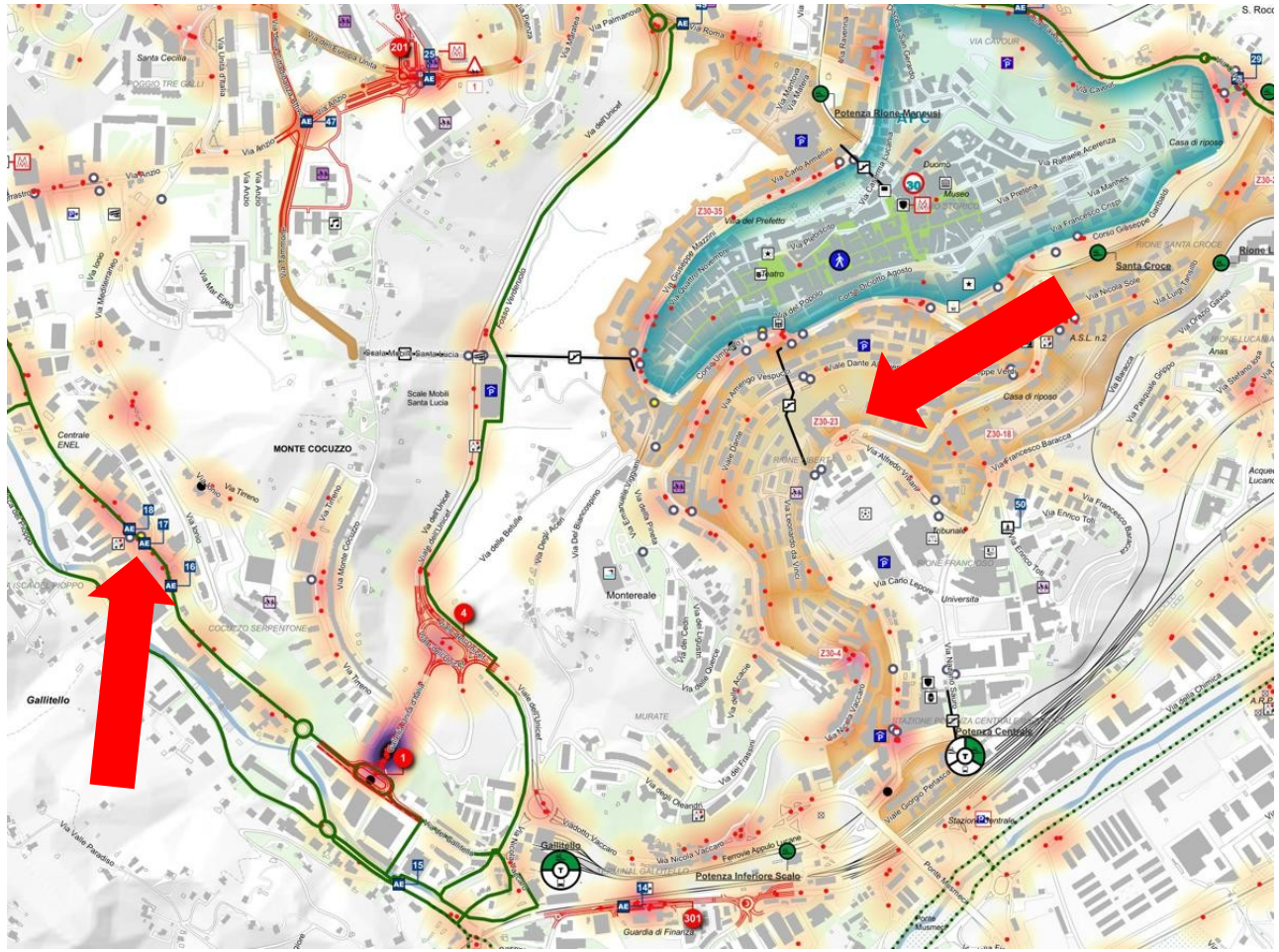
A

B

3

Level 1
Low cost/high impact

BLACK SPOTS & MEASURES



OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1
A
B
2
A
B
3

Level 1
Low cost/high impact







BLACK SPOTS & MEASURES

OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1
A
B
2
A
B
3

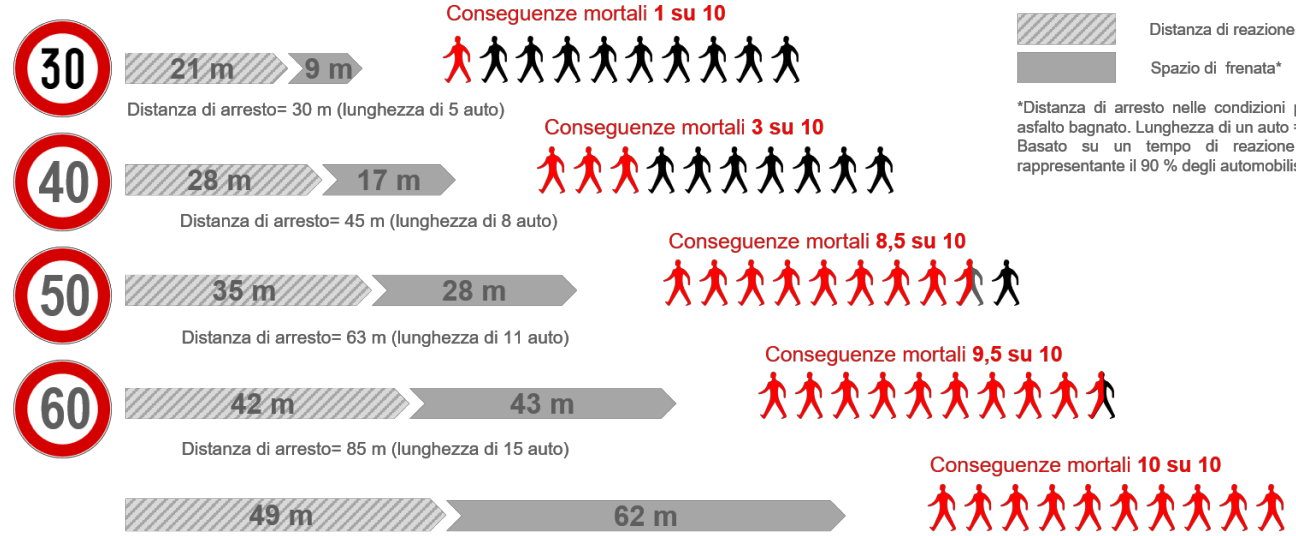
Level 1
Low cost/high impact

BLACK SPOTS & MEASURES







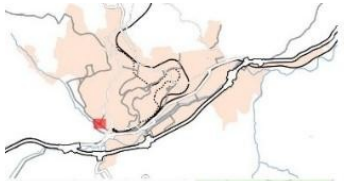


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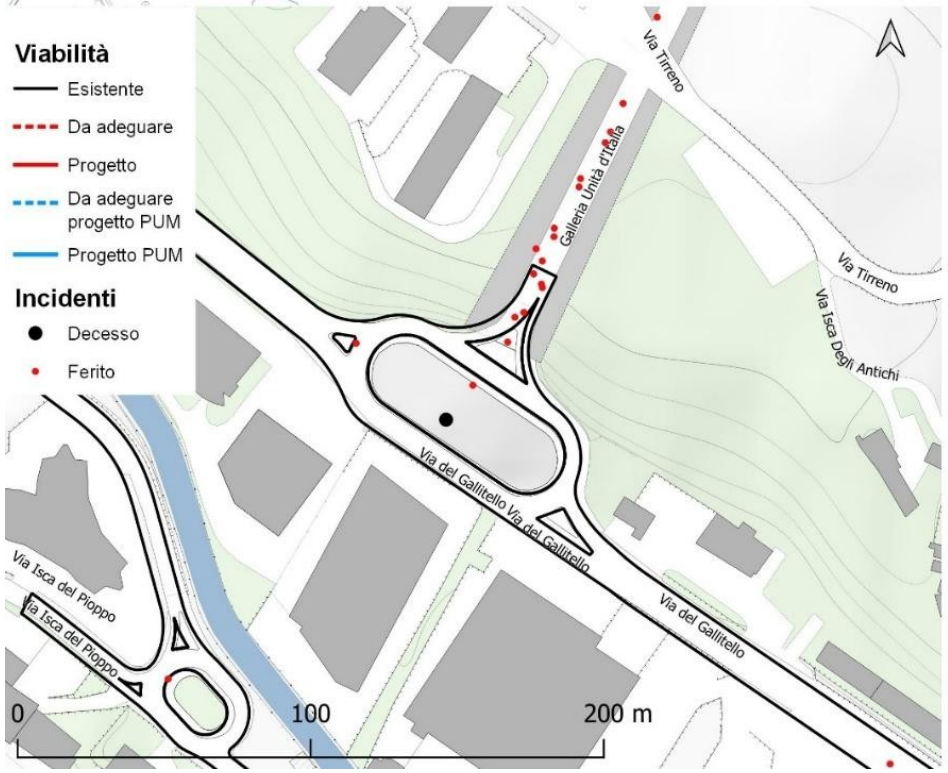
1
A
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2
A
B
3

Level 2 Geometric reconfiguration & interchange safety

BLACK SPOTS & MEASURES

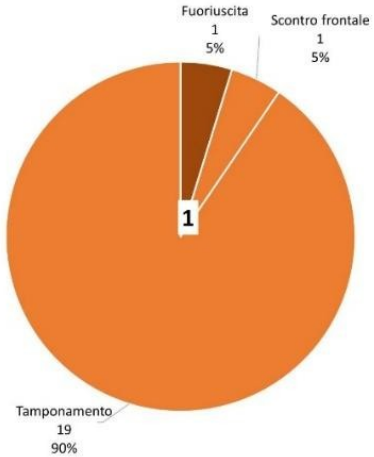


Intersezione: 1
Nodo Complesso Via del Gallitello - Galleria Unità d'Italia
N. incidenti tot. (anni 2015-19): 21

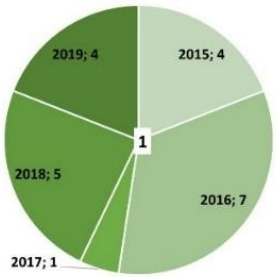


Natura dell'incidente

- Incidente tra veicoli in marcia
- Investimento di pedone
- Incidente a veicolo od ostacolo fermo
- Veicolo in marcia senza urto



Anno dell'incidente



OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

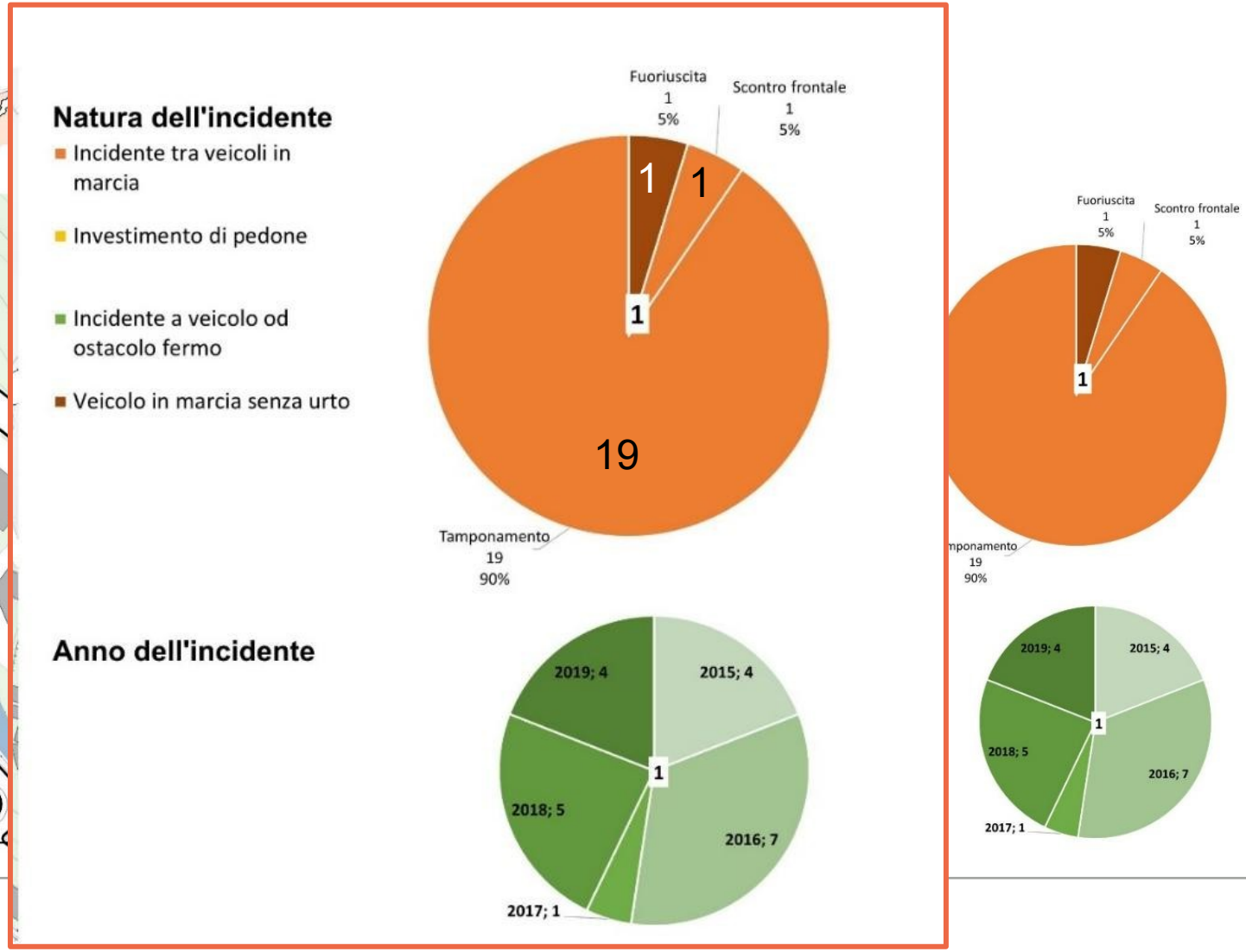
1
A
B
2
A
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3

Level 2 Geometric reconfiguration & interchange safety

BLACK SPOTS & MEASURES







OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

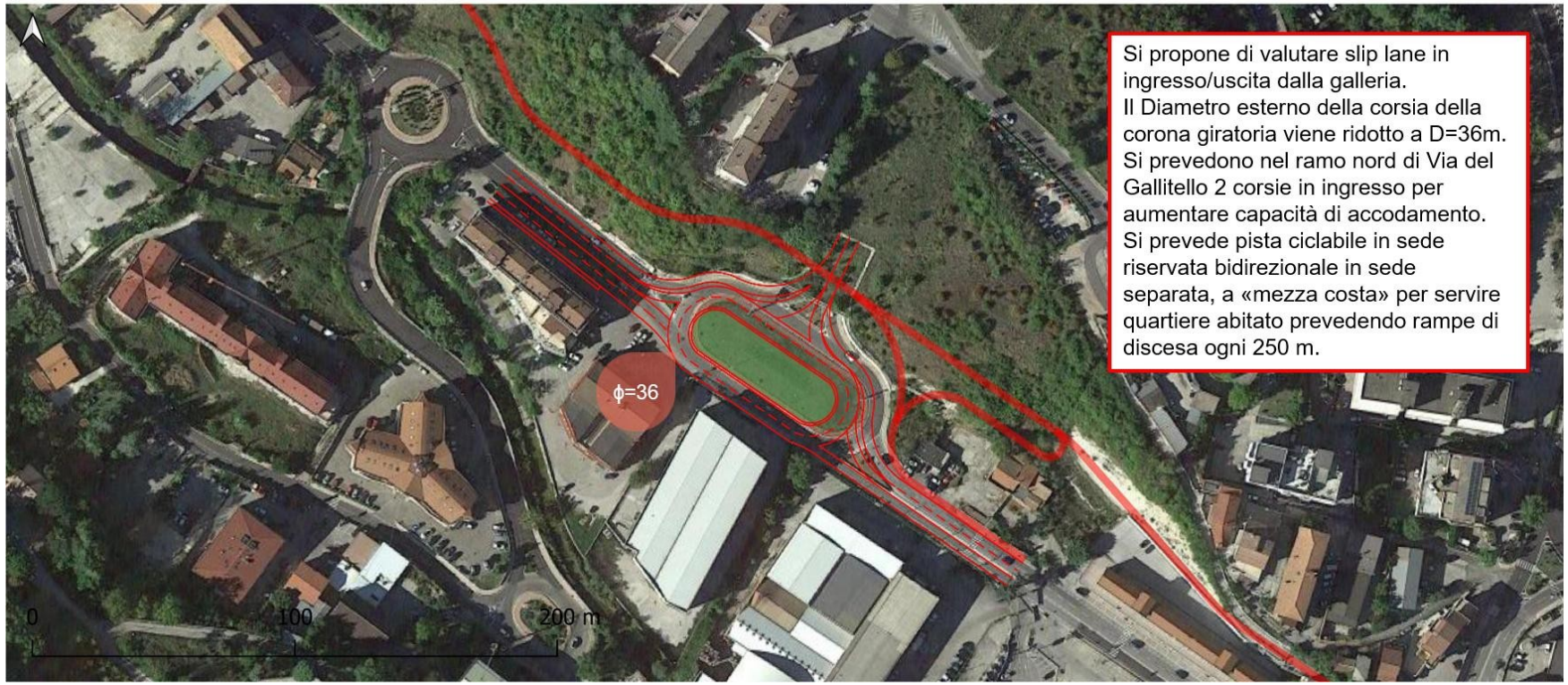
1
A
B
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B
3

Level 2 Geometric reconfiguration & interchange safety

BLACK SPOTS & MEASURES



Schema planimetrico intersezione: 1
Nodo Complesso Via del Gallitello - Galleria Unità d'Italia
N. incidenti tot. (anni 2015-19): 21
SCHEMA PLANIMETRICO - IPOTESI 2



Si propone di valutare slip lane in ingresso/uscita dalla galleria.
Il Diametro esterno della corsia della corona giratoria viene ridotto a D=36m.
Si prevedono nel ramo nord di Via del Gallitello 2 corsie in ingresso per aumentare capacità di accodamento.
Si prevede pista ciclabile in sede riservata bidirezionale in sede separata, a «mezza costa» per servire quartiere abitato prevedendo rampe di discesa ogni 250 m.

OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

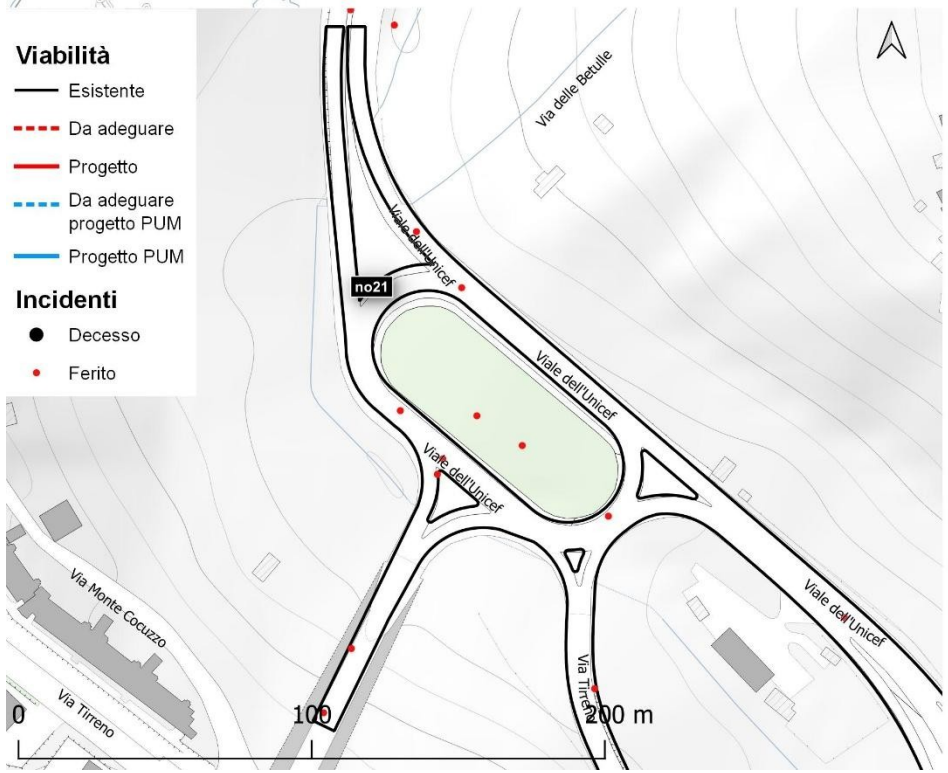
1
A
B
2
A
B
3

Level 2 Geometric reconfiguration & interchange safety

BLACK SPOTS & MEASURES

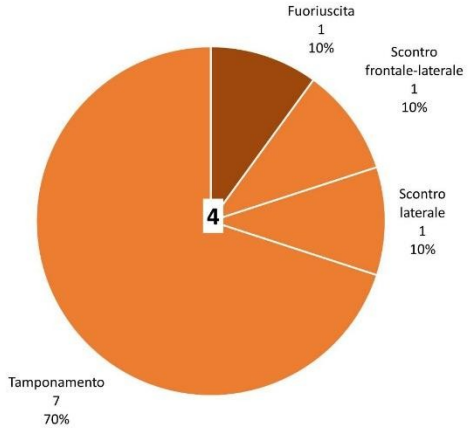


Intersezione: 4
Viale Unicef - Galleria Unità d'Italia - Via Tirreno
N. incidenti tot. (anni 2015-19): 10

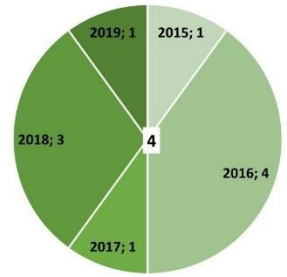


Natura dell'incidente

- Incidente tra veicoli in marcia
- Investimento di pedone
- Incidente a veicolo od ostacolo fermo
- Veicolo in marcia senza urto



Anno dell'incidente



OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

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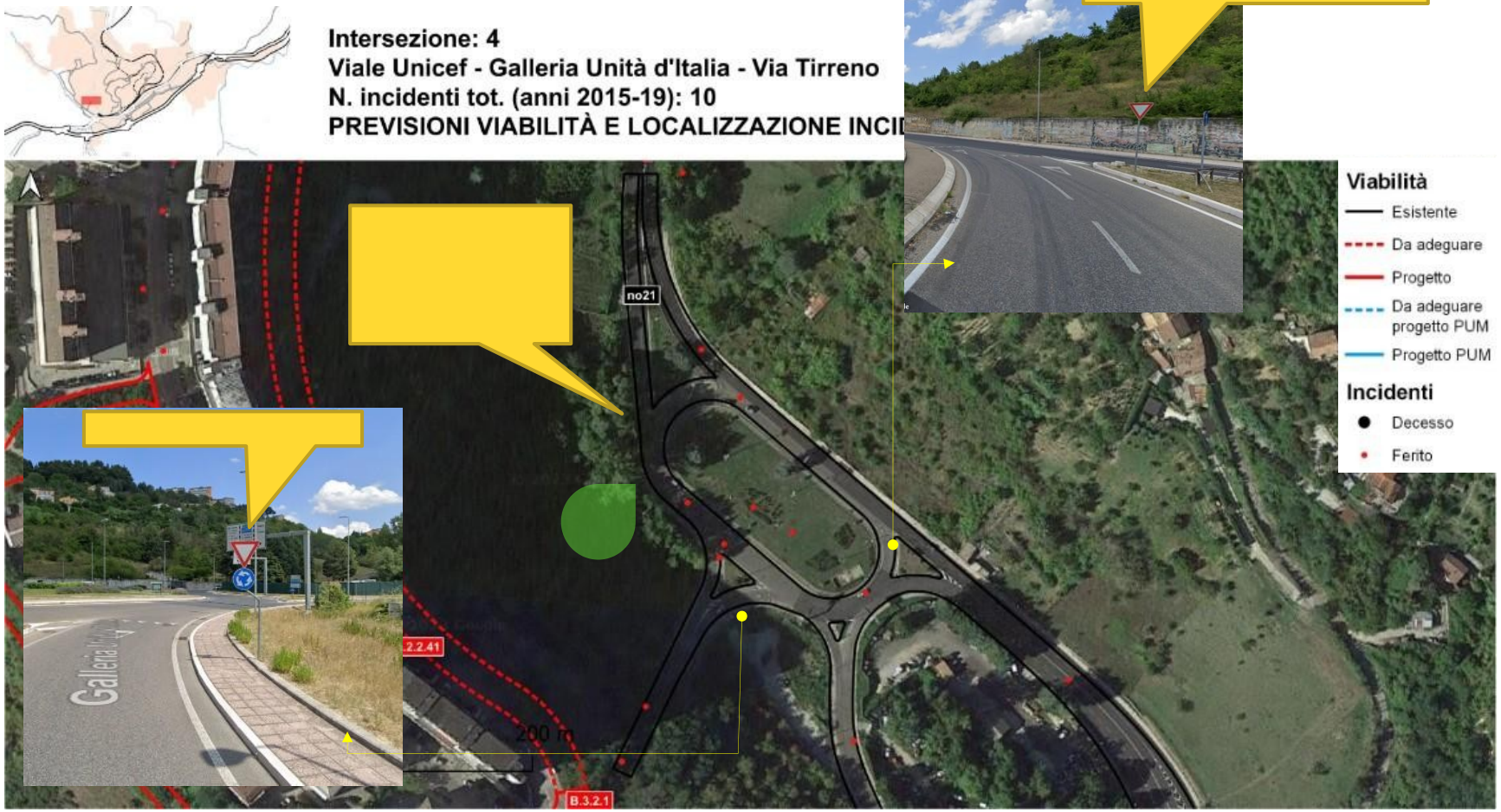
A

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Level 2 Geometric reconfiguration & interchange safety

BLACK SPOTS & MEASURES



OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1

A

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B

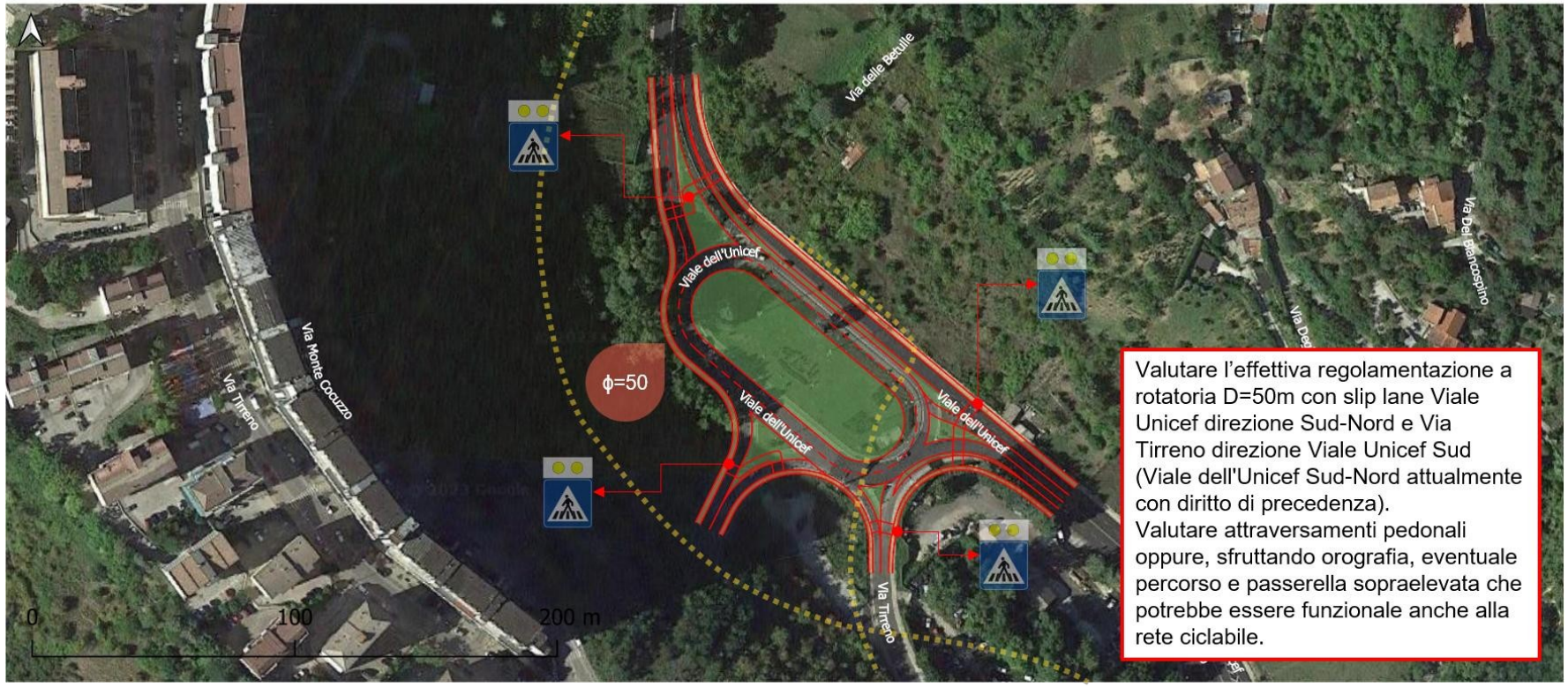
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Level 2
Geometric reconfiguration & interchange safety

BLACK SPOTS & MEASURES



Schema planimetrico intersezione: 4
Viale Unicef - Galleria Unità d'Italia - Via Tirreno
N. incidenti tot. (anni 2015-19): 10
SCHEMA PLANIMETRICO - IPOTESI 1



Valutare l'effettiva regolamentazione a rotatoria D=50m con slip lane Viale Unicef direzione Sud-Nord e Via Tirreno direzione Viale Unicef Sud (Viale dell'Unicef Sud-Nord attualmente con diritto di precedenza).
Valutare attraversamenti pedonali oppure, sfruttando orografia, eventuale percorso e passerella sopraelevata che potrebbe essere funzionale anche alla rete ciclabile.

OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

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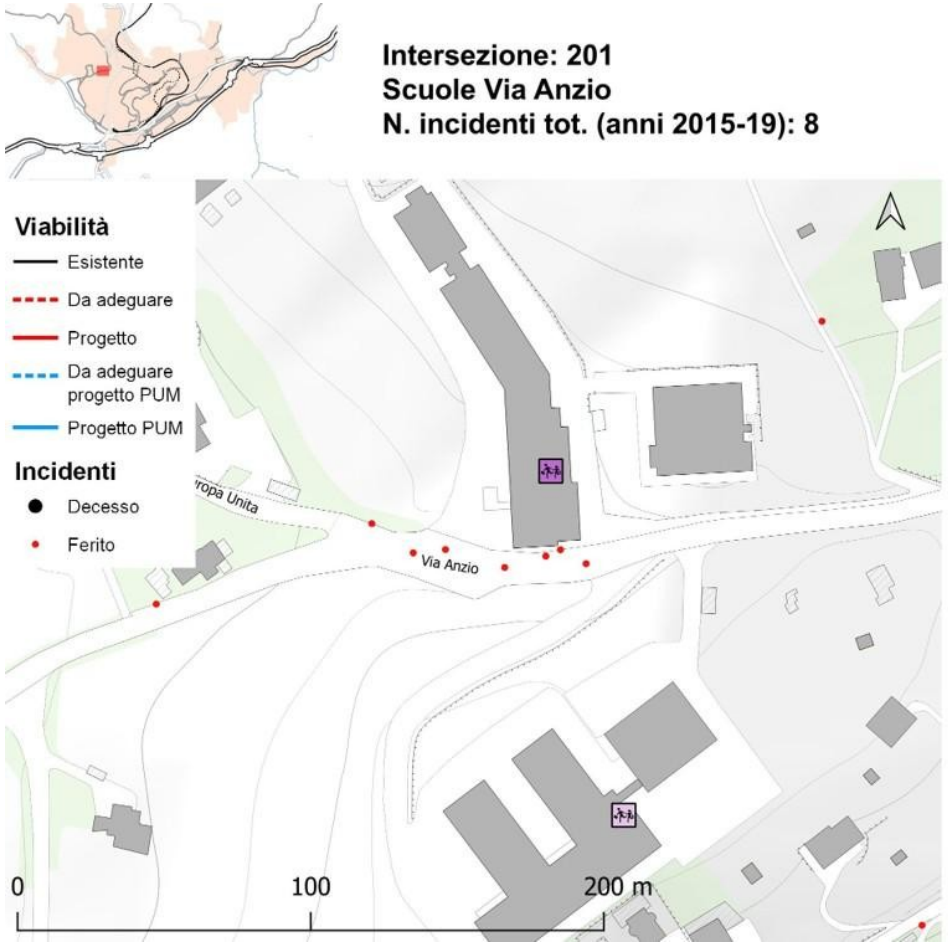
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B

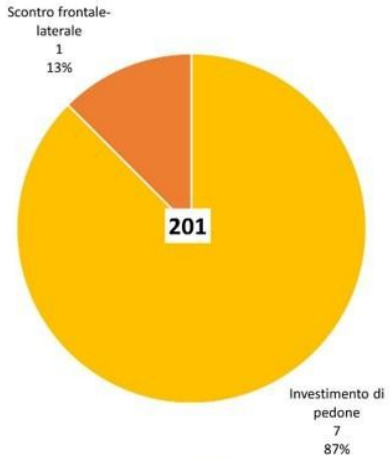
3

Phase 3 Flow separation & vertical link optimization

BLACK SPOTS & MEASURES











OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1

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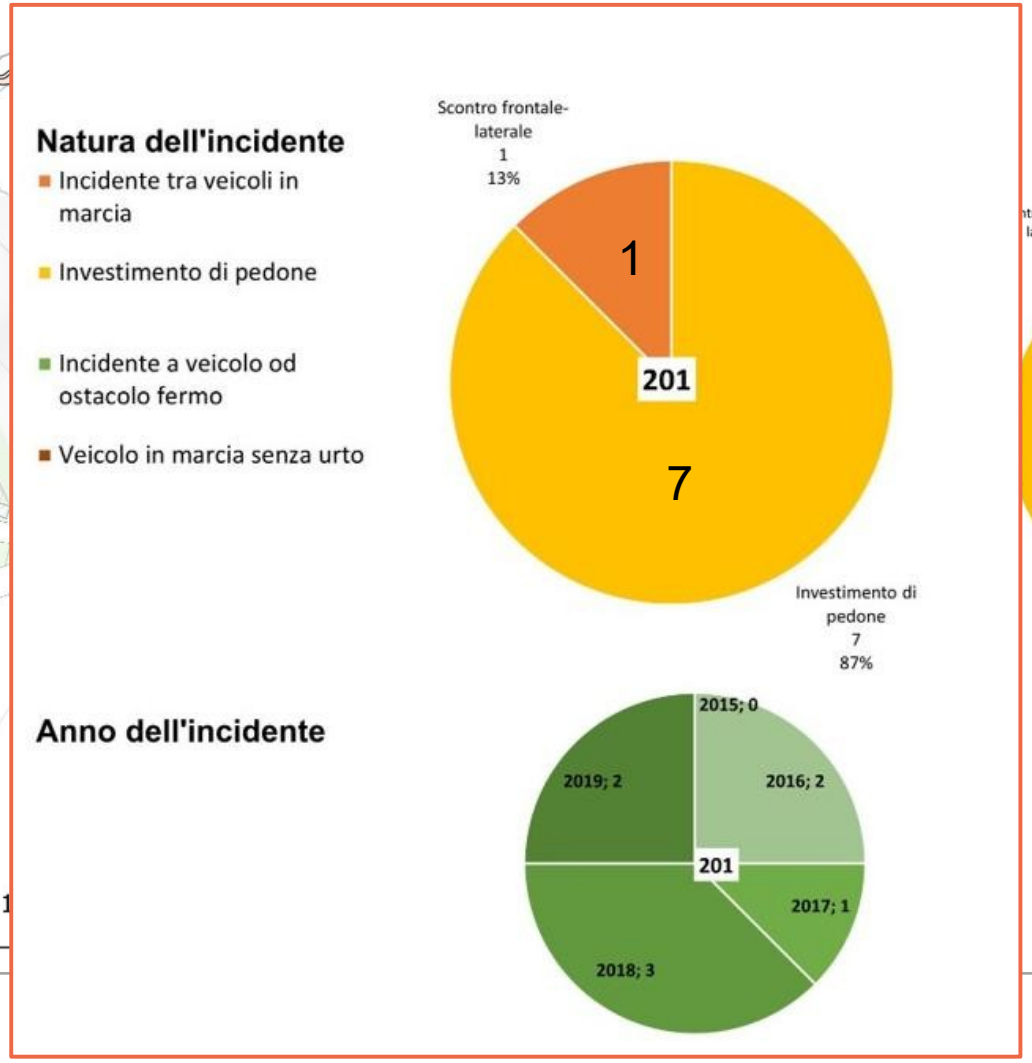
B

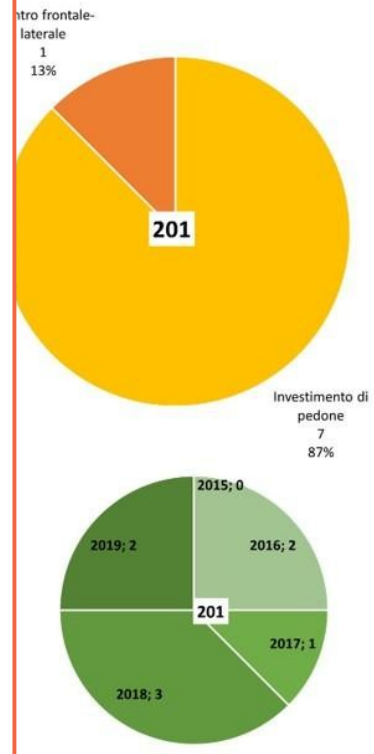
3

Phase 3 Flow separation & vertical link optimization

BLACK SPOTS & MEASURES







OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

1

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3

Phase 3 Flow separation & vertical link optimization

BLACK SPOTS & MEASURES



Intersezione: 201
Scuole Via Anzio
N. incidenti tot. (anni 2015-19): 8









OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS

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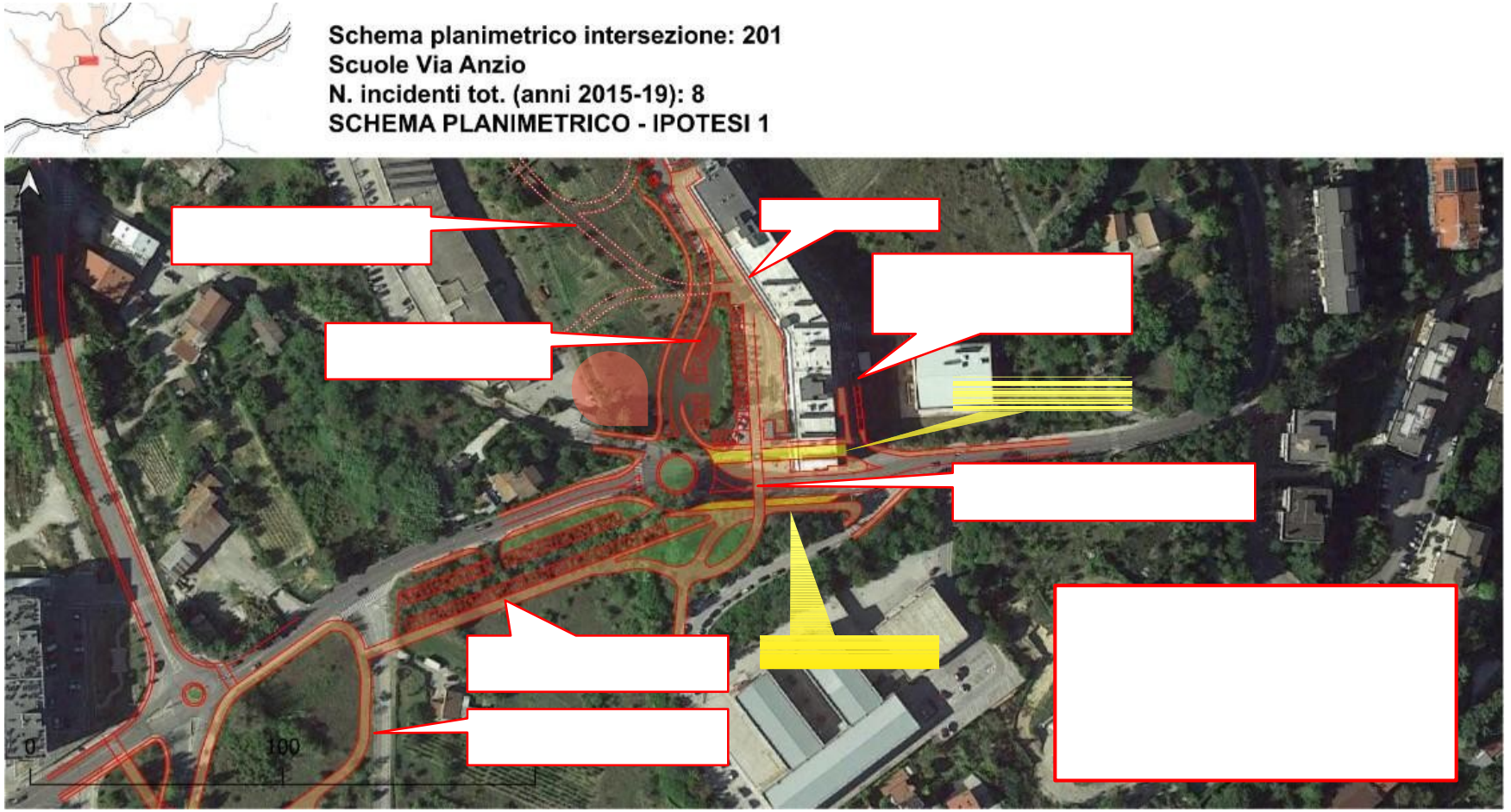
A

B

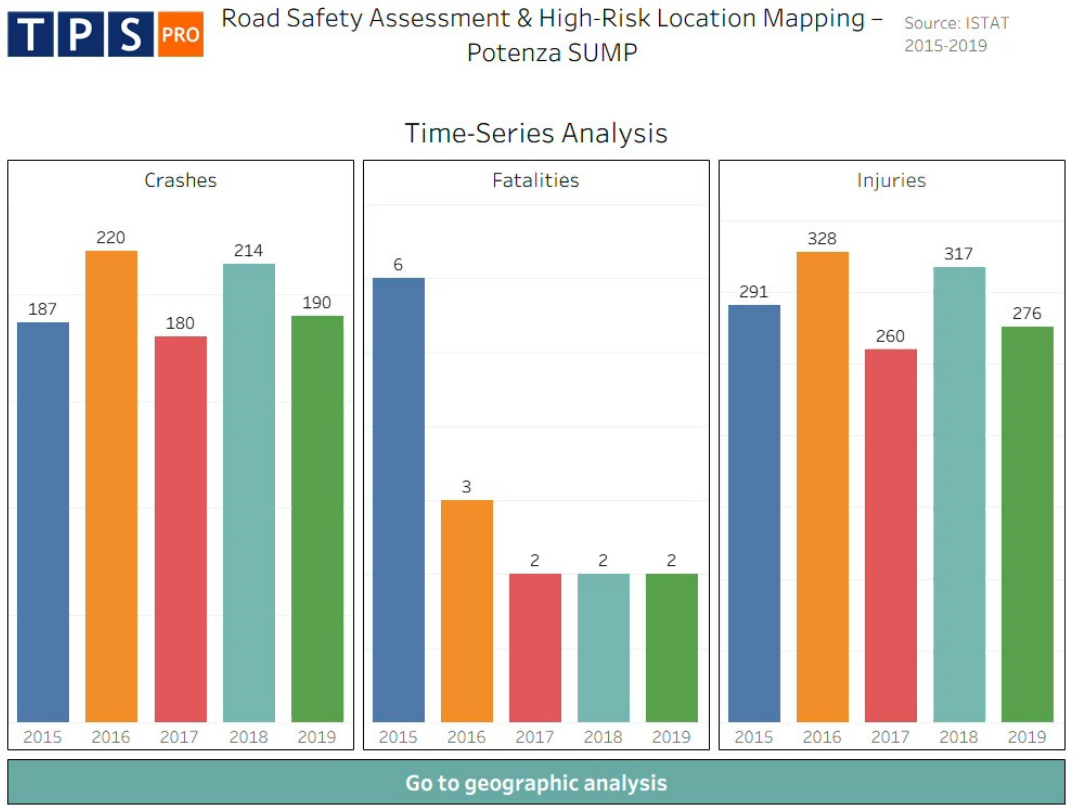
3

Phase 3 Flow separation & vertical link optimization

BLACK SPOTS & MEASURES



OUR METHODOLOGY FOR IDENTIFYING INTERVENTION AREAS



Interactive Dashboard & Integrated Communication

- **Pattern Recognition & Blackspot Analysis:**
  - Direct, interactive querying of the accident database to uncover spatial crash patterns and analyze risk factors at identified blackspots.
- **From Analysis to Action:**
  - Clear visualization bridging historical crash data directly with proposed safety interventions on a single spatial platform.
- **Two-Way Community Dialogue:**
  - **Outbound (Informing):** Transparent sharing of crash statistics, safety performance, and project priorities with citizens and lo stakeholders.
  - **Inbound (Listening):** Capturing local ground-level insights, unreported safety issues, and community needs that analytical c alone cannot reveal.
- **A Scalable Prototype (Future Expansions):**
  - Current version serves as a functional framework open to future data integration.
  - Scalable to include mobility datasets, additional spatial layers, and context-specific crash variables (e.g., severe weather/snowfall impact in alpine areas).

Conclusions

The strength of the Data-to-Design model lies in its systematic and scalable nature built on standardized analytic protocols and codified engineering solutions. It is an exportable methodology for diverse urban and suburban contexts. It provides an operational tool for administrations targeting Vision Zero, that reframes road safety as prevention rather than response. The Potenza example, methodical and plan aligned, illustrates how data can improve safety and anchor coherent urban renewal.