



Technical session 4: Intelligent systems for urban mobility

Innovative data collection systems

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Road mobility projects in urban regions and their Impact on the environment

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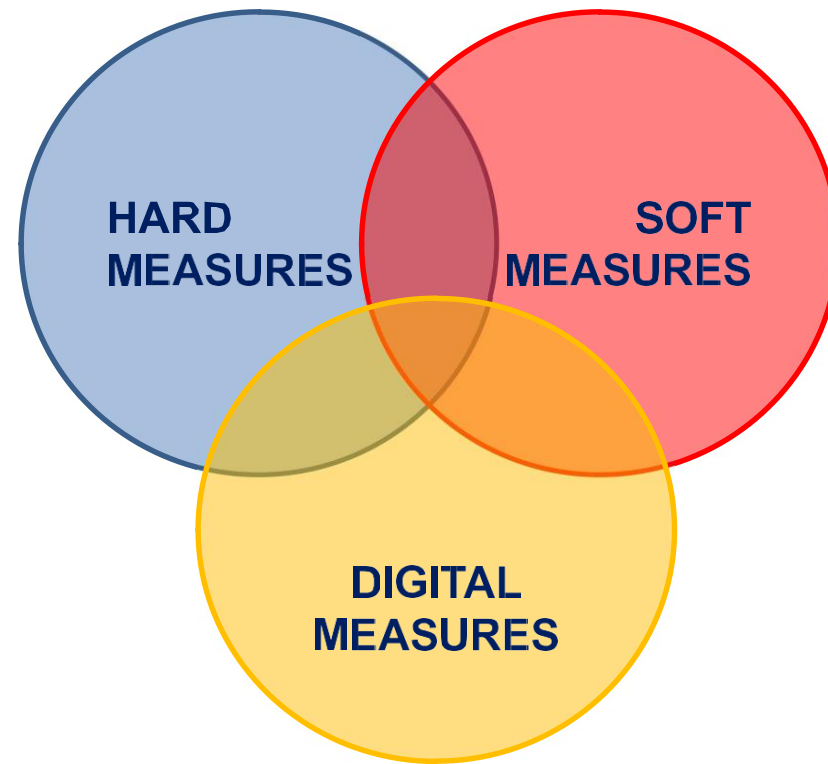
OUTLINES

- | | | | |
|----------|------------------------------------|----------|--|
| 1 | Cities challenges | 2 | Data collection, selection and management |
| 3 | Open Platforms and data set | 4 | Maas |

CITIES' CHALLENGES

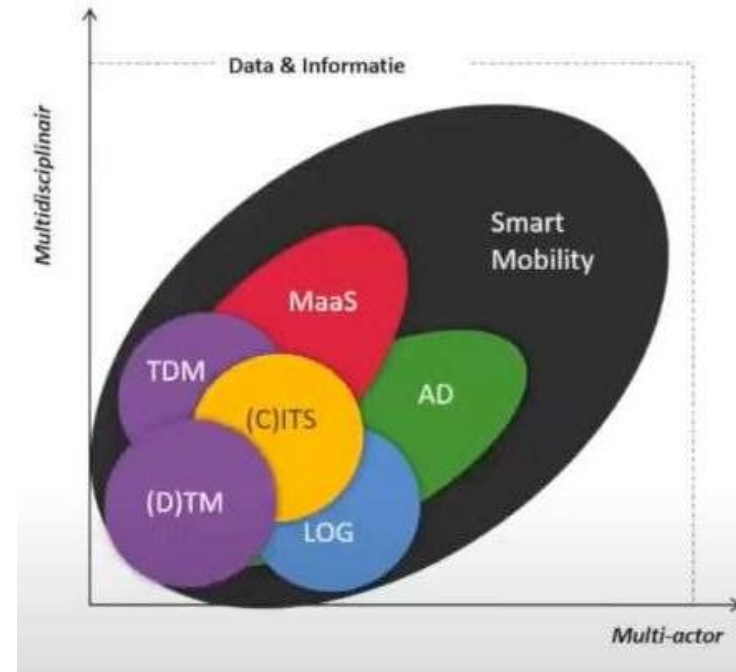
- Improve city liveability
- Reduce CO2 and improve air quality
- Reduce noise emissions
- Improve transport accessibility
- Improve safety
- Reduce congestion
- Boost economic growth
- Unlock spatial opportunities
- Enable smoother, seamless journeys
- Boost public transport
- Boost active travel
- Boost electromobility
- Better transport data

ACTIONS



SMART MOBILITY CHALLENGES

- (D)TM= (Dynamic) Traffic Management
- (C)ITS= (Connected) Intelligent Transport Services
- TDM= Travel Demand Management
- LOG= (Smart) Logistics
- MaaS= Mobility as a service
- AD= Autonomous Driving





DATA COLLECTION, SELECTION, MANAGEMENT

Mobility Demand

Mobility Offer

PRIVATE

- Car traffic
- Bicycle traffic
- Mobile big data
- Parking request
- LTZ permits
- LTZ access
- Plan for travel between
- home and work (PSCL)

- road network
- cycling network
- parking stalls
- bicycle racks
- pedestrian areas
- limited traffic areas
- circulating vehicle fleet
- electric stations
- taxi stations

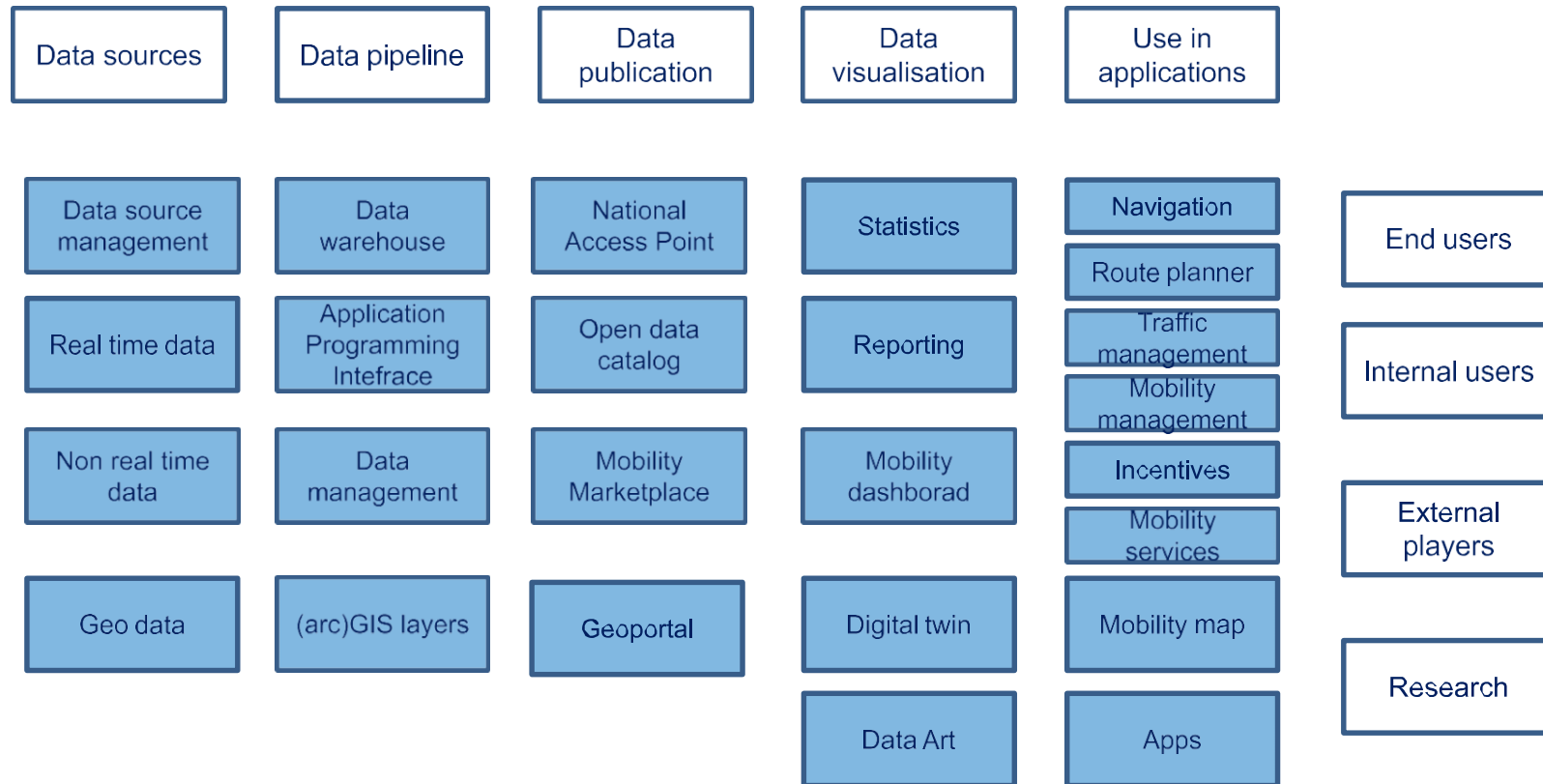
PUBLIC

- Bus on/off; load on lines
- Car sharing rides
- Bike sharing rides
- N tickets sold

- Railways
- Metrolines
- bus courses
- bus stops
- real time fleet control
- LPT fleet
- train stations
- fare integration
- n. carsharing cars
- E-ticketing
- n. bikesharing
- lines, frequency, route
- data on use of electric

WHAT IS NEEDED:

DATA ECOSYSTEM MANAGEMENT

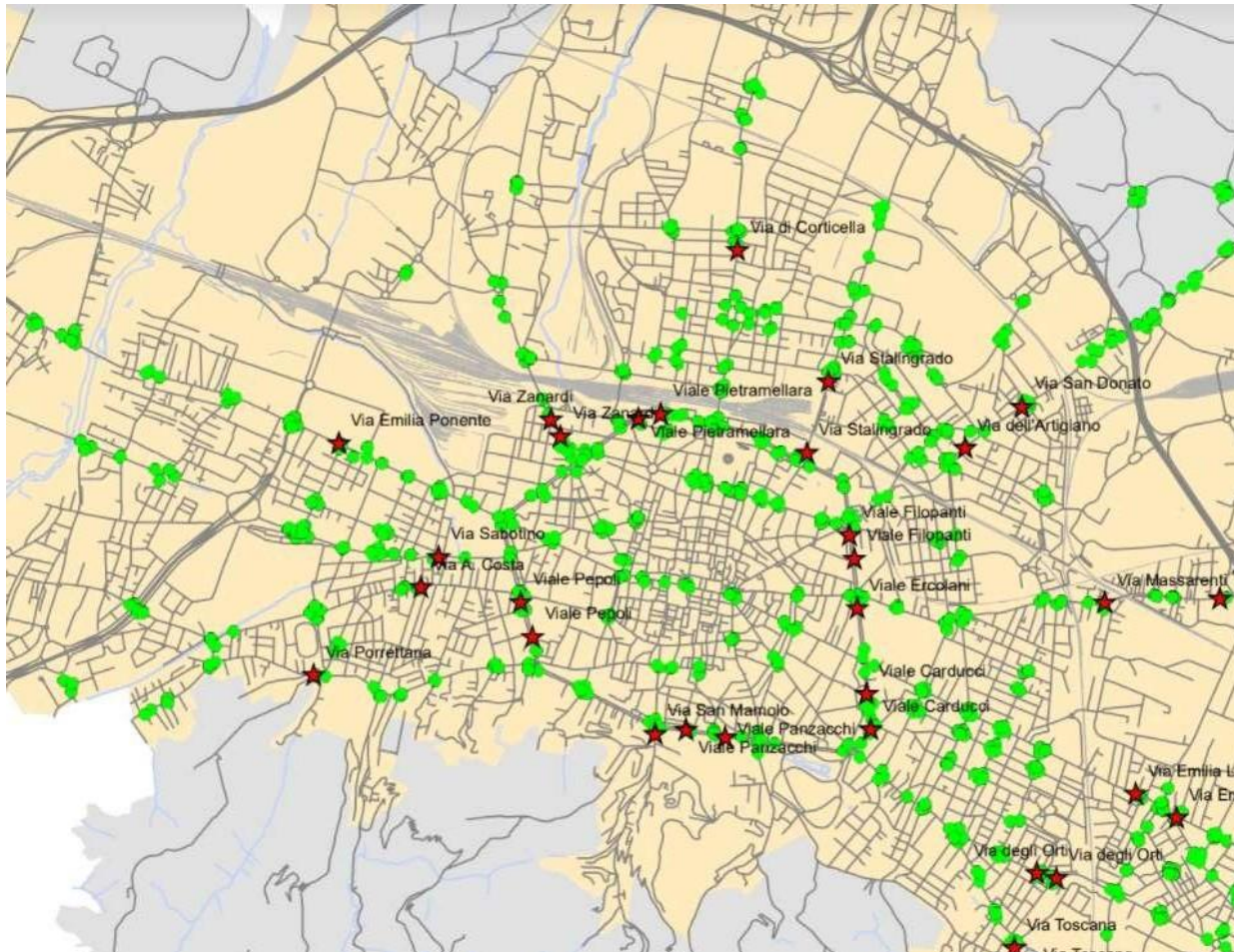


STATIC DATA COLLECTION

- ❖ National Census Survey: on commuter trips, detailed on means of transport and purpose
- ❖ Field mobility surveys: counting car flow with loops and drivers interviews
- ❖ Telephone surveys: sample surveys, specific but restricted
- ❖ Final result (data management): Trips matrixes (usually peak hour)

Bologna SUMP is based mainly on those methods

FIELD SURVEYS



Bologna has a dense network of loops and cordon lines which has been producing a vast amount of accurate data for the last 20 years

ORIGIN/DESTINATION MATRIX

Through the use of census forms, telephone surveys, traffic flows - loops, and field mobility surveys, it is possible to create a narrow but very accurate trips representation.

Provincia di Destinazione Provincia di Origine	BOLOGNA	FERRARA	FORLI - CESENA	MODENA	PARMA	PIACENZA	RAVENNA	REGGIO NELL'EMILIA	RIMINI	Totale INTERNO	Totale ESTERNO	Totale COMPLESSIVO
BOLOGNA	18509	2452	2318	3548	1148	605	3354	1296	1003	34244	12075	46318
FERRARA	3612	1142	74	25	0	27	460	13	29	5380	2395	7775
FORLI - CESENA	3090	44	1547	42	23	39	543	37	1430	6795	1247	8042
MODENA	3722	29	72	3358	1268	201	61	1490	55	10255	2176	12431
PARMA	1281	47	27	982	4729	2049	29	896	11	10049	2779	12829
PIACENZA	492	8	12	174	1445	460	0	117	6	2714	4188	6902
RAVENNA	3349	349	752	32	89	13	3765	7	628	8984	710	9694
REGGIO NELL'EMILIA	1801	0	27	1002	1431	147	18	1773	37	6236	1452	7688
RIMINI	1259	61	1349	21	12	2	474	5	888	4071	1451	5522
Totale INTERNO	37114	4131	6179	9185	10144	3542	8712	5633	4087	88728	28473	117201
Totale ESTERNO	12075	2395	1247	2176	2779	4188	710	1452	1451	28473		28473
Totale COMPLESSIVO	49189	6526	7426	11360	12923	7731	9423	7085	5538	117201	28473	145674

DINAMIC “BIG” DATA COLLECTION (TELECOMUNICATION COMPANIES)



SIM DATA



MOBILE TOWERS/ANTENNAS



MOBILE NETWORK



CLOUD

SUITABLE COMPANY FOR SUITABLE
DATA

BIG DATA SELECTION (STATISTICS AGENCIES)



MARKETING FUNNEL

- mobility behaviours
- customer profiles
- segment analysis

DATA PROCESSING

- origin / destination
- means of transport
- travel time
- roots
- average speed

ANALYSIS RELIABILITY

KNOWLEDGE VS TRUSTFULNESS

What kind of data is big data?

- ❖ Origin/Destination, Impact of events, Tourist flows, Presence

How do I determine the origin of a trip?

- ❖ How do I determine the means of transport used?
- ❖ How do I figure out if two or more people are traveling in the same vehicle or not?
- ❖ The origin/destination position depends on the power of the antennas. How reliable is it?

Not all data available are useful for travel analysis

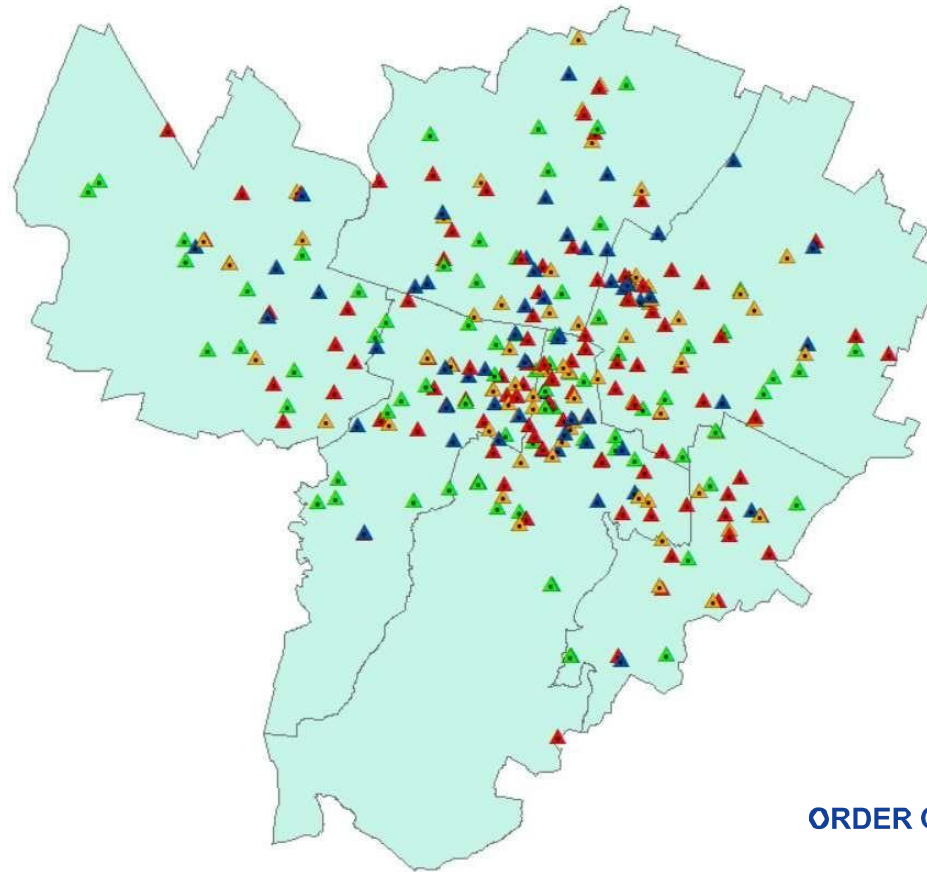
It is necessary to extract meaningful data

The topic is new and suppliers are gaining experience with public authorities requirements.

It is necessary to get used to asking questions and understanding how data is extracted.

WE ARE LEARNING TO MAKE QUESTIONS

MOBILE TOWERS IN BOLOGNA



ORDER OF APPROXIMATION?

HOW TO ANALYZE BIG DATA?

Do we need to learn how to analyze big data or is it enough to know what to ask providers?

Three options:

- 1) Analysis by data providers (external expertise)
- 2) Analysis by administration (internal expertise)
- 3) Analysis with a “big data as service” (mixed expertise)



Data providers often don't have experience specifically in the mobility field,
Administrations usually don't have a constant need for analysis and don't have as broad a view as an expert acting daily on multiple areas.

Consulting a “third part” in data analysis is probably the best solution for efficient interaction

However, Administrations must maintain analysis capacity for a proper use and dissemination

ANALYSIS, CORRELATION, COMPARISON

Old data are based on surveys and estimates

Big data are based on actual movements

It's useful to make comparison to find similarities

It's helpful to find relationships to set the same "State of the Art".

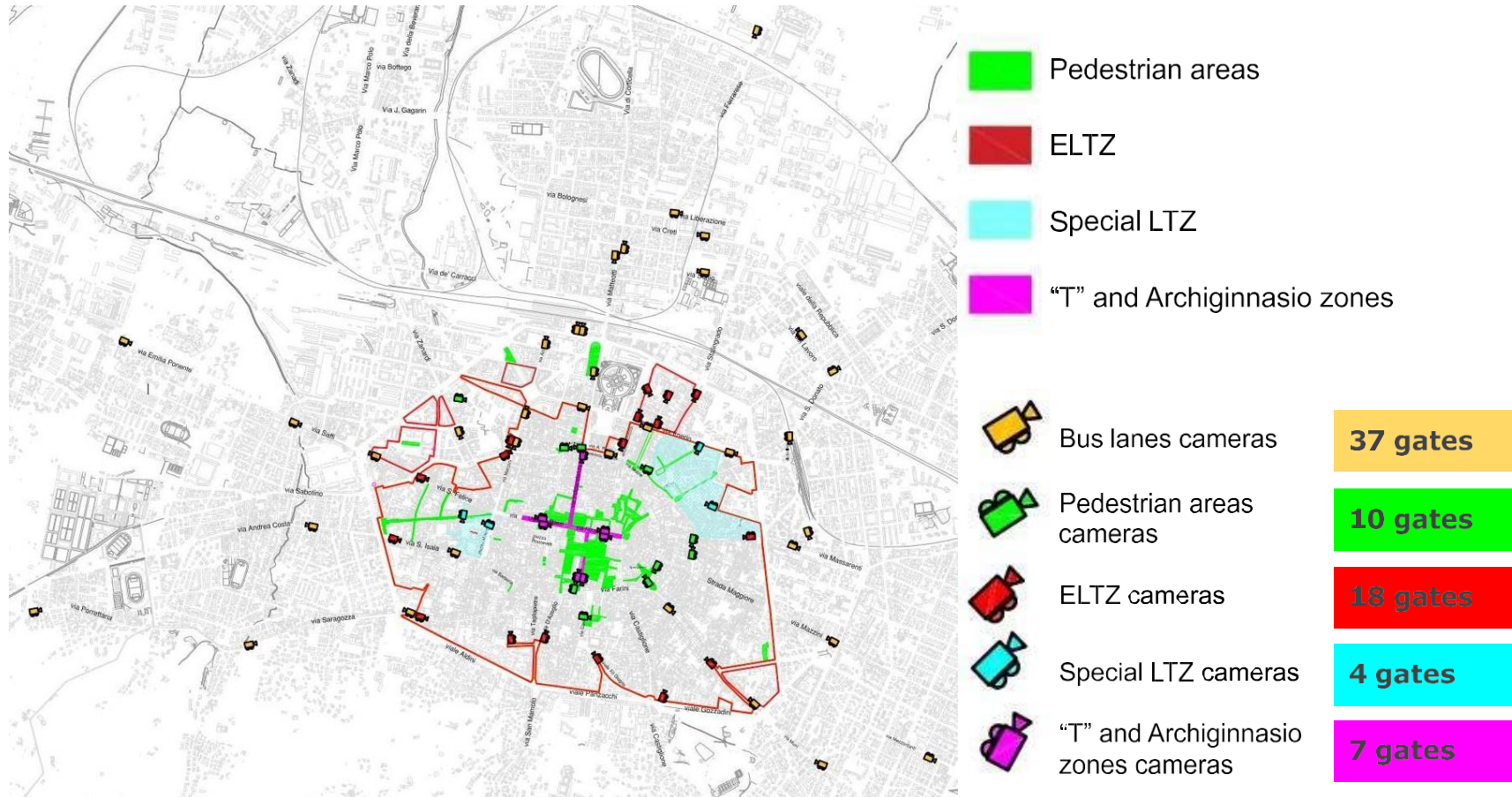
It's useless to persist in comparison; not the best approach in the long run.

Data can be complementary: it shows different aspects of the poliedric mobility system.



Platforms and data sets

Real time monitoring and control of road restrictions



LIMITED TRAFFIC ZONE



ELTZ – ENVIRONMENTAL LIMITED TRAFFIC ZONE

controlled by 30 CAMERAS

*Launched in **feb. 2005***

*Ltz area: **3.2 km²***

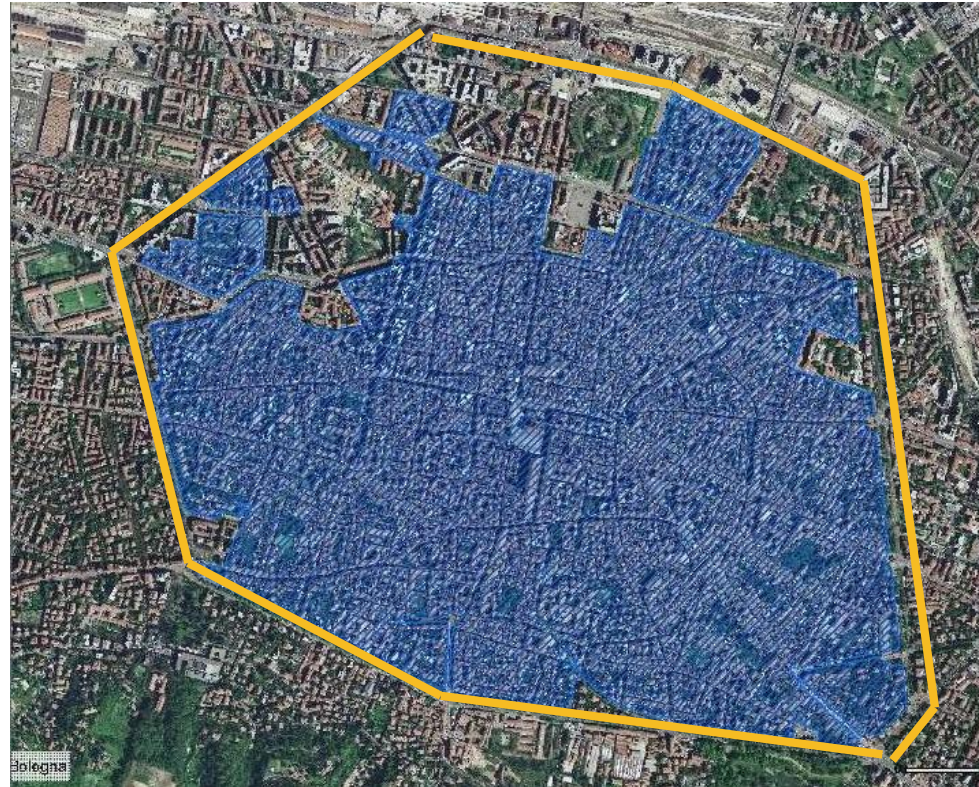
*Restriction hours: **7am ÷ 8pm***

*N. Authorized access: **~60.000***

***It automatically generates fines** for transgressors by the system*

Old Town —

ZTL Area —



TYPE AND NUMBERS OF PASS COMPLEXITY

PROG.	TITOLI ACCESSO ZTL: REQUISITI CONTRASSEGNI	
1	RESIDENTI CENTRO STORICO	RESIDENTS 1
2	CONTRASSEGNI POSTO AUTO A.	RESIDENTS 2
3	CONTRASSEGNI POSTO AUTO B.	RESIDENTS 3
4	AGENTI DI COMMERCIO	BUSINESS1
5	AGENTI IMMOBILIARI	BUSINESS2
6	AGENTI FUORI PROVINCIA	BUSINESS3
7	AGENZIE INVESTIGATIVE	BUSINESS4
8	DS C/TERZI PROVINCIA BOLOGNA	BUSINESS5
9	DS C/TERZI FUORI PROVINCIA BO	BUSINESS6
10	DS C/PROPRIO PROVINCIA BOLOGNA	BUSINESS7
11	DS C/PROPRIO FUORI PROVINC. BO	BUSINESS8
12	DSI PROVINCIA BOLOGNA	BUSINESS9
13	DSI FUORI PROVINCIA BOLOGNA	BUSINESS10
14	DS C/TERZI SEDE ZTL	BUSINESS11
15	DS C/PROPRIO SEDE ZTL	BUSINESS12
16	DSI SEDE ZTL	BUSINESS13
17	BANCHE-ARTIGIANI-OFFICINE ZTL	FIRMS & SHOPS
18	AMBULANTI POSTO FISSO ZTL	FIRMS & SHOPS
19	AUTOSCUOLE SEDE ZTL	FIRMS & SHOPS
20	NEGOZI MERCATO DELLE ERBE	FIRMS & SHOPS
21	AMBULANTI SPUNTISTI ZTL	FIRMS & SHOPS
22	NEGOZI SEDE ZTL	FIRMS & SHOPS
23	INVALIDI RESIDENTI A BOLOGNA	H
24	INTERESSE PUBBLICO (IP)	PUBLIC SERVICE
25	MEDICI	DOCTORS
26	TEMPORANEI ASS. VOLONTARIATO	OTHERS1
27	ACCOMPAGNAMENTO SCOLASTICO	OTHERS2
28	TEMPORANEI PER ESIGENZE DIVERSE (ASSIST.SOCIO SANITARI; ASSIST.ANZIANI E INABILI; TERAPIE E/O VISITE MEDICHE IN ZTL)	OTHERS3
29	AUTO IBRIDE ED ELETTRICHE	OTHERS4

YEAR	PASS NUM.	% DECREMENT
31/12/11	74.502,00	0,00%
31/12/12	71.746,00	-3,70%
31/12/13	71.823,00	-3,60%
31/12/14	73.351,00	-1,54%
31/12/15	72.563,00	-2,60%
31/12/16	75.730,00	1,65%
31/12/17	78.697,00	5,63%
31/12/18	66.333,00	-10,96%
31/12/19	62.522,00	-16,08%
31/12/20	60.332,00	-19,02%
28/07/21	59.842,00	-19,68%

THE SYSTEM PROCESSES

40.000 PASSAGES PER DAY

1.000 FINES PER DAY

CENTRAL MANAGEMENT TRAFFIC LIGHT SYSTEM



SETTLED IN 2000

traffic lights:

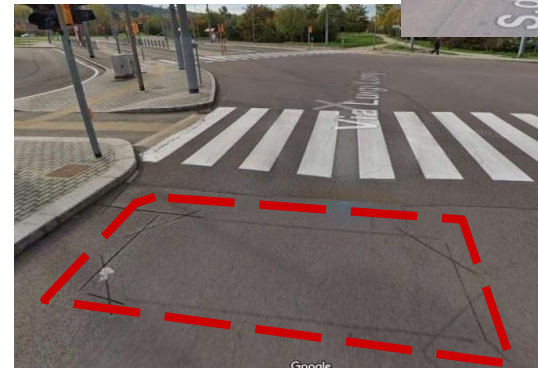
384 intersections regulated with traffic lights

285 regulators

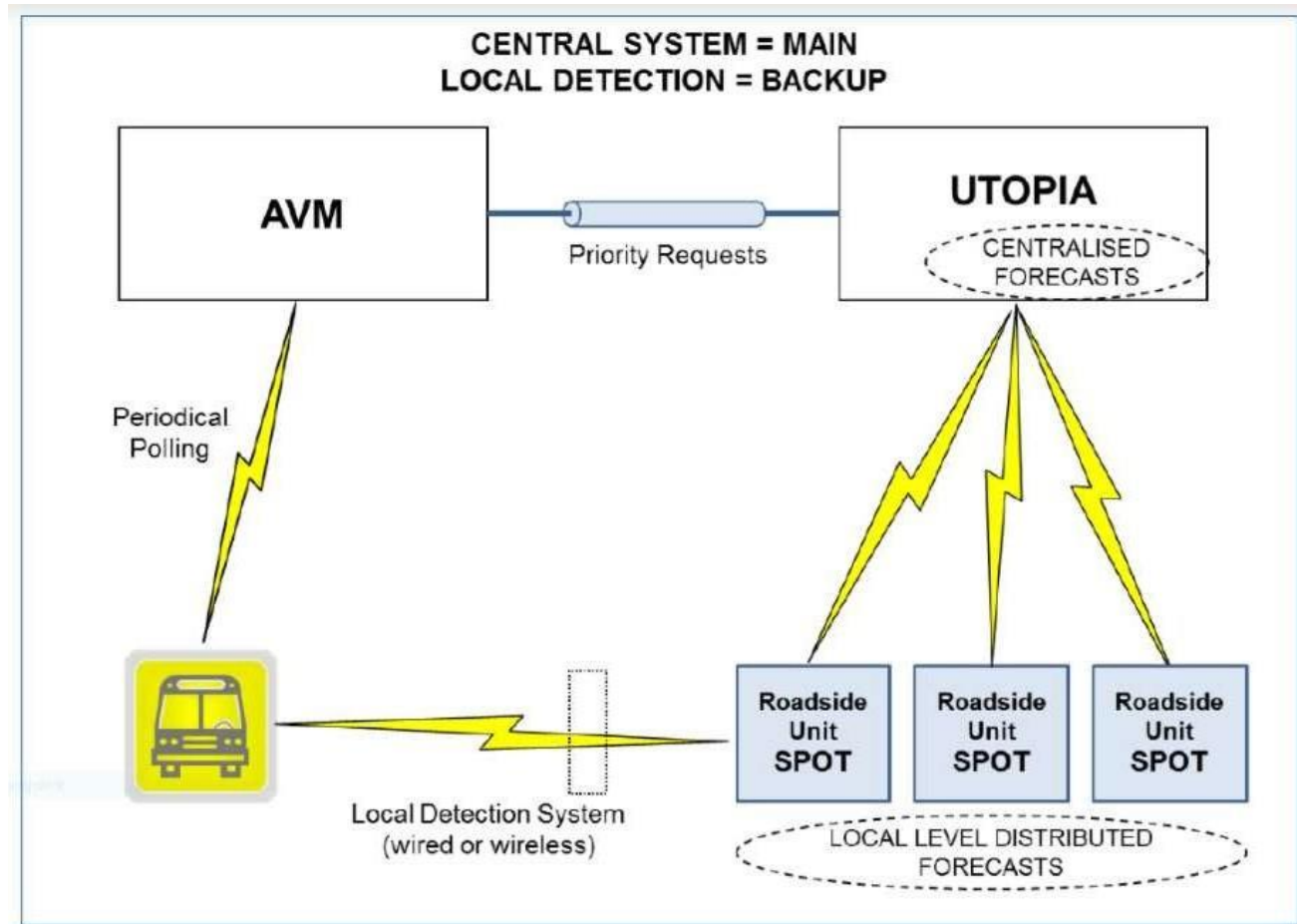
- **197 centrally controlled**
- **88 local**

real time data collection:

- **34 cameras**
- **1165 vehicle detection loops**



FLEET MANAGEMENT – BUS PRIORITY



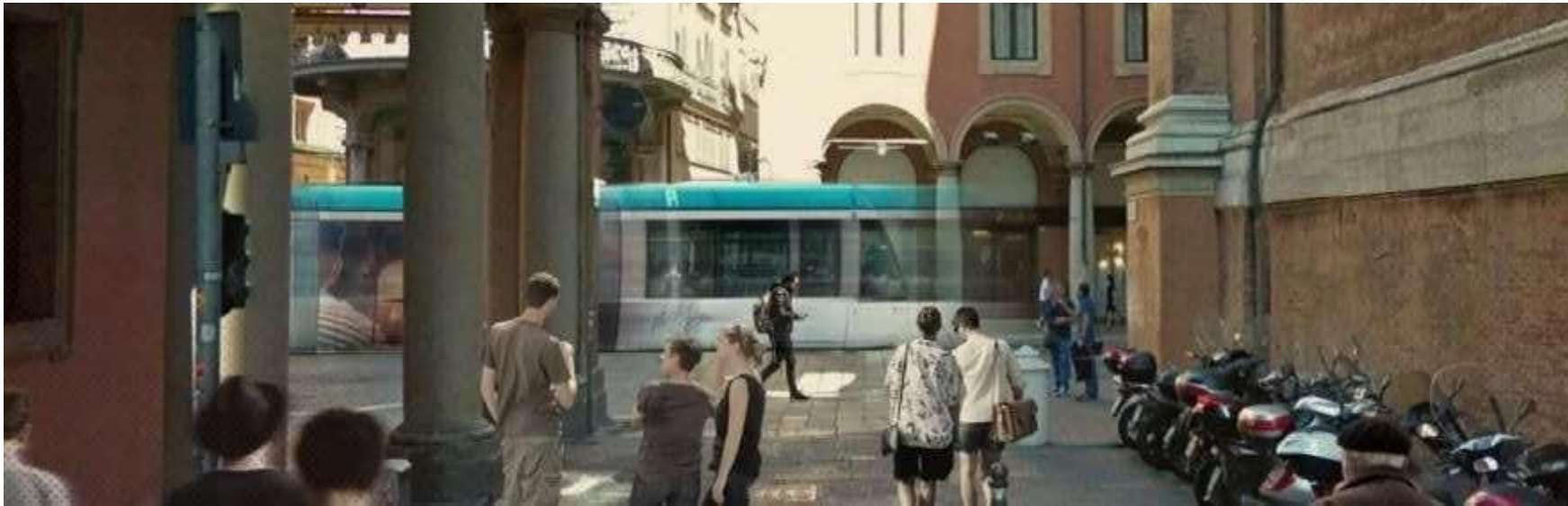
Dynamic Traffic Light System

Real-time traffic information is given by police via social media.



Dynamic Traffic Light System

Bologna's plan is to implement the current dynamic traffic light system with a system compatible with the city's new tramway.

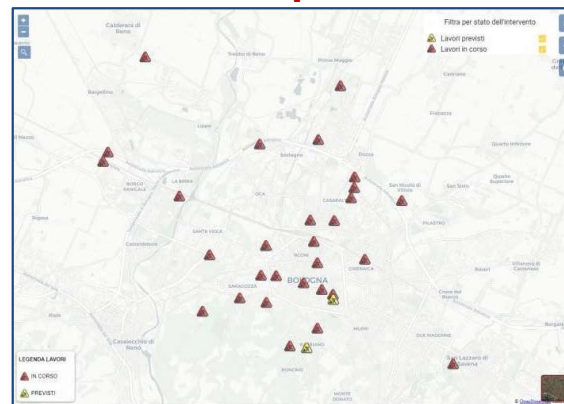


VARIABLE MESSAGE PANELS



INFO MOBILITY:

- **30 VMP for real time information** →
- **Road construction sites maps:** weekly upgraded to offer information to citizens on websites and socialmedia ↘



OPEN DATA SET

Open Data project, developed over the last decade, has allowed the enhancement and sharing in an open and interoperable form of public information assets and has contributed significantly to the development of an open data catalogue, which today allows to record, classify, organize and reuse both static and updated data in real-time.

FAIR (Findable, Accessible, Interoperable, Reusable) principle: half of the datasets are geographical type, 104 are the datasets of the topic of mobility and transport. The main sources of data on the transport topic are owned by the Municipality or by the SRM agency for the regulation of mobility services.

Development process of new data driven digital services, including MaaS, respects DAMA (Data Management) standard which divides the issue of data governance in seven areas for each of which defines roles, processes and tools.

GTFS, Datex-II and Netex as required by the European directive, are the standard formats for initiatives which include the processing and publication of data in the most precise forms.

Bologna therefore offers an advanced open data system but intends to continue in this direction in the awareness that in this field the public administration plays the role of technological facilitator and support for mass operators to favor their integration and development.

Fleet Management - Open platforms

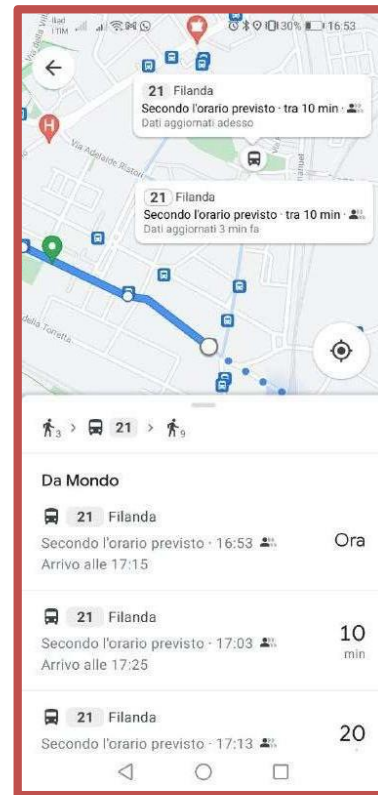
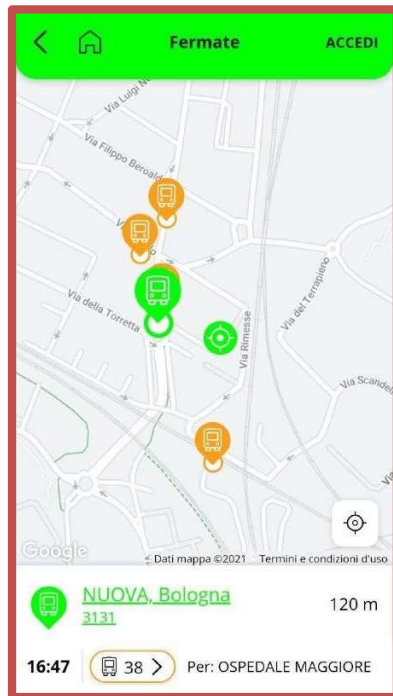


The Municipality of Bologna is involved in managing the process of developing new data driven digital services

**300 public dataset
104 mobility dataset
5 million records**



Fleet Management - real time data



Real-time
bus
routes



Mobility as a Service

Current trends and challenge - Mobility as a Service (MaaS)



Roger offers a travel planner service and a payment system



With Roger it is possible to manage the mobility bonus, an electronic purse for mobility, recognized as an incentive to those who choose to move with the bus, cab / ncc, car sharing (Corrente or Enjoy) or bike sharing (Mobike) instead of the private car, following the establishment of the Low Emission Zone (ZTLA).

Current trends and challenge - Mobility as a Service (MaaS)



Thank you for your attention!



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