



Comune di  
Milano



*Agenzia per la  
Coesione Territoriale*



**UNIONE EUROPEA**  
Fondi Strutturali e di Investimento Europei

# The City's Digital Twin

**Bruno Monti**

*Responsabile SIT*

*Organismo Intermedio – Città di Milano*

Milano



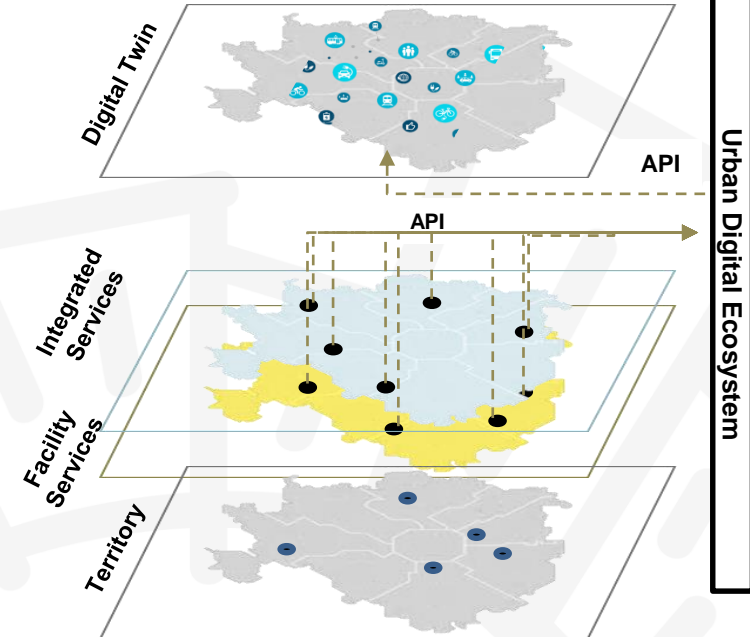
# Urban digital ecosystem concept

## Objectives

Digital twin as a lever to support municipalities and other urban stakeholders to manage and monitor the performance of urban services. Therefore, expect as a result of this integrated management among urban managers, we will face a more comprehensive and accessible smart city for all citizens.

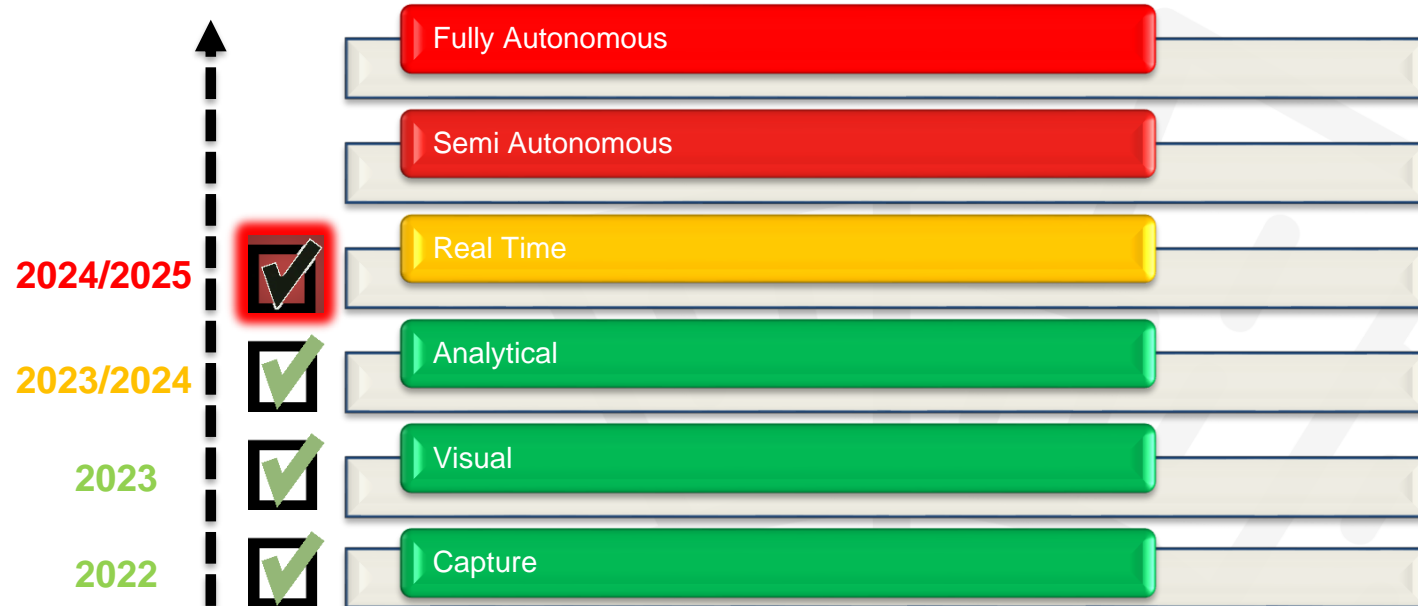
## Digital Twin & Milan :

- It is the digital representation of the city, powered by real-time data and information from all digital services in the area
- It enables monitoring and management of the city and its services, both regionally and for each particular service, as well as information sharing about various services and areas.
- It can be used to support "data driven" decisions



# Process of expansion of the Digital Twin

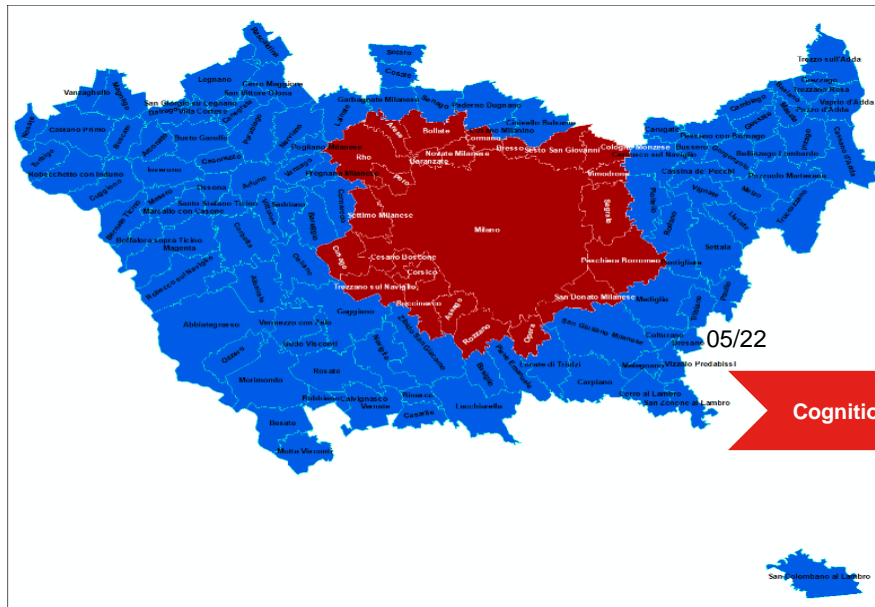
MI = Maturity Index



# The Project: Aerial e territory survey

## High-quality review of the territory:

- Surface returned from the aerophotogrammetric flight and LiDAR (20 points/smq.) over **1.500 sq Km**
- Linear development of the land relief **2.600 km.**
- Terrestrial point cloud over **2.000 points/smq.**
- Census of approximately **1.100.000** urban objects
- Over **250 Tb di dati.**



# Data Integration

## Strategic advantages

- Data-driven decisions
- Multi sectoral approach
- Complete understanding of the subject
- included both internal and external stakeholders in the process
- ROI (return on investment)

### Operations and Technological systems

- Presence & number of users
- consumption, effectiveness, and detection of errors and irregularities

### Structural integrity

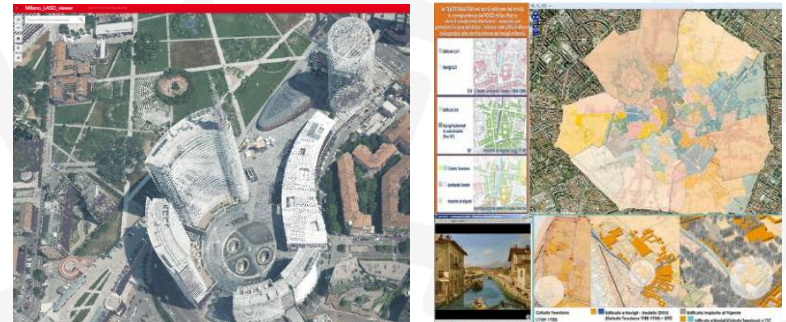
- Stress, deformation, vibration, inclination
- Humidity, temperature, wind direction and intensity and solar radiation

### Indoor Conditions

- Temperatura, umidità e pressione dell'aria, luminosità e livelli acustici, qualità del microclima

## Operational advantages

- Access to data in real-time
- Optimization of technical and administrative activities
- Efficient Process
- Shared Information
- Scale economies at all levels



# Advantage of project

- **Very high and demonstrable knowledge of the region, and with a certain date**
- **High-resolution 3D model of a metropolitan city**
- **Asset identification and lifecycle management**
- **Development of specific cases for predictive and analysis models**
- **Territory monitoring with the opportunity to review operational models**



# Critical issue of project

- Adequate technological equipment for vast data
- Assessment of preventive applications for project product integration
- Determination of priorities on use cases
- Professional profiles and competent organization
- Estimate a detailed project update plan



# Multi Survey

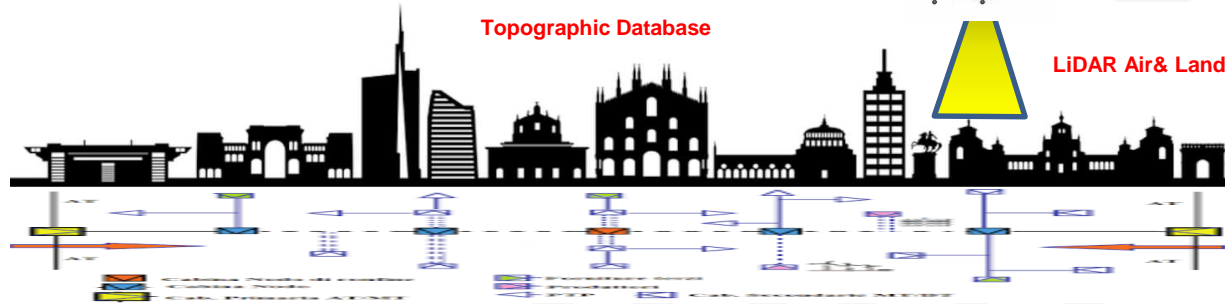
MMV



GIS Indoor & BIM



Topographic Database



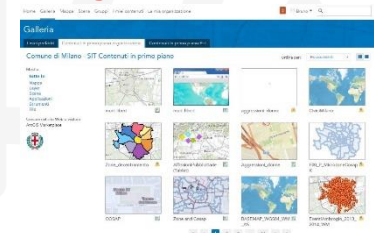
True Orthophoto



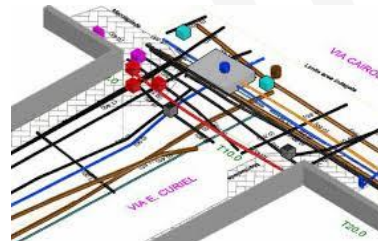
LiDAR Air & Land

+  
0,00

Underground Database



AS- Built

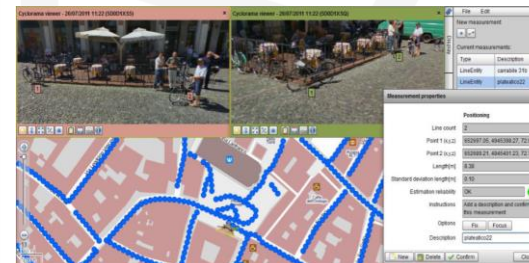
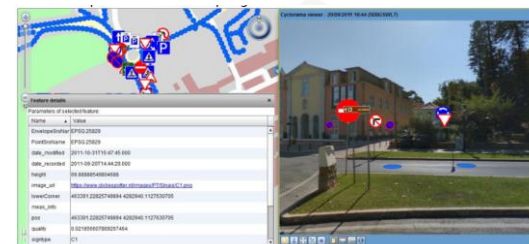




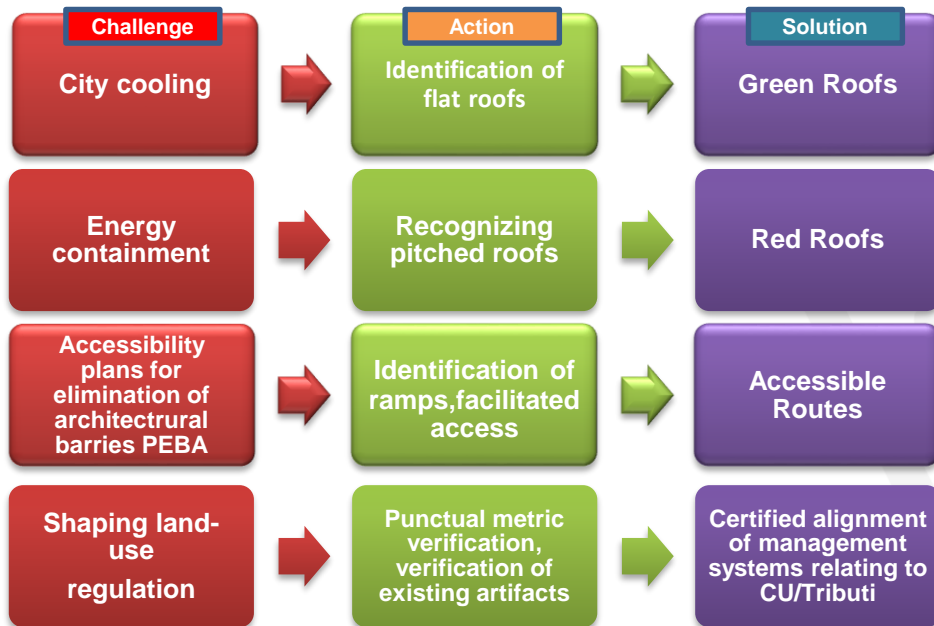
# Object Survey

## The Urban objects census:

Numero Progressivo	Oggetti Urbani	Acronimo
1	Impianti semaforici (manufatto + lanterne)	SE
2	Pali luce	PL
3	Pali reggifilo	PR
4	Passi carrai	PC
5	Barriere (dissuasori, transenne, fittoni, ecc.)	BA
6	Dehors	DH
7	Chioschi, Edicole, Box di servizio ATM	CE
8	Materico area di circolazione stradale	MS
9	Dimensioni varchi ponti e tunnel	PT
10	Targhe Viarie	TV
11	Targhe Commemorative	TC
12	Numero e dimensione (larghezza) vetrine attività commerciale	VN
13	Impianti di Pubblica Affissione	PA
14	Impianti Pubblicitari	IP
15	Paline e Pensiline TPL	PP
16	Rampe disabili incroci	RD
17	Orologi pubblici	OC
18	Binari delle linee tramviarie	BT
19	Verifica posizionale della numerazione civica e accessi non numerati (esclusi passi carrai e attività commerciali)	CI
20	Pannelli a messaggio variabile	PV
21	Segnaletica stradale verticale	SV
22	Segnaletica stradale orizzontale	SO



# Use cases in planning phase



# Future to go....

- **Upgrading strategies of assets**
  - Campaign for land and air surveys
  - Procedure for integrating urban variations (Building, mobility, greenery, etc.) → BIM
  - Integration with IoT
- Enhance the asset in **monitoring processes**
- **Use case** developments and integration with earth observation images (ESA/IRIDE)
- Evaluation of extension to **underground survey**
- Mesh achievement.

# Draft Mesh



# Thank You!

[bruno.monti@comune.milano.it](mailto:bruno.monti@comune.milano.it)

Milano

