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**NO - DIG**  
FLORENCE 2019

Fortezza da Basso • FLORENCE (Italy)

30<sup>th</sup> September • 2<sup>nd</sup> October 2019

***THE CADASTRE OF UNDERGROUND INFRASTRUCTURE NETWORKS:  
THE REGIONE LOMBARDIA MODEL***

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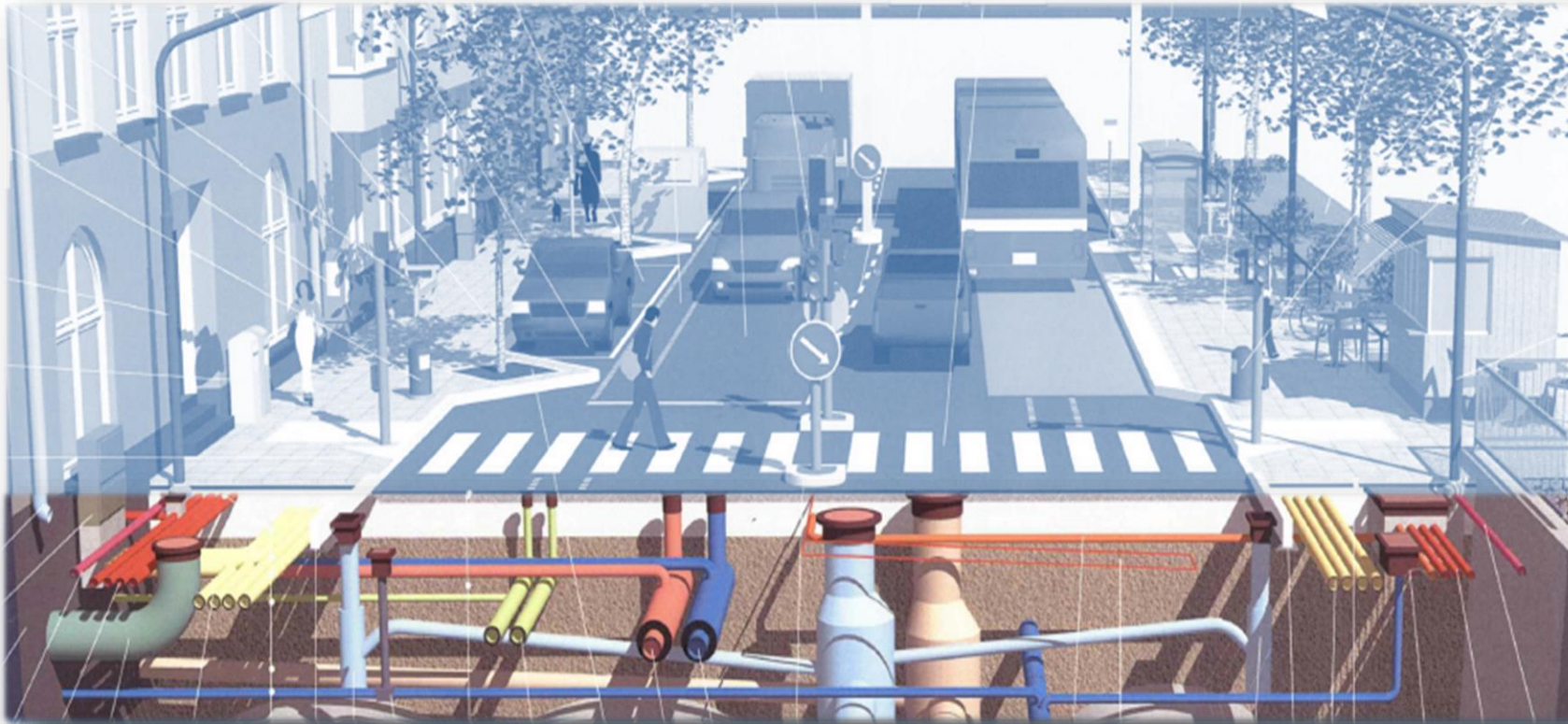
Regione  
Lombardia

D.G. INFRASTRUTTURE, TRASPORTI E MOBILITÀ SOSTENIBILE  
U.O. FERROVIE E INFRASTRUTTURE PUBBLICHE  
RETI PUBBLICHE E MOBILITÀ SOSTENIBILE

# WHAT ARE UNDERGROUND INFRASTRUCTURE NETWORKS?



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*PUBLIC ILLUMINATION*

*ELECTRICITY*

*BROADBAND*

*WATER SUPPLY*

*SEWAGE DISPOSAL PLANT*

*GAS*

# ISSUES ABOUT THE SUBSOIL



IRRATIONAL USE



EXCAVATION INCIDENTS



UNAUTHORIZED TAMPERINGS



INTERFERENCE MANAGEMENT



NO SAFETY      INCREASED POLLUTION



CHAOTIC OCCUPATION

**1999** - Directive by the President of the Council of Ministers  
*“Rational Arrangement of the Technological Systems in the Subsoil”*



**2003** - Law n. 26 *“Management of Local Services of Public Interest. Rules on Waste Management, Energy, Use of Underground and Water Resource”*



**2007** - *INSPIRE DIRECTIVE - IN*frastructure for *SP*atial *InfoR*mation in Europe (Annex III)



# THE VALUE OF THE PROJECT «LABORATORIO SOTTOSUOLO»



**2005** - A project conceived and coordinated by Regione Lombardia to deal with issues regarding a more rational, optimal use of the subsoil

## COMMITMENT STATEMENTS FROM:

6 Regions, 2 Lombard Provinces, 7 Municipalities, 1 Union of Municipalities, 30 Public Utility Providers, 2 Universities and 1 Research Institute  
pledging their commitment to the project by signing a “Declaration of Commitment”



ESTABLISHMENT OF A  
COMMUNITY

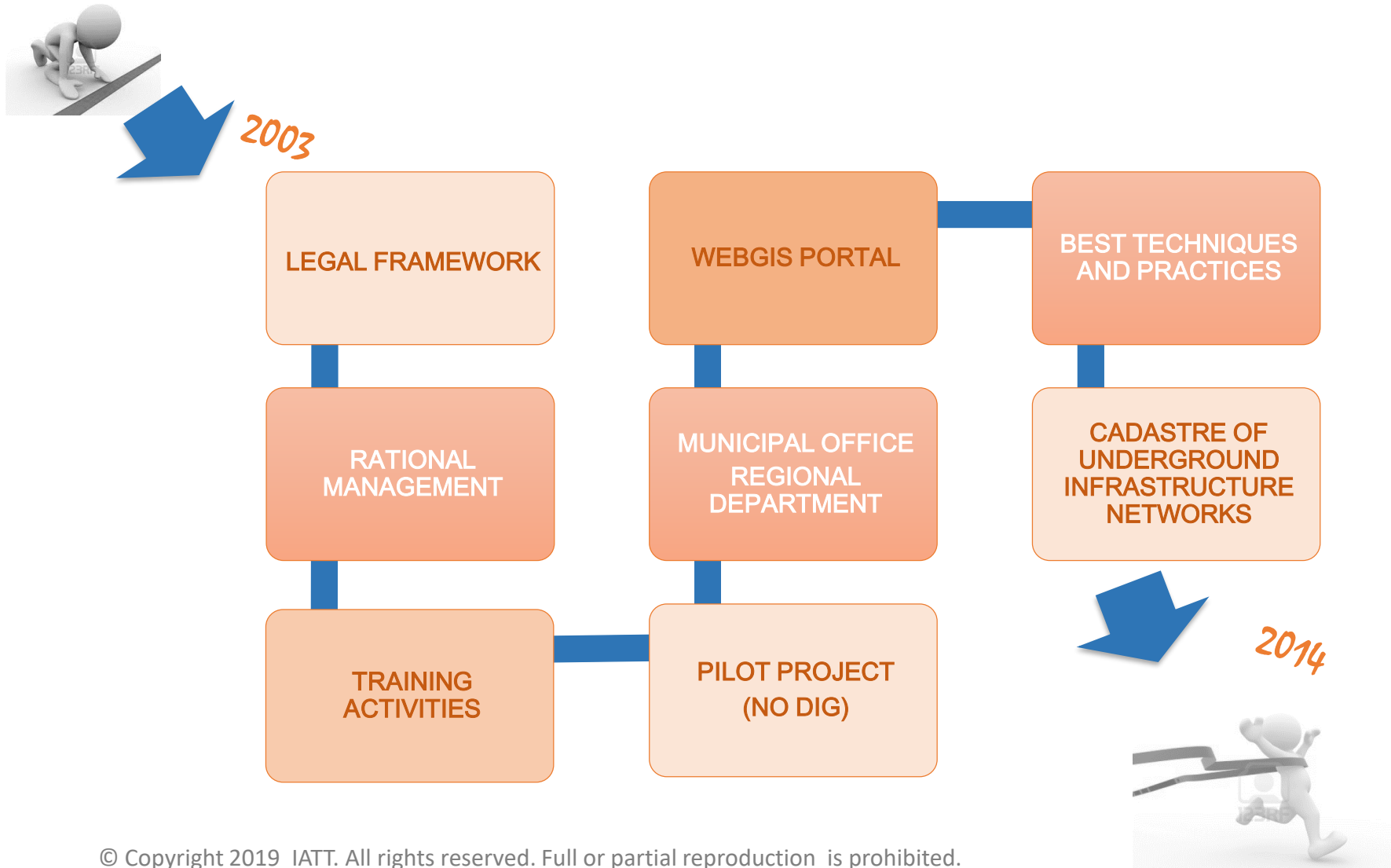
considers the various  
aspects related to the  
management of  
subsoil

adopts an integrated  
approach

1.EFFECTS SYNERGY WHILE TAKING  
ACCOUNT OF THE NEEDS OF EACH  
INDIVIDUAL PLAYER

2.PURSUES A COMMON, SHARED  
OBJECTIVE

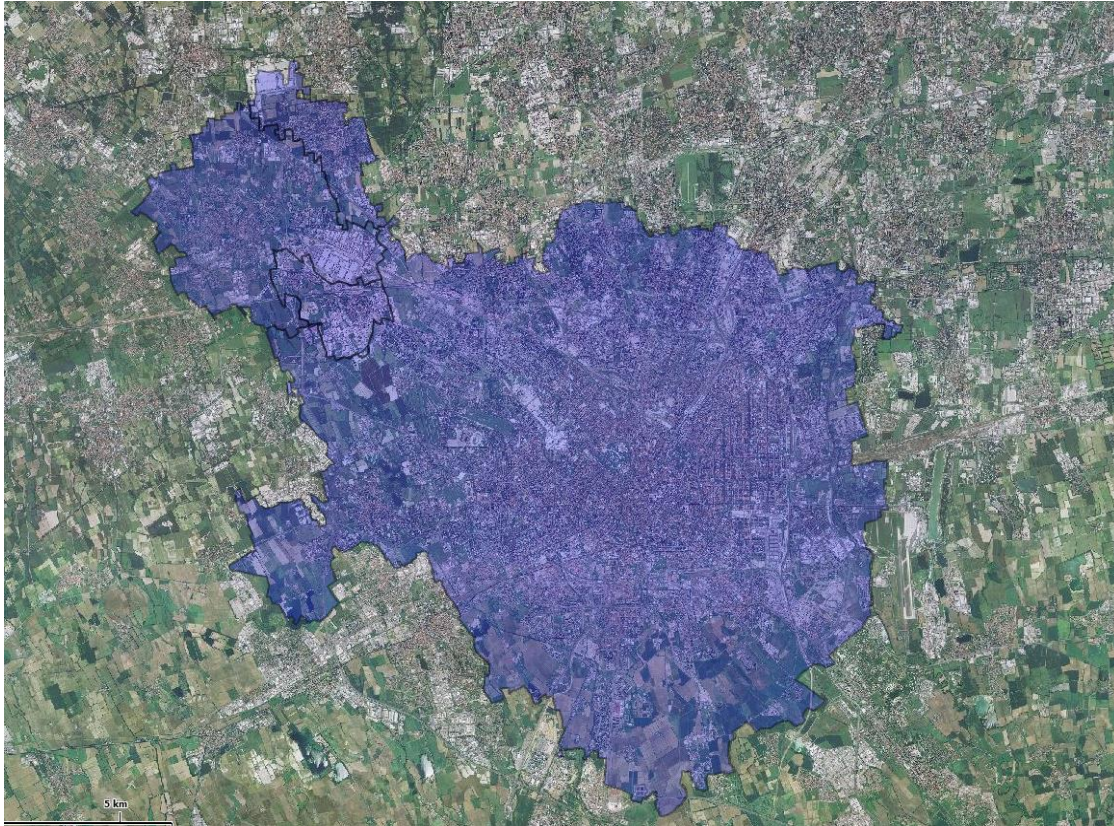
# LABORATORIO SOTTOSUOLO, A LONG WAY TO..



# A PILOT PROJECT FOR THE EXPO AREA: PARTICIPATORY PLANNING OF UNDEGROUND UTILITIES



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**Networks:** water, electricity, centralized heating, sewage, storm water, gas, TLC, public lighting

**Utility companies:** ENEL, Colt, Ionomi, Metroweb, Telecom, Fastweb, Wind, Terna, A2A, Snam, MM

**Total project area:** 48.166.242 mq

**Area occupied by utilities:** 2.423.212 mq

**Population in the area:** 168.966 inhabitants

**Index for utility crowding on the area** = 5%

# PROJECT AREA, PERCENTAGE AND TYPE OF NETWORKS



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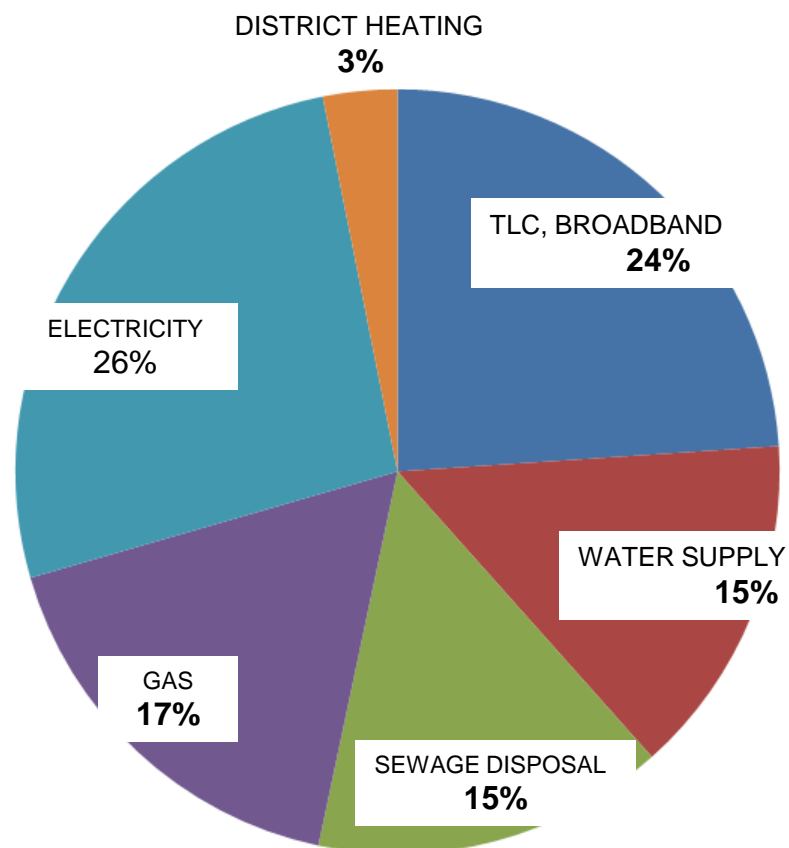
Comune Arese



Comune Pero



Comune Rho



## KEY ELEMENTS:

- MAPPING NETWORKS ACCORDING TO EXISTING SHARED STANDARDS;
- TESTING GEO-RADAR AVAILABLE TECHNOLOGIES AND PROTOTYPES

## PURPOSE:

TO ALLOW THE GOVERNMENT TO DEFINE THE BEST TARGETS, PRIORITIES AND POLICIES FOR OPTIMAL PLANNING OF UNDERGROUND INFRASTRUCTURE

# THE TASKS OF THE PROJECT

## EVALUATION OF FEASIBILITY

## EVALUATION OF COSTS

## MODEL TESTING

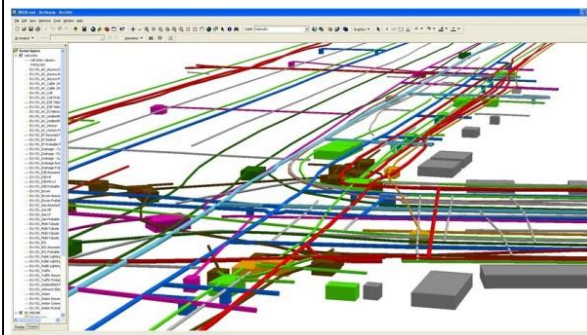
### DATA ACQUISITION:

- ACQUIRING THE UTILITY DATABASE
- INSTRUMENTAL SURVEYS
- PROCESSING ALL DIFFERENT DATASET
- MASHING THE GEO-DATABASE
- DATA REPRESENTATION
- WEBGIS PORTAL



### TESTING DIFFERENT SURVEY METHODS:

- DIFFERENT MAPPING METHODS:
  - DIGITAL SLIT TRENCHES
  - GPR STANDARD
  - GPR 3D COMPLEX
- DATA PROCESSING
- DATA MASHING
- 2D-3D WEBGIS



### DATA REPRESENTATION:

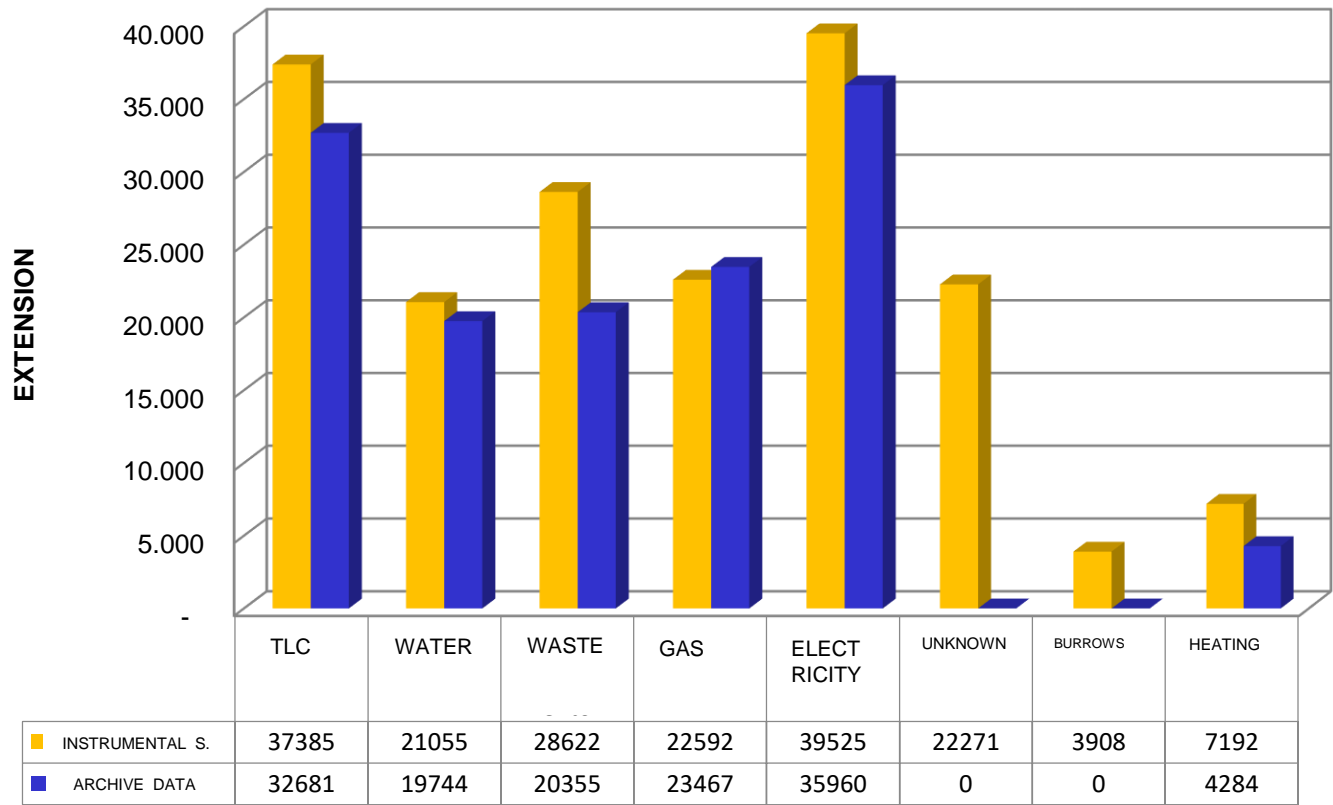
- REGIONAL LEVEL: MANAGEMENT OF A PUBLIC PORTAL CONTAINING ALL THE REGIONAL COMMON DATASET
- LOCAL AUTHORITIES: DATA INTERCHANGE INFRASTRUCTURE FOR SHARING INFORMATION BETWEEN UTILITY COMPANIES AND AUTHORITIES
- ADOPTION OF COMMON DATABASE TABLES



# DATA COMPARISON: QUANTITATIVE ACCURACY OF THE NETWORK INFRASTRUCTURE IN THE PILOT AREA



THE ANALYSIS OF THE EXTENSION DATA FROM GPR SURVEYS SHOWS A **PERCENTAGE DEVIATION** OF APPROXIMATELY **34%** COMPARED TO THE VALUES PRESENT IN HISTORICAL ARCHIVES

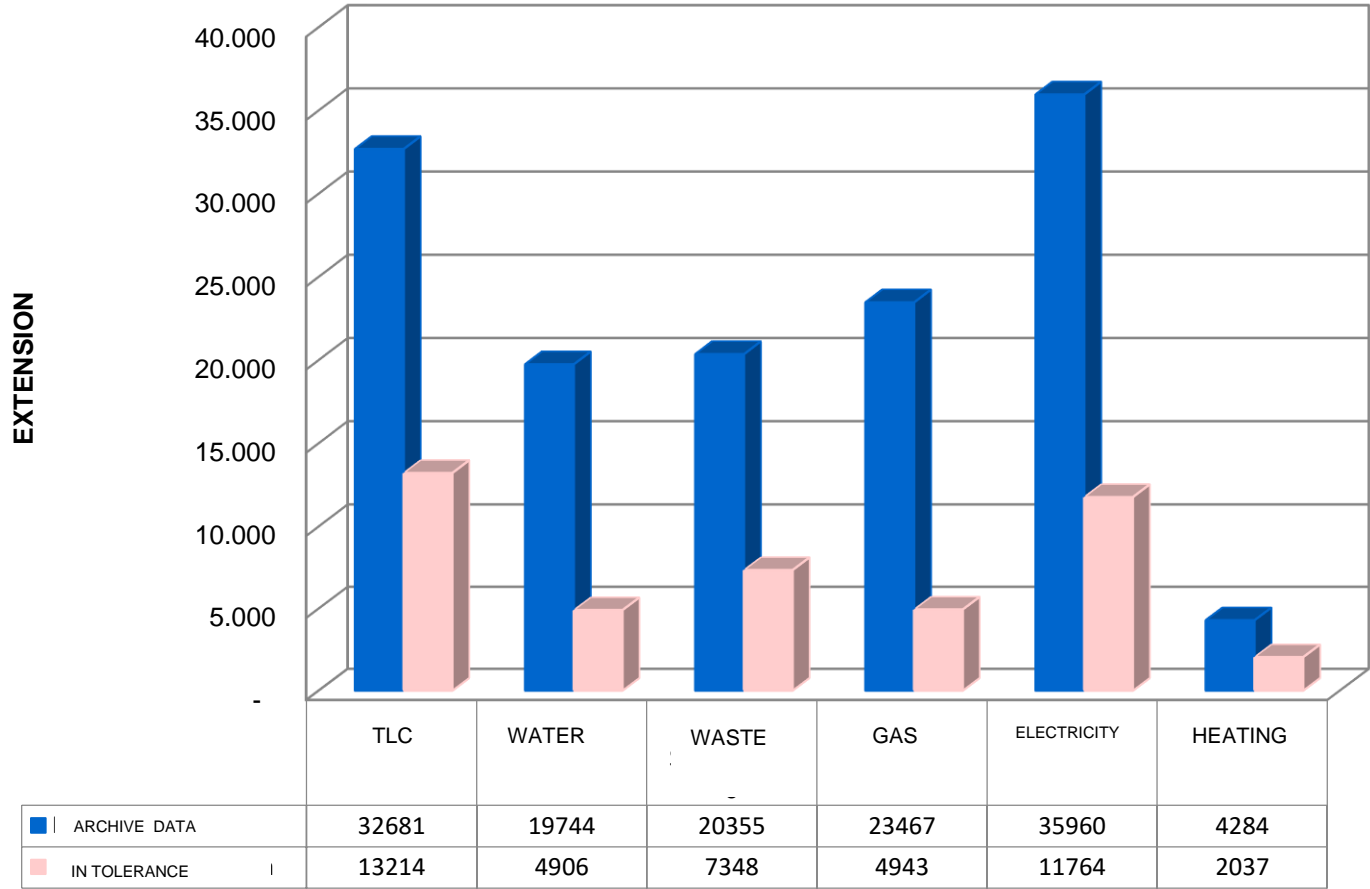


A THIRD OF THE NETWORKS PRESENT IN THE UNDERGROUND ARE NOT REPORTED IN ANY ARCHIVED CARTOGRAPHY

# DATA COMPARISON: QUALITATIVE ACCRACY OF DATA POSITION



THIS PARAMETER EXPRESSES THE PERCENTAGE OF ERROR IN THE PLANIMETRIC POSITION OF THE PIPELINES DRAWN IN THE HISTORICAL ARCHIVE COMPARED TO THEIR REAL LOCATION AS FROM INSTRUMENTAL SURVEYS



# DATA COMPARISON: QUALITATIVE ACCRACY OF DATA POSITION

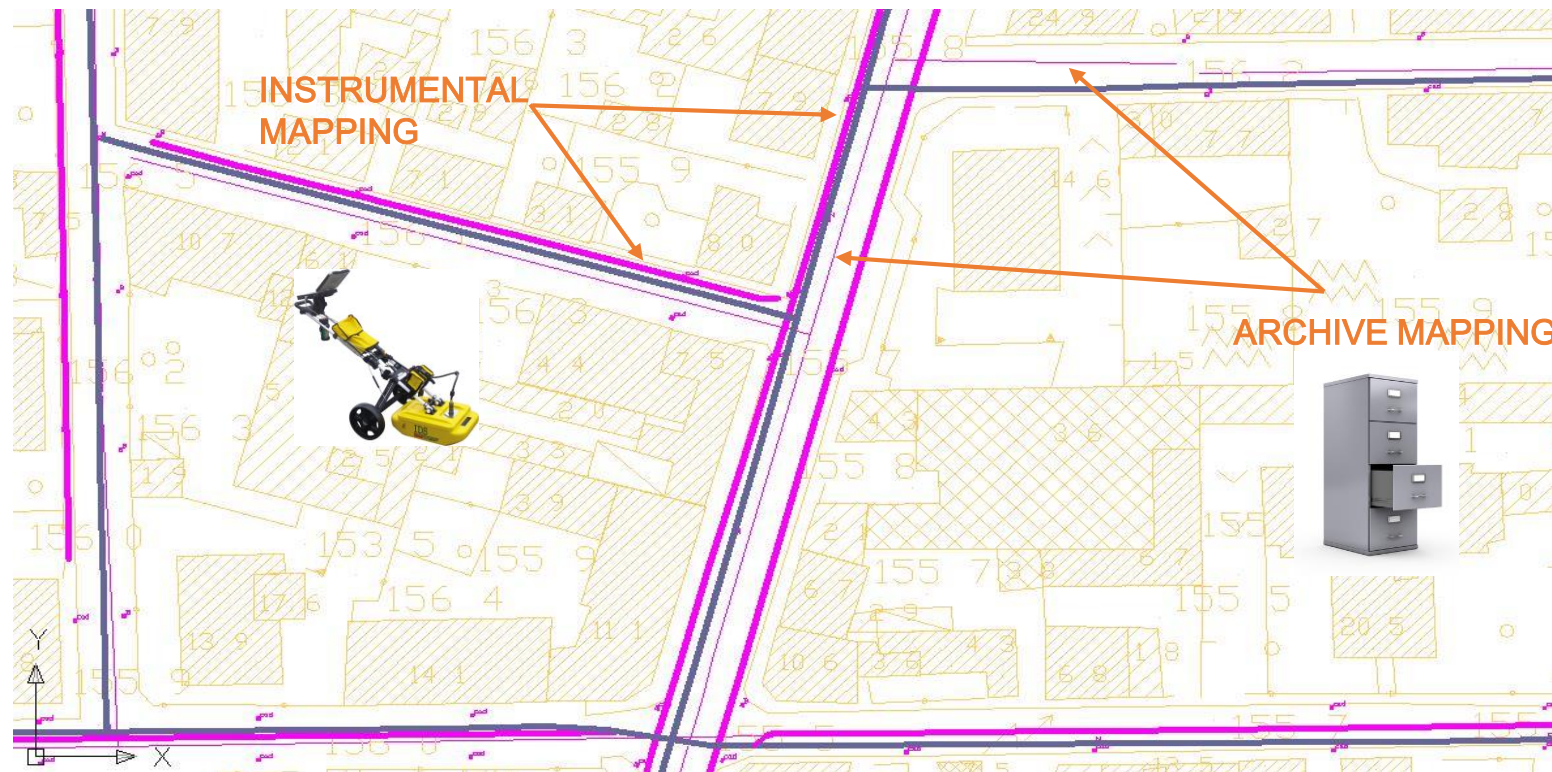


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32%

**WAS THE ESTIMATED PERCENTUAL OF PIPELINES IN TOLERANCE:**

THE DISCREPANCY FOR THE PLANIMETRIC POSITION BETWEEN HISTORICAL AND INSTRUMENTAL DATASET WAS CONSIDERED ACCEPTABLE BASED ON THIS FIGURE



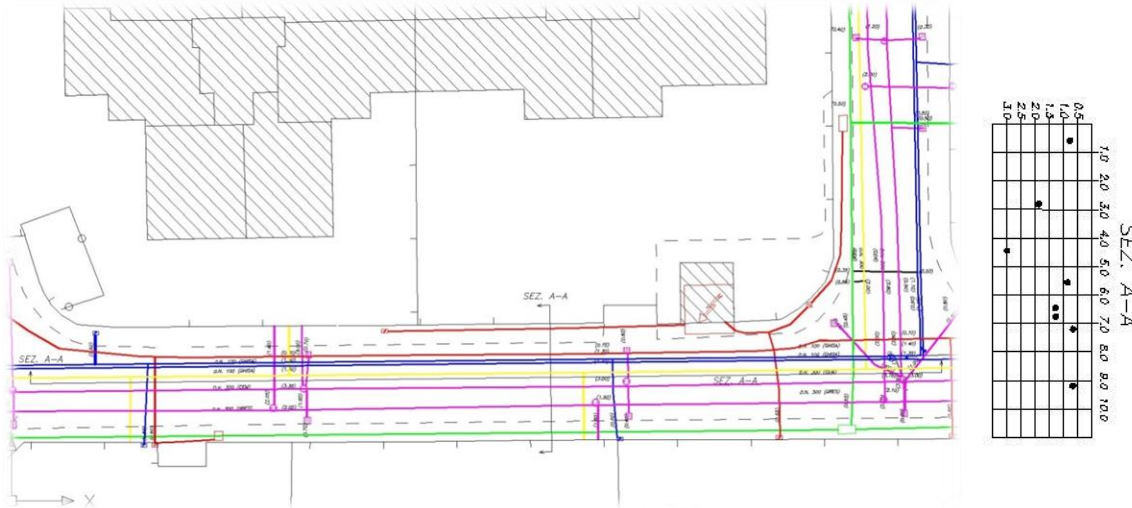
# NO-DIG UTILITY MAPPING

## MULTI-TECHNICAL APPROACH TO EVALUATE:

- ✓ THE MOST SUITABLE TECHNOLOGY FOR THE CADASTRE OF UNDERGROUND UTILITIES
- ✓ COSTS AND BENEFITS

**TECHNICAL ASPECT:** WHICH TYPE OF GPR CAN BE USED AND WHY?

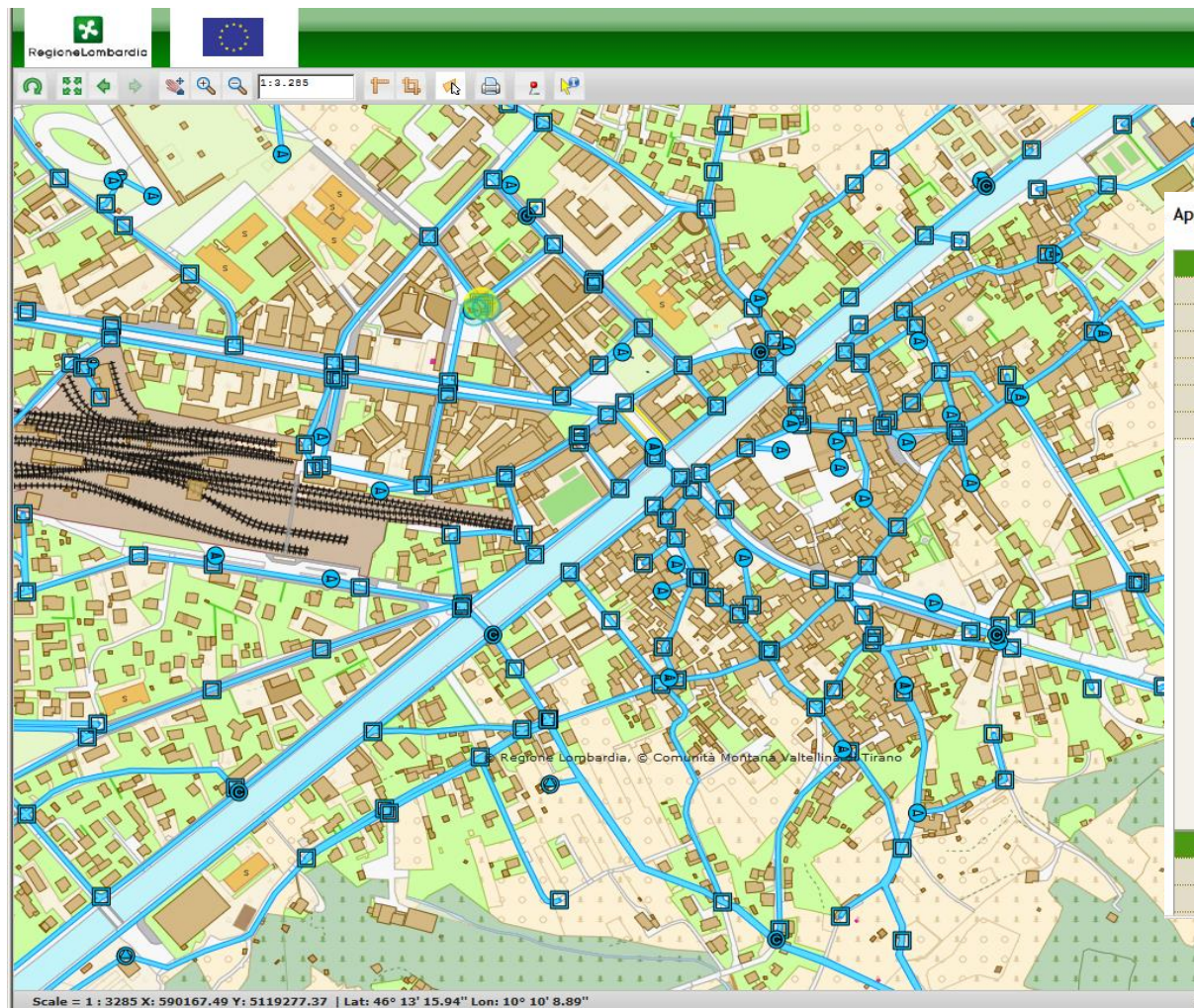
**PROCEDURAL ASPECT:** SEQUENCE OF OPERATIONS FOR EACH SPECIFIC SURVEY TYPE



EXAMPLE OF TRANSVERSAL AND LONGITUDINAL SECTIONS



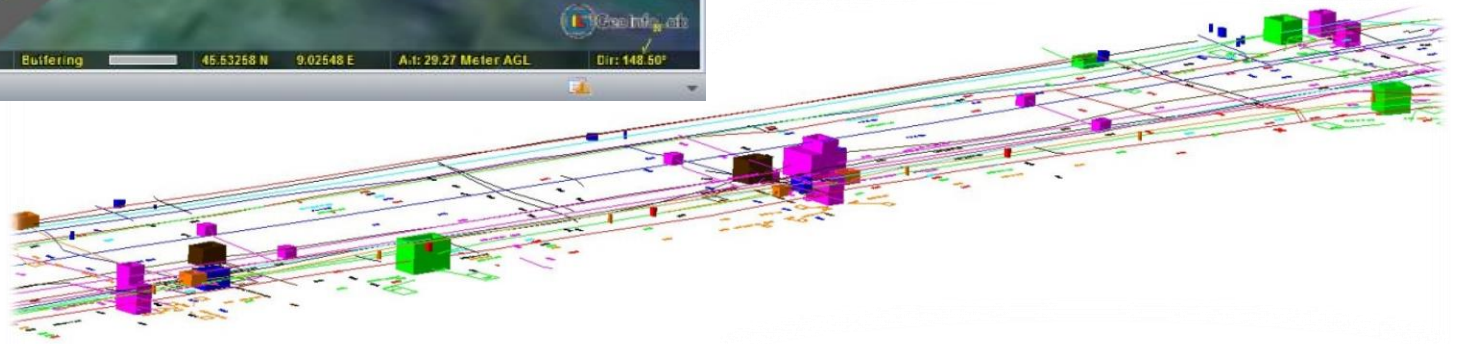
# DATA REPRESENTATION: 2D WEBGIS PORTAL



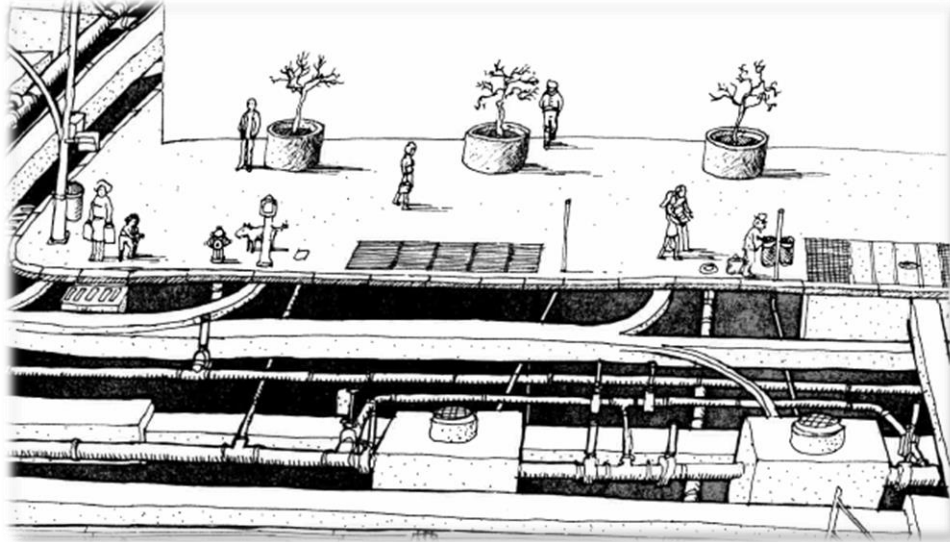
Approvvigionamento acque puntiforme > Tipo di elemento: Pozzetto di ispezione

Attributi identificativo	
Cod. elemento 070102	N° elemento 337
Descrizione Approvvigionamento acque puntiforme	Fonte ATO
Tipo Pozzetto di ispezione	Cod. acquedotto 91 - Ignoto
Strada Ignoto	Cod. posizione 91 - Ignoto
Rilevatore 02582430126	Data rilievo 25/07/2007
Cod. istat 14066	Annotazioni
	
Attributi di tipo geografico	
Cod. posizione 91 - Ignoto	Quota 433.26
Den. punto	

# DATA REPRESENTATION: 3D PROTOTYPE WEBGIS PORTAL



# FINDING THE RIGHT APPROACH FOR THE CADASTRE OF UNDERGROUND INFRASTRUCTURES NETWORKS



## THE CADASTRE IS AN INSTRUMENT OF KNOWLEDGE:

- supporting decision makers in both design and investment choices to optimize the use of resources
- making more effective interventions in case of failure, and to ensure greater security of networks and systems
- making it easier to design renovations of a network or its expansion
- identifying existing usable infrastructure in order to reuse them
- facilitating access to information on networks layout in order to avoid interference construction

# THE CADASTRE OF UNDERGROUND INFRASTRUCTURE NETWORKS



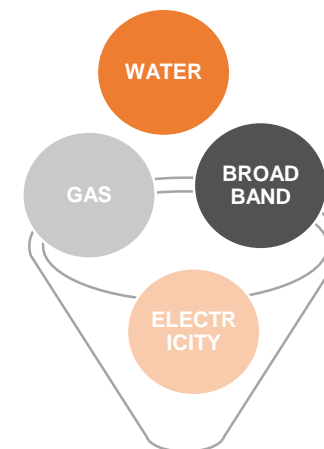
## 2012 REGIONAL LAW N° 7 PROCEDURES FOR ECONOMIC DEVELOPMENT AND OCCUPATION

THE UNDERGROUND CADASTRE IS DEFINED AS THE SET OF TABLES, MAPS, PLANIMETRY AND DOCUMENTS SUITABLE TO REPRESENT:

- THE UNDERGROUND STRATIGRAPHY
- LOCALIZATION AND SIZE OF INFRASTRUCTURES
- ATTRIBUTES RELATED TO THE PROPERTY (MATERIAL, AGE, STATE OF USE, ETC)

## 2014 DECREE OF GENERAL DIRECTOR N° 3095

TECHNICAL SPECIFICATIONS FOR SURVEYING AND MAPPING UNDERGROUND SERVICE NETWORKS



**WHO?**

stakeholders

**WHEN?**

periodic updates

**HOW?**

Webgis portal

<https://www.multipan.servizirl.it/>



# THE WEBGIS PORTAL OF THE CADASTRE



<https://www.multiplan.servizirl.it/>



## MULTIPLAN Sito di Pianificazione Territoriale



### Introduzione

Benvenuto nella pagina di accesso agli applicativi di Pianificazione Territoriale di Regione Lombardia.

Attraverso il sito MULTIPLAN gli utenti possono accedere alle applicazioni **RIMWEB** ( Archivio documentale relativo ai dati sul Reticolo Idrografico Minore), **PGTWEB** (Archivio documentale Piani di Governo del Territorio), **PTCPWEB** (Archivio documentale Piani Territoriali di Coordinamento Provinciale), **PUGSSWEB** (Archivio documentale Piani Urbani Generali dei Servizi del Sottosuolo) in base al profilo di accoglienza ottenuto in fase di registrazione

### Accesso agli applicativi

Accesso in sola lettura a [PGTWEB](#)

Accesso in sola lettura a [PTCPWEB](#)

Accesso in sola lettura a [PUGSSWEB](#)

Accesso in sola lettura a [RIMWEB](#)

Accesso in sola lettura a [Mappa Reti Sottosuolo](#)

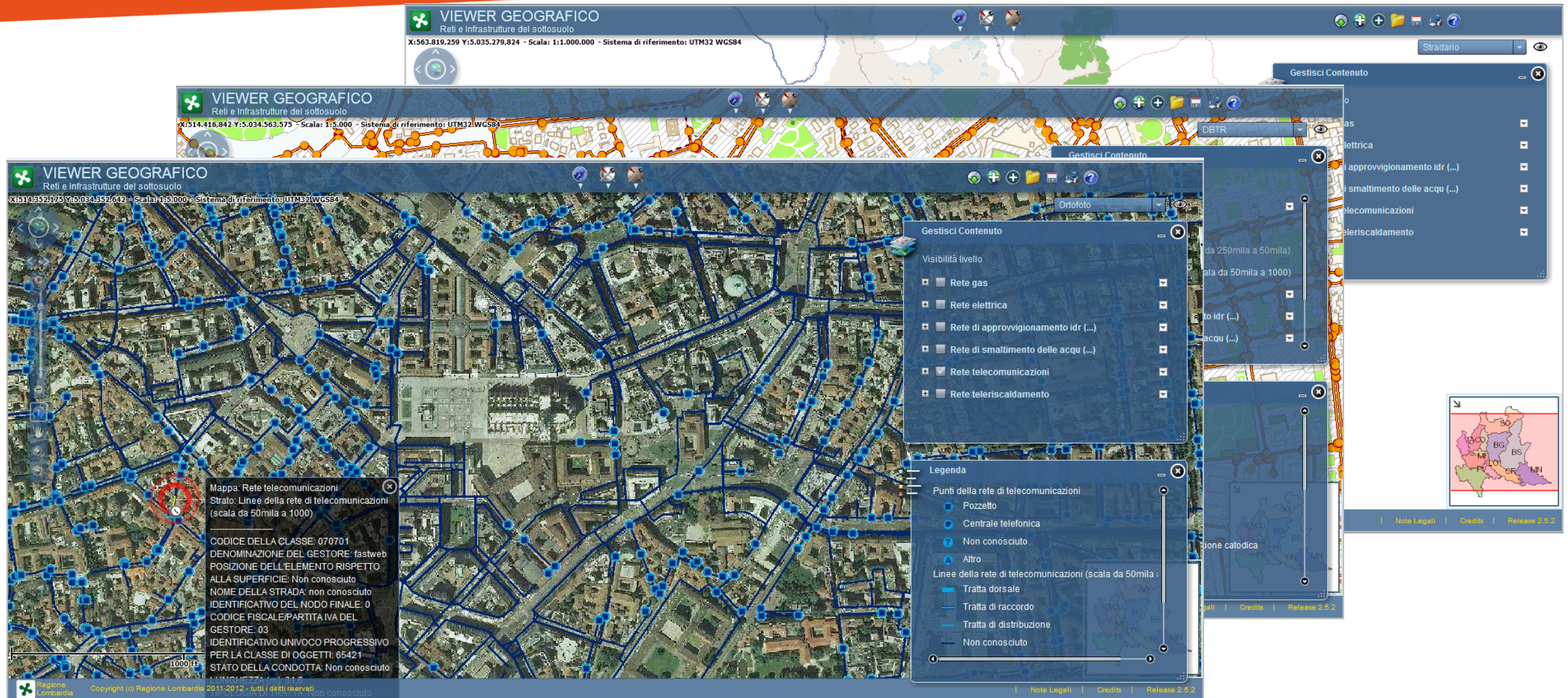
### Accesso con Login

Puoi accedere al servizio:

utilizzando una SmartCard con il proprio PIN (CRS o altra CNS) dopo aver effettuato la registrazione online, utilizzando il codice utente e password forniti dal sistema

[Accedi](#)

# THE WEBGIS PORTAL OF THE CADASTRE



**VIEWER GEOGRAFICO**  
Reti e Infrastrutture del sottosuolo  
X:563.819,259 Y:5.035.279,824 - Scala: 1:1.000.000 - Sistema di riferimento: UTM32 WGS84

**VIEWER GEOGRAFICO**  
Reti e Infrastrutture del sottosuolo  
X:514.416,842 Y:5.034.563,575 - Scala: 1:5.000 - Sistema di riferimento: UTM32 WGS84

**VIEWER GEOGRAFICO**  
Reti e Infrastrutture del sottosuolo  
X:514.552,175 Y:5.034.592,612 - Scala: 1:5.000 - Sistema di riferimento: UTM32 WGS84

**Gestisci Contenuto**

- ☐ Rete gas
- ☐ Rete elettrica
- ☐ Rete di approvvigionamento idr (...)
- ☐ Rete di smaltimento delle acque (...)
- ☒ Rete telecomunicazioni
- ☐ Rete teleriscaldamento

**Legenda**

Punti della rete di telecomunicazioni

- Pozzetto
- Centrale telefonica
- Non conosciuto
- Altro

Linee della rete di telecomunicazioni (scala da 50mila a 1000)

- Tratta dorsale
- Tratta di raccordo
- Tratta di distribuzione
- Non conosciuto

**Mappe: Rete telecomunicazioni**  
Strato: Linee della rete di telecomunicazioni (scala da 50mila a 1000)

**CODICE DELLA CLASSE:** 070701  
**DENOMINAZIONE DEL GESTORE:** fastweb  
**POSIZIONE DELL'ELEMENTO RISPETTO ALLA SUPERFICIE:** Non conosciuto  
**NOME DELLA STRADA:** non conosciuto  
**IDENTIFICATIVO DEL NODO FINALE:** 0  
**CODICE FISCALE/PARTITA IVA DEL GESTORE:** 03  
**IDENTIFICATIVO UNIVOCO PROGRESSIVO PER LA CLASSE DI OGGETTI:** 65421  
**STATO DELLA CONDOTTA:** Non conosciuto

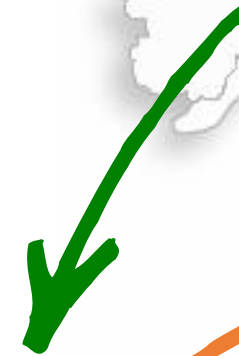
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Note Legali | Credits | Release 2.5.2

# THE ITALIAN NATIONAL INFRASTRUCTURES INFORMATION SYSTEM (SINFI)

AN EXAMPLE OF THE FEDERATION BETWEEN  
THE REGIONAL CADASTRE OF REGIONE LOMBARDIA  
AND THE NATIONAL ONE

*National Infrastructures  
Information System  
(SINFI)*



*ACCESSIBILITY*

*Standards open source*

*DATA INTEROPERABILITY*

*Data sharing*

# FOR MORE INFORMATION



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*assistance*



*[catastosottosuolo@regione.lombardia.it](mailto:catastosottosuolo@regione.lombardia.it)*



*website*



[www.reti.regione.lombardia.it](http://www.reti.regione.lombardia.it)  
[www.multiplan.servizirl.it/it](http://www.multiplan.servizirl.it/it)

THANKS FOR YOUR ATTENTION



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