Comune di Milano

PROJECT:

DIGITAL MAPPING TOOL AND DIGITIZED UNDERGROUND DATA

Creating a complete picture of the natural and built urban environments through innovative mapping tools to improve resilience, save time, and money.

Keywords: Geospatial data, underground layers, data-driven decision making, urban infrastructure, resilience and sustainable development.

ABSTRACT

The City of Milan has developed a mapping tool that combines newly digitized information about the cables, pipes and other critical infrastructure that runs beneath the city's streets and surface-level geospatial data about the built and natural environments. The digitalization of underground utility data is important to preventing serious damage and delay that could be caused by excavation and construction works. It also enables the City to plan more effectively for the impacts of climate change and save time and money for the city and its residents, by making it easier to design and execute both public and private works.

While information about subterranean infrastructure has always been tightly controlled due to security concerns, it's also been difficult to access because of the distributed ownership of these services across many providers. Whenever any public work requires excavation, a months-long paper-based process has to be conducted, requiring sign-off from over 40 entities to verify location information. Now the city is collecting and digitizing all public and private data available to the city about underground services and bringing it together in a digital mapping platform, that merges it with layers of surface-level information. The Municipality of Milan is among the first cities in the world to create such a tool, that provides a complete picture of the city with a wide variety of applications.

CONTEXT

Underneath Milan's centuries old streets and sidewalks lies a network of cables and pipes from dozens of different private companies and public services that have accumulated over time. These 'underground services' provide Milan's residents with fresh drinking water, electrical and telecommunications access, sewage treatment and much more. Many companies that once ran underground cables no longer exist and data is often lacking about exactly what is running below a particular

street or intersection. The sign-off process required to verify what lies under the ground, slows down key public works and increases the probability of accidents occurring due to misleading or outdated information about vital services, such as the location of drinking water or flammable gas.

Planning and executing projects often involves multiple City agencies and private entities, each with their own data, maps, and strategic priorities. This was especially true in Milan for greening projects, which require the coordination of many departments and are a strategic priority of the City and a focus of the recent citywide masterplan. There were limited tools available to help staff and decision-makers across City government visualize projects and priorities.

This project proves the importance of collecting, managing, and combining accurate, up-to-date datasets in dynamic digital mapping platforms to improve the speed and reliability of multi-stakeholder projects.

CHALLENGES AND OPPORTUNITIES

Information about underground services is restricted due to public security concerns. The Municipality must observe confidentiality agreements with providers and some infrastructure assets fall under national security laws as well. The City protects this data in numerous ways, including secure, approved access to the mapping system itself.

The Municipality of Milan has historically faced challenges in accessing data on underground utilities and services, as this infrastructure has been managed at a regional level. This platform, along with a requirement to report changes to these networks to both regional and local authorities, resolves this issue and assures access to up-to-date information. Detailing the underground network of the city is extremely valuable in terms of lowering social costs: reducing the probability of accidents and controlling the cost and duration of construction

around the city. This project lays the groundwork for improving the quality of subterranean infrastructure maps and benefits from data being continuously updated as works around the city are performed and completed.

Most importantly, this project brings together subterranean data with surface level data layers that include administrative and statistical boundaries, transportation routes and zones (public transit lines, bike lanes, and pedestrian areas), environmental data (daytime land surface temperature), and a wide variety of layers from the most recently citywide masterplan. This innovation allows the city to run sophisticated analysis on how surface level infrastructure and zoning interact with underground assets, allowing Milan to become one of the first cities to do this type of cross-referenced assessments. Work is being done across City Departments and agencies now to ensure that the tool evolves with additional data and functionality to become a regular part of planning processes for the Comune di Milano.

STAKEHOLDERS
The main team working on this project is the Department for Territorial Information Systems –the GIS Unit of Milan– assisted by the "Underground Services Unit" within the Mobility Department and designated members of the Municipal Police, who are involved each time an excavation is done on public land. The project is implemented by the Analytics Division of the Information Systems and Digital Agenda Department in partnership with other Departments of the Municipality of Milan.

Bloomberg Associates (BA), a municipal philanthropic consulting firm founded by former NYC Mayor Mike Bloomberg, helped to conceive the digital mapping tool together with the City of Milan's Resiliency Team. Greening the city is a priority, and BA worked closely with the GIS Unit of Milan to build the mapping tool as a key innovation to improve interdepartmental planning.

IMPLEMENTATION
In its initial stages, this project required a high level of coordination with the different agencies and stakeholders that are traditionally involved in the administrative processes of authorizing excavation works, or that possess data on underground utilities and services. The Municipality also coordinated with the various individuals and construction teams who perform these excavations and underground infrastructure works.

From the initial discussions through the prototype phase, the City of Milan gathered valuable feedback from teams on how they operate as well as insights on the complexities of the City's underground infrastructure. This allowed the City to identify specific needs and bottlenecks in the administrative processes to be refined and improved.

The collection and management of geospatial data is carried out by the Department for Territorial Information Systems. The initial database was built from many sources, including the Municipality's historical records, which were almost all paper-based. As changes are made to the database, whether the intervention or excavation is done by a private company or city workers they are saved to the system, keeping the underground mapping constantly up-to-date.

The geospatial data visualization platform used to display underground services was designed and implemented with the support of a specialized company for geospatial digital solutions. Throughout the design process, the Municipality has held workshops to exchange feedback with users, establishing a constant direct communication channel with them, collecting

their suggestions, and improving the model. As mentioned, the digital mapping tool incorporates many other layers of data which can be activated in conjunction with underground infrastructure data to enhance project planning & design.

Once the prototype was functional, a training campaign was launched to enable anyone involved in excavation processes to be able to use the system to obtain the required permits and to actually register a map of that particular work in the database. Online training allowed a large number of contractors to participate through two tracks: the first for small public interventions for spaces under 10 square meters and the second for large scale excavations. Each training module lasts two months. At the beginning of 2021, more than 500 people had been trained to use the platform.

LEARNINGS
During the implementation of this project, the Municipality was reminded how crucial it is to communicate and engage relevant stakeholders, in the initial stages, about the relevance this tool could have for their work. The early engagement process allowed the main partners of the project to gain the support of key agencies and Departments. By becoming familiar with their internal and administrative processes and sharing how a digital tool like this could open up new ways of working – as well as saving time and money, the City was able to get access to third party data and garner support for the implementation of the tool.

FUTURE
This project is currently in beta release. Upcoming excavation and construction works will be added to the map of Milan's underground network. This will constantly update and enlarge the platform's database, keeping the most up-to-date information available.

The replicability of this project is very high, since cities around the world face the same challenge of maintaining reliable digital information about underground and above-ground utility services, otherwise causing delays and cost increases for municipal projects. Turin and Genoa have already shown interest in replicating this model and have started conversations with the City of Milan on how to implement this digital solution for their municipalities.

DATA AND NUMBERS

Paper-based process made entirely digital saves 10-20% of cost over old procedure

40+ individual approvals streamlined into one end-to-end digital process

17 layers of subterranean geospatial infrastructure mapping information