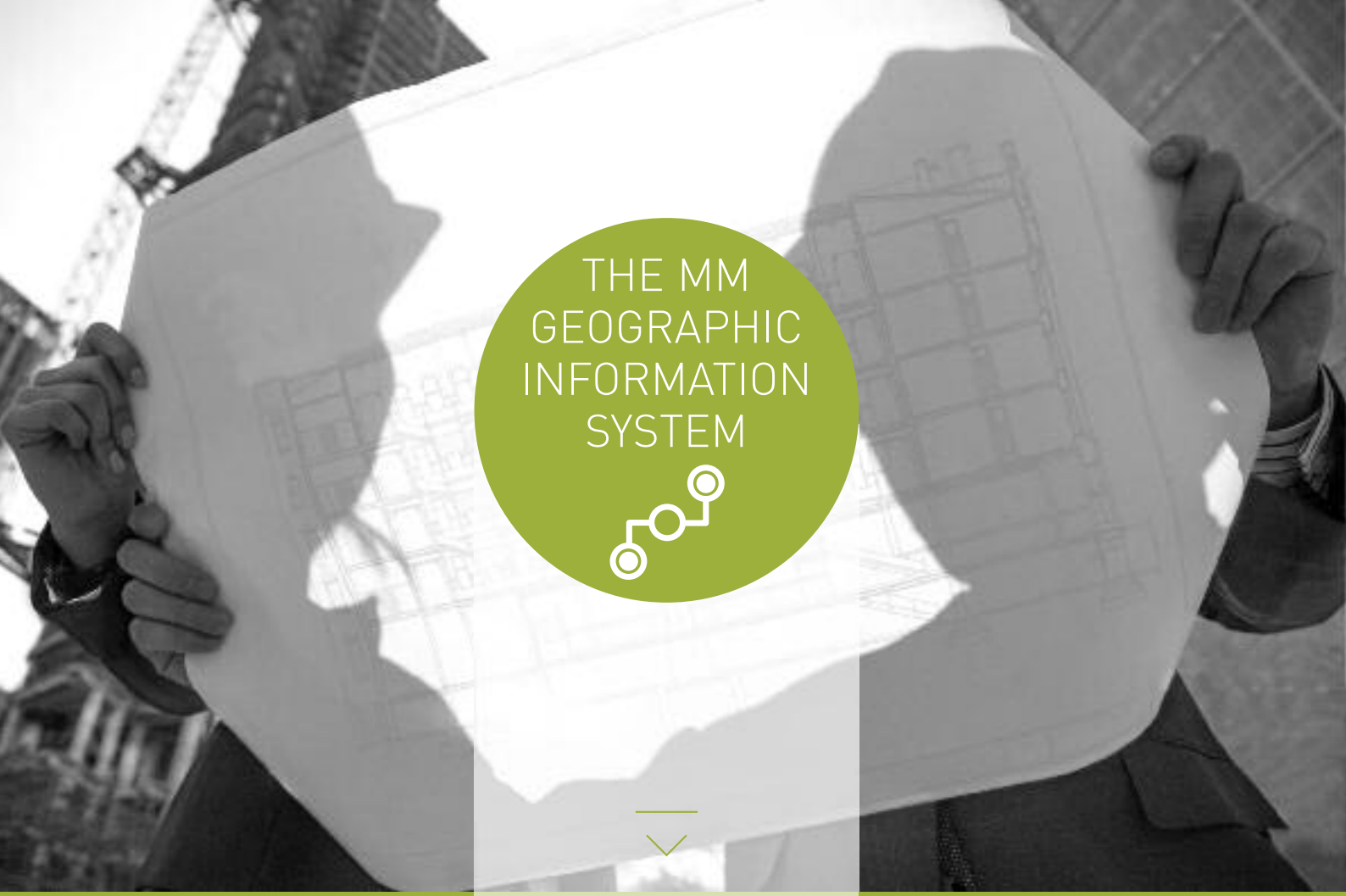

# THE MM GIS PLATFORM



# THE MM GEOGRAPHIC INFORMATION SYSTEM

**Developed for the ArcGIS Client-Server environment and available online via Geocortex, MM's GIS covers all networks and installations in City of Milan Integrated Water Services (IWS), the surface water network in the surrounding area, and the metropolitan rail lines designed by MM.**

MM implemented its GIS project with a number of objectives:

- Implement rapid archiving of all network and installation assets;
- Integrate and complete management of asset identification data, providing its operators and third-party agencies in the Milan area with a web consultation tool;
- Provide an integrated platform for data collection and consultation in the field via mobile technologies.

The MM GIS is configured as a multiplatform integrated with IWS software and databases: Enterprise Asset Management, Esperta (user billing), Innovyze Infoworks (hydraulic models), Laboratory Information Management System (water analyses), MM maintenance and upgrades (road work).

## PROJECT GOAL

Implement rapid GIS archiving of all network and installation assets in the city of Milan's IWS, create a GIS-based support platform for various company operations and functions (asset management, planning, planning and management of maintenance and upgrades in Milan and the surrounding area, mathematical modeling of the networks), provide a web-based and mobile GIS consultation tool for its operators and third-party agencies in the local area.

### Principal project features

In line with the Geographical Information Systems of the City of Milan, Metropolitan Milan and the Region of Lombardy, an Environmental Systems Research Institute (Esri) ICT platform was chosen. The technology partner, GeoGraphics, was chosen via a public call for tenders for GIS products and services. The physical and logical data model was then developed to organize the information structure of the IWS network and installations.

The data model and the principal system characteristics comply with Lombardy laws, standards and norms, which are considered to be a national benchmark of excellence.
MM technicians take part in regional and national committees to update the Technical Specifications of Subsurface Networks and Infrastructure of the IWS in a GIS environment and to institute the Federated National Infrastructure Information System (Sistema Informativo Nazionale Federato delle Infrastrutture - S.I.N.F.I.).

Massive data uploading was accomplished by digitalizing the networks via data polishing, certification of geographical data, geometrical reconstruction, attribute compilation, and revision, rectification and connection to the surrounding network of existing cartographic data.

The final phase of automatic, assisted inspection, structured according to dedicated technical specifications and procedures, was accomplished via data validation and certification by geometrical analysis, topological check, and checking of data entries to ensure correctness and completeness.

### Principal features of the MM GIS and work team

The MM GIS now runs on an ArcGIS 10.2 platform, with ArcGIS Desktop Basic and Standard licenses and Web capabilities based on the Geocortex application (total of 150 users) and, regarding infrastructure, a dedicated ArcGIS server and SQL server.

# FROM PLAN TO GEOGRAPHICAL INFORMATION SYSTEM

**To support the various MM functions over a web-linked intranet, the IWS Cartographic Portal was created to allow operators to access cartographic and detailed information from their work stations, also through the use of simple operations (e.g. pan, zoom, info, measurements, print, etc.).**

A web portal is now available via the Geocortex application (GeoGraphics and Latitude GeoGraphics). It unites and allows management of the various applications and use frameworks of the MM GIS with immediate mobile visibility on tablets, smartphones, etc.


MM GIS: The Web portal

## IWS ASSET MAINTENANCE

The MM GIS functions as an interface platform with the MAXIMO system for integrated management of IWS assets. The system is used by MM to manage ordinary (planned and forecast) and extraordinary maintenance, interfacing with the IWS operational management systems (operations based on work orders for maintenance or repairs of the water supply and sewer network and installations). Dedicated technical specifications have also been prepared and integrated into the MM Special Contract Conditions to allow easy import of as-built drawings into the GIS. These specifications were also integrated into the Technical Specifications for the execution of City of Milan public works and into the technical norms annexed to the Price List.

## HYDRAULIC MODELING OF THE WATER SUPPLY AND SEWER SYSTEMS: GIS AS A BASIC TOOL FOR EFFICIENCY AND OPTIMIZATION OF IWS MANAGEMENT

In accordance with the most recent guidelines of the International Water Association (IWA), MM carries out management measures on the water supply system (innovative leak detection methods, districting of the water distribution network, pressure and water table management) to optimize the IWS. The MM GIS constitutes a knowledge base and support platform for the mathematical model (Innovyze Infoworks) for analysis, calculation and simulation.

# IWS EFFICIENCY AND OPTIMIZATION

**The implementation of computerized networks is also an indispensable element and necessary information support for the sewer network as well as for the development of a supporting hydraulic model (Innovyze Infoworks) and the monitoring and online control of the sewer system, with the goal of reducing inflows, monitoring the quality of wastewater and increasing the network throughput capacity.**

Effective and efficient collection of all city wastewater for treatment requires minimizing the collection and draining of stormwater via control and elimination of groundwater or surface water discharges ("invasive" discharges) to the sewer and monitoring of industrial wastewater to ensure good effluent quality. Thus groundwater takeoff points for heat exchangers have been loaded into the GIS (potential unauthorized discharge points to the sewer), and all industrial discharges in the city have been surveyed and georeferenced (with links to the MM database). In addition to the IWS network and installations, information necessary for the proper management of the service was also loaded into the GIS, such as data describing the Secondary Surface Water Network (which MM surveyed), which is not within the purview of the IWS operator, as well as water table data.

## CUSTOMER MANAGEMENT

By means of georeferencing and implementing user water meters in the GIS, a one-to-one mapping was established between the MM GIS and the client software (Esperta - Data Management Utility) with links to identification data and billing of IWS users.

Consumption and billing data can thus be organized according to different criteria for analyses on different scales (address, street, NIL or multi-user meter) with the possibility to perform comparative or other analyses of users or groups of users by consumption, billing, and payments/non-payments.

Consumption data may be of immediate use in the hydraulic model discussed above: specifically resident data can provide added value to territorial analyses.

MM GIS: Historical documentation tool for future planning

## MM MAINTENANCE, REPAIRS AND UPGRADES AND ROAD WORK IN THE GREATER MILAN AREA

Maintenance, repairs and upgrades carried out by MM on the IWS network and installations can be viewed within a georeferenced framework, allowing easy, state-of-the-art monitoring, a complete description, the display of relevant data (worksite ID, timeline, phases, impact on traffic, etc.) and storage of descriptive documents. From the planning through the executive phase, the interventions in the local area can be viewed with the various work phases and the timeline for their completion (design, call for tenders, execution, inspection and testing). The web portal makes it possible to share and update information and analysis of data for the area according to various criteria.

## HISTORICAL ARCHIVE

In collaboration with the Department of Architecture and Urban Studies of the Politecnico di Milano, work is underway to implement historical information and data on the water supply and sewer system in the GIS. The main objectives include efficient management and more thorough knowledge of historical assets, and, via a process of dating systems and installations, the development of intervention strategies to enhance effective planning of investments.

## THE GIS BEYOND THE IWS: METROPOLITAN RAIL AND SUBSIDIZED HOUSING

A project to implement the metropolitan rail (metro) lines M1, M2, M3, M5 and the M4 (work in progress) in the MM GIS is nearing completion. It will thus be possible to represent them in two and three dimensions (tunnels, stations,

MM GIS: Water management in Milan

technological components). The work has involved the creation of an exceptionally well engineered data model, the only one of its kind in Italy.

The objective is to provide MM with a complete information tool that is immediately usable via web or mobile device for the issuing of competent technical opinions on interventions by third-party agencies within the municipal territory, manage the important document archive, and have state-of-the-art support for preliminary studies or feasibility assessments.

## GIS PROJECT FOR MM CASA

**Preliminary studies and analyses are underway for a MM GIS project for MM Casa. The objectives include support for management of facilities and real estate, represented by city of Milan subsidized housing.**

# ABOUT MM

**MM Spa**
is a leading Italian engineering firm specialized in the design and construction of public transportation infrastructure and urban redevelopment projects promoting the sustainable development of the local area.

Founded in Milan in 1955, MM is responsible for the construction of the city's entire metropolitan rail system - 108 stations and over 100 km of track - and for major traffic and hydrological engineering projects.

MM is now able to export the solid experience it has developed in this sector to other major projects throughout Italy and abroad. It has participated, for example, in the construction of the metropolitan rail systems in Naples, Rome, Brescia, Turin, Copenhagen and Thessaloniki, the light rail systems in Padua and Venice, and the Autostrada 35 (BreBeMi).

MM Spa offers services ranging from project design to technical and financial assessments, from preliminary characterization to work supervision, and from design validation to inspections, testing and quality control.

MM is now a business partner to public agencies on major public works, whose cost and complexity demand consolidated management capabilities and absolutely reliable technical and administrative support.

Since 2003 MM is also in charge of Milan's Water Supply Service, which includes abstracting, purifying and distributing groundwater, collection and treatment of municipal wastewater, and generally, planning maintenance and investments for the water supply and sewer systems.

In 2014, MM also undertook management of the real estate assets of the City of Milan, comprising over 38,000 subsidized housing units, parking garages and other facilities. To accomplish this, MM created the new organizational unit "MM Casa", which works alongside other company structures that are already managing city services.

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