INTERREG MED Programme

2014-2020

ESMARTCITY

Enabling Smarter City in the MED Area through Networking

(3MED17_1.1_M2_022)

Priority Axis 1. Promoting Mediterranean innovation capacities to develop smart and sustainable growth

Specific Objective 1.1 To increase transnational activity of innovative clusters and networks of key sectors of the MED area

WP3 – Testing

Activity 3.3 – Pilot Testing

Deliverable 3.3.1 – Pilot deployment – Partner PP6

Contractual Delivery Date: **xx.xx.2019**

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Dissemination Level

PU	Public	X
PP	Restricted to Programme Partners and MED Programme	
RE	Restricted to a Group defined by the Partnership and MED Programme	
CO	Confidential, only for members of the partnership and MED Programme	

Content

1 Framework of Metropolitan City of Milan

1.1 Target of Metropolitan City of Milan

On December 22, 2014 the Metropolitan Conference of mayors approved the Statute of the Metropolitan City of Milan (briefly MCM) by the resolution 2/2014. The Article 3 of the Statute indicates MCM pursues, among others, as its objective "the happiness and well-being of the population, the care and the strategic development of the metropolitan area, also through the integration of services, infrastructures and communication network". Moreover, the Article 33 lists among the fundamental functions of MCM the "promotion and coordination of the computerisation and digitisation systems in the metropolitan area".

The strategic plan of the Metropolitan City of Milan provides the development of the interconnection of public realm in the metropolitan area as a strategic tool in order to perform the function of "promotion and coordination of computerization and digitalisation systems in the metropolitan area". The Metropolitan Cities Law provided gives them the function of promoting and coordinating the computerisation and digitisation systems in the metropolitan area (56/2014 art. 1, paragraph 44, letter f).

1.2 State of fibra optic

The Metropolitan City of Milan has an important fiber optic communication channel, particularly 3.700 km which, in addition to connecting its offices and schools of competence, is intended to interconnect the municipalities of the metropolitan area. This goal is reachable by developing of a large Intranet of the public body where the Authority assumes the function of coordination and promotion of the technological and digital development of the metropolitan area.

This telematic infrastructure is capable to vehicular and it allows to share innovative applications between all the actors of the network. The last one facilitates the achievement of institutional agreements, as well as the aggregation of scientific and technical knowledge, in view of the realisation of a unitary and innovative system which is capable to support the take-off of new interactive services also aimed at citizens and companies.

This fiber optic network and the infrastructures are the pillar for the creation of a real and efficient Smart Land and they are a strategic resource for 5G. The fiber infrastructures already play an

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important role in reducing the energy consumption and emissions in relation to the life cycle of network and the ability to allow innovative and more efficient digital services.

2 Development of pilot

2.1 The characteristics

Within this context, the ESMARTCITY project was developed with which the Metropolitan City of Milan carried out some use cases in the context of monitoring of the electricity consumption and buildings, as well as the purification of air inside of some relevant offices, already interconnected to its ultra-wideband fiber optic network, in order to encourage the introduction of innovative solutions that give value to the well-being of its students and citizens present on the metropolitan area.

The project therefore goes in the direction of encouraging the city to become "Smart Cities" thanks to the collection and analysis of data coming from IoT sensors. Basically, it relieves the environment in order to decide how and when to act in relation to the to safety, environmental quality and the consumption generated.

The new data and technologies, used within the project, must be considered as a mean to solve the sustainability challenges of cities, especially economic, social and environmental issues.

2.2 Objectives of the project

Innovative solution that allows dynamic structural control of buildings, consumption monitoring and air purification. The operation of the solution is based on the fiber optic infrastructure of the MCM network.

In particular, the following two use cases have been realised:

MCM headquarters - Isimbardi Palace MILAN

environmental and structural monitoring of the Tiepolo Hall

"Zappa" High School - Viale Marche MILANO

environmental and structural monitoring of a school classroom

This project describes the supplies and services offered in order to develop innovative research and development project for energy efficiency solutions. The concrete objectives are the following:

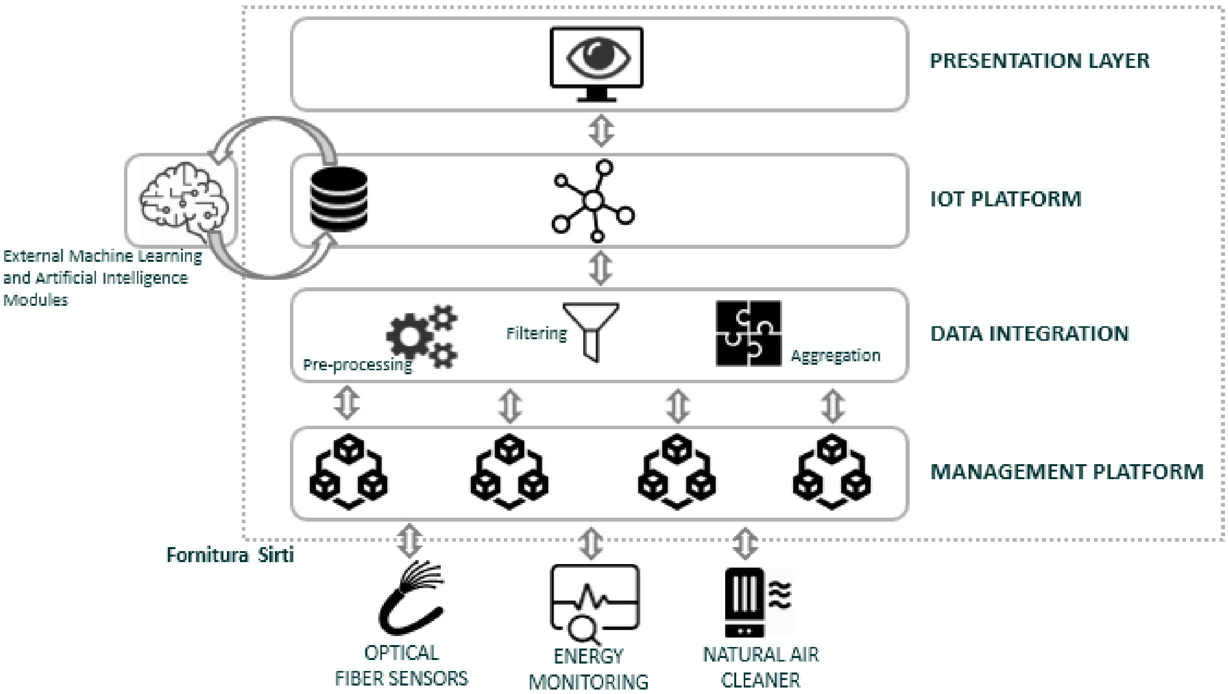
- to identify the optimal combinations and integrations between systems and measurement methods;
- to identify significant correlations between the measured quantities;
- to build scalable service models that are sustainable from an economic, technical and social point of view;
- to orient actions to create awareness and correct incorrect habits;
- to install different systems in heterogeneous contexts:

- fiber Optic to obtain environmental measures combined with measures relating to the stability of buildings;

- energy monitoring system to analyse the consumption of the individual elements connected to the network;

- air purification system.

2.3 Building blocks of proposed solution



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3 The data integration, processing and presentation component

The central core of the solution consists of the software platform modules dedicated to data acquisition from the 4 subsystems (included in the supply and described below), normalisation, integration with third parties, processing, presentation and distribution.

The integration platform offered therefore has the purpose of normalising and integrating heterogeneous data sources in a single repository and developing a presentation layer of field data, both punctual and aggregated in summary dashboards. This platform will present aggregate data to third parties against a precise definition of interchange formats and protocols.

Summary dashboard:

Figure 1 Mockup landing page

Single subsystem detail:

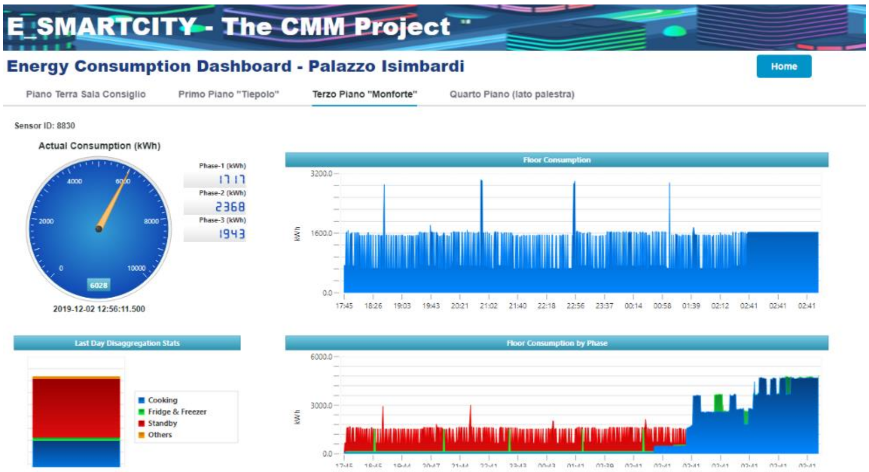

Figure 2 Detail mockup

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The data will be made accessible for the execution of artificial intelligence algorithms by the Politecnico of Milan, Department of Electronics Information and Bioengineering coordinated by Prof. Luca Ferrarini.

Access will be via a Database-level connection with dedicated queries.

The data that can be consulted are relative to the sensors and to the relative sampling frequencies as described in the paragraph "Sensors and detection times" and will relate to:

- Energy Monitoring
- Multi-building Fiber Optic Monitoring
- Air monitoring and purification

The 3 subsystems that are part of the supply are described below.

3.1 Energy Monitoring

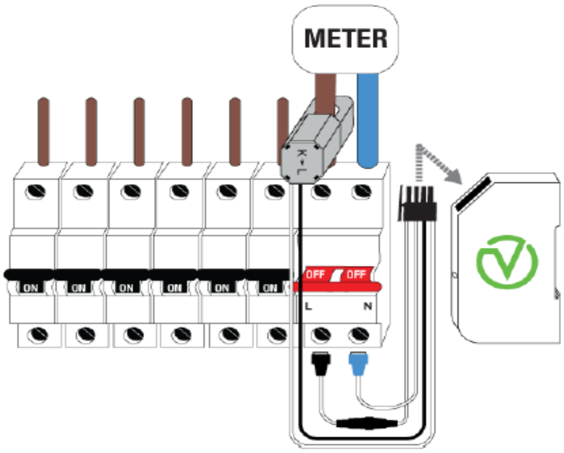
Real-time measurement system for the energy consumption of devices connected to the electricity grid.

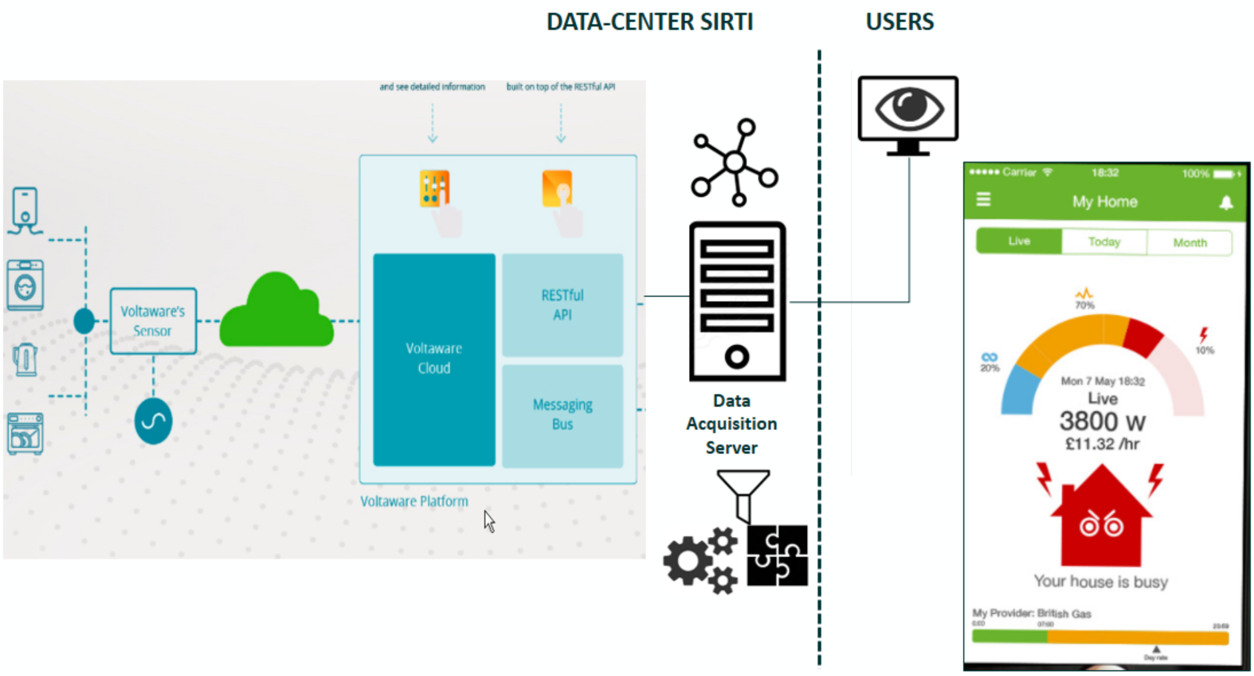
The System, through an appliance mounted in the meter compartment and connected to the phase (single or three-phase), allows to analyse the different types of consumption and suggests improvement actions.

The system sends a periodic report with a breakdown of the electrical devices, with data on costs and consumption to analyse trends and identify the most energy-intensive devices and inefficiencies.

3.1.1 Architecture of the proposed solution

- 5 minute installation
- Multiple Connectivity options
- High Frequency Sampling
- 50-60 Hz – 120-240 V – 1/2/3 Phase
- Meter Grade Accuracy





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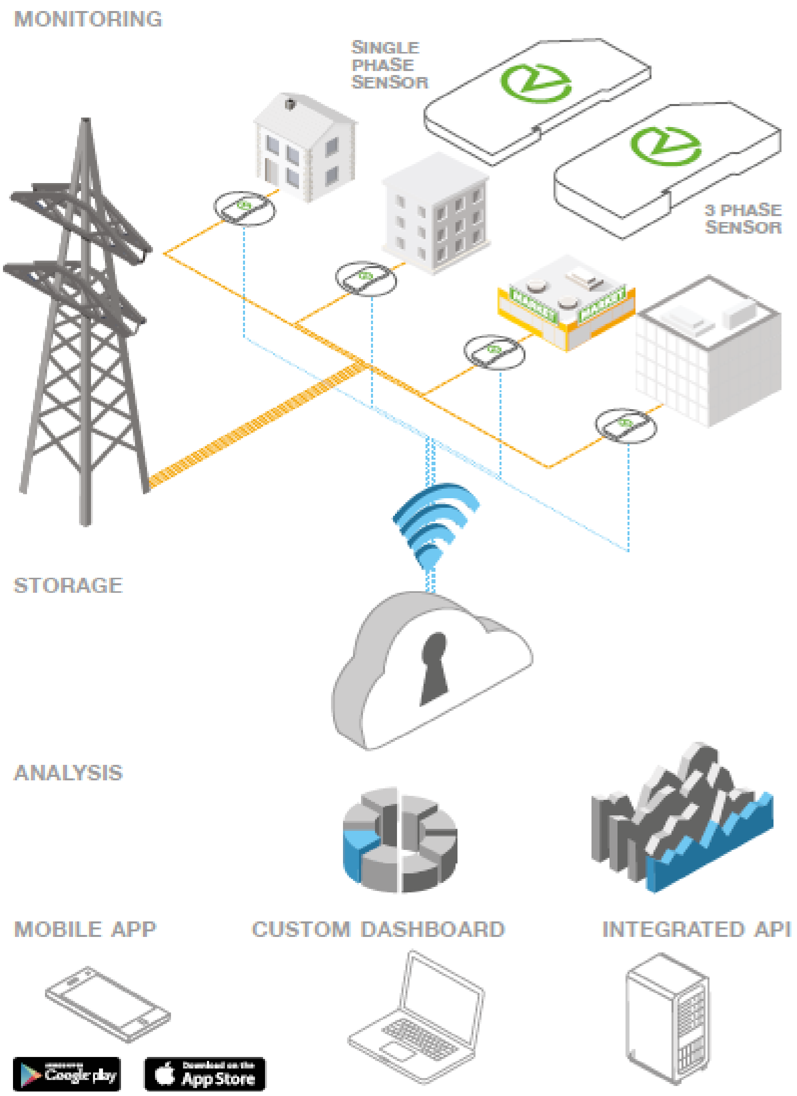
The total consumption of data and related costs is immediately available, live, daily or monthly.



The algorithm takes about a week to learn before it starts identifying individual devices from their electrical signature.

By switching these On / Off devices it is possible to detect and label them using the dedicated app.

The electricity monitoring data collected with the proposed system (Voltaware) is protected by security systems that guarantee confidentiality and can be consulted from the integrated dashboard and with an Android / Apple app.

For MCM a customised dashboard will be developed, and API will be exhibited through which data can be imported into MCM systems.

Below are some images that exemplify how to present the data detected by the appliance and processed by the IA modules on the cloud.

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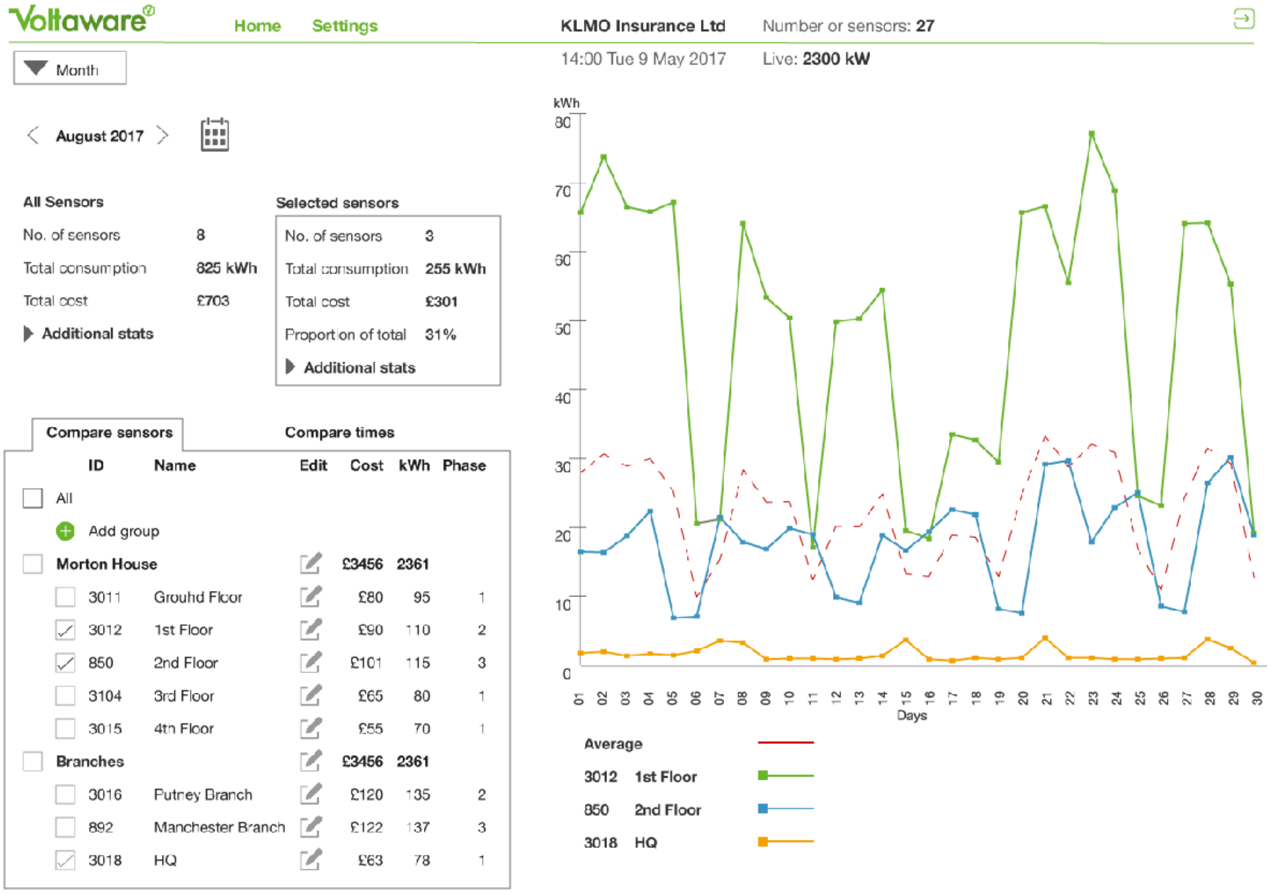
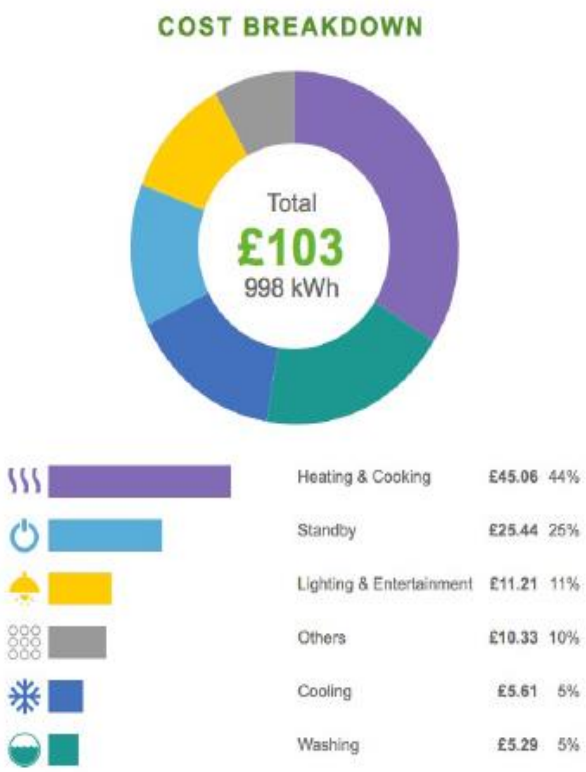


The Automatic Bill Breakdown module, included in the proposed solution, allows:

• to adopt strategies to contain the costs of the bill using machine learning;

• the user to understand how much each device costs each month with tips on how to optimise;
• automatically to identify inefficient appliances;
• the user to benchmark the model of use of their appliance.



4 Fiber Optic Monitoring

The objective of this component of the solution is the realisation of a system of measurement of physical parameters for the purpose of energy efficiency, to monitor the infrastructures, thus also protecting cultural heritage (Tiepolo fresco at Isimbardi Palace) and school buildings (school hall Zappa di viale Marche).

1 selected building:

- Isimbardi Palace

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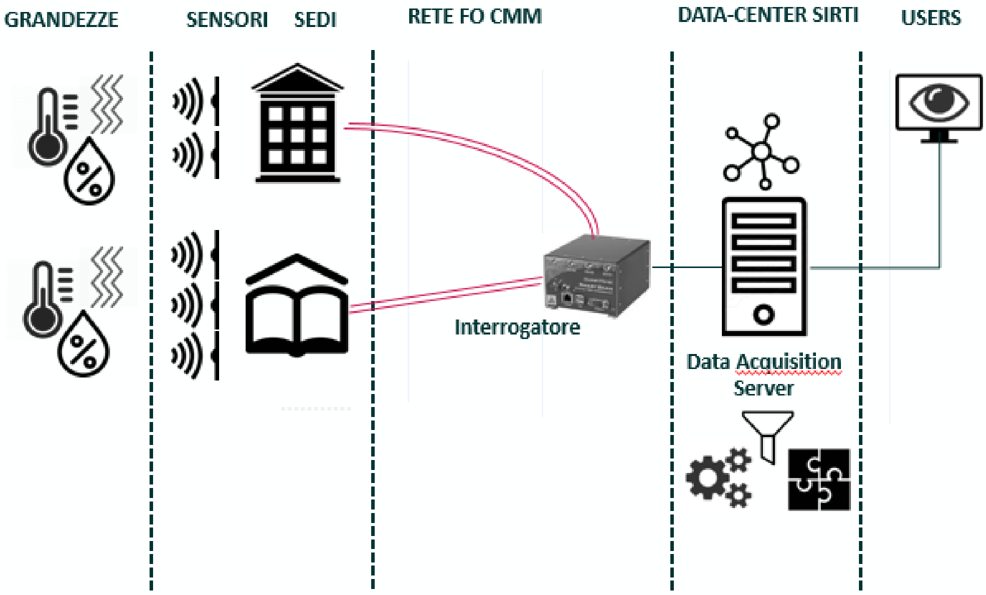

The purpose of the system is to measure the following quantities:

- TEMPERATURE
- DEFORMATION
- HUMIDITY

The collected measures will help to monitor and measure, in an induced manner, the state of health of historical wall frescoes and will contribute in part to produce useful data for a subsequent analysis of the general state of structural integrity of the municipal building.

The use of optical fiber further enhances the fiber network already installed, which is a strategic MCM asset, enabling the supply of high-tech solutions even in locations far from the center of Milan. The optical fiber eliminates the geographical gap and makes it immediately possible to activate solutions for efficiency, infrastructure screening, monitoring, solutions for smart cities and air purification.

The adoption of optical fiber allows to extend the range of measurements acquired with the same installed infrastructure. The fiber optic measurement is carried out by means of Bragg's lattice and bare-fiber sensors.

The elements that make up the proposed solution are:

- Sensorised fiber
- Interrogator
- Data acquisition and transmission and processing module using specialised algorithms.

Figure 3 Tiepolo Room

In order to increase the level of control and protection of Tiepolo's work and, more generally, to demonstrate the effectiveness of the optical fiber in terms of protecting cultural heritage, the installation of 'bare' optical fiber on both sides of the 'fresco in order to constantly measure the level of deformation of the wall that houses the work. After an initial phase of observation and 'learning' of acceptable deformation levels, exceeded thresholds will be activated, which the platform will send alerts to. The bare fiber is transparent, has a smaller diameter than a hair and therefore its visual impact on the wall that houses the work is practically zero.

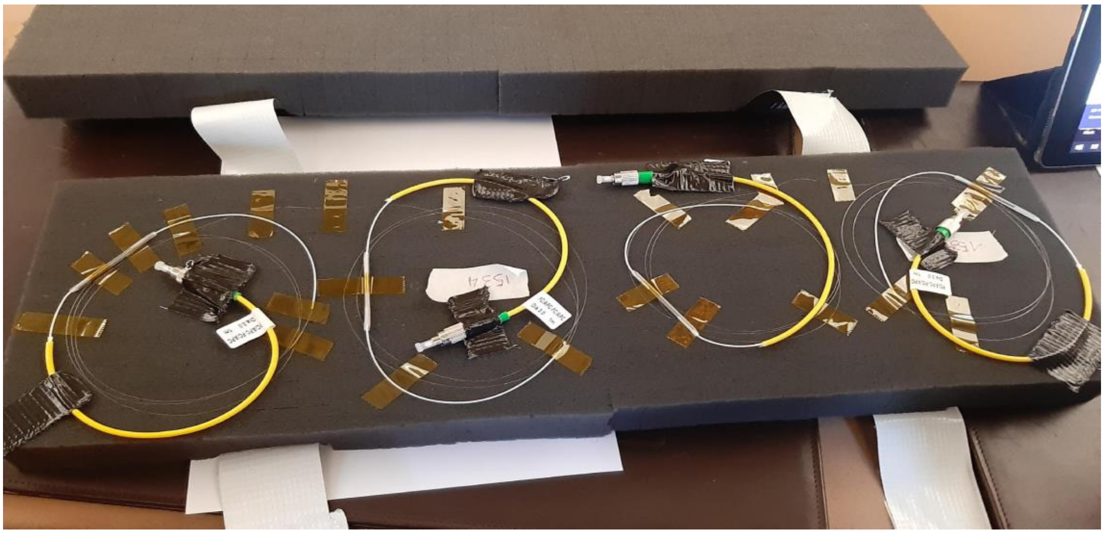

Figure 4 Sensorised fiber

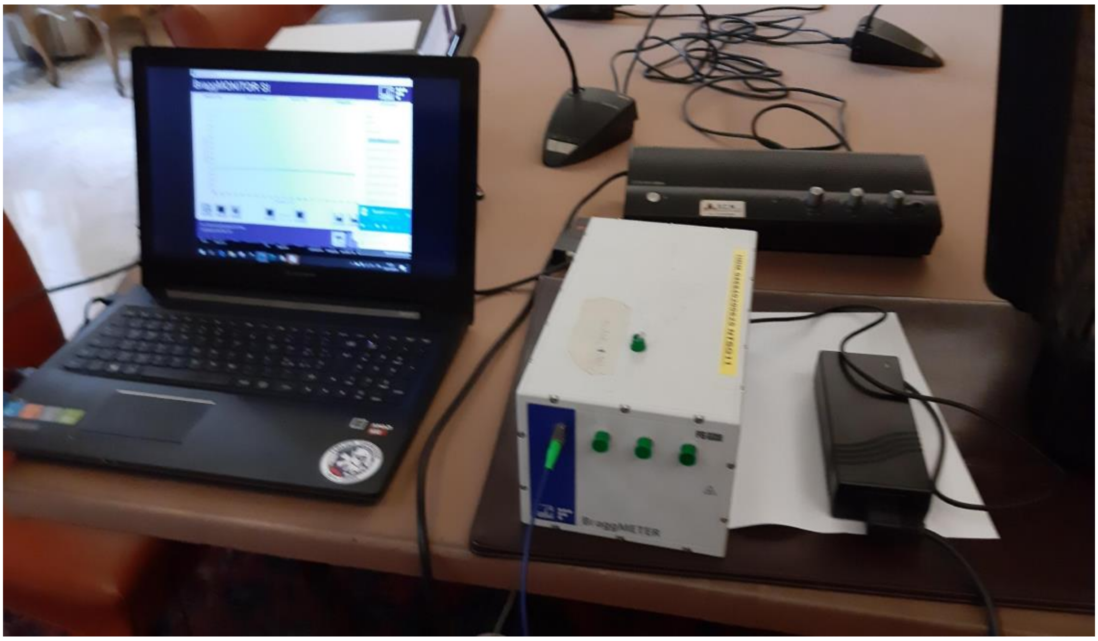

Figure 5 Interrogator

Figure 6 Installation of fiber optic

The same solution was applied in a classroom of the Zappa Higher Institute in Viale Marche - Milan, using MCM connectivity and with the sharing of optical interrogator.

Figure 7 Zappa Higher School

Figure 8 Installation

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Figure 9 Air purifier

4.1 Advantages of optical systems

The use of fiber optic sensors offers significant advantages compared to the use of electrical or digital measuring instruments, as they guarantee:

- high degree of sensitivity and dynamic resolution;
- immunity to interference generated by electromagnetic fields (because they use light signals);
- immunity to corrosion and possibility of use in damp, aquatic and brackish environments;
- heat resistance (up to 800 ° C);
- high intrinsic level of safety (they do not use electricity, do not increase in temperature and do not produce sparks or flames);
- stability over time: absence of zero calibration drift;

- versatility: possibility to measure different sizes;
- multiplexing capability: possibility to install up to 100 sensors of different types in series on a single optical fiber, reducing the number of cables to use;
- minimal intrusion: the reduced dimensions of the optical sensors allow installation in minimal spaces and the insertion of composite materials inside;
- long distance data acquisition: the control unit can be positioned up to 100 km from the object to be monitored, without affecting the accuracy of the measurement;
- reduced maintenance costs.

The adoption of fiber optic systems makes it possible to implement them in an integrated manner:

- monitoring system of the building structure, in real time, at high acquisition speed;
- safety system and protection of the structure and of the people who use it;
- instrument able to test the characteristics of the materials and their geometric shapes;
- tool for specific structure validation;
- control system for deterioration and aging of the work;
- data generation and transfer system using optical fiber.
- system for the detection of quantities to develop and monitor increasingly efficient energy efficiency plans.

4.2 Maintenance

A further strength of the proposed fiber optic system consists in reducing ordinary maintenance costs. Thanks to the use of optical technology, data transmission takes place through the transmission of light signals inside the glass fiber with very low wear coefficient: the deterioration of use of the optical fiber is on a secular scale.

The System needs only extraordinary maintenance service, in case of damage to the fiber cable, caused by external agents, or anomalies in the readings recorded by the sensors (due, in most cases, to failure of the support material to the sensors).

The maintenance required by the System is programmatic, targeted and based on the information recorded by the sensors themselves: it is therefore possible to estimate a considerable overall reduction in the maintenance costs of the System compared to traditional monitoring systems.

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4.3 Technological elements of the FO monitoring system

4.3.1 Strain sensor

The optical deformation sensors are composed of optical strain gauges installed on the surface to be monitored. The sensor is made with only the optical fiber suitably protected or glued on a special transducer (steel base) whose ends are mechanically fixed to the surface (plugs or suitable adhesive).

Guaranteed minimum specifications:

• Full scale: 0.25 mm (real scale of the optical sensor: 0.5 mm)

• Accuracy: 10 ^ -3 mm (Real accuracy of the optical sensor: 2 nm)

• Resolution: 10 ^ -4 mm (Real resolution of the optical sensor: 1 nm)

• Sampling frequency: 1 Hz-1 kHz

• Operativity: H24-365gg

The sensors are connected in series on the same optical fiber in a number varying between 25 and 100 depending on the type of material on which they are installed. Optical deformation sensors do not require electrical power or maintenance; after the first post installation calibration, they work continuously until they are disconnected.

The fiber optic chain to which the deformation sensors are connected (to which other optical sensors can also be connected) is in turn connected to an optical acquisition machine located in the control panel (which can be up to a maximum of of 100 Km from the point of application of the farthest sensor).

The optical acquisition machine is controlled by a computer that analyses the data in real time and sends the alarms to the control operator.

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Figure 10 example of deformation sensor with steel support

4.3.2 Thermal sensor

The FBG thermal sensor consists of a protective stainless-steel tube and is used to measure thermal variations, exploiting the extreme sensitivity to heat typical of optical fiber.

Guaranteed minimum specifications:

• Resolution Temperature 0.1 ° C

• Accuracy Temperature 1.0 ° C

• Operating Temperature -20 ° C / + 80 ° C

• Dimensions 8 * 63 mm

Figure 11 example of Thermal sensor

4.3.3 Optical interrogator

The fiber optic sensors must be connected to an acquisition machine (interrogator) which sends the light beam into the fiber and reads the measurements sent by the sensors.

The acquisition machine is connected to a computer on which the analysis software is installed which sends the processed data and any alarms to the operator. This computer has minimum technical requirements, which are met by any new generation personal computer.

For the configuration described above, different machines are required, below some specifications of a 4-channel sample machine:

- N ° channels 4
- Sampling frequency 500 Hz
- Wavelength range 1510-1590 nm
- Accuracy 2 pm
- Stability 1 pm
- Repeatability 0.5 pm to 1 Hz
- Dynamic 50 dB
- Ethernet network card
- Dimensions 117 mm x 234 mm x 135 mm
- Weight 2 Kg
- Operating temperature 0-50 ° C - humidity 0-80%
- Room temperature -20-70 ° C humidity 0-95%
- Power consumption at 12V 20 W

Figure 12 Interrogator

The fiber optic network that will connect the sensors to each other and to the various acquisition machines has from a backbone in an anti-rodent, multi-fiber armored cable with 16, 32, 64 (other) optical fibers. The armor consists of an external anti-abrasion polyurethane coating and, inside, a protective metal corrugated and kevlar fibers for shooting.

The connection between the backbone and the sensors is made with a single-mode fiber optic cable, fitted with a protective cover with a variable thickness of 2 mm or more, depending on the application environment. The connections between sensors and backbone are protected inside suitably sized junction boxes.

Since the optical system does not carry current but light, it does not require shielding or protection from water or humidity.

4.4 Data processing and correlation system. OF building

Figure 13 Simplified scheme of the "OF" System

The OF system, integrated by Sirti in the solution object of this specific research project, is developed by NTSG (New Tech System Generation), as a tool for measuring 2D and 3D deformations for structures of any shape, material and size, based on technology of optical fibers. The solution has the great advantage of being ready to detect and process high quality data by adopting algorithms and correlation systems scientifically validated and applied to different operational contexts (buildings, viaducts, wind turbines, pipelines, sewers ...). The installed infrastructure (fiber, sensors and interrogator) can be reused on different solutions and research projects that over time show greater adherence to the requirements expressed by the Client.

The OF System allows to determine and monitor the stress state of the structure and to detect parameters such as compression, elongation, curvature, load, torsion, vibration, pressure, displacement, corrosion, inclination, temperature and current levels.

In particular, "OF Building" defines the optimal configuration for monitoring the quantities needed to characterize the stress state of a building, its deformations in space and in the plane, its deterioration over time.

The use of fiber optic sensors, of very small dimensions, allows their installation inside the materials, making them completely integrated with the object to be monitored.

5 Air monitoring and purification

Based on a bioreactor capable of destroying contaminants with minimum energy consumption.

The central element of the solution is an additive based on non-pathogenic, non-genetically modified microorganisms and enzymes in a completely natural formula.

Objectives:

- Improving air quality reduces the need for replacement. And often opening the windows brings further pollution as well as new heat to be dissipated with energy expenditure.
- To measure the benefits in terms of air decontamination and cross-reference all the other measured quantities in order to verify improvements in terms of energy saving beyond the improvements in the quality of life of those who frequent enclosed spaces.

The proposal includes the creation of a mixture of bacteria specifically developed for schools and presented exclusively and for the first time for the project covered by this proposal. An exclusive line developed for the Metropolitan City project and presented that becomes the Italian enabler of this solution on schools. The proposed device will be customized with a graphic that recalls the exclusivity of the project led by Metropolitan city of Milan. The apparatus presented here for the first time.

The proposed technology allows the capture and destruction of all the contaminants in the air without any grain size or type limit. The technology combines the fundamental scientific principles of:

- **CONVECTION**

  A ventilation system is used to move large particulates, over 0.5 microns, which represents approximately 10% of airborne contaminants in indoor environments.

- **ATTRACTION FOR MOLECULAR CHARGE**

  It happens when the air around the bioreactor, electrically charged and rendered neutral by "grounding". It is used as a source of attraction for 90% of particulate contaminants in the air that do not respond to ventilation to capture and destroy contaminants in the air without type or size limitations.

- **NATURAL OXIDATION**

  It happens when the airborne contaminants entering the system are digested and broken down into WATER + CARBON DIOXIDE + ELEMENTARY BASE of the compound in the case of aggregates. The result is cleaner air without the problem of waste disposal. Periodic replacement

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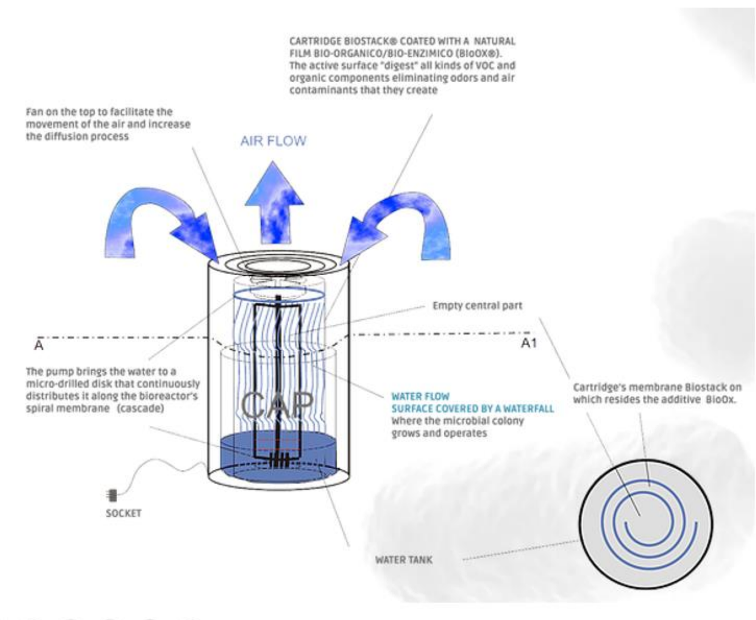
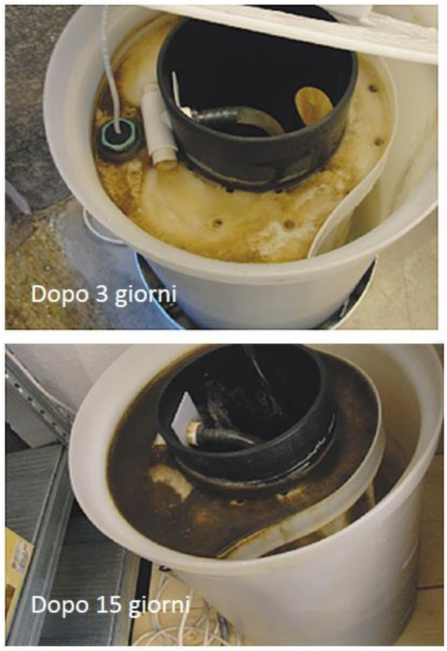
of water and the colony of microorganisms contained in the bioreactor are requested. Very low energy consumption system.

The proposed solution also includes the "U-Monitor" sensor, an all-in-one sensor capable of tracking atmospheric pollution levels every 5 minutes.

The following figure shows, also on a visual level, the quantity of pollutants "trapped" by the u-heart bioreactor.





6 Supply detail

The following table shows the list of quantities foreseen for the specific installation for the two sites envisaged by the project:

Unità	Palazzo Isimbardi - CMM Q.tà	Scuola Superiore Zappa - Qtà	Qtà TOT	Obiettivo	Risultato aspettato
Monitoraggio strutturale in Fibra Ottica					
Interrogatore Ottico (4 Ch, 2,5 kHz)	1		1	Monitoraggio strutturale Sala Tiepolo e area Scuola	Controllo dinamico dell'infrastruttura con segnalazione alert e reportistica
Sensori di temperatura + supporti di ancoraggio, pigtail 3m connettorizzati, cover protettivi, materiali di ancoraggio	2	1	3		
Sensori di deformazione + supporti di ancoraggio, pigtail 3m connettorizzati, cover protettivi, materiali di ancoraggio	3	2	5		
Sensori di deformazione in fibra nuda + pigtail 5m connettorizzati, materiali di ancoraggio	4		4		
Sensori di umidità + supporti di ancoraggio, pigtail 3m connettorizzati, cover protettivi, materiali di ancoraggio	1		1		
Boccole di collegamento + cover protettivi, materiali di ancoraggio	8	7	15		
Fibra ottica di collegamento connettorizzata, materiali di ancoraggio	50	50	100		
Scatole di derivazione, materiali di ancoraggio	1	1	2		
Installazione e messa in esercizio.	1		1		
Calibrazione e tuning per il primo trimestre e report	1		1		
Consumi elettrici					
Energy Meter wifi con driil down dei consumi -	8	5	13	Misurazione automatica dei consumi rispetto agli elementi collegati all'interno di un quadro elettrico	Report consumi energetici real time e storico dei singoli elementi identificati automaticamente
Licenza Software per Energy Meter drill down SAAS + Data + Dashboard (mesi)	12		12		
Installazione e messa in esercizio sistemi oggetto di questa area.	8	5	13		
Qualità Aria					
Purificazione aria basato su Biotecnologia (AirCel)	0	1	1	Abbattimento sostanze inquinanti nell'ambiente dove è posizionato il purificatore	Misura degli elementi ambientali con differenze tra zona trattata e no come evidenza di funzionamento della soluzione
Sensore di Qualità Aria	0	1	1		
manutenzione periodica trimestrale e gestione refill per 30 mesi	1		1		
Installazione e messa in esercizio sistemi oggetto di	0	1	1		
IoT Platform					
Piattaforma di integrazione della sensoristica per elaborazione, presentazione aggregata dei dati ed interfaccia verso moduli esterni.	1		1	Acquisizione ed elaborazione dati con consultazione via web ed utilizzabili da algoritmi esterni	Dashboard di consultazione per tutti gli elementi del progetto ed API per le terza parti
Hosting piattaforma su infrastruttura ICT	12		12		
Servizi di conduzione dei sistemi					
Manutenzione e conduzione operativa dei sistemi	1		1	Operatività della soluzione	Funzionamento garantito nel tempo
Progettazione per progetto innovativo.	1		1	Design di progetto	Documentazione tecnica del

6.1 Sensors and time measurement

6.1.1 Energy consumption (VoltaWare)

POSITIONING

- n. 8 three-phase sensors at the Zappa-Cremona School (4 + 4)
- n. 5 three-phase sensors at Isimbardi Palace
- n. 2 single-phase sensors at Isimbardi Palace

MEASURES

- live energy consumption data every minute
- consumption data disaggregated on the sample of the previous day (lights, refrigeration, etc.) once a day.

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N


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6.2 Structural Analysis (NTSG)

POSITIONING

- n. 2 classrooms (5B and 2E) at the Scuola Zappa-Cremona thus configured:
    - n. 2 deformation sensors
    - n. 1 deformation sensor with thermal sensor
    - n. 1 external temperature sensor
    - n. 1 inclination sensor
- N. 3 halls of Isimbardi Palace thus configured
    - Sala Giunta (Fresco by Tiepolo)
        - n. 1 deformation sensors with thermal sensor
        - n. 1 deformation sensor
        - n. 2 deformation sensors in bare fiber for fresco wall
        - n. 2 temperature sensors in bare fiber for fresco wall
        - n. 1 humidity sensor for fresco wall
    - Presidency Room
        - n. 1 deformation sensor with thermal sensor
        - n. 1 deformation sensor
    - Presidency waiting room
        - n. 1 deformation sensor with thermal sensor
        - n. 1 deformation sensor

MEASURES

- 10 second sampling

6.3 Air quality (U-Earth)

POSITIONING

- n. 2 environmental sensors at the Cremona School (classroom 1F and 3F)

MEASURES

- sampling on 3-hour slots (8 daily slots, from 00 to 02:59, from 03:00 to 05:59, etc.)

7 Conclusion

The project, born to be sustainable, has brought energy efficiency, making users more aware and at the same time increasing the structural safety of buildings and the quality of the air inside them. In order to extend the use of IoT systems to new urban areas it is expected that future investments could be developed thanks to the analysis of the data collected and processed within this pilot project.

The project is to be considered the proof of concept for the future intelligent service projects and it was implemented by involving all stakeholders in the community, as industry, university and civil society, following the Open Innovation model in every single phase implementation of the project.

Urban growth has a lot of challenges to the planning of infrastructure that can meet all citizens' needs. For example some of these challenges are caused by the intensive increase of the number of dwellers, others instead are related to the physical expansion of cities. These challenges could be explained by the United Nations prediction that today round 55% of the world's population lives in urban areas and it is expected that this percentage will rise up to 75% by 2050. For this reason the cities should become larger and more numerous worldwide, with a few exceptions.

With the acceleration of the urbanisation process, the challenges for the future of cities are constantly growing. This project is focusing directly on three of a lot challenges in this trend. In particular, the first is the optimisation of energy consumption, the second is related to the problems of air pollution in urban areas and the last one concerns the safety of buildings to preserve artistic and historical works but also to increase the safety of users of these spaces (as for example, students and teachers of schools and employees of the Metropolitan City of Milan).

On a broader picture, the project is influencing several of different challenges, acting on the sphere of safety, protection and quality of life as a whole.

The results of the project can be considered very positive, the monitoring and energy analysis have allowed the Administration to identify energy-efficient instruments, therefore to plan a replacement in the next years with a view to energy efficiency and economic savings, succeeding at the same time to improve the air quality inside their buildings and infrastructure safety.

The project has made it possible:

- promoting the intelligent and rational use of resources;
- making measurable both the energy efficiency and the environmental sustainability;
- contributing to the redefinition of the energy system value chain;
- reducing the economic and environmental impact of energy systems on public spending.

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8 Future work

This project introduces one of a lot of possible intelligent services to improve the quality of life for citizens of the Metropolitan City of Milan in the 21st century. The activities related to the project should interest a larger population by increasing the understanding and awareness of all the benefits and by reasing the total expectations on the urban lifestyle in the city. It should be built around the strategy with clear short and long term plans for the development of the city.

The Metropolitan City of Milan has a capillary fiber optic network with which it reaches and provides connectivity and digital services to public bodies, schools and road network; this infrastructure will allow to be able to scale and spread the technologies tested in this pilot contributing in this way to the effective and real diffusion of new services based on innovative technology.

Through the transparent involvement of the public sector and citizens as much as possible, using seminars, training, workshops, conferences and other educational programs involving the academic sector, presentations on social media, the Metropolitan City of Milan can identify and make itself proactive for expanded use of the project.

The scale of this action should lead to extend the project to infrastructures and public buildings not yet achieved by optic fiber, particularly the Metropolitan City of Milan could:

- dublicate the structural monitoring, the air purification and the consumption monitoring within the 156 buildings of Secondary Education;
- extend the structural monitoring to road infrastructure, around 200 bridges, managed and reached;
- assess with other public institutions in the metropolitan area as municipalities, healthcare companies, etc., where to bring the digital services of this project.

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