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REGIONE AUTÒNOMA DE SARDIGNA
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Med-EcoSuRe

MED beX.Live webinar

Topic: **How may technology, especially BIM Methodology, accelerate growth and competitiveness in the Building sector?**

Date: **14-07-2020**

Host:

Department of Architecture (DIDA)

University of Florence

DISCLAIMER

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Med-EcoSuRe Project

Project Title	Mediterranean University as Catalyst for Eco-Sustainable Renovation
Project acronym	Med-EcoSuRe
Funding scheme	European Union under the ENI CBC Mediterranean Sea Basin Programme 2014-2020
Start date	September 1st, 2019
Duration	36 months

Med-EcoSuRe is a project funded by the European Union, under the ENI CBC MED programme 2014-2020. The programme is managed by the Autonomous Region of Sardinia (Italy) and aims to promote cross-border cooperation in the Mediterranean region.

The main objective of the project is to propose and implement innovative and eco-sustainable energy renovation solutions for Mediterranean university buildings and introduce an active collaborating approach for decision support, among key actors involved, in the framework of a Living Laboratory: MED beX.Live (Live the eXperience of university building environment).

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1. Target audience

- Managers and technicians from the "Infrastructure and Buildings" departments in universities;
- Key Actors (experts, manufacturers, engineers, architects, etc.) with activities related to energy management in buildings;
- Professors and students interested in the advancements of the digital management of building data related to energy efficiency;
- Energy and Facility managers and technicians of Public Bodies and Municipalities in charge of energy efficiency in public buildings.

2. Addressed Issues

- Objectives and the approach of the Mediterranean Cross Border Living Lab;
- The experience of the Local Living Lab (UNIFI) and the challenges of the pilot project;
- The BIM / Digital Twin application on the pilot sites;
- Monitoring and human comfort;
- Managing energy in university buildings;
- BIM for energy efficiency in the public sector;
- BIM tools and best practices.

3. Invited speakers

- University energy managers and software house representatives.
- The Italian partner of the BEEP project (Istituto per le Tecnologie Applicateai Beni Culturali - ITABC) funded by the European Union, under the ENI CBC MED programme 2014-2020

4. Welcome and Introduction

Presented by Antonella Trombadore – Department of Architecture (DIDA), University of Florence

Antonella Trombadore started the event by welcome all the participants to the third webinar of the MED beX.Live webinar series organized within the Med-EcoSuRe project. In line with the series objectives, the national on-line seminar involves local stakeholders but also twins with international projects financed under the ENI CBC MED programme.

Med-EcoSuRe is a project financed by the ENI CBC MED programme, and addresses the thematic priority of energy efficiency of public buildings, and in particular the evaluation of the integration of innovative renovation strategies, by joining together partners from 5 countries (Italy, Tunisia, Palestine and Spain). Two project partners are based in Italy: the Department of Architecture of the University of Florence (UNIFI-DIDA) and ANEA (Agenzia Napoletana Energia e Ambiente).

Med-EcoSuRe projects aims to turn university buildings into active laboratories where to experiment not only innovative technological solutions, but also the involve end-users, students, researchers, and other actors, such as energy managers which will be a part of the renovation process.

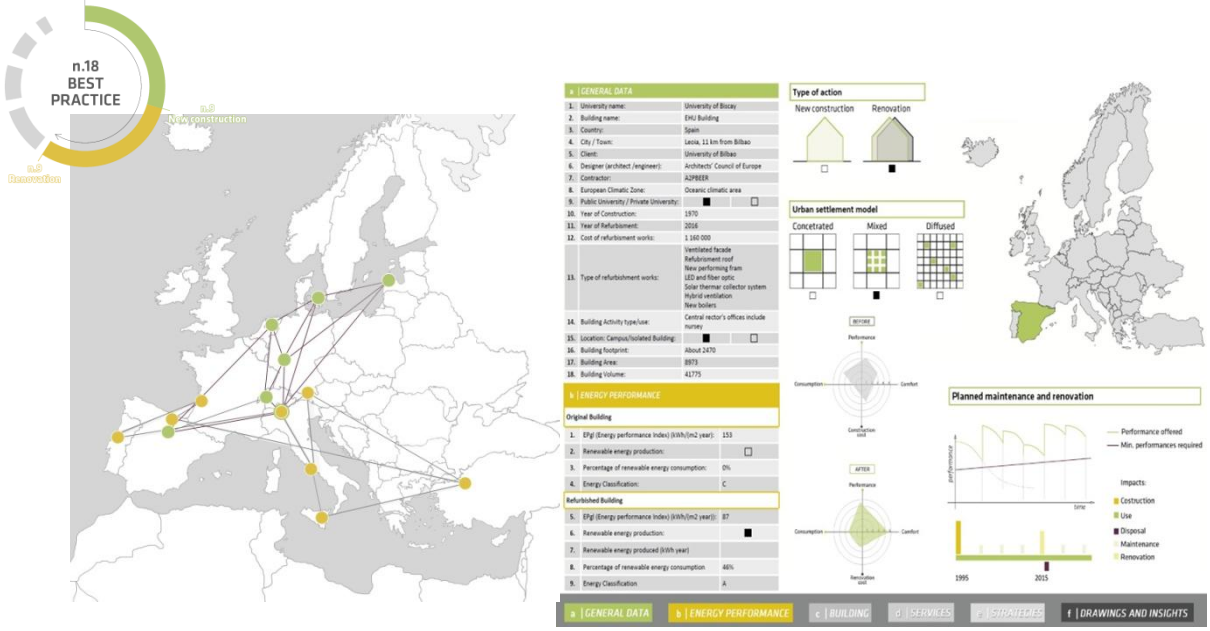
In the framework of the project, a "Living Lab" will be established to propose energy renovation solutions to university energy managers based on decision-support tools that take into account social, economic and environmental aspects.

The Living Lab is structured as follows:

The strategic level, also called the Cross Border Living Lab, will gather partners of the project and stakeholders to collaborate and share knowledge directly with each other to propose and implement the most suitable innovative solutions in university Buildings. The operational level represents the physical/local living labs. In fact, the solutions proposed and validated within the Cross Border Living Lab will be implemented in University Buildings in three countries which are Tunisia, Italy and Palestine.

As a think tank, the Cross-border Living Lab is an international scientific group which works on common objectives exchanging knowledge, methodologies and best practices in order to implement the best solutions adapted to different countries' contexts. The challenge is to create a collaborative approach in an innovative laboratory based on the vitality of the pilot projects. University buildings are the best place for this experimentation, thanks to the active involvement of students, researchers, building/energy managers, companies, and public organizations. Here, innovation activities can be experimented day-by-day not only through constantly monitoring the building performances but also through evaluating the effective comfort of the occupants.

The UNIFI-DIDA Living Lab is analysing case studies of other renovated university buildings, in order to understand the type of interventions, the modalities, the financial schemes, and the facility management (etc…) in Mediterranean climatic conditions.



The produced material on best practices will be part of the Toolkit that operators, technicians and managers in the building and energy field can use to tackle renovation interventions. Beyond quantitative indicators, fundamental to define the baseline, special focus has been placed on the end-user behaviour.

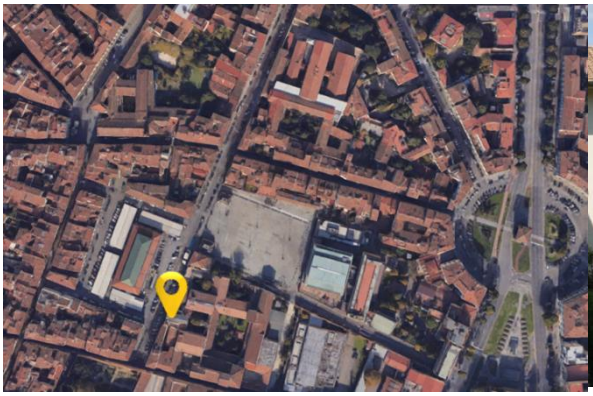
The innovative approach is the creation of the Digital Twin of the physical buildings, in order to analyse, in a virtual way, the real performances but also the performances in improved scenarios, through simulations. As a copy of the real building, the Digital Twin is a virtual model where to experiment and test solutions, evaluating step by step costs, performances or the levels of integrability (fundamental in the Santa Verdiana pilot case, which is a historical building in the city centre of Florence), but also the end-users feedbacks, since the pilot building isat a university.

5. The challenge of Santa Verdiana Pilot building

Presented by Antonella Trombadore – Department of Architecture (DIDA), University of Florence

The complex of Santa Verdiana, at the School of Architecture of the University of Florence, was a former convent and prison, object of transformations over the centuries. The most characterising elements of the building complex are the cloisters. The selected pilot is a building

block facing, on a side the main cloister, and on the other a new building prospecting to Piazza Annigoni, where the main entrance to the School of Architecture will be placed.



The pilot building is physically equipped with sensors measuring ambient parameters and human presence and, is modelled with the BIM methodology, with the objective to observe the deviation between the simulated and real building.

Selected spaces are representative of the didactic space in terms of environmental quality, based on perceptive comfort (visual, thermohygrometric, acoustic, etc...), necessary to calibrate technological strategies and improvement solutions.

The UNIFI-DIDA Living Lab is working on the real building renovation and, combined with the Digital Twin, on a virtual model to enable the dialogue between the real and virtual buildings, because data from the real building have to enrich the digital model and the digital model has to help creating improvement's scenarios. Thus, a decision-making tool is being developed for administrations and public technical offices (e.g. universities) to understand which solutions are more suitable for the specific context.

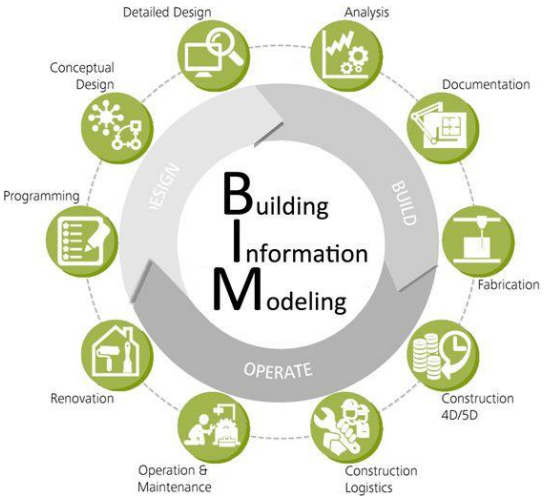
The setting of the Local Living Lab within the Med-EcoSuRe project corresponded to the launch

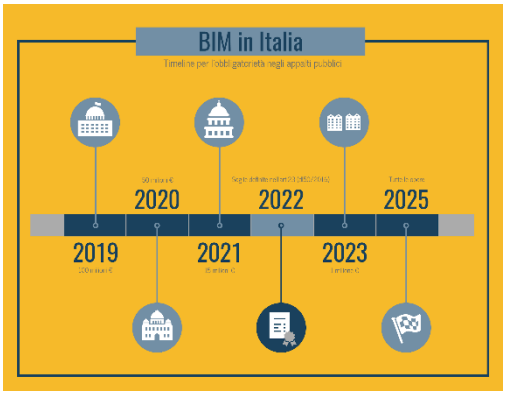
of a new laboratory (DIDA lab) which joins researchers in architecture and engineering in an interdepartmental and interdisciplinary research on the topics. Information work-flow (BIM/Digital twin) for the energy performance evaluation of buildings.

Presented by Juan Camilo Olano, Gisella Calcagno, Marco Paolini– Department of Architecture (DIDA), University of Florence

The main activities of the new laboratory, near the Santa Verdiana's pilot project, are the energy aspects of the building renovation, and the digital aspects related to the processes of organization of the buildings' information.

European Union Directives are guiding the energy efficiency of public buildings, but are also referring to digital tools and models for the management of the information related to the buildings. From the national point of view, the latest Italian normative on public procurement (D. Lgs. 50/2016) introduced the use of electronic tools in the public construction sector, with the Ministerial Decree 560/2017 establishing the adoption of BIM methodology for public works since 2019.





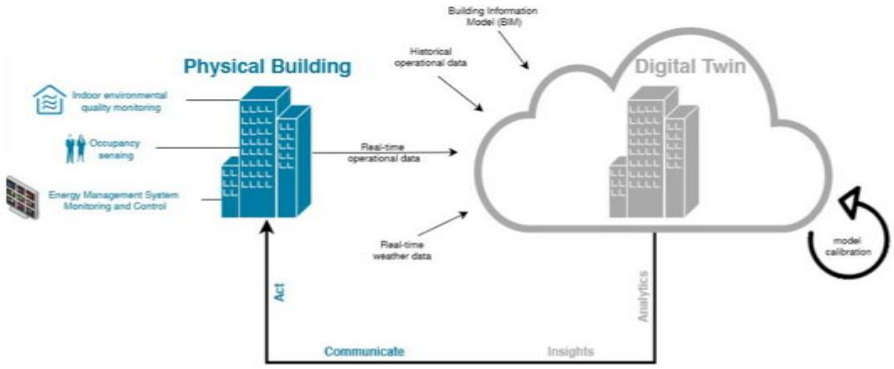
The main reason behind this evolution is that Public Administrations do not have an actual knowledge on the building existing stock, and do not have also the right tools to monitor the status of the buildings along the entire lifecycle which enables to have a clear understanding of the building in its totality.

The main intention of the Living Lab is to reunite stakeholders for the development of a tool to improve the university building and its energy use towards better performances.

The survey does not regard only the geometrical aspect (i.e. cloud point), but also the energy-related data, which need to be incorporated in the BIM model. Having a clear idea of the quantity, quality and development level of the information is the basis for the definition of

processes, from the survey to the production of the digital model of the building as-it-is, where to start with tests and simulations on the real building performances.

The first specific objective of the BIM model construction is the development and capitalization of a specific know-how for the design and construction of energy renovations in university buildings. The final objective is to create a tool to support the decision-makers and energy managers to assure a sustainable refurbishment of existing buildings through the use of Digital Twins. The Digital Twin in fact, beyond the static building information, can be enriched with information coming from IoT (Internet of Things), which is exploited to monitor the pilot building, not only during the project phase but also for the future operations and along all the building lifecycle.



The most important part of the process is the quality of the information retrieved and modelled, and their standardization, that is not a tightening of the process, but the only way to have clear and precise process: know exactly what is the level of information required, how data are retrieved and modelled or how to strategically use them in the simulations.

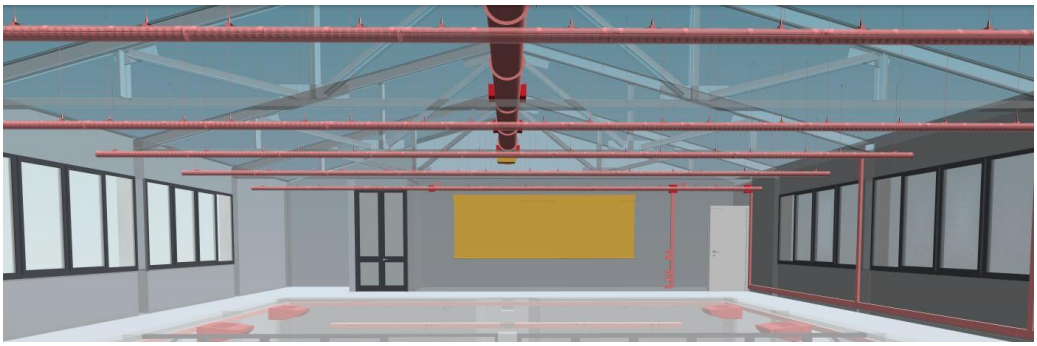
Moreover, if a monitoring system is installed, there is also the possibility to understand if data in the model are correct or incorrect, which enables to calibrate the model. The advantage is to test different strategies through simulations (e.g. envelope refurbishment, technical systems upgrading or integration of renewable energy systems), in order to identify the best cost-effective solutions. There are a lot of aspects to evaluate with the digital tools, in a relatively low-cost manner.

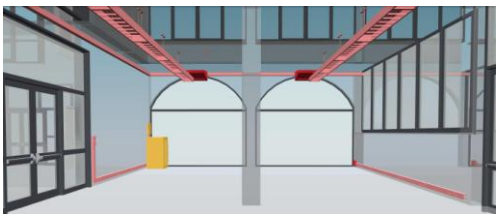
The installation of the sensor system in the pilot building aims to evaluate different categories of data, from climatic, to environmental, to the end-users comfort. When the renovation works are achieved, the pilot building will maintain the monitoring system, and it will be linked with the BIM model, in order to have a bidirectional enrichment of data between what the previous state of the building, how it was designed and what it is really happening in the renovated building.

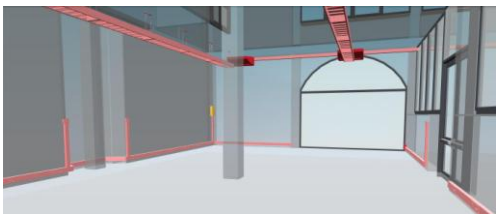
In the implemented process, there is a strong consideration of the end-user behaviour because it can alter the parameters set in the design phase during the operational use. Buildings do not consume energy, but people do. It is fundamental to understand the users' dynamics in order to implement education by sustainable design.

The digital model is under development, both in its geometrical and informative parts. The objective of this experimentation is to define a process for the creation of the digital model of a

public building, in order to provide clear guidelines to develop models that will support both the designer and the owner/facility manager to take decisions, looking at absolutely clear and specific parameters and while having a user friendly tool.







6. Monitoring protocol and human comfort in buildings

Presented by Carla Balocco, Maurizio De Lucia, Giacomo Pierucci – Department of Industrial Engineering (DIEF), University of Florence

Due to the Covid-19 emergency state, the necessity of hygiene and security appears to widen the gap between the building-plant systems, isolating the technical systems from the thermo physics of the building. The constant use of the technical plants requires instead an even more continuous and dynamic control, monitoring and regulation, as basis for awareness and energy savings. This new situation is giving impulse to the Digital Twin approaches and to the importance of monitoring, to reach both the sanitary roles and the sustainability objectives.

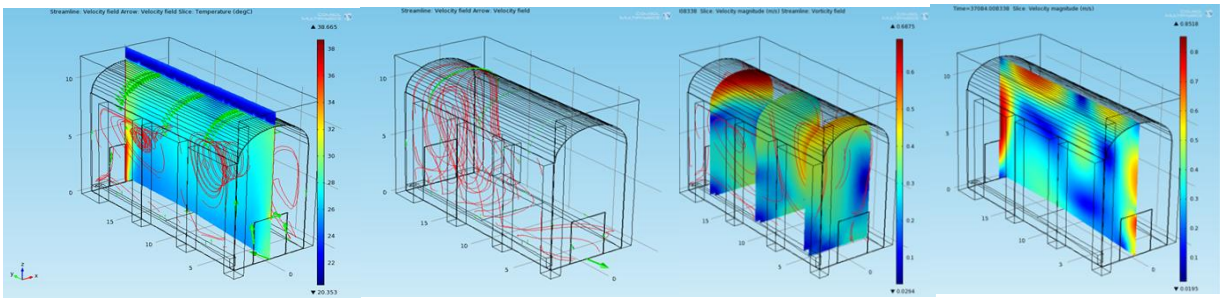
Beyond an optimal regulation of the technical systems, it is fundamental to provide occupants who use the buildings with guidelines and protocols. An optimal design can in fact identify if the behaviour occupants is incorrect.

Different case studies testify the efficacy of monitoring to sustain better strategies for the improvement of building energy performances and environmental quality.

1) Sede del Calcio Storico Fiorentino - Florence

The building was modelled with data retrieved by a dynamic survey, which took into account the accesses and the uses of the spaces, and this allowed to reach not only energy savings, but also adaptivity, reversibility and acclimatisation, with the technical system that adapts itself to the thermophysical answer of the occupied building.

2) Santa Maria Nuova Hospital – Florence



In this case, the micro-climatic monitoring concerned both the entrance with the first aid area and the surgery rooms. Here, a regulated control of the sliding doors allowed energy savings of 70%, considering that in a 30minutes surgery, doors are opened 90 times. The behaviour highly influences the use of the technical plants system. For this reason, it is fundamental to have a continuous control of the building in function of the occupants' use.

3) Biblioteca Palatina – Parma

In this case, the integration of a continuous monitoring allowed to find new solutions for the delicate operations needed to preserve the historical books in the archive. For example, it was possible to keep track of the aerial bacterial composition, in order to define better behaviours of the operators.

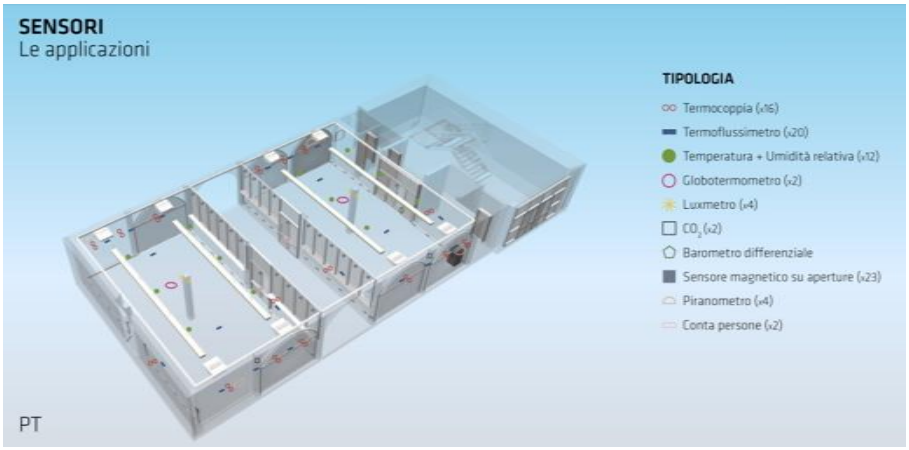
4) Opificio delle Pietre Dure – Firenze

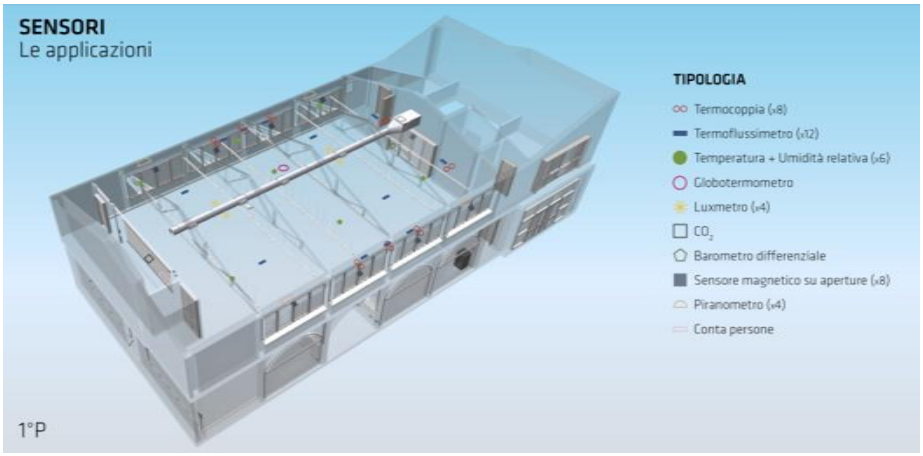
Another interesting case study was the restoration of the painting "L'UltimaCena" by Giorgio Vasari. The objective was to continuously monitor the level of illumination in relation to the visual health of the restorer. The results of the experimentation lead to the definition of a protocol for the health, hygiene and visual ergonomics of the restorer, due to the hard-visualtask in presence of laser lamps.

Focusing on the Med-EcoSuRe Living Lab, the monitoring process requires defining the measurements, the data workflow, the information to obtain and the importance of detailing this information in an appropriate manner.

The pilot monitoring has the aim to understand how the building works, how dynamics take place and how actions can influence them with the objective of achieving energy efficiency and environmental quality. For this reason, best practices are adopted to set the measurement system, to define the facility management and how the building is used; the idea is to replicate the procedure in different buildings. Data retrieved from the monitoring will be elaborated and transformed into information to calibrate the BIM model and to simulate intervention scenarios.

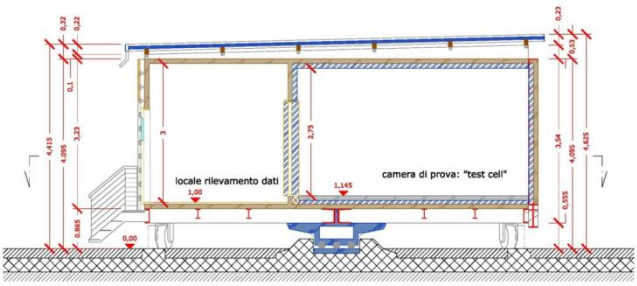
The monitoring systemin the three selected rooms comprises more than one hundred sensors.





The research works were carried out in the framework the project Abitare Mediterraneo, and within the Department of Architecture, which led to the realization of the Test-Cell laboratory, a rotating and monitored box intended to test different building solutions with dynamic measurement.

Another case of application was the dynamic monitoring system installed in the new wooden buildings realized by Casa S.p.A. in the complex ex-Longinotti (Florence). Sensors were installed in two apartments in order to take track of the occupants' behaviour. After some years, it is



possible to have very detailed data, with a clear idea of what happens in the apartments and what is the contribution of occupants.

To make monitored data useful also for non-technical operators, and in particular the users themselves, they need to be aggregated. It derives the need to realise user-friendly platforms, able to educate the end-users towards a virtuous behaviour. One of these platforms has been realized by the Department of Information Engineering (University of Florence), called Snap4city.

7. BIM for energy efficiency in the public sector

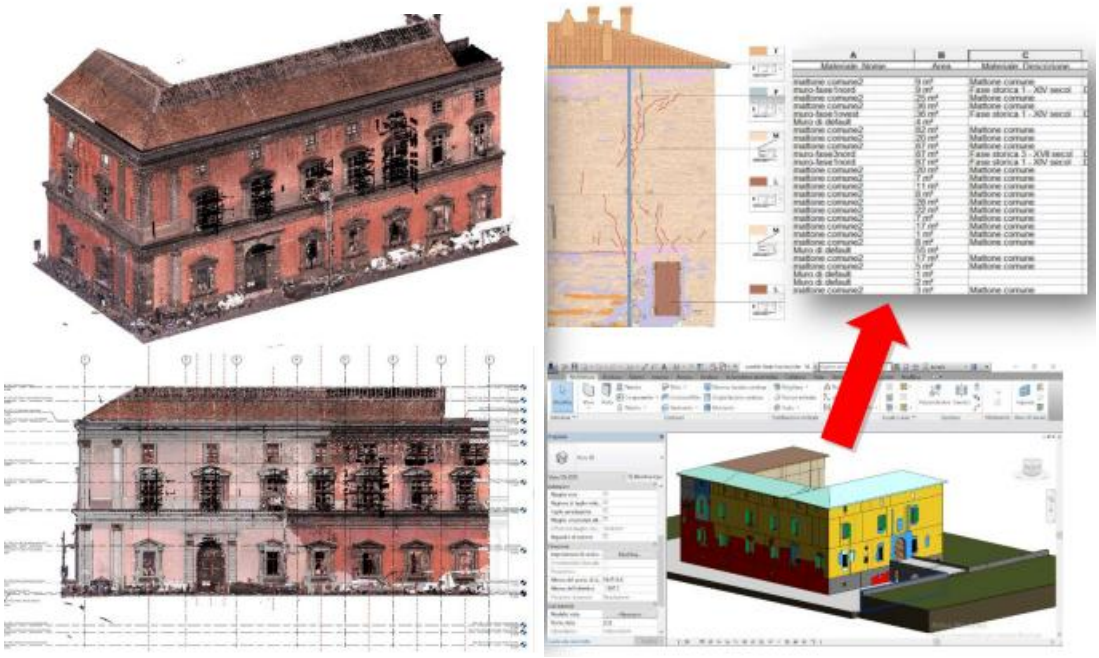
Presented by Elena Gigliarelli (BEEP project) – Istituto per le Tecnologie Applicate ai Beni Culturali (ITABC)

The BEEP project is coordinated by the Institute of Cultural Heritage Sciences (ISPC) of the CNR (National Research Council of Italy), and in particular by the Built Heritage Innovation Lab, a laboratory that works on the built environments with traditional and innovative approaches on the following themes:

1) Diagnostics and protection of the built environment, analysis of architectural, structural and functional characteristics of buildings;
2) Environmental analyses, energy up-grading and technological adjustments;
3) Heritage BIM for the management of data on diagnostics, geometry, energy, plants systems, structure, functions and conservation status of the built environment;
4) Innovative design and multimedia exhibition for museums and archaeological sites.

The BEEP project proposed to combine in an integrated process the use of new technologies, such as BIM, and the innovative financial models to improve the energy performances of heritage public buildings in the Mediterranean Area. The consortium is composed of 8 partners from in Italy, Spain, Cyprus, Lebanon, Palestine, Jordan and Egypt.

Heritage buildings are very important, due to the great history of the built environment: here, the problem is how to match energy efficiency needs with historical conservation. Yet, it has to be noted that historical buildings are more performing that the ones constructed between the II World War and the introduction of building standards for energy efficiency, because of their big thermal masses, natural ventilation, genius loci and sometimes very efficient bioclimatic systems. During the last years, it has been established, in the field, that energy efficiency is a strategy for the protection of the cultural heritage.



The HBIM (Historic Building Information Modelling) is a promising research field, thanks to the possibility to manage the big quantity of data for this kind of interventions, in order to carryout simulations for studying the building behaviour under different conditions.

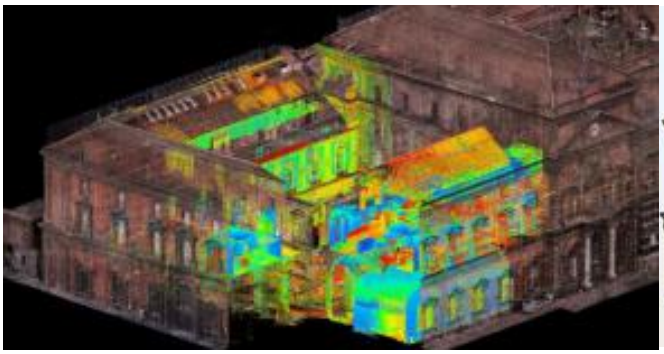
The most important elements in the HBIM are the modelling and the information: the first is fundamental for historical buildings, because of the unique architectonical elements, the latter permits to reunite under the same model all the needed data, also from diagnostic analyses.

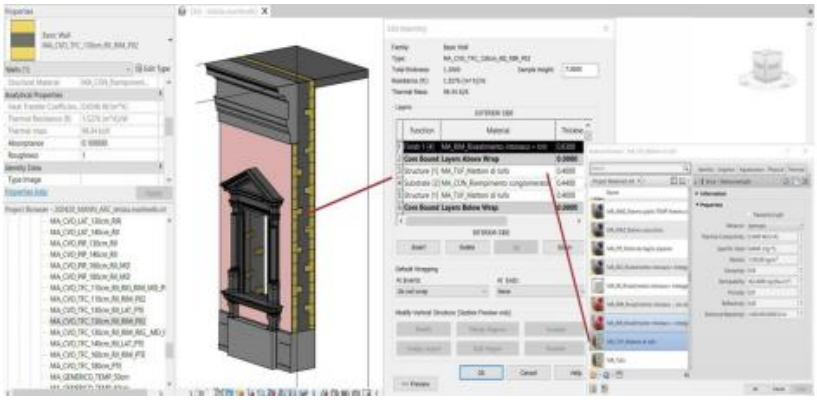
Another theme is the management of very complex buildings, usually dedicated for other functions, in which end-users play a predominant role, which has been changing since this pandemic period started (e.g. limited accesses or physical distancing).

A case study on this topic is the Archaeological Museum of Naples, where BIM has been adopted by facility managers for the environmental monitoring, supported by the use of IoT.

Using BIM for historical buildings requires very accurate surveys, such as laser scanner techniques, with the point cloud used for a detailed modelling of the architectural elements. It should be noted that the construction of the BIM model requires, beyond the representation, a deep critical analysis and data comparison to reach a realistic simulation of the building decay in time. The parametric modelling is used with a compromise between the real status and the adaptability: for example, specific elements (e.g. Corinthian capitals) are being modelled without parameterisation, while repetitive elements (e.g. windows) are parameterised and then singularly adapted to the specific shape. Moreover, BIM methodology offers the possibility to insert historical phases: for each phase, it is possible to attach all the related documentation (e.g. cartography, images or texts). Another strategic BIM feature is the possibility to create a Common Data Environment, in order to archive all the data and information in a univocal and

clear way, in order to manage the team roles and to keep track of the required information.





Returning to the BEEP project, the BIM methodology has been combined with the financial aspects, and in particular with the adoption of Energy Performances Contracts, intended to stimulate the intervention of private Escos in the renovation of public buildings.

At the actual state of implementation, the BEEP project is now working on the energy analyses, based on a series of measurements and monitoring, which also took into account the role of the end-users (questionnaires), which will be provided with specific guidelines.

It is noteworthy that energy simulations are not largely used for historical buildings, due to the high uncertainty deriving from irregular geometries and the overlapping of the stratigraphy along the different historical phases.

The passage from the BIM model (Revit) to the energy simulation has been approached using the open standard developed by Building Smart (IFC). The energy modelling has been conducted with Lady Bug and Honeybee, passing by Rhinocheros/Grasshopper. In order to make the procedure accessible for Public Administrations, a simplified dynamic simulation has been used (Termolog – Logical Soft).

8. The building stock of University of Florence

Presented by Giovanni Falqui – Ufficio Tecnico, University of Florence

The University of Florence has a very large building stock, consisting of 183 buildings, placed in 8 municipalities, for a total of 633.849m^2. The management of such facilities is not computerized.

Many of UNIFI buildings are placed in the historical centre of Florence, but they lack a complete building documentation; here, the management is very difficult, also due to the constraints deriving from their historical value. Two recent university hubs (Novoli and Sesto Fiorentino) are better described in the project documentations, and so the facility management is easier.

Existing building data are collected within a platform (Infocad), such as planimetries, images, functional distributions, but they only refer to the patrimonial aspects (e.g. ownership, building expense or waste taxes), that is completed. The main gap is the lack of a dynamic management of the building data in order to foresee and program the ordinary and extra-ordinary maintenance, which should be overcome by the means of the BIM methodology and should represent an enormous advantage for the management.

For the past years, the Ufficio Tecnico has been working on the digitalisation of the buildings' paper archives, a documentation that should be integrated in future BIM models. An important activity is the population of assets, already done for the thermal part: the idea is to extend the analysis to all the assets, with the adoption of the BIM technology.

The University of Florence is realizing a new university hub in Sesto Fiorentino (in the North area of Florence), that will host the Department of Agriculture, Food, Environment and Forestry. The very big complex, composed by several buildings, is the first UNIFI building with a BIM model (actually in the design phase), and this appears very promising for the future facility's management.

9. Energy management and Energy Performances Contract

Presented by Valentina Coccia – Consorzio Energia Toscana

The Consorzio Energia Toscana (CET) was established in 2003, promoted by Regione Toscana and with the impulse of the Department of Electric System and Automation of the University of Pisa. CET is composed by public entities only, 91 direct and 109 indirect partners, and is a certified society, according to ISO. Its mission is to assist partners in the purchase of electric energy and gas in the free market, optimized thanks to the aggregation of the demand.

The support activities are carried out through a centralized system, thanks to the developed software WOM, and they range from different levels of evaluation of the energy efficiency to the specific activity of energy management, provided to some partners.

The figure of the energy manager was launched with the law 10/1991, where the article 19 stated its presence for the major energy subscriptions in all the productive sectors. Its main function is to prepare energy balances and support decisions for a rational energy use. Energy managers, internal or external to the public entity, are compulsory in the basis of energy thresholds and are nominated by the FIRE (Italian Federation for the Rational use of Energy). According to the FIRE, in 2018 in Italy, there were 2353 energy managers, 1589 of them with obligation.

The main activities carried out by the CET are the following:

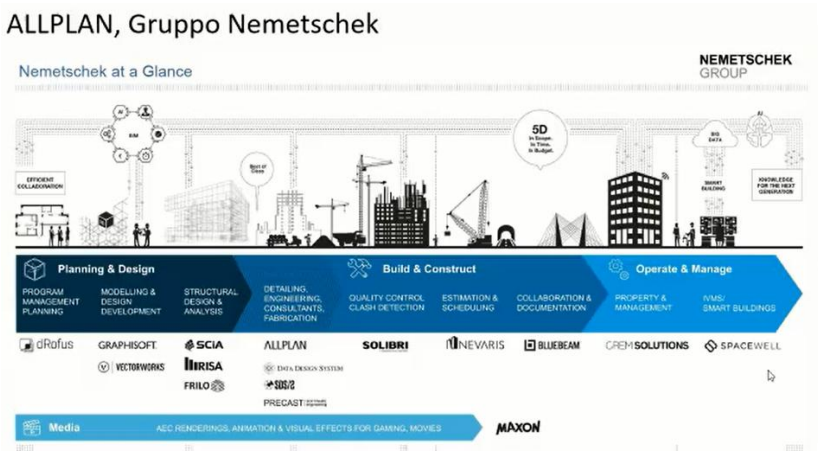
1- Fulfilment of the obligations deriving from the Law 10/1991 (Rules for the implementation of the National Energy Plan regarding the national use of energy, energy saving and the development of renewable energy sources);
2- Analysis of consumptions;
3- Reconstruction and check of the consumptions;
4- Individualization of consumption for each building;
5- Benchmarking, energy comparison between the different sites in order to prioritize interventions;

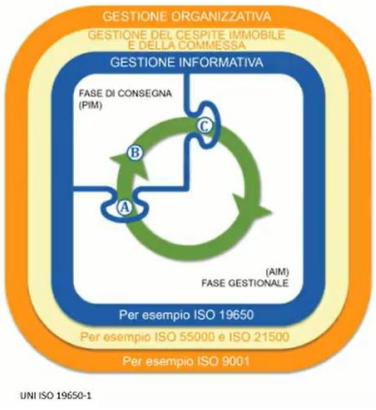
6- Identification of the improvement interventions;
7- Policies for energy savings and use of renewable systems;
8- Evaluation of tools for incentive and promotion;
9- Educational project to raise awareness on the energy savings.

10. BIM tools and best practices

Presented by Flavio Andreatta – All Plan Italia

All Plan company is part of the Nemetchek Group, and its challenge related to the digitalization of buildings is to work across all the building lifecycle.





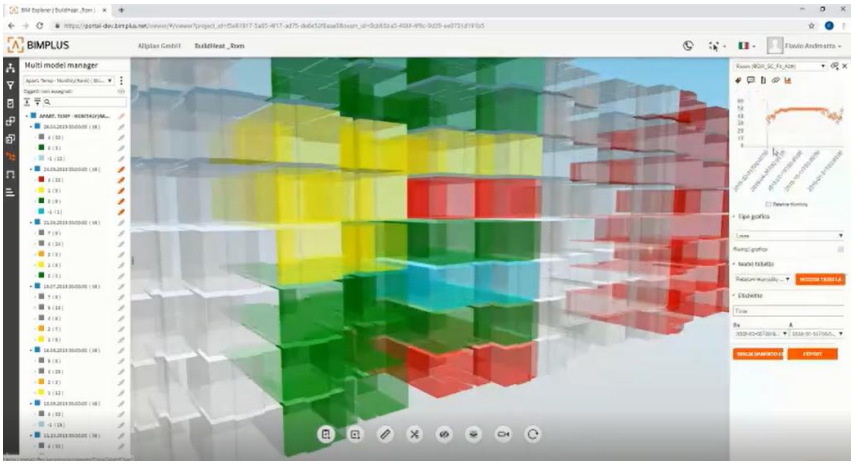
The main developed software within the company is BIM authoring (others are for coordination) and they manage data according to UNI ISO 19650-1, from the design to operational phase.

For existing buildings, BIM intervenes at least in four activities:

- Survey (laser scanner and cloud point);
- BIM authoring;
- Intervention and improvements (BIM authoring);
- Monitoring (IoT and sensors)

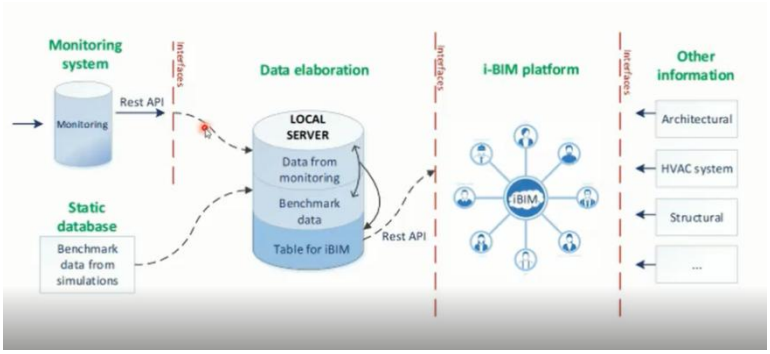
All Plan performed different case studies in this regard, such us the project BuildHeat that has pilot buildings in all the Europe.

Project results were simplified BIM models, navigable in space and time, in a common data environment, which builds a basis for the design in an easy interface. The modelling followed the subdivision in flats, staircases and buildings, in order to aggregate data.



Thanks to the data infrastructure, and to interoperability deriving from the open standard, it was possible to have, from one side the monitoring data and, from the other, the benchmark data, elaborated and integrated in a shared platform, BIM- transparent.

The application of BIM with specific objectives aims to integrate different data in a shared platform that allows to aggregate data and so even more focused analyses.



11. Debate and conclusions

Working on building's survey Prof. Puma (University of Florence) intervenes to appreciate the webinar and to underline the challenges of HBIM in the field. Prof. Gigliarelli answered proposing even stronger collaboration schemes to support the experimentation with digital technologies. Finally, Prof. Trombadore thanked all the participants and invited them to improve the collaboration for the future research.

ANNEXES

1. Agenda

2. Webinar News

http://www.enicbcmed.eu/med-ecosure-oragnises-series-webinars-launch-its-bexlive-ll

http://www.enicbcmed.eu/third-med-ecosure-webinar-series-med-bexlive-living-lab

3. Registered Participants

Full Name	Organisation	Position within the organisation	Country
Marco Paolini	University of Florence	Architect	Italy
Aicha Ben Smida	Mediterranean Renewable Energy Centre (MEDREC)	Technical expert	Tunisia
Aida Darghouth Asli	JTS / ENI CBC Med	Officer	Tunisia
Alia Ben Ayed	Ecole Nationale d'Architecture et d'Urbanisme Tunis	Professor	Tunisia
Andrea Palumbo	Consorzio Energia Toscana	Collaborator	Italy
Antonella Trombadore	University of Florence	Professor	Italy
Antonella Violano	Università della Campania "L. Vanvitelli"	Professor	Italy
Carla Balocco	University of Florence	Professor	Italy
Elena Gigliarelli	Institute for cultural heritage science (ISPC)	Researcher	Italy
Elisa Belardi	University of Florence	PhDstudent	Italy
Filippo Calcerano	Institute for cultural heritage science (ISPC)	Researcher	Italy
Flavio Andreatta	All Plan Italia	Consultant	Italy
Giacomo Pierucci	University of Florence	Researcher	Italy
Giovanni Falchi	University of Florence	Technicalofficer	Italy
JingRuan	University of Florence	PhDstudent	Italy
Juan Camilo Olano	University of Florence	BIM specialist	Italy
Leo Lorenzi	Institute for cultural heritage science (ISPC)	Researcher	Italy
Lorena Di Ianni	University of Florence	Student	Italy
Marco Quarta	University of Florence	Technicalofficer	Italy
Margherita Vicario	University of Florence	PhDstudent	Italy
Min Zhou	University of Florence	PhDstudent	Italy
Nicola Barbato	ANEA	Project Manager	Italy
Paola Gallo	University of Florence	Professor of Architecture	Italy

Paola Puma	University of Florence	Professor	Italy
Rosa Romano	University of Florence	Professor	Italy
Shuang Liang	University of Florence	Student	Italy-china
Souha Ferchichi	Mediterranean Renewable Energy Centre (MEDREC)	Technical expert	Tunisia
Valentina Coccia	Consorzio Energia Toscana	Technical expert	Italy
Giovanni Freschetti Muzio	University of Florence	PhDstudent	Italy
Gisella Calcagno	University of Florence	Post doc	Italy
Giulia Lazzari	University of Florence	PhDstudent	Italy
Grazia Viciconte	Self-employed	Architect	Italy
Giovanni Falchi	University of Florence	Technicalofficer	Italy
Monica Cannaviello	Universitàdella Campania "L. Vanvitelli"	Professor	Italy

4. Presentations

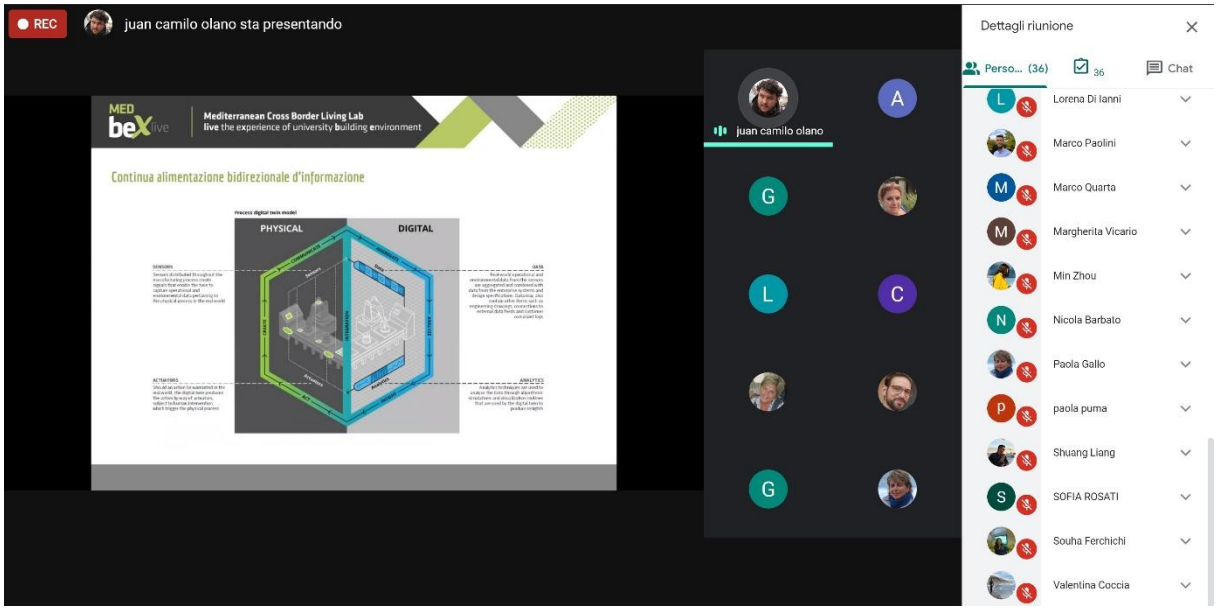
https://drive.google.com/drive/folders/1tRjOQWj_oW22x4ZifXvTkeVlsTOYvA9j?usp=sharing

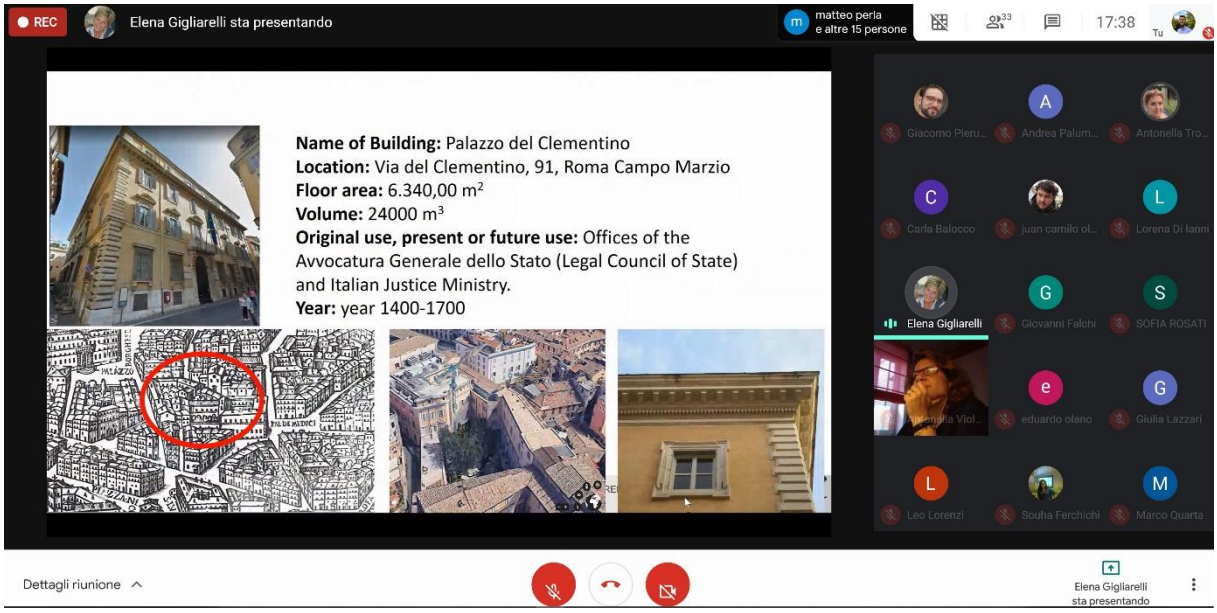
5. Recording of the webinar

https://drive.google.com/file/d/1ylAPVkDLyl0rL6C7wSmpXih9regUVz_x/view?usp=sharing

6. Photos

Med-EcoSuRe


REC
juan camilo olano sta presentando
MED beX live
Mediterranean Cross Border Living Lab
live the experience of university building environment
Continua alimentazione bidirezionale d'informazione
PHYSICAL
DIGITAL
Dettagli riunione
Perso... (36)
Chat
Lorena Di Ianni
Marco Paolini
Marco Quarta
Margherita Vicario
Min Zhou
Nicola Barbato
Paola Gallo
paola puma
Shuang Liang
SOFIA ROSATI
Souha Ferchichi
Valentina Coccia


REC
Elena Gigliarelli sta presentando
matteo perla e altre 15 persone
17:38
Name of Building: Palazzo del Clementino
Location: Via del Clementino, 91, Roma Campo Marzio
Floor area: 6.340,00 m²
Volume: 24000 m³
Original use, present or future use: Offices of the Avvocatura Generale dello Stato (Legal Council of State) and Italian Justice Ministry.
Year: year 1400-1700
Elena Gigliarelli
Dettagli riunione
Elena Gigliarelli sta presentando