B.SuRe

Building SUstainable REuse

A MULTIDISCIPLINARY AND MULTISCALE EDUCATIONAL APPROACH
FOR SUSTAINABLE CITIES AND COMMUNITIES
International Winter School 2022
BOOK OF ABSTRACTS

Volume 1

edited by
Marco Morandotti

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Via Salasco, 5- 20136 Milano
Tel. 02/5836.5751- Fax 02/5836.5753
egea.edizioni@unibocconi.it
www.egeaeditore.it

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B.SuRe

Building SUstainable REuse

A MULTIDISCIPLINARY AND MULTISCALE EDUCATIONAL APPROACH FOR SUSTAINABLE CITIES AND COMMUNITIES

The volume consists of a collection of contributions from the International Winter School "*B.SuRe. Building Sustainable REuse*". The event, organized by the experimental laboratory of research and didactics STEP Lab. and PLAY Lab. of DICAr - Department of Civil Engineering and Architecture of University of Pavia, promotes the themes of sustainable methods of management and maintenance of building assets and the development of innovative solutions for the production of images and the construction of virtual architectures and environments.

The The Winter School has provide the contribution of external experts to promote the development of different knowledge and skills among Students, Researchers and Professors with international experience, supporting the educational program of the School with Open Lectures held by Partnership Expert Researchers and Invited Lecturers.

University of Pavia Organizer: Prof. Marco Morandotti

Winter School Organizing Secretariat: Elisabetta Doria, Alexa Spigolon- University of Pavia

UNIVERSITÀ DI PAVIA

DIPARTIMENTO INGEGNERIA CIVILE ARCHITETTURA DICAr

STEP

STEP Laboratory- UniPv

Scienza e Tecnica per L'edilizia e la Progettazione

PLAY

Photography and 3D Laser for virtual Architecture LaboratorY

PLAY Laboratory- UniPv

Photography and 3D Laser for visual Architecture Laboratory

This volume collects the synthesis of the research products presented by different international authors in the Winter School funded and promoted by the University of Pavia "*B.SuRe: Building SUstainable REuse*". The school was held virtually on 24/25 February - 02/03/04 March 2022 for international MSC students of degree course in Building Engineering and Architecture, Civil Engineering and Faculty of Architecture and students of Doctoral Schools.

B.SuRe Winter School is part of EC2U activities for students. The main aim of the School is to trigger processes of exchange and experimentation between students and scholars of different disciplines, focused on the field of building and urban sustainability, with reference to the intervention on historic cities and building heritage.

The School aims to establish the initial nucleus of a community of researchers who share the same interest in the subject according to interdisciplinary and complementary approaches and skills. Sustainable management of built heritage is a priority that cannot be postponed on a global scale. Existing and foreseen policy plans and targets of UE in the Sustainable development area will imply the need of a huge amount of experts with green competencies and skills.

The United Nations Sustainable Development Goal (UNSDG) 11 "*Sustainable Cities and Communities*" is assumed in this Winter School as one of the reference topics for the development of appropriate national and supranational policies.

The European Campus of City-Universities (EC2U) is a multi-cultural and multi-lingual Alliance consisting of seven long-standing, education and research, locally and globally engaged universities from four diverse regions of the European Union.

EC2U ALLIANCE
THE EUROPEAN CAMPUS
OF CITY-UNIVERSITIES

1290 UNIVERSIDADE D COIMBRA
UNIVERSITATEA „ALEXANDRU IOAN CUZA" din IAȘI
FRIEDRICH-SCHILLER-UNIVERSITÄT JENA
UNIVERSITÀ DI PAVIA
Université de Poitiers
VNIVERSIDAD D SALAMANCA
TURUN YLIOPISTO

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B.SURE BUILDING SUSTAINABLE REUSE: AN INTRODUCTION

Marco Morandotti

Work Package 6: Sustainable Cities and Communities. University of Pavia Representative

Sustainable management of built heritage is a priority that cannot be postponed on a global scale. Existing and foreseen policy plans and targets of UE in the Sustainable development area will imply the need of a huge number of experts with green competencies and skills. Within this framework the United Nations Sustainable Development Goal (UNSDG) 11 "Sustainable cities and communities" is assumed here as one of the reference topics for the development of appropriate national and supranational policies.

The European Campus of City-Universities (EC2U) is a multi-cultural and multi-lingual Alliance consisting of seven long-standing, education- and research-led, locally and globally engaged universities from four diverse regions of the European Union: the University of Coimbra (Portugal), Alexandru Ioan Cuza University of Iasi (Romania), the University of Jena (Germany), the University of Pavia (Italy), the University of Poitiers (France), the University of Salamanca (Spain) and the University of Turku (Finland). It represents a community of 160 000 students and 20 000 staff, in direct reach to more than 1 600 000 citizens.

Within the Alliance framework is established also a specific task, named "sustainable cities and communities" which two main aims are: the implementation and consolidation of a Virtual Institute, active in SDG11 area, and namely in the field of preservation and retrofitting of historical university buildings with relevant cultural heritage; the creation of a new master programme in sustainable cities and communities. On a local scale, in the University of Pavia there are research skills in the field of sustainable restoration and valorisation of heritage, and sustainable urban planning. At the same time the University of Pavia is an active stakeholder due to its relevant historical building heritage, on which it is developing recovery and enhancement projects in the perspective of sustainable development strategies. Due to these reasons it seemed to be a promising opportunity for the launch of an international educational initiative aimed at specifically investigating the issues of building and urban sustainability in historical contexts.

The main aim of the School is to trigger processes of exchange and experimentation between students and scholars of different disciplines, focused on the field of building and urban sustainability, with reference to the intervention on historic cities and building heritage.

The second aim of the School is to establish the initial nucleus of a community of researchers who share the same interest in the subject according to interdisciplinary and complementary approaches and skills.

The school aims to stimulate students to a multi-level debate on the topic, that may be interesting for all the participants, whatever the specific training of each student and the cultural context of reference, in the perspective of a possible future transformation in a so called "open badge" didactic activity.

The school, organized with a full online model, provided a multidisciplinary and multiscale educational approach. The school focuses on a current and strategic topic at international, national, and local level, offering itself as a moment of connection and comparison between international case studies from different partner universities. The educational and organisational model of the school is highly international, since it forms part of the European EC2U programme, both in relation to coordination activities, integration and sharing of research and awareness activities of the Virtual Institute, both as a coherent activity with the training activities of the future joint master. The school included in its activities a representative of students and teachers from several partner university, such as Pavia, Coimbra, Poitiers and Salamanca.

The school also provided a first opportunity for cooperation between the universities involved in the programme on this specific topic and also acted as a trigger for further joint actions. It also contributed to define the first nucleus of a community of teachers and students belonging to the different universities, who share common cultural, scientific and educational interests.

"B.SuRe – Building SUstainable REuse" WINTER SCHOOL

The school was organized with an online model due to pandemic situation and provides a multidisciplinary and multiscale educational approach. The activities are planned das following:

JOINT LECTURES

Four key topics have been identified. For each of them there were interventions by a Univerisities teachers, followed by moments of collegial discussion by members of the school's faculty and participants, so as to stimulate the active participation.

- TOPIC T1 Urban sustainability
  Urban sustainable development strategies and tools.
- TOPIC T2 Energy Retrofitting of cultural heritage
  Energy efficiency and retrofitting on historical buildings;
  The energy-oriented management of public historic buildings: an integrated approach and methodology applications.
- TOPIC T3 Sustainable reuse
  Sustainable reuse and restoration: a resilience-based approach;
  Sustainable reuse of cultural heritage: models and strategies.
- TOPIC T4 Innovative technologies for heritage representation and valorisation
  Digital documentation for heritage conservation and valorization;
  Historical architecture between aesthetic and techniques.

BEST PRACTICES: UNIVERSITY and MUNICIPALITIES CASE-STUDIES

The discussion of case studies concerning functional reconversion projects, restoration, reuse in place or programmed to Pavia and other partner universities was organized in order to stimulate trans-European comparison on similar issues.

FOCUS GROUP AMONG PARTICIPANT STUDENTS

The students involved in the school have been involved in a focus group aimed to share and discuss personal thoughts concerning their experiences, expectations and visions concerning their studies.

FINAL CONFERENCE AND ROUNDTABLE

At the end of the week was organized a final conference, open to a wider audience, including local professional associations and a round table with local administrators, school faculty members and local community representatives.

The school aims to become a regular EC2U event, becoming an integrated training moment in the master's degree curricula, for example on the occasion of one of the planned annual seminars, possibly focusing each year on a different aspect while remaining in the context of overall coherence of the theme.

FOREWORD

Antonella Forlino

Pro-rector of Internationalization

The Winter School has constituted an effective opportunity for synthesis and comparison of the various interests and different skills in conservation of Historical and Architectural Heritage. By combining the traditional vocation of the University of Pavia to international exchanges with the participation of qualified experts from numerous European countries, an initiative of relevant cultural and scientific interest was organized. Fundamental notions were tested to approach the protection and reuse of historical buildings in their formal, functional, distributive, technological and plant aspects, always keeping in mind sustainability. The fully achieved main aim of the school in addition to provideing updated notional and operational support, was to encourage students from different countries to compare with each other, dealing with the topic of intervention on architectural heritage. The school constituted a moment of cultural and human growth in the training process of the designers who will face the responsibility of intervening on the historical-architectural heritage, and therefore on the truest and most profound memory of each European city in the European Campus of City-Universities (EC2U).

EC2U is a multi-cultural and multi-lingual Alliance between universities from four diverse regions of the European Union: The University of Coimbra, the University of Iasi, the University of Jena, the University of Pavia, the University of Poitiers (Coordinator), the University of Salamanca and the University of Turku. The Alliance's ambition is to develop an innovative space allowing mobility to flow freely between the seven universities and associated cities. This model of openness will contribute to overcome clichéd views of regional and national identities and achieve a united and stronger Europe. The Alliance will reach this ambition by creating a pan-European campus, connected by the common European identity, contributing to the creation of a smart higher education eco-system through a new model of quality education for an inclusive civic society. This unique model relies on the double vertical and horizontal integration strategy, producing synergies from education, research and innovation, from formal/non-formal/informal education, and from the involvement of academic communities, municipalities, higher education regulatory bodies, socio-economic entities, citizens.

INSTITUTIONAL GREETINGS

Lalo Magni
Dean of Faculty of Engineering

Alessandro Reali
Director of the Department of Civil Engineering and Architecture

Among the goals of higher university education sparking curiosity towards what is still unknown and far from the usual domain of intuitive understanding is surely a fundamental task. In the context of an Engineering Faculty, it is essential to train students able to deal with different job scenarios, strengthened by a solid knowledge basis on which it is possible to build, tools and skills, required nowadays.

This is particularly true in the case of the design for the recovery and conservation of historical and architectural heritage, and for this reason, the initiative of this International Winter School organized as part of the activities of the Department of Civil Engineering and Architecture within a European project is of great interest. The idea of bringing together a group of European students and qualified professors in various disciplines, lecturing and discussing on the topic of sustainable reuse of historic buildings and environments, proved to be positive. The interest raised by the choice of the theme and the quality of the round tables -with a clear academic nature but linked to the realities of the involved municipalities - testify the success of the initiative, which is also part of a consolidated tradition of scientific and cultural exchanges typical of our University and, in particular, of our Department and Faculty.

REPORTS

TOPIC T1
URBAN SUSTAINABILITY

URBAN SUSTAINABLE DEVELOPMENT: STRATEGIES AND TOOLS

Roberto De Lotto

Considering that every architectural action depends on an Urban Planning framework and stated that the nature of modern city forecast and management is a complex system, the relation between urban development and sustainable objectives and goals faces a multidisciplinary set of topics.
Mumford stated that the city is the result of historical facts, and it is quite clear to highlight in the global context the result of the extremely fast urbanization and growth of urban population (together with the growth of the whole population). So, considering that human activities have certain impacts on the environment, and that in the city there is a particular concentration of human activities, it emerges how much cities have a strategic role in the equilibrium between human beings' activities and global ecosystem. Urban planning is related at least with these disciplines: Legal framework, Political governance, Cultural framework, Economic framework, Social Framework, Ecology discipline, Architecture discipline, Geography discipline, Landscape discipline. Moreover, the contemporary science of planning divides the theme in two main fields: the substantial one and the processual one. The substantial one was born from the hard science fields (like engineering) and it considers the city and the city plan as objective elements; the processual one deepens the nature of decision-making process, the interrelation among the different subjects (politicians, technicians, population, social structures) and the process that carries to a certain city plan together with its management.
The set of disciplines and the set of substantial and processual approaches interact each other as a complex system. A simplified view could compare complexity with the number of elements, with the heterogeneity of interactions among them, with the level of uncertainty in definition of its structure and interactions among its parts. A system can be represented in simplified models: deterministic models for low complex systems (with a few components or with simple relations; i.e. tree structure), statistical models that describe the average value of some parameters that characterize the system (i.e. a system with a lot of elements with simple relations), heuristic models that describe the system basing on phenomena observation about its behaviours (i.e. direct experience). In natural science and in socio-economic ones it is proofed that complexity depends on the number of elements, on the interactions among them but mostly on the "nature" of these interactions. Non-intuitive phenomena occur, such as: bifurcation, self-organization, disaster, newness generation. J.L.Casti considers that an essential character of complex systems is their capacity to generate surprise, to have not predictable behaviour. Consequently, complex systems' behaviour is not predictable starting from the single elements behaviour. Among all the "strange" behaviour, self-organization the capacity to define a spatial-temporal order without an external action nor internal codes) is one of the most interesting. Self-organization is the way the system responds to the environment, opposing to destructive forces and safeguarding its integrity. The city is a set of different parts interacting each other: residential zones, industrial zones, services zone, tertiary zones, etc. are widespread in the territory and they are connected throughout communication nets and infrastructures.
So, considering that Urban Planning is devoted to define the urban system and to provide forecasts

about its evolution, it is clear that from the complexity science point of view the previsions could be partial or sub-optimal. When approaching the relation among human activities (concentrated in cities) and ecosystem, knowing that the ecological system itself is a complex system, it is not possible to synthesize all the conceivable interactions among these two systems (it is a double order of complexity). Among the lack between the desire to control the destiny of cities and their self-organization properties, and the impossibility to model every interaction between urban systems and ecological ones, the principle of precaution emerges as the right way to define opportunities and limits in urban planning. We have to consider that the first approach to sustainable principles was defined in the United Nations Conference on the Human Environment, in Stockholm on 5th and 16th June 1972, and that almost 5 decades occurred to define a practical handbook for planners based on 2030 SDG, that is the New Urban Agenda of 2017. So, the development of new approaches and guidelines need a medium-long term strategy. Some new topics emerged in the last years together with the 2030 SDG goals: Nature Based Solutions, the application of the 7 Resilience principles, a more effective definition of "smart city" considered as place where "smart citizen" live, flexible approaches able to manage the adaptation of urban systems to the natural modifications of state.
The comprehensive set of instruments that they introduced, carry to more awareness about the instruments and tools that every city planner shall use but the perspective is in medium-long term. Every city usually needs time to adapt itself to the faster social and economic modifications. So, the biggest challenge for urban planners is to make use of the latest instruments and tools having short term response and medium-long term structural approaches.

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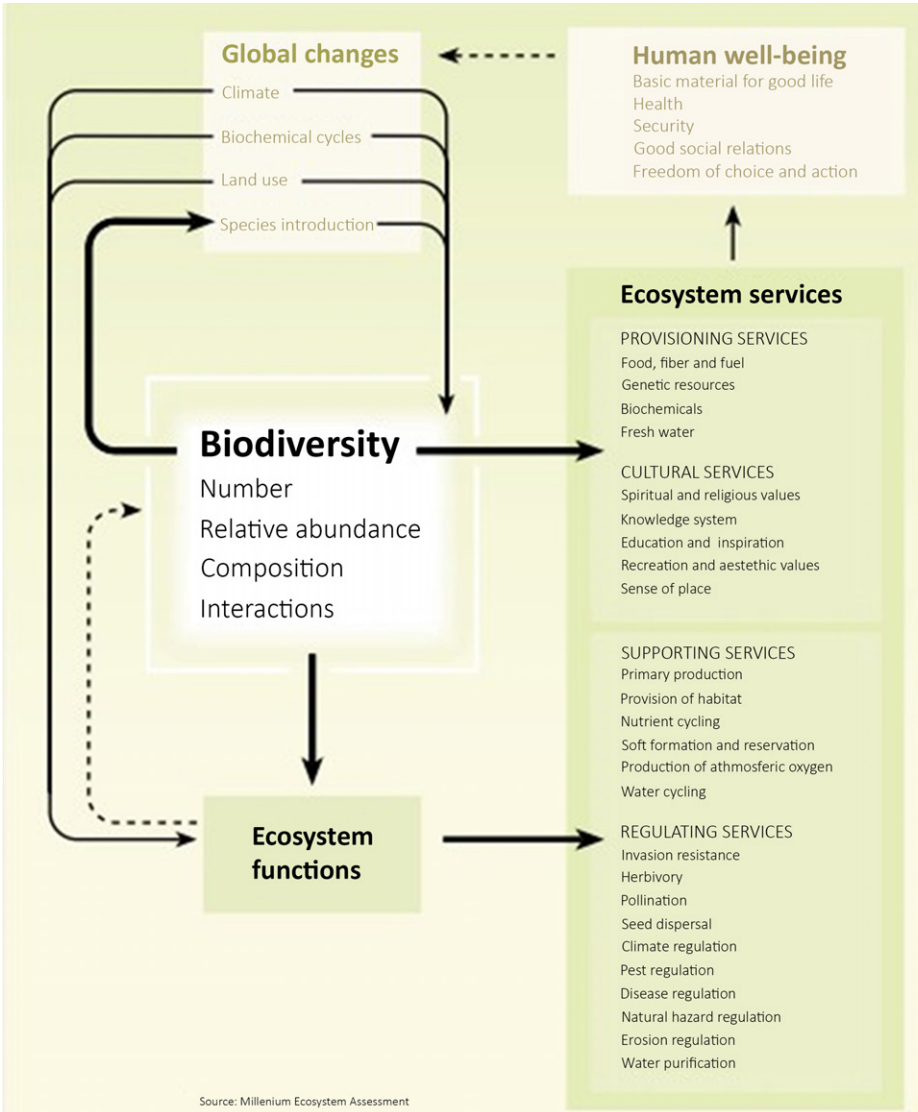

Global changes
Climate
Biochemical cycles
Land use
Species introduction
Human well-being
Basic material for good life
Health
Security
Good social relations
Freedom of choice and action
Ecosystem services
PROVISIONING SERVICES
Food, fiber and fuel
Genetic resources
Biochemicals
Fresh water
CULTURAL SERVICES
Spiritual and religious values
Knowledge system
Education and inspiration
Recreation and aestethic values
Sense of place
SUPPORTING SERVICES
Primary production
Provision of habitat
Nutrient cycling
Soft formation and reservation
Production of athmosferic oxygen
Water cycling
REGULATING SERVICES
Invasion resistance
Herbivory
Pollination
Seed dispersal
Climate regulation
Pest regulation
Disease regulation
Natural hazard regulation
Erosion regulation
Water purification
Biodiversity
Number
Relative abundance
Composition
Interactions
Ecosystem functions
Source: Millenium Ecosystem Assessment

TOPIC T1
URBAN SUSTAINABILITY

A NEW URBANISM FOR EUROPE: THE EUROPEAN RECOVERY FUNDS, AND THEIR IMPACT ON THE FUTURE OF CITIES

Juan José Rastrollo Suarez

The Next Generation EU (NGEU) fund is a European Union economic recovery package to support member states adversely impacted by the COVID-19 pandemic. This program represents an unprece-dented effort. Besides promoting a European Union more ecological, digital, and resilient, the recov-ery funds aim at financing projects of public-private partnership around a series of issues. Some espe-cially related to urbanism, such as ecological transition, smart, sustainable, integrative growth, or social and territorial cohesion.

In the first part of the present work, we analyze the evolution of urbanism in Europe since the 1972 European Soil Charter, adopted by the Council of Europe in Strasbourg. Secondly, we examine potential areas where urban projects could be promoted implementing European funds, in connection with the new Leipzig Charter and the European Territorial Agenda 2030, which support an urban environment more just, green, and productive.

Despite the absence of direct competences in this area, the European Union has a great influence on the present and future development of urban planning in Europe, which means that we can speak of an European urban planning that has its own identity.

This urban planning, constructed on the basis of the different public policy principles promoted by the European Union, and supported by many initia-tives of European cities in diverse fields, is alive and in continuous evolution.

The new Leipzig Charter and the European Territorial Strategy 2030, in direct convergence with the objectives set by the Millennium Declaration, propose the need to fight against social exclusion, sup-port the principle of sustainable territorial and urban development, as well as promoting the produc-tivity of cities. To achieve such goals, a new model of urban governance is proposed, based on a series of strategic principles and democratic instruments.

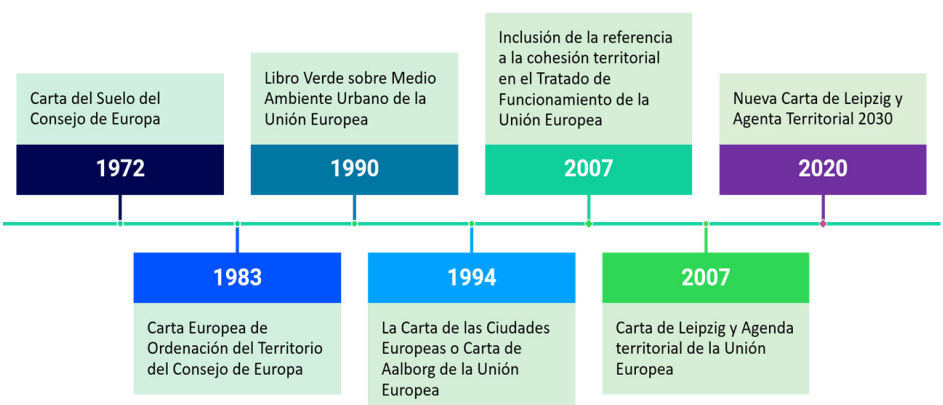
These should serve as a keystone from which to encourage the involvement of diverse public and private actors in the design of the city. The governance of the just city seeks to involve citizens, first of all, in the fight against social exclusion. Green governance has the goal of advancing sustainable management, secondly, as the backbone principle of public policy making and implementation, which is further based on the creation of spaces for a regular and sustained public conversation between diverse social and political actors. The governance of the productive city, finally, seeks to align public and private perspectives around the need to project a city growth that respects the interests of all. To promote these goals, the strengthening of the public sphere of the city represents a key resource, seeking to achieve wide inclusiveness by means of democratic participation at the local level. In this regard, all across Europe, many cities have been trying to offer more areas of public policy making to the decision of assemblies and councils formed by citizens and collective actors such as unions, professional associations, business representatives, and diverse grassroots organizations. Such initiatives by urban governments and by citizens' as-sociations also contribute decisively to the configuration of a European urban governance.

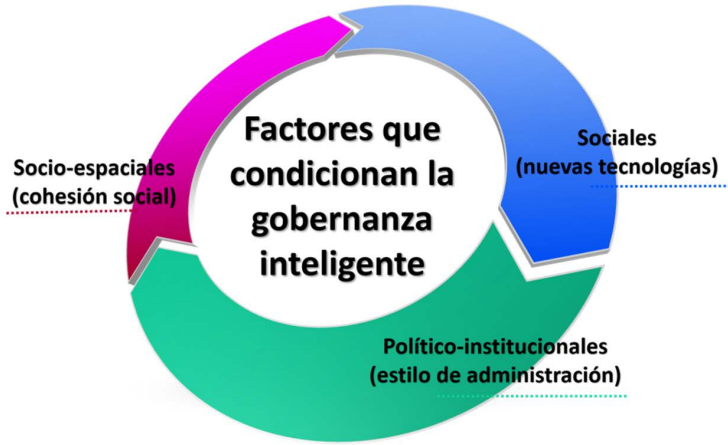
The principles of this European conception of the city life aim not only at inclusiveness, as mentioned before, but also at government transparency and proximity to the citizens for a better management of urban public policy.

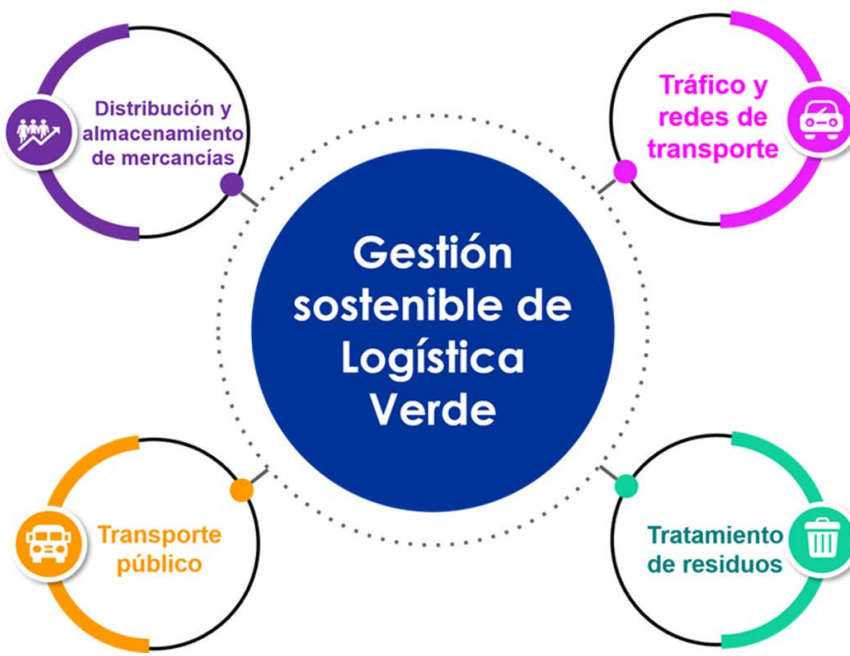
The European funds linked to the Recovery Plan can and should serve to support the reform of Euro-pean cities around a fairer, greener and more productive urbanism, facilitating the financing of projects in which public-private collaboration is achieved. The promotion of European projects with urban planning relevance should be the result of consensus among the various social actors involved in local governance and the projects should be, as far as possible, devoid of personalities and excessive politicization, which in practice generates disaffection between the city project to be promoted and those who live there.

In the new urban planning that is being proposed, beyond this new governance, it is essential to take into consideration issues such as the materialization of the principle of gender equality in the urban perspective, the consecration of the safe and non-invasive city with respect to the privacy of its inhabitants, the achievement of the "healthy and compact city" or the alignment between economic and social interests, in the design of a long-term socioeconomic policy that generates sustained and satis-factory economic growth for those who live in the city.

The different urban experiences that we describe throughout this paper should be able to be articulated in the framework of this new urbanism, based on plans linked to the European Recovery Instrument in a sustained manner over time.




Factores que condicionan la gobernanza inteligente
Socio-espaciales (cohesión social)
Sociales (nuevas tecnologías)
Político-institucionales (estilo de administración)


Gestión sostenible de Logística Verde
Distribución y almacenamiento de mercancías
Tráfico y redes de transporte
Transporte público
Tratamiento de residuos

TOPIC T2
SUSTAINABLE REUSE

DEVELOPMENT OF INDOOR CLIMATE MONITORING AND PREDICTION TOOLS

Manuel Carlos Gameiro

The successful reuse of historical buildings depends very much on the indoor environmental quality (IEQ) since the main functional purpose of a building is to provide its occupants with safe, healthy, and comfortable conditions. The IEQ concept, usually defined as the set of conditions associated with the thermal environment, the indoor air quality, the acoustic environment, and the visual environment, is normally used to assess the extent to which this objective is achieved in a given building.

If buildings are not providing good indoor environmental conditions to occupants, they are not fulfilling the main function for which they were designed. In addition to the damages that may result in terms of occupant health and comfort, which necessarily have an impact on occupational absenteeism, the productivity of workers in intellectual tasks is also clearly affected if good indoor environmental conditions are not provided.

The efforts conducted in the framework of the retrofitting process of Gemeentehuis Horst, the town hall building of the municipality of Horst aan de Maas, in the Netherlands, to transform it in a case of excellence in terms of IEQ, are firstly addressed in the presented lecture.

The installed monitoring system is able to assess the IEQ conditions of the building in the various aspects contributing to the human perception of comfort (thermal, acoustic, and visual environments together with indoor air quality). Besides the measurement of the relevant environmental variables, another feature is the calculation of the indices commonly used for a more holistic assessment of thermal environment, e.g. the operative temperature (To), the predicted mean vote (PMV), the predicted percentage of dissatisfied (PPD) and the noise equivalent level (Leq). The architecture of the monitoring hardware and software elements including measuring, signal conditioning, processing and transmission, data recording, analysis and visualization are addressed.

Following, the efforts to miniaturize the IEQ system and make it more affordable and user-friendly are described. The existence of miniaturized probes sensible to various input environmental quantities and ready to be integrated in electronic digital circuits, created the opportunity to develop new measuring systems.

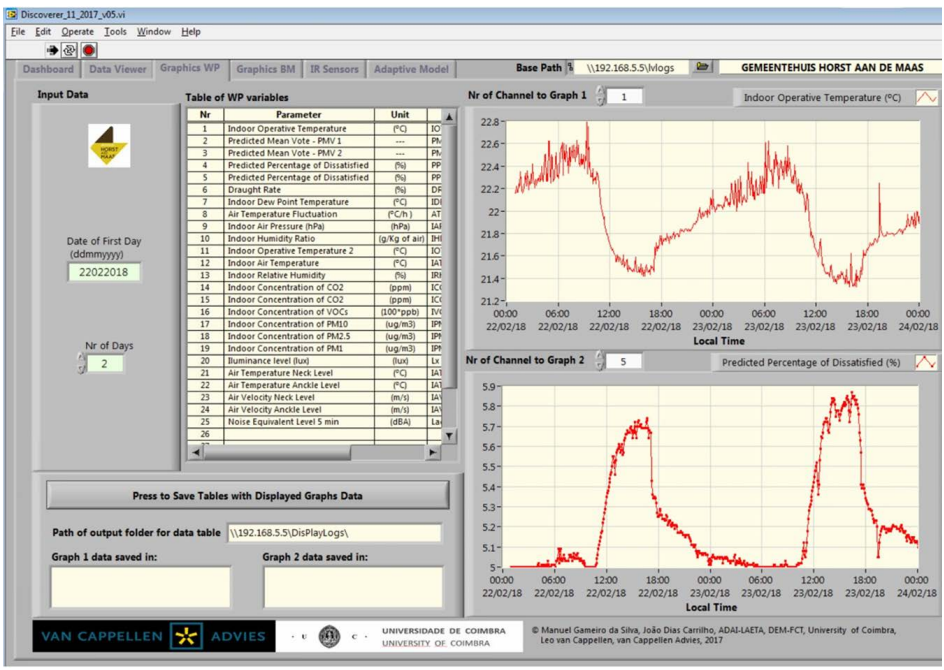
The objective of the work has been to have an intuitive, coherent and user-friendly system to be used either in short term, in long term IEQ audits. The main novelty of the system is that, besides presenting the measured values both in displays and graphics, it classifies, in each sampling moment, the indoor environmental conditions according to the categories defined for thermal comfort, relative humidity and indoor air quality by EN-16798-1 standard. Thus, a good communication, even with a non IEQ expert common citizen, can be achieved.

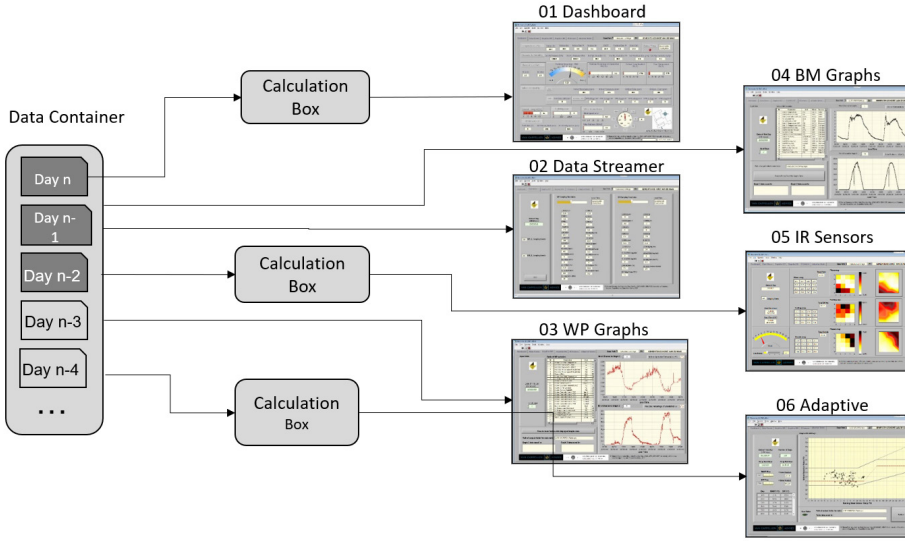
The multiprobe measuring probe has been tested along field monitoring surveys conducted in various types of indoor environment enclosures (rooms, passenger compartments of buses, trains, and airplanes) and the results are presented and discussed. One of the case studies

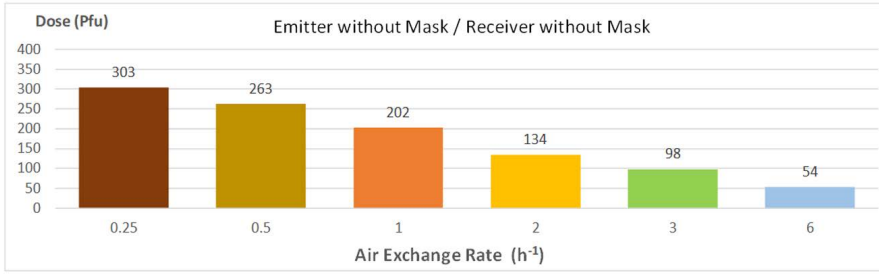
of excellence in indoor environmental quality monitoring is the Gemeentehuis Horst aan de Maas. Was installed a mobile station for indoor evaluation and to transmit the data from the mobile station to the computer where we have the management of the condition of the building. All the information goes to an external server to check what are the condition. Is possible to collect data from different days to analyse them.

The necessity in terms of hardware was Sensors, Transducers, Signal Conditioners, Data Transmission, AD Converters, Data Storage.

The necessity in terms of Software was: Data Acquisition, Data Processing, Monitoring, Visualization, Data Analysis, Benchmarking, Compliance checking, Communication.







ROOM	SOURCES	AIRFLOW	AIR CLEANING
Volume	Number	Type of Ventilation	Type of System
Area, Height	Intensity	Flow Rate	Flow Rate
Configuration	Location	Air Exchange Rate	Efficiency
Materials & Furniture	Mobility	Flow Topology	Location
Exposure	Protective Devices		

TOPIC T2
SUSTAINABLE REUSE

SUSTAINABLE REUSE AND RESTORATION: A RESILIENCE-BASED APPROACH

Marco Morandotti

In the field of architectural renovation through adaptive reuse, resilience, intended as the maximum transformative load that can be borne by an existing building without losing its identity, can be the key concept in order to produce solid bases useful to guide the processes of knowledge, communication and action that involve the architectural assets.
Recent debate on social, ecological and sustainable urban development increasingly includes resilience amongst its fundamental categories. The attitude of a territory, a city, or a system to adapt and to respond positively to the changes and demands of the context, or the capacity to lead to a continued existence by incorporating change" may be seen as one of the primary values in a sustainable evolutionary perspective. According to the general theory regarding the resilience of complex socio-ecological systems modifying pressures, the so-called drivers of change, generate perturbations in response to which the system demonstrates its higher or lower resilience, given precisely by its ability to cope with the change that has been introduced while maintaining its own constitutive identity, without setting out on transformative trajectories that lead to less desirable conditions.
Within the present contribution, resilience is defined as the tolerable transformation that a generic existing building can undergo unless the impact on its constitutive systems (material, typological, distributive, constructive) generates undesirable effects on its semantic coherence, if not its physical existence. This transformation ensures that the building system can adapt and accommodate changes arising from new uses, or from performance and regulatory updates to previous uses while maintaining a recognizable identity and a functionality level appropriate to new uses and respectful of the historic value of the asset.
The transformative pressure upon existing historical assets is nowadays generated by at least three distinct factors: i) the push towards the re-use of assets through the definition of a new set of functions; ii) the push exerted by binding legal provisions (for example in the field of safety and fire prevention, the reduction of seismic vulnerability, accessibility) whose requirements may result from new functions to be relocated in existing spaces; iii) the push exerted by the need to improve the energy behaviour of the building. This transformative pressure is commonly translated through design action, in interventions of performance improvement of a functional, distributive, technological, structural, or plant engineering nature. These could lead to the actual fulfilment of users' needs, but may also generate significant impacts on the existing historic object. Therefore, with the aim of reaching a high level of confidence with the built environment, information related to three fields should be considered and elaborated: the knowledge on the good, the requirement frame linked to the potential users and the wide reference context that characterize them both.
In this contribution some synthetic indicators are proposed, according to an ongoing research, along with the criteria for their calculation, with the purpose of formulating a standardized

methodology for the preliminary evaluation of the degree of resilience of the examined buildings. The method described is focused to assess the overall sustainability of intervention in relation to specific resilience thresholds of the system that are determined by the balance of requests for conservation, the satisfaction of users' needs, and the managerial sustainability of the process. It may help decision makers and stakeholders involved to avoid forced placement of inadequate functions in existing buildings. Otherwise, a design solution, albeit coherent with new needs and with current regulations, may generate drastic compromises of material, typological, or pre-existing technological integrity, and therefore become, ultimately, un-sustainable.

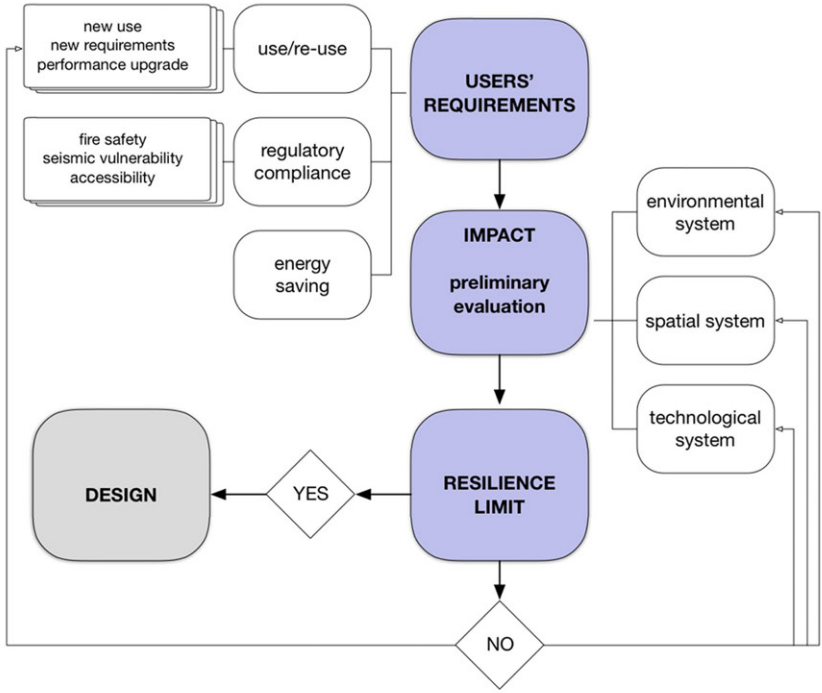
The method proposed is developed according to the sequence of analysis/diagnosis/evaluation. The general scheme of the process developed includes two synthetic indicators of behaviour or performance. The first one has been defined performance adequacy value (PAV) and measures the performance analysis evaluation of the existing building by means of specific parameters which synthetize the complex system of spatial requirements into six indicators: i) usability, intended as both dimensional and distributive adequacy; ii) comfort, both thermal and luminous; iii) safety, both as seismic vulnerability and fire security; iv) accessibility; v) conservation, both material and structural; vi) flexibility, both structural and related to plants.

The second indicator one has been defined resilience threshold value (RTV) and measures the impact of transformation design solutions on the existing building, being related to six potential negative impacts on the building, assumed as control variables of the system, defined as following: a) Material removal, b) Structural alteration, c) Spatial alteration, d) Surface alteration, e) Morphologic alteration, f) Identity weakening.

Case by case it will be assessed if the design solution under evaluation, alongside an increase of a specific PAV value (or transformation driver), will affect (and eventually how much) one or several of the control variables.

The application of the method may guarantee to simultaneously check both performance improvement and impact in order to suggest to the stakeholder (i.e. the designer, the owner, the facility manager…) if the design solution under evaluation generates (or not) a sustainable transformative pressure in terms of negative impact versus positive transformations.

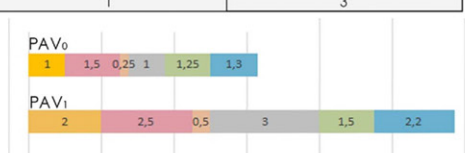
For each PAV indicator is therefore possible to synthetize not only a positive variation related to the specific performance increase generated by the project, but also a negative impact affected on the building itself.



DIPARTIMENTO DI PSICOLOGIA E FILOSOFIA

			SCENARIO 1 (IP. BIBL.)				SCENARIO 1 (IPOTESI BIBLIOTECA)			
WELL-BEING	THERMAL		0,279	1	1	1	0,279	1	1	2
	VISUAL		38,700	1			33,300	1		
CONSERVATION	MATERIAL DETERIORATION		0,930	1		1,5	3,000	\		2,5
	STRUCTURAL DETERIORATION		2,000	2			2,000	\		
FLEXIBILITY	STRUCTURAL		0,000	0	0	0,25	3,5 m	0	0	0,5
	MEP	VERTICAL	0,000	0	0,5		24 m	1	1	
		HORIZONTAL	0,310	1			0,31	1		
ACCESSIBILITY			0,445	1	0	1	1	3		3
USABILITY	DIMESIONAL SUITABILY		0,715	1	1	1,25	0,478	1	1	1,5
	DISTRIBUTIVE SUITABILY	HORIZONTAL	0,418	1	1,5		0,574	2	2	
		VERTICAL	24,818	2			24,818	2		
SAFETY	STABILITY	SEISMIC VULNERABILITY	D	1		1,30	D	1		2,17
	SAFE USE	FIRE SAFETY	/	2			/	2,5		
	SOVRACCARICHI			1				3		

BENESSERE	1	2
CONSERVAZIONE	1,5	2,5
FRUIBILITA'	0,25	0,50
ACCESSIBILITA'	1	3
USABILITA'	1,25	1,50
SICUREZZA	1,3	2,2



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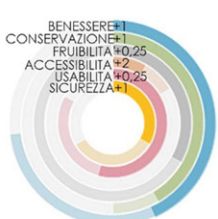
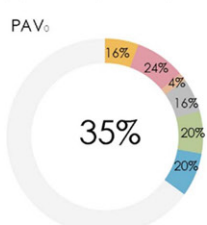
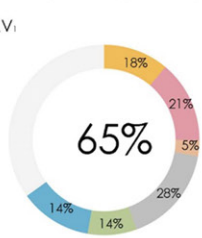
PAV0 E PAV1 A CONFRONTO







TOPIC T2
SUSTAINABLE REUSE

SUSTAINABLE REUSE OF CULTURAL MODELS AND STRATEGIES

Daniela Besana

A sustainable method's approach on Cultural Heritage forced an evaluation regarding a complex process design project. It is important to consider different and preliminary aspects to understand a possible way of intervention. First of all, the context, which is not only the geographical, morphological place on which the building is but also give us both some suggestions on social, cultural and economic aspects and other important data on regulation as preliminary information regarding possible project design solution.

A very important keyword related to the Cultural Heritage design process is knowledge as an indispensable and preliminary tool to any urban-design choice. Knowledge studies is a complex project path, almost a project within a project, made up of a series of actions separated but integrated with each other to achieve a synthesis between them: the survey and representations as a tool for morphological, typological but also technological and constructive analysis, diagnostic techniques, photographic shots, scientific and diagnostical investigation instruments, historical-archival documents are just some of the most common examples of what contributes to define the knowledge process and therefore the understanding of a building.

The complexity of the knowledge phase is related to the different output generated by the study of the morphological analysis able to produce a full documentation on a building, as bidimensional and tridimensional representation of the monument, historical manual on constructive techniques and 3D models, also based on Building Information Modelling. The knowledge phase can be considered complete only when the state of conservation analysis on the monument is studied. It means the highly important phase able to give to designer information about the state of conservation and the pathological diagnosis based both on the technical and material decay and the static and structural aspects regarding its residual performances.

Some restoration theorists often associate the design process with the medical one: the designer who, like the doctor, has to treat, take care to the sick building - the patient - only following a careful phase of knowledge and diagnostic tests to find the synthesis in the choice, the therapy, in relation to the specific subject and its previous history.

So, to propose a sustainable project, it is necessary to make a reflection on how to work on the building both in respect of the value and memory and, on the other hand, from the new needs of use. An important phase of interpretation of the monument is interposed between the instances of authenticity and conservation to be guided by the evocative capacity of the building. It is essential to follow the issues of compatibility and adequacy: the responsibili¬ty of designer is to act as an interpreter and guardian of the safeguarding and protection of the existing Cultural Heritage, respecting its materiality and its historical past.

The approach on intervention on Cultural Heritage can be different: the conservation project, the restoration one or even its re-functionalization or sustainable reuse. It's quite clear that different approach on a building derives first of all by the synthesis of information collected during the

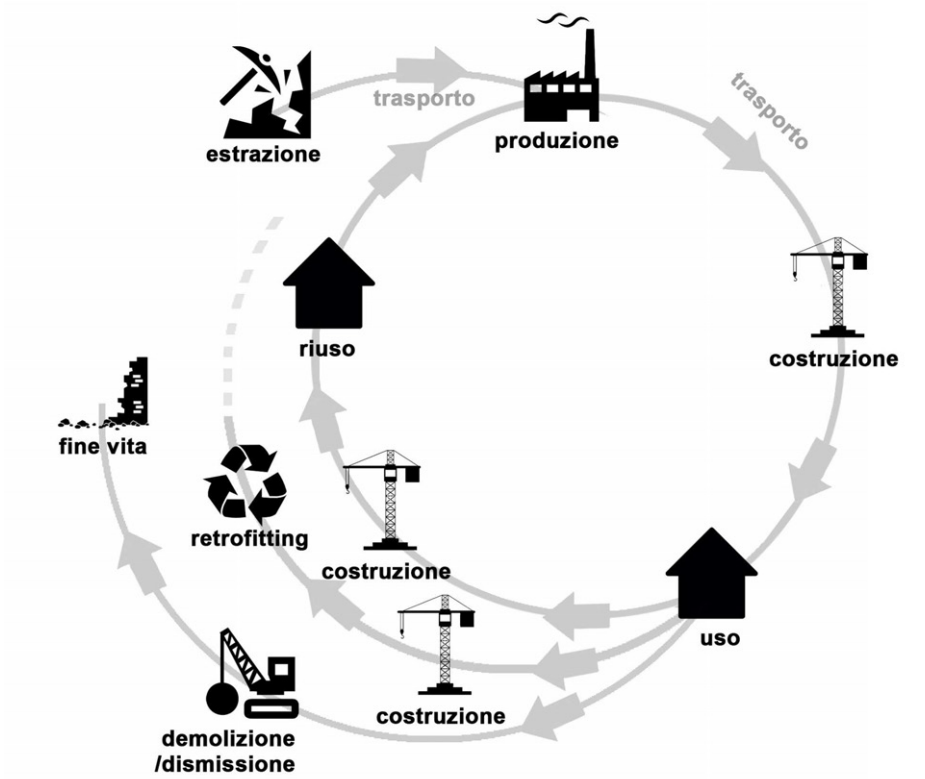
knowledge phase but also that it can be decided “case by case”, considering the monument itself, its memory, the authenticity and the respect on a building and also the real evaluation regarding the compatibility on a monument in relation to its architectonical and historical characteristics with the idea of maintaining over time and transmitting to future generations a heritage rich in history, culture, meaning and memory that cannot be lost.

The key point is to focus on the sustainable reuse as a possible solution to preserve and enhanced the Cultural Heritage in a sustainable way, as the declaration of 2030 Agenda remember to us.

A sustainable reuse strategy can be considered as an important possibility to accommodate the needs of society and the environment and to enhance the obsolescence of the buildings. It can be read as a chance to enhancement a building in terms of some functional deficit, technological gap (in terms of performances, incapable to accommodate new needs, or energy saving) and even figurative deficit, (such as a poor quality of the façade).

Designers have to consider the need to create a virtuous cycle in the design process, aimed to the reuse and re-functionalization of our heritage to avoid impacts on the territory. This action starts from the early stages of the project with choices that respond to the logic of reversibility and constructive flexibility to be able to proceed through a final decomposition of constructive components or of the entire project proposal for reuse. It’s also very important to check, case by case, and to evaluate the residual performance of the existing building in terms of compatibility between predetermined form and function to define. If we look back throughout history, architects had always re-designed existing buildings to adapt them to the changing needs of society. So, designer have to consider and analysed constraints derive from the typological existing building and the local and urban regulation.

An important phase of the reuse process concerns to the choice and evaluation of the admissible design strategies to help designer to find that best respond to the critical issues encountered in the evaluation phase of the existing building. The challenge lies in the ability to produce, by the design project, an unpublished text (I.e. monument) from a text already existing in its own tangible materiality. It means giving a new sense, re-enacting and re-interpreting the past’s history in order to allow to future generations to read the stratification in time, the memory of the monuments and the historical evolution: *“Architecture is a transformation project”*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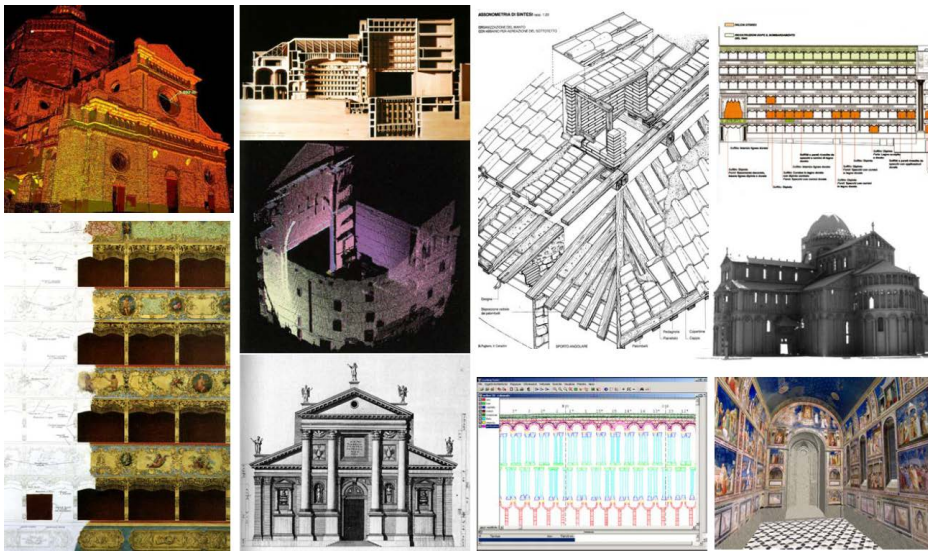

TOPIC T3
ENERGY RETROFITTING OF CULTURAL HERITAGE

THERMAL MODELLING, NUMERICAL SIMULATIONS AND EXPERIMENTS APPLIED ON HISTORIC BUILDINGS TOWARDS ENERGY RETROFIT

Myriam Lazard

In this study, the subject dealt with the thermal behaviour of building, especially old buildings. In a first part, thermal regulation and also environmental regulation are briefly presented. Then the core is dedicated to simulations of the buildings, from BIM and energy consumption to dynamic thermal simulations. Then experiments are performed in order to avoid damages on old buildings. Historic building energy retrofit projects are really of great interest as highlighted by Angrisano and al [1] and in order to have an accurate view of the scientific landscape, a VosViewer map (see Figure 1) could be considered through Web of Science using the following key words « energy retrofit for existing building » « bio- based materials » « new materials for energy retrofit design project » These considerations about energy consumptions are not really new. Indeed in 1973, as a consequence of the oil crisis, the government decided in France to get a thermal regulation named RT 1974 for the buildings. The energy consumption target was 225 kWh/m2.year. Then after the new oil crisis in 1979, three new regulations RT 1982, 1988, 2000 were considered with a target from 170 kWh/m2 .year decreasing to 130 kWh/m2 .year and 90 kWh/m2 .year for the RT 2005. The RT 2012 took not only the energy consumption into account 50 kWhep/m2.year but it is also requested to achieve an air permeability of 0,6 m3/h.m2 and the surface of the windows must be at least 1/6 of the net floor area. The use of a renewable energy source is also required. RE 2020 must now be considered,(E is for environmental) and the carbone footprint is now considering.

Energy efficiency and gas emission assessments must be done for each building (see Figure 2).

The Environmental Protection Agency is dedicated to the topic of gas emission and in United States, there are US's Reporting Rule and in Europe EU Emissions Trading System. Buildings are responsible of 25-30% of global gas emission which is quite high. Concerning the heat losses in a building, several causes could be identified and the contribution is usually the following one : roof 21%, high floor 9%, ventilation less than 1%, thermal bridges around 2%, walls 38%, windows and doors 15% and low floor 15%. [2]. A convenient way to detect the heat losses in a building is the use of an infra-red camera. The shape of the building must also be considered through a significant parameter called shape coefficient which is the ratio of the surface over the volume.

The higher is its value, the worst the heat losses are and a defect of compacity of the building cannot be corrected by the technicity (see Figure 3).

Moreover the choice of the material should carefully be done because it has an impact on the environment in terms of CO2 emissions (see Figure 4). In order to have the transient thermal behaviour of a building, simulations called Dynamic Thermal Simulations have to be performed. Depending on the time scale, different software can be considered : Perrenoud and Climawin (for a year or a typical week) and Kozibu, TRNSYS, Design Builder (Energy +), Tase, Comfie Pléiades (for hourly accurate results). The aim of the heat transfer simulations in a building is to obtain the thermal evolution regarding the boundary conditions which are the weather conditions and intern constraints (persons, heating, light, air conditioning, ventilation) in order to reduce the energy consumption

of the building. The following items have to be considered : better insulation, thermal bridges avoidment, solar impact improvement, intern contributions optimization and thermal inertia of the building maximization.

The methodology of Dynamic Thermal Simulations is mainly based on the inputs which are the 3D modelling of the building, the weather conditions and also the scenarios of occupation, heating cooling and so on...For the first step, BIM should be considered. BIM means Building Information Model or Modelling or Management. Green Building XML (gbXML) is the language of buildings and it allows disparate building design software tools to communicate with one another.

For the weather conditions, dedicated modules based on Meteonorm data base are already included in Comfie Pleiades. The following data are requested for each hour of the day : temperature of the air and of the ground, relative and absolute humidity, orientation, and speed of the wind, diffuse and direct radiation. Once the zoning of the building done, the scenarios selected and also the materials for the walls, the windows, the doors, results such as temperature as a function of time could be obtained for each zone of the building. Moreover the comfort could be investigated thanks the Brager Diagram. Concerning the experiments, there is a need of characterization of materials used for construction of the ancient buildings with regards to thermal and hydric properties in the framework of preservation and rehabilitation. Non-invasive methods should be considered for investigation. Measurements could be done with thermocouples or with integrated wire. The humidity and also the moisture should be estimated.

To conclude, buildings are a subject of great interest. It is crucial to save energy but the comfort is also a key point. The thermal properties of the materials used are to be carefully considered. The cost not only in terms of money but also in terms of environmental impact must be considered. Some practical and logical rules should be followed but software performing dynamic thermal simulations are useful to predict the transient behaviour of the building and to investigate different scenarios.

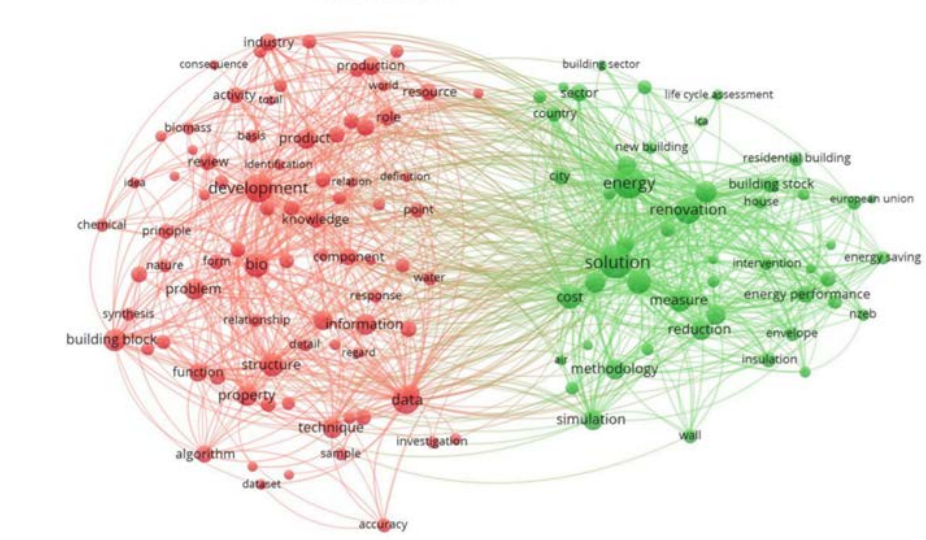

Figure 1 : VosViewer map of the scientific landscape (from [1])

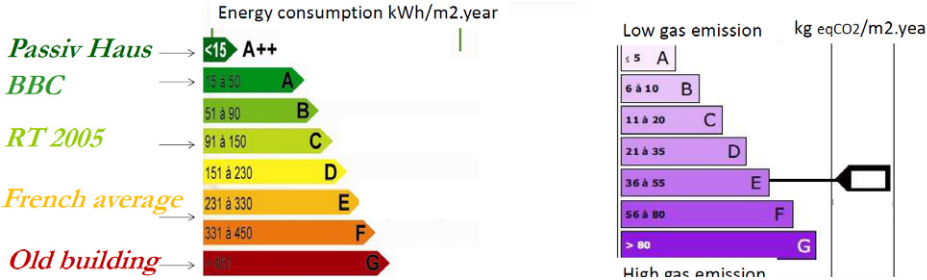

Figure 2 : DPE Energy Efficienty Assessment (left) and GES Gas Emission (right). Energy consumption with corresponding labels and gas emission

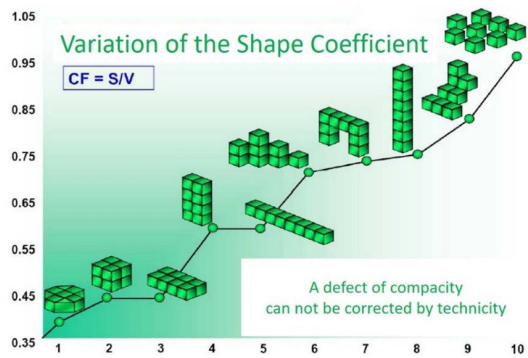

Figure 3 : Shape coefficient values for different buildings (from INES [3])

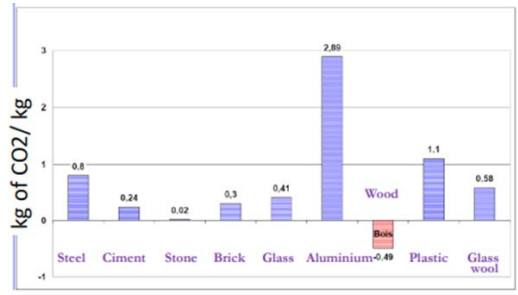

Figure 4 : Emission of CO2 for different materials (from INES)

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[2] Chéry, M.: Habitat ancien en Alsace: énergie et patrimoine. Pierre d'Angle, 2016
[3] https://www.ines-solaire.org/

TOPIC T3
ENERGY RETROFITTING OF CULTURAL HERITAGE

ENERGY EFFICIENTLY AND RETROFITTING ON EXISTING BUILDINGS

Anna Magrini

The presentation concerns in general existing buildings. For historic buildings, there are more constraints and difficulties but in general, the techniques that can be adopted and the problems that may arise are the same. When we refer to energy efficiency and energy saving in buildings, we consider that the building-system should allow the best management of the energy sources and passive elements with the aim of maintaining internal comfort for humans or objects (from museums to computer centres).

TARGET NZEB - The European path towards the reduction of energy consumption in buildings begins in 2002 with the first European directive, which puts the foundations for achieving a better energy performance of buildings. In 2010 there is a re-edition of the European directive with the introduction of the NZEB concept. The nearly zero or very low amount of energy required should to a very significant extent be covered by energy from renewable sources, including renewable energy produced on-site or nearby. In more recent times, other directives have considered various aspects related to the energy performance of buildings and to the use of renewable sources to produce the needed energy. In 2030 another intermediate goal is to reduce consumption through an important energy requalification action for buildings. In 2050, a highly efficient and fully decarbonised building stock is expected to be reached. To do this, the deep renovation rate of buildings must become about 3% per year while now it is on average 1%.

NEW BUILDINGS AND RETROFITTING - The European directives initially focused attention on the energy performance of new buildings, then gradually turned towards targeted actions on the energy retrofitting of existing buildings. The building stock grows by about 1% per year and the impact of new constructions on current energy consumption is not as important as that of the existing building stock.

EU BUILDING STOCK - The EU existing building stock was largely built at least 50 years ago and no major energy redevelopment actions have been undertaken over time. In addition, some European states have a much older building stock and therefore even greater problems related to energy consumption. Actions to improve energy performance are also required for historic buildings, although architectural and artistic heritage constraints are a priority.

BUILDING ENVELOPE AND THERMAL SYSTEMS- The main energy performance actions on a building concern both the envelope and the thermal systems. In particular, as regards the envelope, the thermal insulation of both the vertical walls and the roof and the replacement of the windows with low-emissivity glass that reduce solar gains are considered. Passive elements are also important are, such as overhangs and sunscreens and shading caused by trees or other external obstacles.

Moreover, the adoption of systems that can use solar energy both to produce electricity and to produce thermal energy becomes fundamental. The thermal energy produced can be used for the domestic hot water system, and to support the heating system. Usually the most efficient thermal systems can be represented by heat pump systems that use electrical energy to produce thermal

energy for heating and for cooling. These generators are usually coupled in the most efficient way with radiant floor panels. It is obvious that the radiant floor is not a solution especially in energy retrofitting and therefore it will be necessary to study each time the best integration of the heat pump system or other heat generators with the existing building features and constraints. The most efficient solutions for the thermal systems need to be considered in close relation to the actions on the envelope.

ENVELOPE RETROFITTING - Each retrofitting action must be evaluated both for the energy reduction losses and for the collateral aspects that must be considered. It is possible to consider the application of an insulating layer on the internal face which must necessarily be limited in thickness because otherwise it reduces the internal volume of the rooms too much or by operating with an external insulation that instead can have a greater thickness. Even when the wall has an air cavity, the intervention can be the same, or the possibility of filling the cavity with loose material can be considered

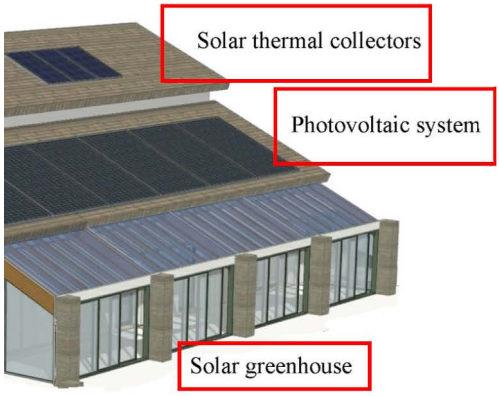
RETROFITTING STRATEGIES - The solutions are different and the advantages also, as in the interventions from the inside or in the air cavity you can act directly inside each apartment, while in the interventions from the outside a system of scaffolding is required to be able to access all the facades. In addition to these, all the elements of discontinuity are of particular importance: they are generally identified as thermal bridges

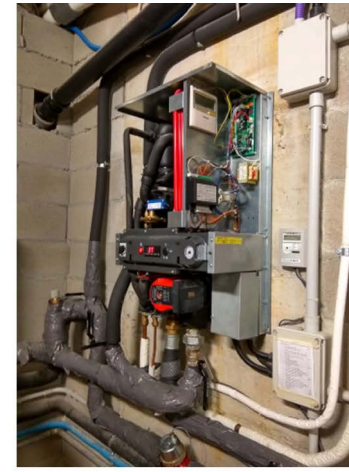
THERMAL BRIDGES - The facade has areas in which the heat transfer finds less resistance and therefore is more easily transferred through the envelope. These areas are identified as Thermal Bridges and their insulation is very important to effectively reduce the heat flow through the building envelope. Usually the best way to reduce the effect of thermal bridges is the external thermal insulation

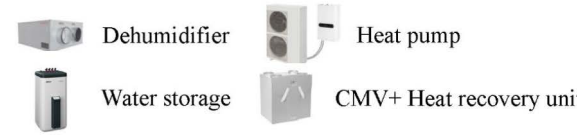
HYGROTHERMAL PROBLEMS - Aspects that must be considered when working on the building envelope are for example linked to the higher quantity of vapor that remains inside the rooms due to reduced ventilation. The replacement of doors and windows leads to a reduction in the natural exchange of air. Furthermore, if no action is taken on thermal bridges, cold areas exposed to indoor air with high humidity values can be subject to the mould growth. According to the external climatic conditions, it is therefore necessary to carefully evaluate the problems related to the water stream transport. The steam can pass through the building envelope and, depending on the position of the insulating layer, it could condense and therefore could be liquid inside the wall. This phenomenon can cause deterioration of the insulation layer and of the wall in general.

WINDOWS AND SOLAR PROTECTION- The energy performance of buildings is a problem linked to winter conditions and to heating but also concerns summer conditions and therefore the control of solar radiation in the environment in the summer season. In this case, it is important to protect the internal environment from solar radiation with low-emissivity glass, or to provide external solar shields that allow you to control the solar gains. The contribution of solar inputs for winter heating should be enhanced and, in this case, a very useful element is represented by the solar greenhouse. This element however must be managed to bring an advantage in the winter season but not worsen the situation in the summer season. Summer conditions are extremely variable over time it is important to evaluate the behaviour of the building with dynamic thermal analysis. This kind of analysis regarding the internal and external conditions throughout the year is always to be preferred, in comparison with an analysis based on monthly averages, as the solar gains in the

winter season contribute to reducing the thermal load of the heating system.
THERMAL SYSTEMS - Here is a synthesis of some elements that can, together with adequate envelope characteristics, lead to the construction of buildings with almost zero consumption and therefore that require a reduced energy input and that can obtain this energy mostly from renewable sources. The system mainly consists of a heat pump, which heats water and sends it to a tank, which distributes it through a radiant floor (figure). The control of the air quality is done through a ventilation system associated with a dehumidification system that controls the intake of air, the recovery of heat from the expelled air and the control of relative humidity. In addition, a passive heating of the air is implemented through a Solar Greenhouse: in winter the air heats up and is introduced directly into the environment through a ventilation system. A photovoltaic system is used to cope with electrical energy consumption, while the solar thermal collectors contribute to heating the water that is collected in the water storage
EU PROJECTS- Europe has promoted several research projects for the evaluation of the possibilities of intervention on buildings for energy retrofitting, for example for public buildings for historical buildings and in general for existing buildings. All the interventions that are promoted must also be evaluated according to the associated costs to find the best compromise between the energy result achieved and the cost of the operation and in any case the recovery of the investment.







TOPIC T3
ENERGY RETROFITTING OF CULTURAL HERITAGE

THE ENERGY-ORIENTED MANAGEMENT OF PUBLIC HISTORIC BUILDINGS

Cristina Cecchini

The theme of information management of built assets is extremely complex and requires innovative approaches able to deal with a variety of user profiles and knowledge domains, each of which makes use of different building representations to meet specific needs. With the aim of promoting effective building processes, new tools for modelling and communicating the behaviour of the built environment should be activated in order to capitalise the knowledge already available and to integrate new data throughout the whole life cycle. In this direction, in recent years, the solutions aimed at improving knowledge and management of built assets evolved towards digital technologies. Among them, the opportunity of merging urban and building information modeling (GIS and BIM) through the definition of multi-scale spatial database is emerging. This allows the definition of digital archives suitable to organize the knowledge on the goods, taking advantage of IT (Information Technology) for the development of applications aimed at data visualization, interrogation, and analysis.

A study carried out within the Department of Civil Engineering and Architecture of University of Pavia proposes a workflow aimed at defining an information system based on GIS (Geographic Information System) and BIM (Building Information Modeling), able to receive multi-scale building models for the purpose of defining a shared knowledge base on which to link thematic modules and decision-making tools. To achieve this objective, a series of digital tools designed to represent and manage information are put together, realizing an interoperable supply chain that allows the collection and harmonization of heterogeneous data in a single platform, founded on spatial databases which include standard three-dimensional building models.

One of the goals is, in fact, moving from a non-organized model of information management to a centralized information model. Currently, huge amount of information already exists on the built environment, but it is frequently fragmented into a variety of sources, which makes it difficult to comprehend building systems as a whole. A centralized information model is for sure an improvement which entails multiple advantages: from the reduction of redundancy and the lowering of errors to the simplification of communications and processes. However, what is most important in the view of the author has to do with the possibility of highlighting the relation exiting among phenomena.

In the study, the point of view of public managers is assumed, analysing deeply the theme of energy behaviour of existing buildings and the opportunities deriving from sustainable developing scenarios. In fact, in the framework of building energy retrofit, public assets play an exemplary role being associated with accelerated renovation rates and requiring information model tools that incorporate comparative analysis of design solutions. However, within the European context, both the effective management and the improvement of energy performances of public existing buildings are complex problems. This is due to the nature of the built environment, which often include buildings that are obsolete form a technological perspective, but precious with respect to

their cultural value, for which interests of preservation and transformation coexist.
With the aim of testing and validating the methodology, the workflow was tested on the historical centre of Pavia and particularly on the University property asset, which is of great interest both for its exceptional heritage value then for its extension and variety. With relation to the case study, the realization of a platform for consulting and interrogating different levels of energy data on the historical city centre and on University's buildings is presented. In addition, a decision-making module is provided for simulating and evaluating the effects of transformative actions aimed at energy improvement. To this aim, a tool was developed based on the cost-optimal methodology: a calculation process introduced by the European Directive 2010/31/EU, with allows the assessment of different design options on the basis of optimal level with reference to life-cycle costs.
The results achieved include: a proposal for the capitalization of existing data sets on buildings through an information system, the definition of a repeatable methodology aimed at creating multi-scalar spatial database, the presentation of a solution to the lack of interoperability between GIS and BIM through CityGML, the creation of some web-based applications for the visualization and querying of data on the built environment, and the development of a decision support tool for the evaluation of energy scenarios.
However, what appears more interesting is the relationship between what has been done and what can still be done. Thanks to the definition of a modular structure based on standard schemes, the central information core can be further exploited with other applications focused on specific knowledge domains, for example in relation to accessibility of routes, emergency management or maintenance planning. By doing so, the greater the disciplinary areas mapped in the database are, the better will be its response to queries, thanks to the possibility of carrying out simulations that are increasingly complete and adherent to reality.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TOPIC T4
INNOVATIVE TECHNOLOGIES FOR HERITAGE REPRESENTATION AND VALORIZATION

DIGITAL DOCUMENTATION FOR HERITAGE CONSERVATION AND VALORIZATION

Sandro Parrinello

Nowadays, the deepening of the documentation of architectural heritage inevitably implies a reflection on the value that digital communication has assumed in the practice of "drawing" and of the architectural "project". The importance of "documentation" and the selection of a communicative language for the dissemination of our historical heritage, in order to preserve its memory over time, is reflected in many areas of "design", whether it deals with the construction of a building, or the construction of a logical-procedural thought. Nowadays, the operation of digital documentation is finalized to the production of images that look for a mimesis of the investigated object both in a semi-total and narrative way. The latter, inspired by the shapes of the real, develops to describe and communicate present aspects through a communicative language that goes beyond the visible phenomenon. While Alberti was inspired by an ideal model to communicate, through words, a designed idea, the current society, starting from the real object, is used to transpose through images an idea of architecture that is beyond time, physical and material space.

In this dualism between image and text, understood as vehicles of a particular thought and recount of architecture, communication becomes part itself of the architectural project and, at the same time, it is transformed in a tool for the preservation of its memory. Thus, the architectural space is abstracted from its context, becoming something else, outside time and physical space: in other words, a "virtual" space is born.

The configuration of new architectures in "virtual" forms makes possible to extend the life of historical buildings and to create new spaces, as "timeless" spaces, accessible and available in a further digital time, that is infinite and without dimension. In this sense the virtual image, or the "virtual" in its overall definition, describes architecture and Heritage in their unlimited space, even if not yet existing and therefore not describable. Thus, the new digital configuration of Heritage, shared and globally perceived by a community of individuals that enjoy it, is shaping a new reality of our historical-cultural memory.

Progressively, the technological revolution and the diffusion of information initiated with the digital era have transferred the sphere of Drawing and Representation towards an almost totally immaterial communication system. Through digital images, unreleased scenarios have been prefigured, being part of an idealized future or of a glorious past, witnessing landscapes in continuous transformation. Thus, image is given the task of re-proposing the characteristics of a determined context by implementing its contents and meanings in its virtual dimension, often modifying the concept of reality itself in favour of a greater emotional involvement from the user. To the many utopian images associated with the "real", the research in the field of drawing and representation is increasingly projecting itself towards the development of new expressive systems, able not only to describe the complexities of contemporary spaces, but also to actively involve the viewer in learning and disseminating the collected information. Within this field of technological experimentation and communication development, which includes contemporary

cinematography, serious games and educational entertainment, museum spaces and contained art-works collections have also found their place in recent years, in favour of the promotion of a cultural experience system increasingly projected towards sharing and global enjoyment.
In these new digital spaces, therefore, a parallelism is generated, between real-material and virtual-digital, where human experience wants to configure itself again giving rise to new project scenarios. The implementation of meanings in the virtual context of digital expression grants a second life to the dimension of places, whose laws are defined by a new grammatical reformation of the communicative language given by computer science.
In this cultural transformation, documentation processes are updated to finalize the entire process of data management through a natural graphic decomposition of the analysed set and its transposition into an information system.
This is not a transformation only developed few years ago and now consolidated, but it is a methodological evolution still in progress, as usual, because it is closely connected with the evolution of digital tools for the virtualization of image and the constant production of new meanings. This implementation also implies a simplification of the complexity of real space, so that the process of construction of image replicates, completely, the act of drawing, and the elaborated products become instruments from which to derive simplified and critically interpreted information about the specific described object.
The research activities about digital documentation relating to a scientific field that ranges from Drawing to Valorization in architecture highlighting its symbiosis of virtual-real, are part of scientific experiments in which numerous professors and researchers participate at national and international level. The different experiences of digitalisation, of interaction between users and three-dimensional drawings or representations proposed in the volume, show the development of a joint multidisciplinary action within the different research, with a mix of communication codes necessary to build a lexical polyphony able to realize new learning logics, both in the virtual and real field. “Digital” experience and enjoyment, thus, means the interconnection of data, and the actualization of actions and design analysis and knowledge that, even at an unconscious level, qualify the learning. Even if the research is moving towards more effective ways in which the technologies of heritage documentation can guarantee the reliability of the obtained databases, the presented research witness the interest in practices of management and interaction with these databases, till to increase a dynamic transposition of the contained spaces and objects. The Digital is transformed from “target” to “mean” of documentation, becoming an investigation tool for virtual scenarios, retracing the historical memory of artefacts, analysing flows, and designing new spaces of the future. The digital reconstruction of a monument, analysed and measured, means to build a digital “double” on which to experiment the infinite possibilities of management; a model where time becomes a modifiable variable and in which it is possible to review the past, reconstructing the different stages of development and the units that have characterized the growth of the complex, to compare its present and to plan both digital and real futures, as parallelly possible.

TOPIC T4
INNOVATIVE TECHNOLOGIES FOR HERITAGE REPRESENTATION AND VALORIZATION

HISTORICAL ARCHITECTURE BETWEEN AESTHETIC AND TECHNIQUES

Massimiliano Savorra

There are many ways to use digital tools and make them interact with the history of architecture. In this contribution I will try to summarize the ones that I think are the most effective, placing side by side some questions on the identity of virtual spaces compared to the monuments of the past. In recent times, digital approaches have been applied in many fields of the humanities and have led to the creation of a new important cross-sectoral area that brings together disparate skills and requires interdisciplinary cooperation. In recent times, the digital approach has increasingly become a common denominator in specialized research and teaching, as well as in archival practices, dissemination, and publishing. In just a few years, online resources, open access collections and digital publications have grown enormously with the result that historians have suddenly accessed masses of new data - documents, images, information - from archives and collections across the world. world. The innovative use of the digital approach in the history of architecture has made documentary research, recordings, and information highly accessible, with a huge social impact. From an academic point of view, the sectors have developed, on the one hand of Digital Heritage, on the other, of Digital Humanities, which address different aspects of historical heritage. While digital heritage focuses on tangible and intangible cultural heritage objects and their conservation, education and research, digital humanities focus on the application of digital technologies to support research in the humanities. The history of architecture, a discipline straddling the humanities and techniques that relate to the world of construction; has taken advantage of the two sectors that have the word “Digital” in common.

This lesson therefore aims to outline an outline of current research topics, challenges, and practices on the frontier between digital humanities and digital cultural heritage, focusing the lesson on the “ways” in which the history of architecture is contributing to research on cultural heritage. Although the use of digital methods is currently widely consolidated and standardized, the scope of digital methods relating to images and other objects based on vision rather than close reading remains, despite various attempts, essentially unknown. There are five ways, in my opinion, that can be used for the history of architecture: the first way is to use the digitization of historical documents, drawings, ancient texts in a “traditional” sense. The second way concerns the study of the historical drawings of architects, as documents that can reveal interested unpublished aspects and new interpretations. The third way consists in studying and verifying historical hypotheses of architectures not built or left unfinished. The fourth way concerns the application of virtualization on real buildings, as in the case of buildings with degraded elements, whose image can be safeguarded by securing the original element and replacing it with a virtual replica of the same. The forms of communication and the dissemination of scientific studies are interesting, the last modality concerns the processes of critical analysis and interpretation of historical-architectural facts or documents. For the first way, we could mention the Digital Serlio project, carried out by the Avery Architectural & Fine Arts Library

of Columbia University, which aimed to facilitate the active use of the collection of drawings and editorial works of Sebastiano Serlio (c. 1475-1554.). In addition to studying documents otherwise inaccessible, because they are located in different parts of the world or because they are difficult to consult due to their fragility, digitization has made it possible to see what could not be seen with the naked eye, as for example in the exhibition organized by the Kunsthistorische photo library. Institute di Florenz, based on the drawings of Michelangelo; This is the second mode, which allows you to view the invisible, as the title of the virtual exhibition states, that is, to analyse the drawings with the aim of bringing out details that are difficult to understand in photography and even with the naked eye. Digital methodologies have introduced radical changes, not only in historical research, but also in the use of cultural heritage. The most obvious effect is a sort of "public use" of the story. In this sense, the third modality concerns the possibility of studying the cases of incomplete, degraded or destroyed architectures. There are many episodes and tools, which in any case concern the virtualization of images of the past: we could cite the cases of the unfinished facades of the churches (see for example the spectacular reconstructions made with video-mapping in Florence on the facade of the church di San Lorenzo), or the cases of monuments and lost cities virtually reconstructed (archaeology has been using digital tools for some time). The fourth way concerns virtualization applied to historic buildings, such as the case of buildings with degraded elements, whose image can be safeguarded by securing the original element and replacing it with a virtual replica (see for example the project, of which Marco Morandotti is the scientific director and Sandro Parrinello the coordinator, on the analysis of the façade and external elevations of the church of San Michele in Pavia). The documentation and the survey with digital tools allow to obtain a metrically reliable redesign of the monument, from which to develop architectural, material, and structural reflections and analyses. The last modality concerns the forms of communication and dissemination of scientific studies, concerning the processes of critical analysis and interpretation of historical-architectural facts or documents; a modality that allows us to ask ourselves some questions about the type of relationship / interaction that cultural heritage can have today with the digital space.

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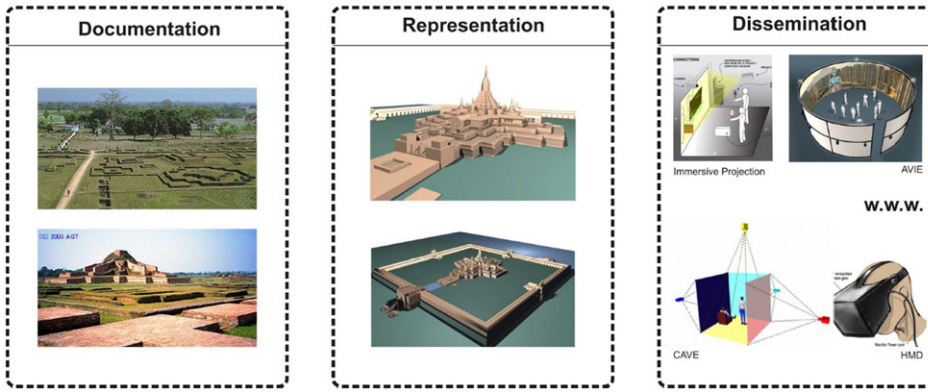
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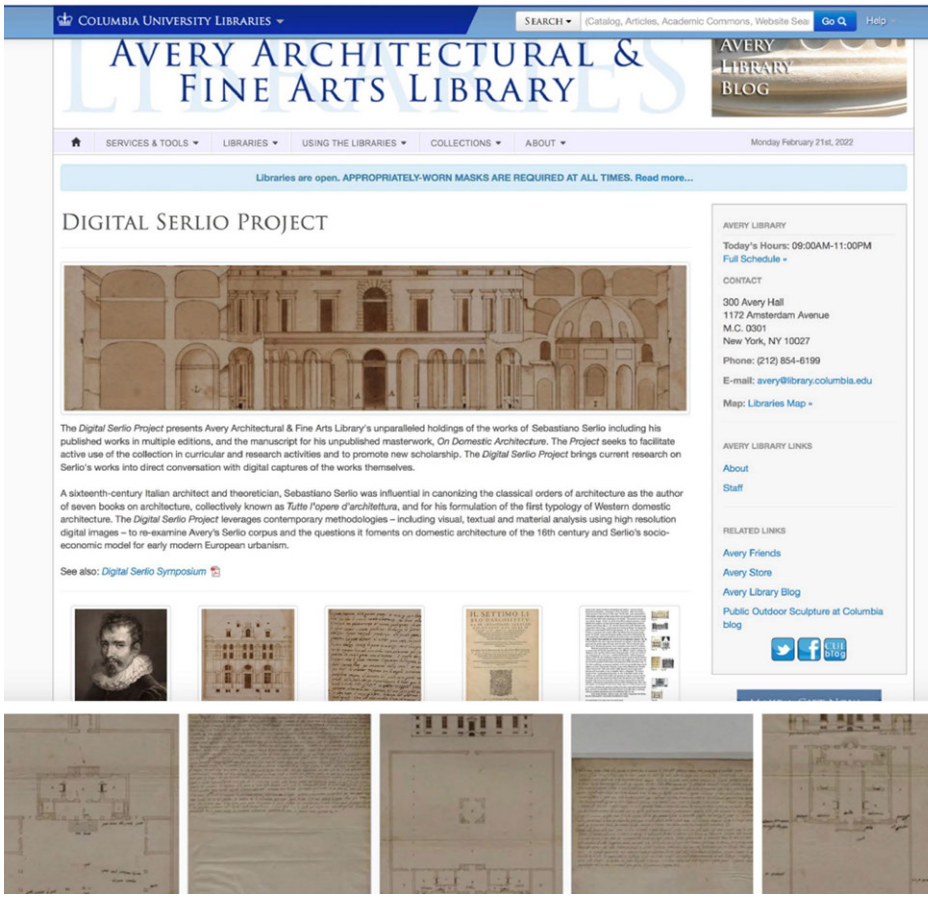
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DIGITAL SERLIO PROJECT
The Digital Serlio Project presents Avery Architectural & Fine Arts Library's unparalleled holdings of the works of Sebastiano Serlio including his published works in multiple editions, and the manuscript for his unpublished masterwork, On Domestic Architecture. The Project seeks to facilitate active use of the collection in curricular and research activities and to promote new scholarship. The Digital Serlio Project brings current research on Serlio's works into direct conversation with digital captures of the works themselves.
A sixteenth-century Italian architect and theoretician, Sebastiano Serlio was influential in canonizing the classical orders of architecture as the author of seven books on architecture, collectively known as Tutte l'opere d'architettura, and for his formulation of the first typology of Western domestic architecture. The Digital Serlio Project leverages contemporary methodologies – including visual, textual and material analysis using high resolution digital images – to re-examine Avery's Serlio corpus and the questions it foments on domestic architecture of the 16th century and Serlio's socio-economic model for early modern European urbanism.
See also: Digital Serlio Symposium
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TOPIC T4
INNOVATIVE TECHNOLOGIES FOR HERITAGE REPRESENTATION AND VALORIZATION

CULTURE AND SUSTAINABILITY

Olimpia Niglio

The importance of environment-human relationships is of undeniable importance to Cultural Heritage but the attempts to focus on the interactions as an object of study and to develop concepts and theory have had not yet achieved the status what they should have. This resulted in making the discipline of the Cultural Heritage in its contents both complex and contested; however, these very facts should be a stimulus rather than a deterrent. Approaches from both science and the humanities are required for a full understanding, which demands a team approach in cross-cultural and interdisciplinary perspectives. Simplistic models of how the environment affects society, and vice versa, have been a subject of contesting struggle in the course of the growth of contemporary society where new interpretations on the line of cultural transformations and adaptation of technology are being developed.
In the different phases of the development of the discipline of Cultural Heritage, instead of recognizing the diverse and reflexive nature of environment-human interaction, determinism portrayed the environmental relations of society in terms of a direct, one-way, causal link, as exemplarily advocated by Ellsworth Huntington (1876- 1947), a professor of geography at Yale University, who propounded the case for climatic determinism, and Ellen Churchill Semple (1863-1932), an American geographer and the first female president of the Association of American Geographers, who describes man as servitudes to nature.This introduction allows us to refocus on the meaning of two important words: Culture and Sustainability to demonstrate how the answers to sustainability issues have important cultural roots.

The Mexico Declaration (1982) introduces the meaning of Culture and affirms:

> […] it is culture that gives man the ability to reflect upon himself. It is culture that makes us specifically human, rational beings, endowed with a critical judgement and a sense of moral commitment. It is through culture that we discern values and make choices. It is through culture that man expresses himself, becomes aware of himself, recognizes his incompleteness, questions his own achievements, seeks untiringly for new meanings, and creates works through which he transcends his limitations […]

After 19 years, on March 2021 at the university of Jena the Canadian and German Commissions for UNESCO, the International Council for Philosophy and the Human Sciences, the Social Sciences and Humanities Research Council of Canada, the World Academy of Art & Science, The Club of Rome, the Academia Europaea, and the International Geographical Union have signed the Jena Declaration “Humanities and Social Sciences for Sustainability” where the article 6 declares:

> […] Cultural, social and natural dimensions of everyday practices are all inherently connected, locally embedded, and globally interrelated in specific ways. This insight requires leadership that transcends disciplinary silos while benefiting from each discipline’s findings and is supported by new forms of research organization […]

This Transcultural dimension is an important reference if we want to analyze the Cultural Heritage in dialogue with the topics of Sustainability. Only an ethical commitment allows us to improve this dialogue between Heritage and Sustainability and for this reason we need to strengthen the different cultural paradigms and thus the local culture.

So, this new cultural perspective helps us to understand that we must valorize the different meanings of the Cultural Heritage in the world, observing and respecting diversity and finding opportunities for growth and sustainable development precisely in these diversities.

Also, the Tokyo Charter, published in Japan n July 2021, introduces an important suggestion on this intercultural relationship.

> […] Every locality and community in the world have its own culture and heritage that must be preserved, protected, shared, and cherished. This gives rise to the rich diversity of cultures and heritages that exist throughout the world and in every geographical region of the world. Creating and cultivating the proper methodological approaches and techniques to know and understand these cultures and heritages is not only the key to respecting and appreciating them as well as their cultural and historical differences but also the solution to achieving "unity in diversity" and respect for the diversity of cultural and heritage expressions throughout the world […]

Now we must reflect on this dialogue between Culture and Sustainability and consider this relationship as the "fourth dimension" of our reality. Giving up valorizing this important dimension, we cannot build a better world.

THE JENA DECLARATION

Humanities and Social Sciences for Sustainability. Cultural and regional dimensions of global sustainability

SUMMARY

Humanity is very close to missing a last chance to reach the broadly agreed Sustainable Development Goals (SDGs) in time. This insight is shared by most experts. Top-down approaches often face significant obstacles to implementa- tion. To increase the speed and depth of the needed societal transformations the key change agents must be reached. These are the everyday actors, ordi- nary citizens, with their routines and habits. In order to reach them, cultural and regional diversities must be respected. In this context, the design and implementation of culturally and regionally differentiated pathways towards global sustainability calls for a stronger engagement of the humanities, social sciences, and the arts.

We, the participants of the conference on "Humanities and Social Sciences for Sustainability" (October 21–22, 2020), organized in partnership with the Canadian and German Commissions for UNESCO, the International Council for Philosophy and the Human Sciences, the Social Sciences and Humanities Research Council of Canada, the World Academy of Art & Science, The Club of Rome, the Academia Europaea, and the International Geographical Union having considered that the world is very close to the last chance to attain the broadly agreed Sustainable Development Goals

Declare that:

1. Accelerating the progress towards achieving the Sustainable Develop- ment Goals and implementing the UN "Decade of Action" successfully, requires a move from talking about sustainability to living sustainably. Such a shift implies the need to focus especially on peoples' everyday practices. This includes developing policies that enable, promote and support radical change in peoples' everyday actions.
2. Many sustainability policies stem from a human-nature dichotomy, understanding nature as humanity's surrounding environment. Yet with our body we are ourselves an integral part of nature, and we also incorporate it into our practices in specific ways, depending on what we are doing. This premise inverts the perspective on sustainability from a nature-society opposition to a society-nature interdependent relation.
3. Most of the present crises find their roots in unintended, often fore- seeable, problematic consequences of human actions that are, ultima- tely, of global significance. This implies the need to frame the crisis as primarily a societal rather than purely an environmental issue, and to expand what is understood to be its knowledge base.
4. Establishing long-term sustainable ways of living requires recogni- zing everyday practices as key drivers of the transformation. This calls for respecting those practices' cultural, social, and regional diversity, as well as past experiences of adaptation. In this context, the social sciences and the humanities must play a central role in shaping sus- tainability policies.
5. Transformations towards living sustainably will be broadly accepted if they are co-developed by everyday people, specific stakeholders, and policy-makers at all levels working

together with academic experts and scientists. This implies a radical paradigm shift away from im- posing “one size fits all” top-down strategies and towards specifically tailored approaches.

6. Cultural, social and natural dimensions of everyday practices are all inherently connected, locally embedded, and globally interrelated in specific ways. This insight requires leadership that transcends disciplinary silos while benefiting from each discipline’s findings and is supported by new forms of research organization.

7. Genuine transdisciplinary research should provide information and insights in an accessible form, and facilitate participatory knowledge production. This requires supporting bottom-up movements among relevant communities, allowing them to offer effective contributions and to take action.

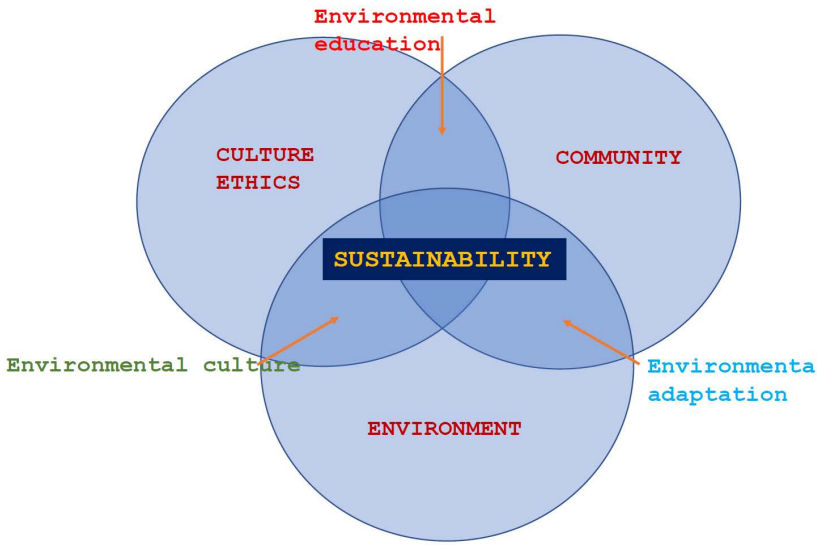
8. A deep societal transformation across generations requires that young people are especially strongly involved in this shift from the start. This demands that they have access to robust information and education, civic involvement, as well as political participation.

9. To establish culturally and regionally diverse ways of living sustaina- bly, creativity and a new aesthetic are necessary. How we do things de- pends very much on what they signify to us, how we see the world and our place in it. The arts in all their forms, together with the humanities and social sciences are crucial for expanding mindsets, providing new perspectives on ways of living. This shall allow humankind to move from the age of extraction towards cultures of regeneration, to reach the SDGs with increased speed and depth, and to ensure measurable success.

10. To that end, we call upon all relevant political and scientific instituti- ons, including funding agencies, to use the UN “Decade of Action” as a time to ensure that the cultural dimension is at the core of sustainabi- lity programs. This includes the need to:

- Reframe the basic perspective from an environmental issue to a societal challenge;
- Complement solution orientated top-down strategies with more inclusive, regionally differentiated problem-avoiding bottom-up approaches;
- Promote participation of younger generations in decision-making processes;
- Reform sustainability research, its funding and organization;
- Strengthen transdisciplinary cooperation in all domains of research;
- Revamp the curricula of all educational institutions, focusing on global social emergencies and their mastering;
- Establish universities, research and educational institutions as authentic examples for societal transformation;
- Integrate the arts, as well as findings from the humanities and social sciences into the co-design of future, culturally and regio- nally diverse “ways of living sustainably”.

Jena, March 18, 2021


Environmental education
CULTURE ETHICS
COMMUNITY
SUSTAINABILITY
Environmental culture
Environmental adaptation
ENVIRONMENT


THE COMMUNITY IS
HERITAGE

BEST PRACTICE & CASE STUDIES
UNIVERSITY OF PAVIA

BETWEEN VALORISATION AND INNOVATION, BETWEEN REUSE AND NEW BUILDINGS: THE STRATEGIES OF THE UNIVERSITY OF PAVIA FOR THE BUILDING HERITAGE

Alessandro Greco

The University of Pavia was established in 1361 and during the last 661 years the history and the development of the town is strongly linked to the destiny of the University. Nowadays the Academic Community is about 27.000 persons (24.500 students and 2.500 professors, administrative staff and technicians) in a town of 70.000 inhabitants. Moreover, it has to be considered that the University owns 53 buildings for about 225.000 square meters and more than 26 hectares of green areas. These numbers are sufficient to understand how strong the impact of all the academic activities on the town is.

The building heritage of the University is divided in three areas:

- the Historic Centre, where 10 big historical buildings (realized before the XX Century) hold Humanistic Departments, Representative Offices and Headquarters; these buildings are spread throughout the urban fabric, without a fence that delimits the academic spaces, often open to the community, but it is a closed system, which due to the density of the urban system cannot expand further. This Heritage, due to the high value of what it holds, requires maintenance and management interventions that have to combine conservation and enhancement;
- the *Istituti Universitari*, a large area with 24 buildings in the north-western part of the town with Scientific and Medicine Departments and Sports Areas; the buildings are distributed in two Campus, with fences that delimit the areas for teaching and research from other urban spaces. This system, however, is integrated with other spaces for research, medical care, sport and also the colleges of the north-western area of the town. These buildings have been reworked several times to meet new research and teaching needs, but without a unified and coordinated approach;
- the Cravino Campus, with 19 buildings for the Faculty of Engineering and other Scientific Departments, a Gym and a Swimming Pool. It is the more recent Campus (realised in the Eighties and Nineties of the last century), with a fence that delimits the areas for teaching and research from other urban spaces. Once again, a system integrated with other spaces for research, medical care, sport and even students' accommodations (private) and colleges. Although it started with a unified planning, over the years the buildings have been carried out in a fragmented way due to the scarce funding for university buildings.

Additionally, in Pavia there are also 17 Colleges (10 public and 7 private) that host 2.500 students coming from different regions and countries and 4 canteens.

The University Governance's approach to the building heritage is based on a largescale and systemic vision that takes into consideration all areas and buildings, with the awareness that a multidisciplinary University (with a vocation for internationalization) must have buildings and spaces where research and quality teaching can take place.

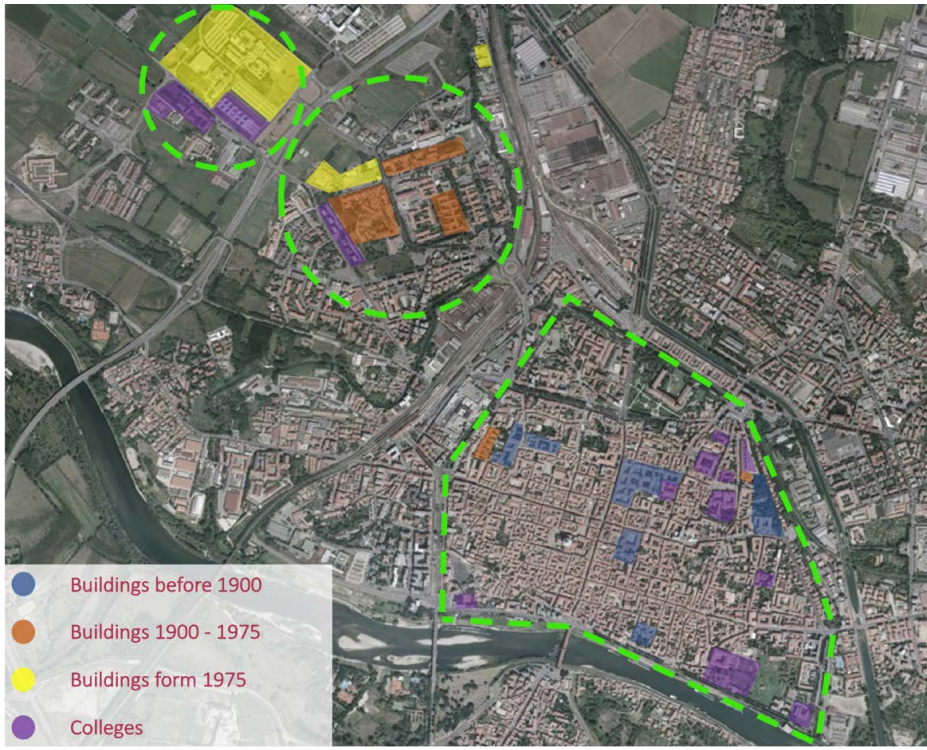
The planning and design activities are therefore oriented towards the enhancement of the available

heritage (especially of the buildings in the Historic Centre) and the construction of innovative and sustainable buildings, according to a unitary approach which has the regeneration of real areas of the city as its ultimate goal (this action is focused on the Istituti Universitari, in order to create new building for the current needs of the scientific research).

The projects that the University is developing, partly implemented with own resources and partly co-financed through ministerial and other institutions' funds, are aimed to:

- ensure adequate, comfortable and safe environments for the academic community (removal of architectural and sensorial barriers, high quality of the air in the indoor spaces, furniture to live the outdoor spaces);
- ensure functionality accompanied by a rationalization of their use, improving research and learning processes (above all the integration of devices in the teaching spaces in order to satisfy the need of connection and interaction);
- optimize management and maintenance, making use of renewable and sustainable energy sources (in order to limit the costs for heating and cooling and for functioning);
- encourage collaborative interaction with businesses (local and international, offering new spaces where the research can meet the manufacturing).

Last but not least, it has to be remembered that the academic life is characterized by remarkable dynamism and by some factors of variability that lead to the needing of a planning and design activity that certainly cannot be completed once the ongoing initiatives have been completed. The transformation of the teaching activities due to the pandemic emergency and the smart working introduced in the public offices will require new intervention to satisfy the needs of students and workers. It will be important to continue with the undertaken activity, involving some buildings in the historic centre with further conservation and enhancement interventions and continuing with the energy and functional efficiency of the rest of the building stock.



Department of San Felice in the city centre

BEST PRACTICE & CASE STUDIES
UNIVERSITY OF COIMBRA

HISTORIC BUILDING SUSTAINABLE REUSE: BARRIERS ON ESTABLISHING PASSIVE BARRIERS IN OFFICE BUILDINGS. A CASE STUDY

Luisa Pereira

The adaptation of spaces to different usage typologies can be complex in heritage buildings. Facilities were initially planned for a specific type of use that, when changed, require additional measures to ensure a suitable indoor environment. Passive strategies, e.g., free cooling, are commonly used as an alternative. However, their implementation often leads to unsatisfactory conditions. Therefore, it is important to clarify the main barriers to achieving thermal comfort in readapted historic buildings. The present study investigated the thermal comfort conditions reported by workers in office spaces of a historic building of the University of Coimbra. The main objective focused on the identification of barriers to the effectiveness of passive measures during summertime.

The case-study was the old building of the Faculty of Medicine of the University of Coimbra (FMUC), built in 1951-56 [2]. It is located at Alta, the Campus I of the university, located at the heights of the city, declared by UNESCO as a World Heritage site in 2013, University of Coimbra – Alta and Sofia [3]. According to the Köppen-Geiger classification, the climate of Coimbra is classified as warm and temperate (Csb), and the prevailing wind varies between 1.5 and 3.2 km/h (average min and max), ranging majorly from SSW to WNW direction. A continuous monitoring campaign was carried out for over four months, from May 4th, 2020 until September 9th, to assess the indoor environmental conditions using hygrothermal dataloggers. Data were recorded every 10 minutes, in eleven offices located on the ground floor of the FMUC, west-oriented (rooms on upper floors were not considered because they still maintain their original functions, while the studied spaces changed their function, being converted from classrooms and laboratories into administrative offices). Due to the COVID-19 pandemic context, the occupancy rate of each office was not uniform during the monitoring campaign (it varied between 30 to 50 %), but desktops were all turned on for remote working. A survey on the internal heat gains was carried out during onsite visits. These former single-occupant medical rooms are nowadays used as administrative offices, provided with several office equipment. The field surveys and thermal comfort analyses were performed and classified according to the most commonly used thermal comfort guidelines: ISO 7730 [4] and ASHRAE 55 [5].

Due to the characteristics of this study – onsite field research of occupied offices –, and the traditional equipment needed to perform such measurements, the study was performed under the assumption of some simplifications: i) the mean radiant temperature was considered equal to the indoor air temperature [6], and the air velocity was considered constant and equal to 0.1 m/s (considering a measured average of 0.07 m/s in the one-day measurement); ii) metabolism of occupants equal to 1.2 met; and iii) clothing insulation ranged from 0.6 to 1.0 clo for summer and mid-season (1.0 clo = 0.155 $m^2 \cdot °C/W$). It was also assumed that no occupants were under direct solar exposure. Additionally, a one-day evaluation of thermal comfort was performed using a climate analyzer and six occupants were surveyed on August 19th, 2020. To conduct this assessment, a Brüel & Kjær 1213 indoor climate analyzer was used to record air temperature Ta, dew point temperature Tdew, radiant temperature asymmetry Tr, and air velocity va with a 1-min timestep. The subjective thermal

comfort survey was carried out by the occupants by filling in questionnaires, expressing their thermal sensation on a continuous scale with indicative qualitative indications (as suggested in [7]). Data evidenced that most offices (especially collective ones) were not thermally comfortable enough due to overheating, as a result of: i) the building itself (thermal inertia; insufficient insulation) and solar radiation exposure of the west façade during the afternoon; ii) the heat generated by internal loads (occupancy and equipment); iii) the inadequate windows' operation (most windows were left open after the 8h-10h am period, even during the solar peak hours and periods of outdoor warm air). Previous occupants' complaints of overheating were highlighted, supported by both the objective and subjective data. Several measures were proposed to mitigate the discomfort conditions, namely:

• reduce to half the number of desktops computers in some offices;

• installation of a local cooling unit in the server center, for the safety of the equipment and space, and to reduce thermal discomfort in the adjacent office;

• change to a users' IT infrastructure based on servers (located in a specific and air-conditioned space), replacing desktops with individual terminals (mini PCs).

• improve/educate and instruct natural ventilation procedures to occupants, in order to potentiate/enhance the use of the free cooling effect, especially in the hottest months (June, July, August, and September) - typically, suggesting windows opening at 8h am, and closure after 10h am. For the success of this measure, occupants should be instructed and motivated to take as a reference the instantaneous data from a nearby weather station (and even the weather/temperature forecast, in the corresponding free-access platform). Though all these measures will improve thermal comfort, authors recognize that these might not be enough, especially when the outdoor daily average $\overline{T}_{out}$ > 24 ºC. Under such circumstances, the impact of external climate conditions is difficultly counteracted without mechanical cooling systems.

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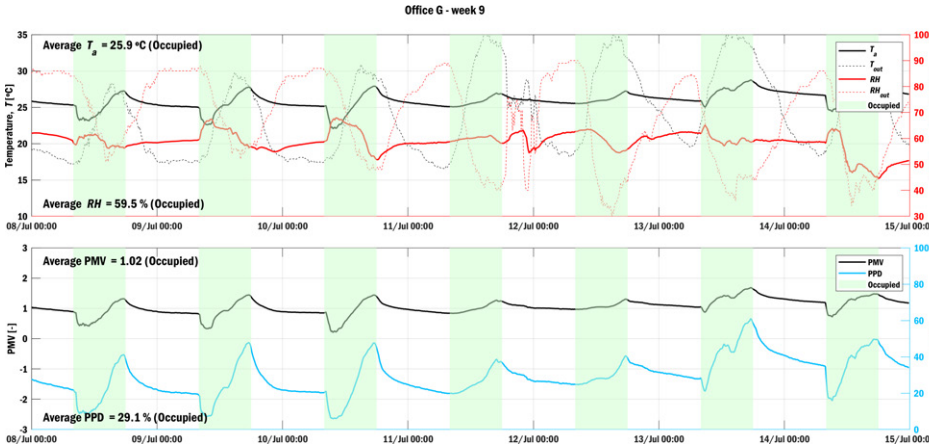

Office G - week 9
Average T_a = 25.9 °C (Occupied)
Average RH = 59.5 % (Occupied)
Temperature, T [°C]
Relative Humidity, RH [%]
T_a
T_{out}
RH
RH_{out}
Occupied
08/Jul 00:00
09/Jul 00:00
10/Jul 00:00
11/Jul 00:00
12/Jul 00:00
13/Jul 00:00
14/Jul 00:00
15/Jul 00:00
Average PMV = 1.02 (Occupied)
Average PPD = 29.1 % (Occupied)
PMV [-]
PPD [%]
PMV
PPD
Occupied

BEST PRACTICE AND CASE STUDIES: MUNICIPALITIES

EC2U AND CULTCITIES PROJECTS: INTRODUCTIONS CULTURAL CITIES TWINNING PROJECT

Maria Spitti

Comune di Pavia Europe Office Coordinator

Cultural Cities Twinning (CultCities) is a Town Twinning project - co-funded by the European Union under the CERV Programme - developed between 8 EU medium sized towns so-called "intermediate cities": Comune di Pavia (Italy), Grand Poitiers Communauté Urbaine (France), Câmara Municipal de Coimbra (Portugal), Primăria Municipiului Iași (Romania), Ville de Besançon (France), Stadt Hildesheim (Germany), Ayuntamiento de Salamanca (Spain), Turun kaupunki (Finland). The cities involved are linked by long-standing relationships (as for the twin cities of Pavia and Besançon and Pavia and Hildesheim) or by more recent relationships (Pavia, Coimbra, Poitiers Iași, Turku and Salamanca, associated partners in the EC2U project). The reciprocal connection in the CultCities project intends to create a specific context for discussion and sharing on cultural material heritage, its conservation, its enhancement and its sustainable reuse. The University of Pavia also participates in the project as an associated partner, offering qualified support for discussion and the opportunity to involve the young student population.

Intermediate cities are supply centres for goods and services for the population of the same municipality and for those of other municipalities (urban and rural settlements) which lie within their area of influence. They also connect local, regional and national networks and usually host local and regional government administration. Hence, intermediate cities are more balanced and sustainable systems, developing more equitable relations with their territories. They also allow for greater civic participation in the government, administration and management of the city, making it easier for citizens to identify with one single collective identity. Intermediate cities represent the contexts in which resources, capital, skills and talents are concentrated and, at the same time, the places where many environmental, economic, political and cultural challenges are experienced. They are the best environment therefore, that allows to experiment the paradigm shift from linear economy to circular economy, in which to promote synergetic, fair and inclusive processes capable of activating new forms of urban productivity and social and economic innovation.

In particular their cultural heritage is one of the main drivers of development and cultural heritage adaptive reuse strategies can play a decisive role not only in terms of increasing the life cycle of the heritage but also as an urban strategy capable of generating new, even values (economic, aesthetic, cultural, educational, political), supporting innovative dynamics of local development.

The general objective of the CultCities project is to share and discuss between citizens and relevant stakeholders, with a long lasting prospective, best practices projects and examples related to the conservation of the cultural material heritage.

The specific objectives of the project are:

- to share, discuss and involve relevant stakeholders to present best practices that explored in total or partially new circular businesses, financing and governance models in heritage conservation, creating synergies between multiple actors, reducing the use of resources and regenerating values, capital, and knowledge;
- to involve young stakeholders as culture experts, young artists, students in discussing conservation policy and practice;
- to set up a permanent cooperation mechanism between cities: a "Culture and Heritage Living Lab" as a practice-driven organization able to facilitate and foster open and collaborative innovation , as well as real-life environments or arenas, where both open innovation and user innovation processes can be studied and experimented with, and where new solutions are developed.

The kick-off meeting of CultCities was held on March, 03rd 2022 in the B.SuRe Winter School – Building and Sustaibable Reuse. On this occasion, the 8 cities started the exchange on projects and good practices, with university teachers and participating students.
The exchange continues in the twinning of April, 04-07 in 2022: the four-day event represents an opportunity for each delegation from the cities involved – municipalities representatives, cultural expert, university professors, students …- to visit the enormous cultural heritage of Pavia, to deepen the mutual knowledge, to implement the exchange of good practices and case studies relating to the enhancement of their cultural heritage, as well as to participate in the open discussion. The 8 Municipalities also intend to sign a Friendship Agreement for the creation of the Culture and Heritage Living Lab, underlining their mutual intention to continue working together on the topics of the CultCities project.

MUNICIPALITY OF PAVIA
THE MIRABELLO CASTLE IN PAVIA

Mara Latini

Head of the Public Works, Maintenance, Expropriation and Mobility Department

In the northern outskirts of Pavia and in the heart of the ancient Visconteo Park, on the right bank of the Vernavola, is the Mirabello Castle. The Castle is a magnificent palace built in the second half of the fourteenth century, set in an equally prestigious area. The Castle and the park were both intended for hunting and entertainment for the Visconti noble family and their court. The information available on the origin of the building does not agree with the researchers who are divided between those who attribute the Castle to the Visconti age, while others to the Sforza age. The South building is partially corresponding to the current one, and the more northern buildings is now used as a stable and portico.

The building currently retains only one side of the original rectangular plant: a two-storey building characterized by a double row of windows profiled in brick. The load-bearing structure is in solid masonry of varying thickness, wooden floors, roof with wooden structure. The facades have an interesting layout of the holes, large and with archivolts in terracotta in the central body of two floors; the main facade towards the courtyard has a protruding gallery, supported by brick arches, supported by carved granite corbels; between the arches there are two marble coats of arms. On some parts of the masonry there are interesting remains of plaster with lozenge design and the bands under the eaves have traces of decoration and fresco with rectangular squares variously coloured in imitation of marble inlays. Inside the building there are interesting stone fireplaces with shaped mouldings and frescoed coats of arms. On the outside there are also some farm buildings which are more than a century old and have constructive characteristics typical of the local rural architecture.

Many interventions have been made on the building which have profoundly changed the appearance of the Mirabello Castle. Originally the central body of the building developed on two floors, in all their height; on the north facade there were two regular orders of large windows with round arches. Likewise, on the south side, there was a regular row of round windows on the first floor. The openings on the ground floor is assumed to be smaller and with a lowered round arch. During the first decades of the sixteenth century, on the south facade and on the north front, the round arched windows on the first floor were closed and new rectangular ones with stone profiles were opened. Subsequently, with nineteenth-century demolition works, the two side buildings were lowered in high, reduced to a single floor. The central part corresponding to the gallery was preserved and safeguarded and intended for farmhouses. The main objective of the proposed intervention is the monumental recovery of the Mirabello Castle and its functional conversion to activities compatible with it, which at the same time guarantee both a constant use by the community, and a more punctual maintenance. This is the idea in order to reconnect it, in the most congenial ways, to the city fabric and determine its transformation into a pole of aggregation for the community.

The advanced project hypothesis foresees 1) the recovery of Castle, 2) the recovery of the houses of employees, 3) restoration of the arcade 4) Requalification of the private green area.

1. The advanced design and restoration hypothesis provides for the recovery of the main building (blue) as museum services, where it is possible to set up exhibitions and performances for territorial and local promotion; this portion of the building is the best preserved of the whole complex and on it, particular attention must be paid to the restoration of the frescoes contained therein, the restoration of the flooring and the plant equipment necessary to accommodate the function. Numerous stratigraphic investigations will have to be carried out in this element in order to guarantee a complete knowledge of the artefact. Through the use of the bibliography, the Castle was analysed for the historical - morphological evolutions in order to eliminate the superfetation's not compatible with the building. Together with such stratigraphic research, investigations will have to be carried out to determine the state of conservation of the structures, the relative deterioration, and the maximum overloads attributable to it.
2. The farmhouses next to the main building (orange) will be used as headquarters for cultural associations and for the promotion of the territory. On these portions of the building the interventions must be more incisive both for restoration and aesthetic point of view, for structural consolidation interventions needed, and preliminary investigations aimed at verifying whether the transformations that have taken place over the centuries have not definitively delayed their historically determined constituent elements.
3. The portico (green building), positioned in the opposite portion of the courtyard with respect to the main building, will be cleared of all the volumes raised below it, and will be used for outdoor aggregation activities, providing for the elimination of the various superfetations. At the same time, the intervention will provide for a rationalization of the garden included among the aforementioned buildings through the creation of transit spaces paved with elements compatible with the context and spaces intended for greenery, possibly also equipped, to ensure the possibility of carrying out aggregative activities in a pleasant context and in close contact with nature.
4. On the east side of the complex there is a vast green area, ideally reachable with the one adjacent to the Vernavola river and park, developing beyond a road layout. In a project hypothesis, a redevelopment of this area is envisaged in order to be used by the public.


TAV. X.
Il Castello di Mirabello presso Pavia.


MOBILITA' INTERNA
ACCESSO VIABILISTICO
ACCESSO VERDE - PARCO DELLA VERNAVOLA

MUNICIPALITY OF HILDESHEIM LIVING WITH OUR CULTURAL HERITAGE

Fritz Ahrberg

Turism Manager of Hildesheim Marketing

Hildesheim is a German city with about 101.000 inhabitants and was founded in 815 around a little chapel. Finished in 872 Hildesheim Cathedral replaced this little chapel. Together with the Church of St. Michael, which was completed in 1031, the cathedral and its treasury became UNESCO world heritage in 1985. But even more important, they have been and still are symbols of identification for generations of people living in Hildesheim.

Hildesheim Cathedral, which is formally called the Cathedral of the Assumption of Mary, was built in Romanesque style. Denominated as a Roman Catholic church it is the seat of the diocese of Hildesheim, which handles an area of about 30.000 km² with about 5.3 million people living in it, even though only about 590.000 of them belong to the Roman Catholic Church.

Church of St. Michael was also built in Romanesque style. Since the reformation during the 16th century, it is denominated as a simultaneous church with a Lutheran main church and a Roman Catholic crypt. The main reason was that the Roman Catholic bishop Bernward, the architect of St. Michael, is buried inside the crypt. Since that time, the main church and the crypt have had different entrances for centuries, and they have bricked the connecting doors inside the building up. Today, you can get through this passage again. After the church was restored from 2005 to 2010, there aren't even any doors between the main church and the crypt. That is meant as a symbol for rapprochement between Roman Catholic and Lutheran Church.

Church of St. Michael and the Hildesheim Cathedral got heavily damaged during World War II. Fortunately, most of the artwork and the treasury had been taken out and brought to a safe place before the bombing in 1945. It took many years to reconstruct them. The Church of St. Michael reopened in 1957 about three years before the Hildesheim Cathedral. Therefore, only parts of both buildings are really original. The main reasons for getting UNESCO world heritage were the perfect examples of Romanesque architecture of the one hand but mainly the famous bronze works and the treasury on the other.

Connected to the destruction in World War II is the story about the "Thousand-year Rose" at the outside wall of Hildesheim Cathedral. The Hildesheim Rose is part of a legend about the founding of Hildesheim and covers an entire part of the facade. Nobody knows if it is over 1,000 years old, but scientists found out that it is at least 700 years old. During the bombing in 1945 the Rose burned down. People thought it was lost. But eight weeks after the fire the first shoots came out of the ground again. That was a signal of hope for the people. Even today, many people say that the city will be fine as long as the Rose is growing and blooming.

Nowadays, both churches are tourist destinations. With an abrupt break during the Corona pandemic, they get visited every day by groups or individual travellers and people from Hildesheim. Especially when the Hildesheim Rose is in bloom, it sometimes gets crowded. In 2015, the new

Cathedral Museum was opened to the public. It is directly connected to the cloister of the cathedral. It contains the cathedral's treasure and has some areas for special exhibitions.
Besides the touristic dimension, Hildesheim Cathedral itself is mainly used in its original function as a religious site. There are services every day. Regularly, they are led by the bishop himself.
The Church of St. Michael is also used for services. And during open hours it is also accessible for individual visitors and groups every day. In addition, it is also used for cultural events. As the Lutheran centre for sacred music and services is located beside the church it is also used for public concerts. During the "EVI LICHTUNGEN", which is a big international light art festival, big illuminations and artworks take place there. In 2010, even a musical production ("Children of Eden") in cooperation with the local theatre was shown on several evenings inside the main church. A conference centre right beside the church is mainly used for seminars or studies on religious topics.
A very important decision in order to use the Church of St. Michael in several ways was made during the restoration between 2005 and 2010. In the complete church, the long pews were replaced by single chairs. That makes it easier to use the church in many ways. Some examples:

- For most concerts and also for the musical production mentioned above, the auditorium gets turned around. The people look at the organ, the altar is behind them. Below the organ a whole chorus and/or an orchestra can be placed on a raised stage.
- For the light art festival "EVI LICHTUNGEN" every two years the chairs get removed completely. In 2018, the main church was used for a room-filling projection accompanied by a reading created by Ursula Scherrer and Liliya Ben Romdhane. In 2020, artwork from the famous Italian artist Fabrizio Plessi was shown impressively in the centre of the empty church.
- During the Corona pandemic, a reduced number of chairs was placed inside the main part of the church. They were standing in little groups with gaps in between. Therefore, the people had the necessary distance to other people even though the church did not look empty.

To conclude, our places of heritage are part of everyday life for inhabitants as well as for visitors. They are used in their original religious function, as historical locations including a newly built museum, as places to pause and recreate, for cultural events and exhibitions, and for meetings and seminars. Despite their more than 1,000-year history, they are alive and part of the city´s identity.

Image: © Hildesheim Marketing, Photo Bierwagen

MUNICIPALITY OF TURKU
HISTORY AND THE FUTURE – TOWARDS A NEW MUSEUM

Joanna Kurth

Project Manager

Turku is situated in South-West Finland, opposite of Stockholm on the other side of gulf. It is the oldest city in Finland and one of the oldest in the North. In its history Turku used to be the second largest city in Sweden, and acted as capital until 1812. The first written document where Turku is mentioned is from 1229, and this year is often seen as the foundation year.
Nowadays Turku is the cultural and economic center of its region, and it's third largest urban region in Finland with 337,000 inhabitants. The population of the city proper is around 195,000. City Turku six higher education institutions with 40,000 students. Maritime industries, biotechnology and information technology and tourism form the basis for local economy. Turku is a bilingual city with Finnish speaking majority and minority of Swedish speaking (5.5 %). 12 % speak languages other than Finnish or Swedish. There are more than 100 nationalities resident in the area. The attraction of Turku in terms of tourism is based on the coexistence of clean and diverse nature, a breathtakingly beautiful archipelago and city's long history and diverse culture scene. As a city Rich history is also present in events developed around past, f.ex. medieval markets. Currently there is 14 professional museums in Turku, among them f.ex. Turku Castle, Luostarinmäki open air museum, Biological museum, archaeological museum Aboa Vetus, Finland's second national gallery Turku Art museum. However Turku doesn't have a dedicated city history museum, even though it has large cultural historical and archive collections. Turku made decision about realization of a new city history museum in 2017. New museum will be opened in 2029 as part of celebration for 800th anniversary of Turku. In its core new museum will act as city history museum, and its focus will be in looking towards possible futures through city's history, and to examine history through future. Finland is a leading country in future studies and future skills have been increasingly seen as an important tool of understanding our existence. Idea of future skills as part of museum's content, operations and educational programs have had a wide appeal. Location for the museum is in Linnanniemi, by the riverside and near Turku Castle. Location has a long and multifaceted history, with Castle as an administrative stronghold from medieval times inwards and with long harbour and industry actives and their history. Most of current Linnanniemi is landfill area, as Castle was constructed originally on an island that later was connected to mainland. Nowadays Linnanniemi is a brown field area used for harbour activities and Castle is partly isolated by these. Land lease with harbour ends in 2026 and land will be returned back to city's use as harbor activities will be relocation. New museum will be the first new construction implemented and will act as a vanguard for urban development in Linnanniemi. Architectural competition for the museum is planned to open 1.9.2022 and end 16.1.2023., and the aim is to start building in 2026. As important for the new museum than the new building is the museum's concept and content, and work with these have been an open process. Cocreation is integral part of planning and doing the new museum. Citizens, museum staff, outside experts and stakeholders have all been included in the engagement process and brainstorming content. a lot has happened,

starting with surveys and interviews from 2014 onwards, being active on social media, organizing mobile workshops and participation workshops, implementing participatory projects in suburban neighbourhoods, and displaying pop up content. As part of the planning process new co-operation agreement with local universities have been signed. Input from all participants have made an impact on how we think about the museum and its implementation as well as its goals and its content. At the same time general awareness of local history and cultural heritage has risen. Participants to all actions have been enthusiastic to talk and learn more about our local cultural heritage as well as to engage in thinking about possible futures for cultural heritage. Challenges that Turku faces as a city are shared globally. New museum can through its own expertise work towards solving these challenges. Museum as an ecological and resource wise building also offers possibilities to act as a platform for stakeholders, who's goals align with working towards sustainable future

New Museum of History and the Future will be built by the water near Turku Castle. Photo: Samu Valleala.

Also the need for new type of partnerships and out-of-the-box business models has been recognized, and discussions around these issues continue. Museum of History and the Future will open in 2029. Museum's operational models will be based on partnerships, and it will act as a platform for creative industries and for future studies. Citizen science, participatory practices and building up future skills are in the heart of audience engagement.

Pivotal will be collecting and documenting intangible cultural heritage in form of memories, recollections, and stories about everyday life. Museum must also function and act outside its walls. For these digital services and digital contents are important. On our journey towards 2029 we are interested in learning from our partners and from other cities. We want to maintain flexibility in our thinking: We are open to rethink our plans and change them. As a city Turku has always been ready to embrace innovations and new connections. We continue doing that.

MUNICIPALITY OF COIMBRA
THE REHABILITATION OF COIMBRA'S CONVENTO SÃO FRANCISCO

Joana Gouveia Loureiro

Cultural Officier

This article aims to provide a small glimpse on the history and rehabilitation process of the Convento São Francisco located in Coimbra, Portugal, from its origins, in the beginnings of the 17th century, as a humble Franciscan Convent until its transformation in 2016 in the region's biggest Cultural and Congress Center.

When analysing the rehabilitation of a structure like the Convento São Francisco, one must first delve into its 420 years' history to understand its importance in the context of the development of the city of Coimbra. What started in the 17th century as one more convent in the already religious-themed saturated landscape of Coimbra became, in the beginnings of the 19th century, a healing shelter for enemy soldiers during the French Invasions, one of the bloodiest wars fought in Portuguese territory. Later on the building came to be one of the first industrial settlements of the city. Nowadays, Convento São Francisco bolsters a whole new image, conjugating culture, knowledge, innovation and economy in the same place.

But how did it all begin? The first stone of the Convento São Francisco was laid on the 2nd of May 1602 and in 1609 the Franciscans occupied the building, with construction work continuing until the end of the 17th century.

During the French Invasions (1807-1810), troops occupied the convent, which served as an hospital, leaving a trail of destruction and death. In archaeological campaigns, carried out between 2010 and 2013, bones and other remains were discovered, including buttons, buckles and medals, which must have belonged to the soldiers.

During the 19th century, with the extinction of the Religious Orders in 1834, the convent came to assume other functions. The old church of the convent became an alimentary products factory and the convent spaces were sold in 1842 and housed a steam factory for weaving cotton, wool and silk. The factory occupied both the convent and the church, spaces dedicated entirely to the manufacture of woollen fabrics. Working for almost a century, the factory continued to operate until the 1980's, having been acquired by the Municipality of Coimbra in 1986.

The restoration of the Convento São Francisco began in October 2010. The project carried out by the Municipality, with European funding, restored the convent, giving it a contemporary dynamic, while maintaining the original design, and also included the construction from scratch of an Auditorium with capacity for 1100 seats.

The vaster operation of rehabilitation of the Convento São Francisco into a Cultural Center includes two projects:

- the restoration of the Convento São Francisco – designed by Architect João Luís Carrilho da Graça.
- the reconversion of the former São Francisco Church (named now as D. Afonso Henriques Hall)- designed by Architect Gonçalo Byrne;

The two projects share common areas, resulting in a design dialogue between the two renown authors. It is, in fact, a contemporary intervention that fully accepts the traces of the different occupations that the building testified throughout its existence.
This rehabilitation provided the Convento São Francisco with an Auditorium and several multi-purpose rooms, which transformed the building into a Cultural and Congress Center, reopened to the public on the 8th of April 2016. Considered a place with unique features in the national context that contributes to the enrichment and cultural notoriety of Coimbra, this Municipal equipment is also an agent of economic development of the territory, boosting various strategic sectors. Carrilho da Graça's project also endowed the building with a new square, exploiting the potential of the landscape.
The reconversion of the old church of Convento São Francisco, by the Architect Gonçalo Byrne, sought to restore the intrinsic spatiality of the old church's Renaissance style layout. The purpose was to guarantee the perception of the original features of the church, with the new additions allowing flexibility to the place, without intrusion, for multiple uses. A fluid space was created in the interior and the staircase also works as an extension of the terraces, unifying the public

space. When it comes to its new purpose, the Convento São Francisco promotes a creative artistic programme in the cultural field, which stands out for the high and recognised quality of the contents presented, as well as for a set of culturally innovative proposals.

The plural and democratizing sense of its project identity is materialized in a programming that crosses various aesthetic languages, artistic disciplines and creative approaches. It is a municipal equipment able to attract diverse audiences and to take them in a rewarding experience to the universe of contemporary arts and culture. In the case of the enterprise and events sector, the Convento São Francisco stands out as the biggest host for business initiatives and events, including congresses, conferences, and symposiums, having the largest auditorium in the Centre Region of Portugal, several meeting rooms, exhibition areas, a 500 spaces parking lot and a magnificent outer area for events. The rehabilitation of the Convento São Francisco as a Cultural and Congress Center is a good example and practice showing how an historical monument can embrace a new life and approach without losing its main architectural traits, while also bridging the gap between the old and the modern

GRAND POITIERS URBAN COMMUNITY

Florence Cazals

Chargée de mission ingénierie de projets européens et internationaux

The « Palais » is one of the most remarkable buildings of medieval civil architecture in France. It was the residence of the Counts of Poitou - Dukes of Aquitaine and has seen some of the most illustrious figures in French history: William the Great, Eleanor of Aquitaine, Alphonse of Poitiers, Pope Clement V, King Philip IV the Fair, Jean de Berry. Its history is closely linked to the figure of Eleanor, Duchess of Aquitaine and then Queen of France and England. A place of power, then a courthouse, it has been a witness to the great events of French history over the centuries. Over the years, the Palais has been transformed from the Gallo-Roman period to the 19th century. During the Revolution, the former ducal palace became a courthouse. Extensive work was undertaken to open the building and adapt it to its new functions. In 1862, the building was listed as a Historic Monument. The building has now entered a new era, following the relocation of the courthouse in 2019 in another area. Owned by the City of Poitiers since 2020, requiring major research, development and restructuring work, the Palais is above all a heritage that must be offered to future generations, but it must be adapted.
In the coming decades, the Palais will need to demonstrate its resilience, its ability to respond to new needs and conform to new uses, as it has always done since its construction in the 12th century. Since 2016, the city and its partners have been engaged in a broad reflection. The revelation of the heritage and architecture of this exceptional monument, but also its reinvention, aim to make it the symbolic gateway to the territory.

Salle des pas perdus
The “Salle des Pas Perdus” with its dizzying dimensions (50 m long, 17 m wide, i.e. 850 m2) is a place of passage, of meeting, of retreat in case of rain or hot weather. Former reception hall, it is now a place to rest and read, but also a place for cultural events, exchanges, and debates. Since 2021, the Salle des pas perdus have been open every day of the year, from 8am to 10pm.

A project in co-construction
Since 2016 and the announcement of the relocation of the Justice Department, a vast reflection has been undertaken on the future of the Palais and the development of the district. The Palais is seen as an essential heritage building, both locally and nationally, and a real opening on the territory, allowing different uses to be combined.
A consultation phase with actors involved in the fields of culture, urban planning, higher education, tourism, and economic development, as well as with citizens, has led to the confirmation of the initial hypotheses and above all the interest expressed by the public in (re)appropriating the building and seeing cultural projects developed there.

THE URBAN PROJECT: A PALACE OPEN TO ITS NEIGHBOURHOOD

The “Palace Neighborhood Project” will reveal and reinvent the Palace, linking the building to the contemporary life of the city, with the aim of changing the way it is viewed and used. It is therefore a project on the scale of a district, from the Palace to the Cathedral-Museum district. This district is an urban ensemble to be (re)discovered, which brings together in a few streets’ historic buildings and the city’s major cultural and tourist attractions.

The development of the Palais district presents a triple opportunity:

- To open up the public space and enhance the heritage, with the creation of an attractive and popular district, combining conviviality and culture around the cathedral/museum axis.
- Reviewing traffic patterns and encouraging soft mobility to enter and leave the city center.
- To provide a response to global warming on a city-wide scale, by encouraging open spaces for freshness and greenery.

The overall coherence between the interior of the Palais, its immediate environment and the Palais district is essential. This requires a proposal that favors access for all citizens, promotes nature in the city, and facilitates projects and creation for cultural actors.

2021: ATELIER NOVEMBRE, WINNING TEAM

The summer of 2021 marks a new stage in the continuation of the project since the team in charge of the rehabilitation of the Palace and the implementation of the project in the monument and in the city has been designated (by the dialogue commission which includes elected officials as well as institutional partners, historians, and qualified personalities). It is the “Atelier Novembre” which has just signed a 9-year contract with the city of Poitiers.

Following the call for tenders issued in the summer of 2019, to which some 100 candidates responded, 4 multidisciplinary teams were selected to compete in a competitive dialogue procedure. These teams, composed of architects, urban planners, landscape architects, scenographers, economists... each proposed their vision of the project, which was refined during the dialogue phases with the members of the project steering committee.

Located at the epicenter of Poitiers, this large-scale project has two parallel components: on the one hand, the renovation of the Palais and the associated public spaces, and on the other hand, the development of the master plan linking the Palais district to the future “Cathedral Center”. It is therefore a global project, architectural, landscaped, and urban, which aims to enhance the city center and to give back to the Palace its symbolic place as the heart of the city.

Credits for the picture : Sébastien Laval

MUNICIPALITY OF IAŞI
PRIMĂRIA MUNICIPIULUI IAȘI

Elena Farca

Head of International Affairs Office

Iași (Romania), situated in the South-Eastern part of Europe, in North-East Region of Romania, is one of the oldest cities in the country and has a strong cultural identity with a rich heritage. Iasi is the center of a metropolitan area with a population over 400.000 inhabitants (the second city in Romania). It is also one of the largest cities at the eastern border of the European Union and the second largest academic center in Romania with 6 universities and about 60,000 students. It also aims to offer business opportunities as a regional hub for knowledge. Iasi has the first University in Romania, "Al I Cuza University", the first Romanian National Theatre, first Romanian Public Library and one of the most beautiful libraries in the world, at "Gheorghe Asachi" Technical University.

The good practice presented by Iasi Municipality in the frame of CultCities project is the Route of Remembrance – digital map of historical buildings of Iași during First World War

The Project the "Route of Remembrance" implemented by Iasi Municipality on 2018 aimed to create a historical & touristic route enhancing the historical monuments that hosted the most important institutions and diplomatic representatives during World War I when Iasi was Romania's Capital.

The project included: buildings identification, installation of 17comemorative plates, from which 3 bilingual, installing 11 informative panels with the project map, including 1 in the thematic painted Tramway of the Centenary, guided tours and free visits of the historical buildings included in the Route, joint efforts to rehabilitate the obsolete heritage buildings.

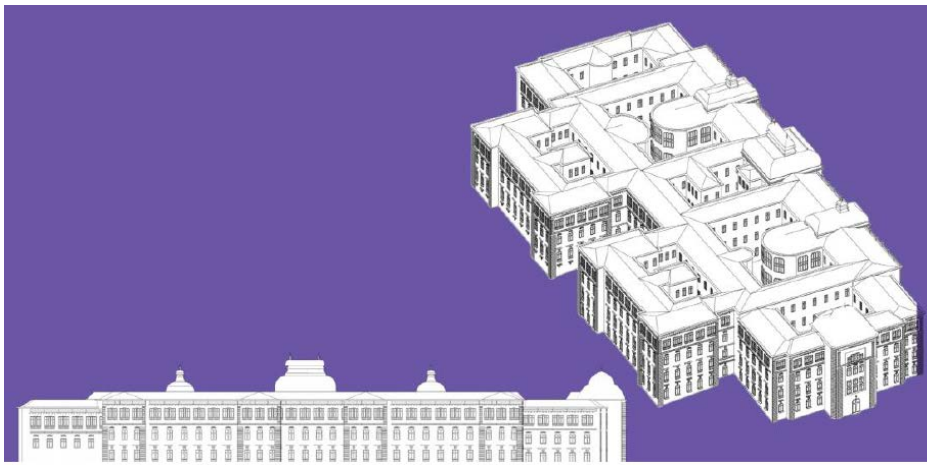
The project had also an innovative approach, to attract young generations – the creation of a dedicated app that can be downloaded from Playstore on mobile phones.

The Memory Route application includes archive photos and information about 35 buildings that represented important historical landmarks in the period 1916-1918, these being presented with the function they had then and now. Following the route of the 35 objectives on the digital map, we can follow in the footsteps of the heroes of the First World War, reconstructing tabs from the history of the city of Iași. The application can be downloaded for free on Android and IOS. Aso, a dedicated web page has been created: www.iasicapitaladerazboi.ro, including the Documentary "Diplomatic missions in the war capital of Romania" (English version)- www.youtube.com/watch?v=jpNeSMYchNs (Romanian and French version available)

A total of 65 three-dimensional models were used to illustrate the Remembrance Route, of which 35 may be admired in detail on the second side of the map where explanations in Romanian and English complete the story of the city of Iasi, War Capital.The Map illustrates all the buildings whose destiny was linked to the period 1916-1918 being presented with their

function of today and yesterday. Thus, among 35 stories we find out that the University Palace hosted the Senate Headquarters, the National Theater hosted the Chamber of Deputies, the Children's Palace became the residence of Queen Maria and the Museum of the Union, the residence of King Ferdinand I.

This project has been an important opportunity to bring back to public attention the rich cultural and historical heritage of the city in various ways meant to reach a wider public, of all ages, with appropriate instruments, from classic maps and guided tours to a website, social media and phone apps.



MUNICIPALITY OF SALAMANCA
AYUNTAMIENTO DE SALAMANCA

Rubén Tostado González

Coordinador general Fundación Salamanca Ciudad de Cultura y Saberes

The history of Salamanca began around 2,700 years ago. Since the beginning of Iron Age, Salamanca has witnessed the passage of different tribes and cultures like Vacceos, Vettones, Romans, Visigoths and Muslims. The medieval repopulation formed the basis of a city that, after eight centuries gathering art and wisdom, has become, due to its cultural spirit, one of the capitals with the greatest cultural traditions and monumental splendor in the entire European continent, which led the UNESCO to recognize it as a World Heritage City more than thirty years ago.

Salamanca is worldwidely known as the home of one of the oldest and most famous universities in the world. Created in 1218, the University of Salamanca (USAL) is a synonym of quality teaching and rehearsing in every field, with privileged centres of investigation that are recognized both nationally and internationally due to its outstanding teachers and educational programmes. In addition to the public university, the Pontifical University of Salamanca (UPSA) makes even greater the academic proposal of Salamanca. More than 35.000 students come every year to study in both universities, having at their disposal a huge catalogue of official titles, masters and specialization courses closely related with literature, many of which can only be studied in our city.

In a wider sense, Salamanca means culture: cultural activities in our city are constant and diverse. The City Government has made great efforts so as to provide the citizens with a remarkable and stable cultural proposal. As a result of it, culture has become a most valuable sector in our local economy, and more and more people come every year to Salamanca attracted by its rich cultural life: more than 600.000 visitors came to our city last year, being the most visited city in our region and the sixth in our country.

Because of this interest and focus on culture, Salamanca was recognized as European Cultural City in 2002. In the course of that year, more than one thousand cultural activities were enjoyed directly by more than two million people, attracting the interest of more than three million visitors and making the name of Salamanca a first level destination in cultural tourism. Nowadays, one of the most outstanding international arts festivals in our country –named FACYL- is celebrated yearly in our city: last year celebrated its ninth edition, focused on presenting the last creations of some of the most renowned international artists in our time.

Moreover, Salamanca is worldly known as one of the most important teaching centers in order to learn Spanish. Since 1492, when the first edition of a grammar concerning the Spanish language was published by the grammarian Nebrija in Salamanca, thousands of learners come yearly to our private and public schools – almost 25.000 foreign students in 2013- so as to learn or improve their knowledge of Spanish, being aware of our city's teaching experience

and quality. With the aim to provide all of them a whole pack of assistance, information and advice, the City Government has put at their disposal a new office called Salamanca, City of Spanish, integrated as well by both universities, the Chamber of Commerce of Salamanca and representatives of private language schools.

Literature and books are, undoubtedly, two of the most significant values that represent our culture: Salamanca was one of the first Spanish cities where printing began; also in Salamanca were built the first university library and press in Spain; the first grammar dealing with a vernacular language, as said above, was published here as well, and still nowadays Salamanca is an important publishing and editing city in our country. Literature has been felt in every corner of the city: Spanish outstanding writers and poets like Miguel de Unamuno or Fray Luis de León gave birth to their everlasting works in our city, and an important canon of universally recognized Spanish masterpieces – El Lazarillo de Tormes, El Licenciado Vidriera or La Celestina- have taken place in its streets, churches and gardens… Our city is pervaded by Literature and culture: more than ninety streets and squares have names related with literary writers and works, being almost twenty the amount of urban sculptures and monuments spread throughout the city connected with Literature.

So as to be able to manage the whole cultural offer and programs that the Municipality organizes every year, a public foundation was created twenty years ago: Foundation Salamanca City of Culture and Knowledge. This public institution is in charge of preparing, managing and organizing a wide and multidisciplinary program of activities.

As a mere indication of this, last year more than 450 different activities were celebrated in spaces directly managed by the Foundation, comprising every cultural field: almost 150 scenic activities, 158 music events, 50 conferences, 39 art exhibitions, etc, which were followed and enjoyed by almost 320.000 people.

As far as cultural spaces are concerned, the Foundation manages directly a wide variety of cultural infrastructures: a public Theatre, a Museum of Modern Art, a Scenic Arts & Music Centre, an auditorium, an exhibition space… As well as a whole network of public libraries scattered throughout the city.

The historic centre of the city, specially protected by rigorous laws and measures so as to improve its preservation, has traditionally been the city area with a lesser amount of public spaces focused on culture. This historic nucleus of the city has plenty of palaces, churches and patrimonial treasures, but, however, it is short of modern buildings and spaces designed to lodge cultural and artistic proposals since it is very difficult to build new cultural containers in this over protected zone.

In order to face with this situation and to be able to attend cultural necessities demanded by people living in this area, the Municipality of Salamanca decided to rehabilitate some historical buildings located in this area so as to improve its network of cultural infrastructures, making them available to be used as cultural and social equipment. One of the most outstanding examples of this proceeding is illustrated with the rehabilitation of the so-called Tower of Anaya. It is one of the very few surviving examples of a military fortification, built in XV Century. This building keeps excellent Mudejar ceilings adorned with family heraldic shields, being the whole building a great witness of the splendorous past of the city.

On account of its outstanding artistic and patrimony value, this palace lodged the Institute for Latin America Studies from 1992 till 2006, a research and investigation center depending on the University aimed at the promotion of links and strengthen relationships between Salamanca and Latin American countries.
However, this research centre did not succeed in the consecution of its objectives and was, therefore, closed and stopped its activities in 2006. Since that date, the building remained without use and closed to the public, beginning an unstoppable process of degradation and abandonment.
Being aware of this regretful situation, the local government decided to recover the building so as to complete the network of cultural spaces in the city, concretely in the historic centre. With this purpose, the Municipality bought the building and launched a public contest in order to choose the best project aimed at its use as a cultural equipment.
In 2019, after many difficulties and delays owed to its special protection condition, the works of rehabilitation of the building began. Due to its deep abandonment and pitiful state of conservation after so many years closed, finally the process of rehabilitation concluded in 2021.
The process of rehabilitation was especially difficult to be performed: the architects found diverse problems of conservation concerning humidity, watered basements, fallen roofs, … One of the main problems they had to face was the difficulties in making the building an accessible one for disabled people: endless stairways, obstacles and narrow doors, non-existent adapted bathrooms… Undoubtedly, they had an important challenge to face with due to building's deficiencies and old fashioned design.
The total cost of the investment dedicated to its rehabilitation ascended to 1.265.919 €, a huge amount of money to be spent only by the local government. As a result, the Municipality bid for an economic support from the national government that was successful: the total investment aimed at the rehabilitation of the building was divided in equal parts between both public administrations.
Once the rehabilitation works were over, now this old building has become a modern and accessible cultural hub, with a wide variety of spaces worthy using for cultural purposes. This new cultural building offers, among others:

- Exhibition space
- Multipurpose rooms
- Library
- Children's area
- Press & Conference rooms
- Great / Minor schoolrooms
- Meeting places

As a conclusion, nowadays the citizens of Salamanca have at their disposal a new, functional and accessible cultural space offering them two main services: on the one hand, a cultural purpose, a place to enjoy cultural proposals, to visit art exhibitions, to assist to conferences or book presentations; and, on the other, an associative aim, a tool to foster life in common, where people may get in touch and meet other people so as to develop their public beings properly.

Thanks to this new rehabilitated space, not only an old and abandoned building has been recovered and put in service, but also the surrounding area has been improved, which implies that people living thereabouts may enjoy a better life.

Finally, it is worth focusing the aspect of management of the building: an agreement of cooperation was signed between the local and the province administration by which all the expenses originated as a consequence of the everyday activities performed in it will be paid by both public entities. This joint management between both institutions has become a remarkable model for new and future projects requiring high investments and collaborative proposals in the public sector.

MUNICIPALITY OF BESANÇON

Marieke Steenbergen
head of the department of international relations, Municipality of Besançon

Pascal Schultz
Project manager attractiveness and promotion at Grand Besançon urban community

Marie-Laure Bassi
Head of the department of Cultural heritage

The city of Besançon is located in Eastern France, close to the border with Switzerland. The city accounts 120 000 inhabitants (200 000 at the scale of the urban community)
The built and archaeological heritage is composed of many historical layers, ranging from the Roman empire until the 19th century. Besançon accounts 200 protected historical monuments and one of the largest protected city centres in France. Two UNESCO nominations crown the protection and enhancement public policies : the craftsmanship of mechanical watchmaking and art mechanics has been listed as Cultural intangible heritage in 2020, and Vauban's fortifications were World heritage listed in 2008. Important restoration works have been undertaken since many years. Natural and cultural heritage are closely related in the heart of the city and fully appropriated by the inhabitants: it is their daily landscape and it is intensively used for leisure and sport activities. The protection measures of the historical landscape do not musealize the city center. On the contrary, the ambition is to preserve it by developing activities and offering various experiences to different kinds of publics : local people, pupils, tourists as example. In this respect, the main issue to address is accessibility. Indeed, the difference in altitude between the historical city centre and the citadel makes visiting the latter quite a challenge. Another issue is the access to information for the different kinds of publics : families, foreigners, blind, etc.
The aim of the projects addressing these issues is to make the values of the heritage (for example the palimpsest of historical layers, the military heritage, archaeological and therefore often invisible heritage) comprehensive to everyone. Many things have been done in this sense : scale models, immersive videos, training of the guides, partnership with the language training centre, exhibitions, events, publications, drawing contests etc.
One of the solutions under development since several years now is the use of digital tools to complete and enrichen the experience of the public. The first experience has been carried out at the citadel, and more recently in the museum for modern arts and archaeology. Since 2019, Besançon is developing digital information spots and routes in the city centre and the surrounding neighbourhoods, for example on themes such as the watch making activity in Besançon since the 19th century, water in the city, urban arts...

Over a hundred points of interest have been filled in. The next route to be inaugurated in summer 2022 will concern the 18th century built heritage and historical personalities related to this period. Of course these digital solutions have to be considered as complementary to the rest of the tourism and cultural offer, which is very rich and deserves to be still much better known.

CONCLUSIONS

PHASES	ACTIONS	GOALS
0: STARTING POINT	Comparison and shared choice of the topics.	Definition of the topic to be explored during the afternoon activities based on the interests of the majority of the group.
1: TOPIC AND SUB-TOPIC	Discussion about the knowledge of each on the subject.	Indicate what the level of general knowledge is based on your experiences.
2: IDENTIFY THE MAIN ASPECTS OF THE PROBLEM	Define the main objectives based on the main aspects of the chosen theme.	To define the main objectives organize the aspects into: 1. Main features 2. Important elements according to the objectives 3. Possibility of action and development
3: ORGANIZE BY AREAS	Group the questions that emerged in Phase 2 by areas of interest.	Classify the questions into categories. Identify a logical path for presenting the topics. Try to answer the questions.
4: SUBDIVISION OF IN-DEPTH TASKS	Search for information on the web and evaluate the validity of the sources to be used.	Research on the web and preparation of material to share with classmates. Each participant prepares a summary to share with the group. Phase of sharing and presentation of what has been summarized and analysed.
5: SYNTHESIZE AS A GROUP ACTION	The students discuss the main aspects of the problem and indicate to the Minute Reporter how to build the final power point, which is created all together as a Group.	While the Minute Reporter prepares the final document, sharing the monitor, the group actively participates, proposes any corrections, and verifies that the points addressed have been correctly summarized. Take a group screenshot and insert it into the ppt. Rename the power point as: DayX_FocusY_GroupZ
6: CONCLUSIONS	Final phase: final round table of all groups together (about 10 minutes per group).	Comparison and discussion with Tutors and Professors of the Winter School. Digital delivery of the final power point.

ONLINE DIDACTIC ACTIVITIES WITHIN THE B.SURE SCHOOLS: METHODS AND RESULTS

Anna Magrini

Three afternoons, dedicated to Teamwork, had the main target to promote team activities to fix some aspects of the issues addressed in the topics of the various days. The teamwork has also the goal to widen concepts presented in the morning sessions. Each team was composed by 5-6 students and the work structure was set up to encourage the ability to:

- Setting up a brief analysis on topics not necessarily already known;
- Thinking about the actions to be developed for an efficient approach;
- Setting relationships between the members of the group;
- Being familiar about tasks to develop and roles to assume in the teamwork;
- Sharing knowledge with unknown colleagues for a common goal.

The students composition of the groups was chosen with the following conditions: mixing components for each team to work with people of different backgrounds and different approach ideas also respecting gender equality and attributing different roles.

This choice was made to facilitate interpersonal relationships such as those that may have to be established in the workplace. In this context, it is not always possible to work with people already known or in any case people predisposed to listen and collaborate.

In principle, another important aspect to manage in a teamwork is the time available to complete the assigned tasks. This activity was structured on the basis of the experience collected in the interaction with the Working Group on Innovative Teaching of the Pavia University.

The topics and the subtopics of three afternoon are listed below:

- *February 25th, T1 – T2 Urban Sustainability and Sustainable Reuse*
    1. Smart city and sustainability
    2. Tools for Evaluating the Sustainability of Urban Design
    3. Resilience approach in Cultural Heritage preservation
    4. Life Cycle Assessment and Conservation on Cultural Heritage
- *March 2nd, T3 Energy retrofitting*
    1. Techniques and problems of Retrofitting to NZEB
    2. Possibility of intervention on the envelope of historic buildings - technologies and constraints
    3. Economic evaluations of energy requalification
    4. Innovative insulating materials - technical features and discussion on positive/ negative aspects of their application
    5. Integration of thermal systems and renewable sources use: schemes and smart management for a better energy performance
    6. EU initiatives for promoting energy retrofitting of existing buildings: a selection of projects started from 2010 and discussion on their results
    7. Renewable energy for building retrofitting: innovating materials and systems with special attention to historic buildings

- *March 3rd, T4 Innovative technologies for heritage representation and valorization*
  1. Virtual Reality for the reuse of Cultural Heritage
  2. History Matters: cultural knowledge for restoration
  3. Digital management of Cultural Heritage: tools and instruments
  4. Documentation strategies for non-invasive analysis in Cultural Heritage
  5. Different cultural approaches for apply the digital technologies in restoration projects

Every afternoon the students' groups could choose one of the subtopics and they must develop it in team following the activities instructions:

1. Presentation of participants (name, origin/current location, study interests);
2. Choice of the topic of study among the proposed sub-topics;
3. Participants discuss and choose their role according to ROLES highlighted in the form ;
4. Reading of the ACTIONS to be carried out during the activity;
5. Definition of the actions and next steps as highlighted in the form: information research, discussion on the topic and on the collected information. For each phase it is recommended to activate a round table among the participants to keep the discussion active;
6. The group must create a Power Point presentation of its work (draft setting suggested by the organization).

The presentations were created within Google Drive and were shared with Tutors and Professors during a knowledge sharing phase at the end of each afternoon. The Group activities were validated in the discussion.

At the beginning of the teamwork, each student had to choose a Role between the following ones:

1. INSPECTOR: Introduces the ACTIONS to be developed in the group. While at work, makes sure conversations in group don't go off topic;
2. TIME-MANAGER: Organizes the line-up of actions and timelines to develop them appropriately. Check that the deadlines are respected;
3. FACILITATOR: Organizes and facilitates the conversation, keep the focus on the subject of discussion, manages the order of those who want to speak and checks that everyone is speaking in turn;
4. FOCUSER: In the different phases of the work, summarizes what has been developed and highlights the salient points and interesting aspects that emerge from the discussion;
5. NOTES REPORTER: Takes notes on the discussions taking place and summarizes the actions and reflections of each;
6. POWER POINT REPORTER: With the support of the group, has the major role in compiling the final power point;

Two last roles can be taken by the same person.

To organize the activities, a schedule was given to each group to plan the following Actions and to respect indicatively the timing:

0. STARTING POINT: Comparison and shared choice of the topics. Definition of the topic to be explored during the afternoon activities based on the interests of most of the group;
1. TOPIC AND SUB-TOPIC: Discussion about the knowledge of each on the subject. Indicate

what the level of general knowledge is based on your experiences;

2. IDENTIFY THE MAIN ASPECTS OF THE PROBLEM: Define the main objectives based on the main aspects of the chosen theme. To define the main objectives, organize the aspects into:
    a. Main features
    b. Important elements according to the objectives
    c. Possibility of action and development
3. ORGANIZE BY AREAS: Group the questions that emerged in Phase 2 by areas of interest.

- Classify the questions into categories
- Identify a logical path for presenting the topics
- Try to answer the questions

4. SUBDIVISION OF IN-DEPTH TASKS: Search for information on the web and evaluate the validity of the sources to be used. Preparation of material to share with classmates, each participant prepares a summary to share with the group. At the end there was a phase of sharing and presentation of what has been summarized and analyzed;
5. SYNTHESIZE AS A GROUP ACTION: The students discuss the main aspects of the problem and indicate to the Minute Reporter how to build the final power point, which is created all together as a Group. While the Minute Reporter prepares the final document, sharing the monitor, the group actively participates, proposes any corrections, and verifies that the points addressed have been correctly summarized;
6. CONCLUSIONS: Final phase: final round table of all groups together (about 10 minutes per group). Comparison and discussion with Tutors and Professors of the Winter School.

After every afternoon working group students were asked to fill in the anonymous questionnaire.

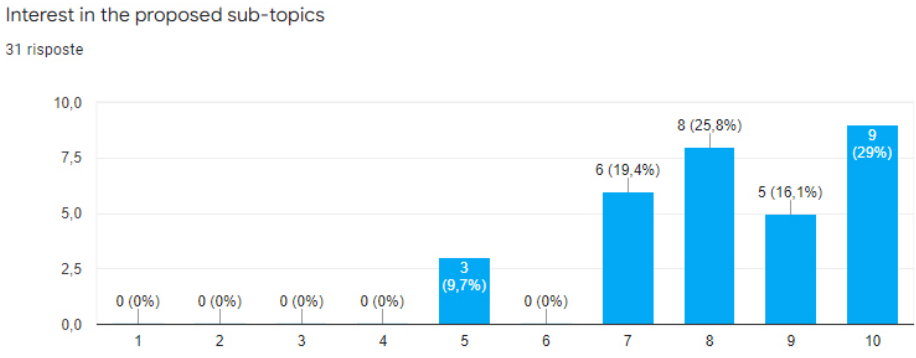
1. Positive aspect of teamwork
2. Negative aspect of teamwork
3. Group work tips you would like to share
4. Interest in the proposed sub-topics
5. Did you already have previous knowledge in the chosen sub-topic?
6. Usefulness of the proposed ACTIONS scheme for group discussion
7. Other sub-topics that you would have liked to discuss
8. Adequacy of working time with respect to the request
9. Active participation level of other students in your group
10. Other suggestions

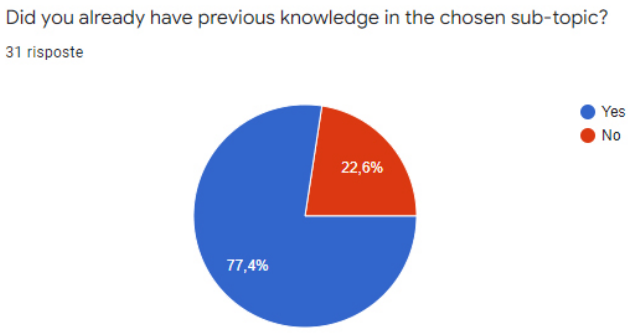
Some positive aspects of teamwork were

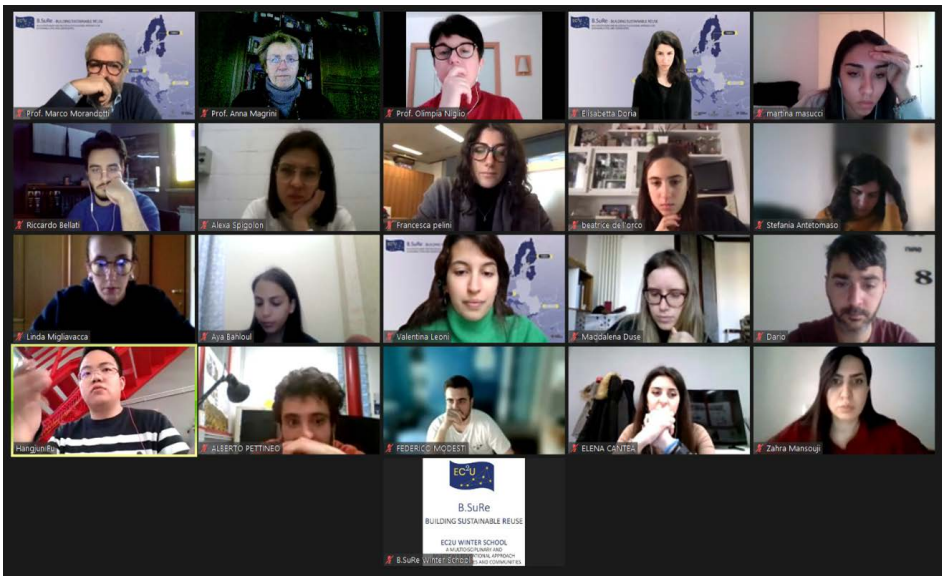
- Participation
- Sharing knowledge
- Interaction

There were highlighted some negative aspects of teamwork: first of all the difficulties in communication that influenced the groups on the various days. Another problem encountered was the ability to co-working with unknown people.

Some answers given by the students in the final questionnaire of group activities.

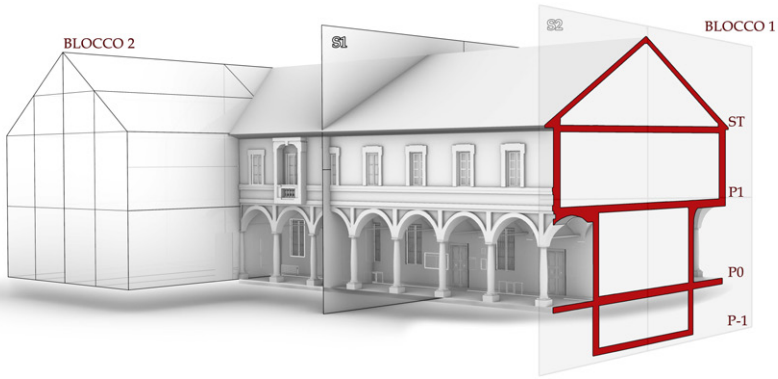






More common words used to describe the positive aspects of the experience

More common words used to describe the negative aspects of the experience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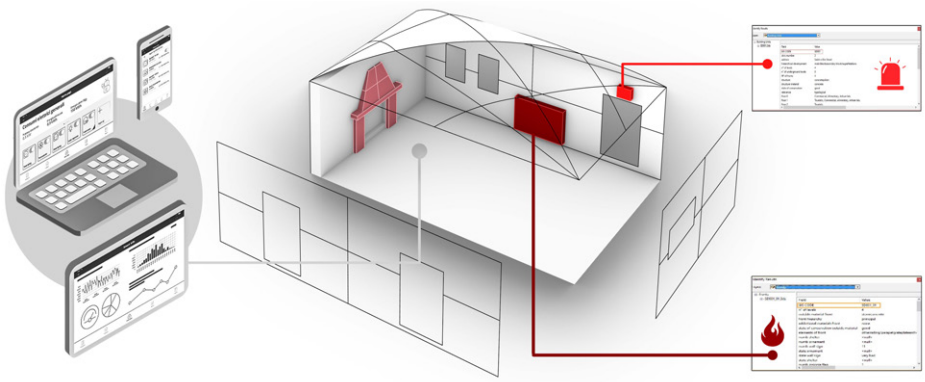
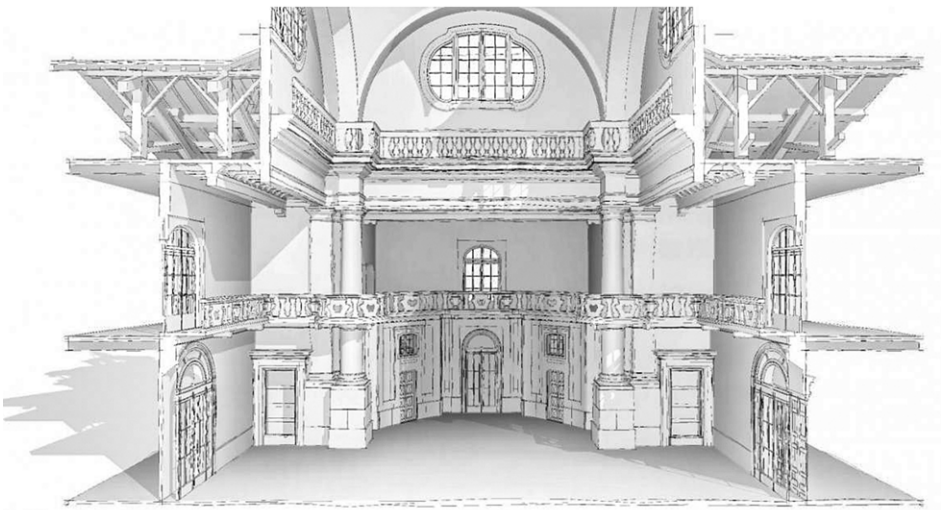




CULTURAL HERITAGE DIGITAL ASSETS MANAGEMENT: A FORTHCOMING REVOLUTION

Marco Morandotti

Digital asset management (DAM) may seem quite off-topic if related to the field of interest of the school, but on the the opposite it's rather transversal and integrated with several disciplines strongly related to cultural heritage sustainable management, and it will become increasingly relevant in a short time as a consequence of kind of forthcoming revolution which is already taking place.

Asset management as a discipline has three different and integrated aims: i) achieve the organizational objectives through balancing risk, opportunities and costs by means of the integration among different digital technologies; ii) produce value through management of the built environment; iii) support sustainability strategies. Concerning the first aim, "integration" is probably the most relevant topic, as a key factor of the whole process, and it involve not only integration among technologies, but also between technologies and users, and between users and buildings. The second aim is strictly related to the concept of valorization of cultural heritage, and consequently related to the topic of sustainable reuse, further than the economic dimension of building process by itself.

Dealing with built heritage, asset management strategies necessary deal with planned conservation protocols and procedures, stepping from restoration as event, to preservation as long-term process. It is something more than maintenance and monitoring: it is a rather complex strategy, merging a large-scale reduction of risks and a careful organization of daily activities that may take a huge advantage by the integration in a coordinated digital ecosystem.

Meanwhile, asset management is still relevant taking into consideration adaptive reuse approach and strategies. These are usually based upon the assumption that buildings, areas, districts, and sites are not static entities, as they are not designed simply for one single use during their life cycle. On the contrary it consists of the practice of introducing new content in an existing site, paying particular attention to the needs of society, and following the principle of maximum conservation and minimum transformation. Within this perspective an integrated digital asset management strategy may integrate several instruments and tools related to predictive evaluation of impacts and decision support strategies, taking a real advantage from integrated and interactive models and increasing huge amounts of data.

These processes should also be considered within the perspective of the Architecture, Engineering, Construction and Operations (AECO) sector, which is strategic in the global market and within the European Union economy, providing 18 million direct jobs, more than 6% of European employment, and generating about 9% of gross domestic product (GDP). Furthermore, the sector is quickly moving forward the so called "servitisation" process, shifting from selling to the final user the physical asset (the product) to selling the physical asset within a set of services that can be activated after the purchase. This hugely impacts on the organisational core business and shifts to the use phase a large part of the value generation and may have further development by means of an integrated and interconnected digital approach.

The impact of this transformation will be also relevant on the national market especially due to the acceleration process generated by the Italian national recovery and resilience plan (PNRR) which focus about three strategic axes: i) digitisation and innovation; ii) ecological transition; iii) social inclusion.

Asset management may be articulated into strategic, tactical and operational functions.

Strategic functions are connected to the long-term objectives of the organisation and strictly related to its core business and include risk management, sustainability management, financial management, value management and quality management.

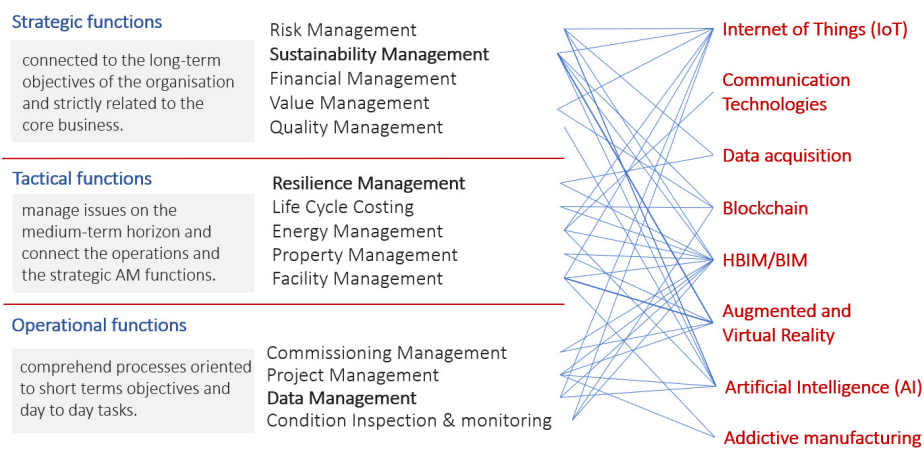
Tactical functions Include processes aimed at managing issues on the medium-term horizon and act as a connection between the operations and the strategic AM functions, such as Resilience Management, Life Cycle Costing, Energy Management, Property Management and Facility Management. Finally, operational functions comprehend processes implemented for realising short terms objectives and day to day tasks, such as Commissioning Management, Project Management, Data Management, Condition Inspection & monitoring.

It is interesting to focus on the kind of interactions that may be assessed among these functions and some innovative ICT technologies, in order to evaluate the impact of the digital revolution in the asset management perspective. A short list of these ICT disruptive technologies may include Internet of Things (IoT), Communication Technologies, Data acquisition, Blockchain, BIM and HBIM, Augmented and Virtual Reality (A/V R), Artificial Intelligence (AI), Addictive manufacturing.

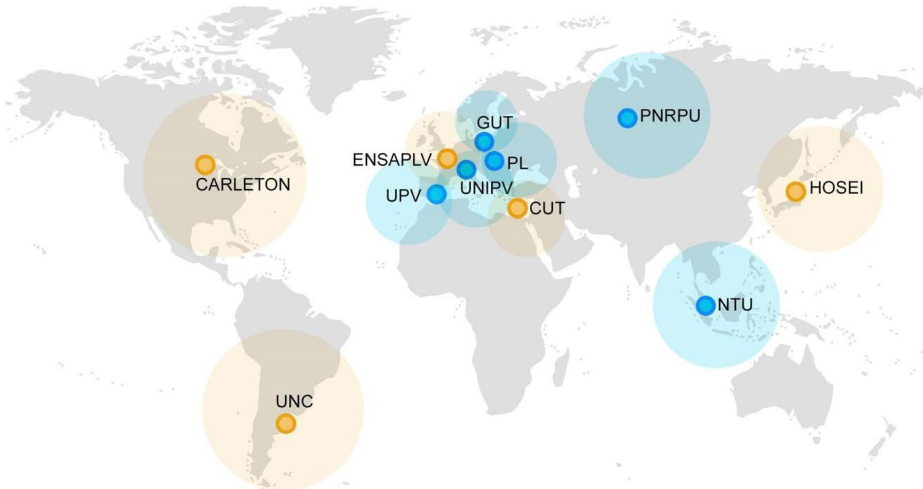
From a comprehensive analysis of these mutual interaction, it is possible to forecast at least two predictable evolutive scenarios:

1) a fast shifting forward from BIM/HBIM, IoT and AI to a spread implementation of interactive Digital Twins;

2) an increasing integration of IoT networks with AI techniques in order to enhance connectivity and interoperability among users, digital models, and buildings, with a real-time auto-updating BIM/HBIM.



In the end, this scenario may configure a real “Digital Asset Management revolution” based upon two pillars: an incoming otologic mutation generated by multidimensional and multiplatform integration and interaction among humans, things and model, both in a real and virtual context; the rising of a new «digi-real» paradigm and ecosystem based on smart, auto-adaptive buildings and models within the so called “everything everywhere” paradigm.
In order to fulfill the new technical and cultural requirements generated by this forthcoming revolution the university of Pavia is developing a new master course called “Virtual Reality Engineering and Game Design for Architecture and Cultural Heritage” (VREA). Its aim is to advance a new generation of students on cultural basis and technical knowledge for managing Digital Twins in the field of Cultural Heritage. The course will integrate knowledge and skills to interact with the world of digital production of artworks, cities, and architectural artifacts, with the creation of databases, archives, and 3D models translated into languages and expressions that belong to the world of digital and creative industries.



B.SuRe Winter School 2022- Program

B.SuRe BUILDING SUSTAINABLE REUSE

A MULTIDISCIPLINARY AND MULTISCALE EDUCATIONAL APPROACH FOR SUSTAINABLE CITIES AND COMMUNITIES

EC2U ALLIANCE ONLINE WINTER SCHOOL

24/25 FEBRUARY - 02/03/04 MARCH 2022
UNIVERSITY OF PAVIA

11 SUSTAINABLE CITIES AND COMMUNITIES

UNSDG GOAL 11: MAKE CITIES INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE

THURSDAY 24TH FEBRUARY 2022 — DAY 1

9.30 - 10.30	**OPENING SESSIONS** Greatings and introductions	Antonella Forlino *Pro-rector for internationalitation* Ludovic Thilly *Coordinator of EC2U Alliance* Lalo Magni *Dean of faculty engineering* Alessandro Reali *Director of the department of Civil Engineering and Architecture* Antonio Bobbio Pallavicini *Deputy mayor and councillor for Public Works, Mobility and Transport of the city ofPavia* Manuel Carlos Gameiro *EC2U WP6 leader* Marco Morandotti *Coordinator of Winter School B.SuRe*	Welcome and introduction
Morning session	**TOPIC 1** URBAN SUSTAINABILITY		
10.45 - 11.30	Urban sustainable development strategies and tools	Roberto De Lotto *University of Pavia*	Oral presentation
11.30 - 12.15	*Partner Alliance EC2U*	Juan José Rastrollo Suarez *University of Salamanca*	Oral presentation
12.15 - 13.00	T1 ROUNDTABLE		
Break			
Afternoon session	**TOPIC 2** SUSTAINABLE REUSE		
14.30 - 15.15	*Partner Alliance EC2U*	Manuel Carlos Gameiro *Coimbra University*	Oral presentation
15.15 - 16.00	Sustainable reuse and restoration. A resilience-based approach	Marco Morandotti *University of Pavia*	Oral presentation
16.00 - 16.45	Sustainable reuse of cultural Models and strategies.	Daniela Besana *University of Pavia*	Oral presentation
16.45 - 18.00	T2 ROUNDTABLE		

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FRIDAY 25TH FEBRUARY 2022 — DAY 2

Morning session	**TOPIC 3** ENERGY RETROFITTING OF CULTURAL HERITAGE		
9.30 - 10.15	Thermal modelling, experiments and numerical simulation applied on historic buildings towards energy retrofitting	Myriam Lazard *Poitiers University*	Oral presentation
10.15 - 11.00	Energy efficienty and retrofitting on existing buildings	Anna Magrini *University of Pavia*	Oral presentation
11.15 - 12.00	The energy-oriented mangment of public historic buildings	Cristina Cecchini *University of Pavia*	Oral presentation
12.00 - 13.00	T3 ROUNDTABLE		
Afternoon session	**STUDENTS FOCUS GROUP** ABOUT TOPIC 1 AND TOPIC 2		
14.00 - 14.30	Presentation of participants	Students focus group	Student activities
14.30 - 17.00	Working group		
17.00 - 18.00	DAY'S WORK PRESENTATION Students roundtable		

WEDNESDAY 2ND MARCH 2022 — DAY 3

Morning session	**TOPIC 4** INNOVATIVE TECHNOLOGIES FOR HERITAGE REPRESENTATION AND VALORISATION		
9.30 - 10.15	Digital documentation for heritage conservation and valorisation	Sandro Parrinello *University of Pavia*	Oral presentation
10.15 - 11.00	Historical architecture between aesthetic and techniques	Massimiliano Savorra *University of Pavia*	Oral presentation
11.15 - 12.00	Culture and Sustainability	Olimpia Niglio *University of Pavia*	Oral presentation
12.00 - 13.00	T4 ROUNDTABLE		
Afternoon session	**STUDENTS FOCUS GROUP** ABOUT TOPIC 3		
14.00 - 14.30	Presentation of participants	Students focus group	Student activities
14.30 - 17.00	Working group		
17.00 - 18.00	DAY'S WORK PRESENTATION Students roundtable		

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THURSDAY 3RD MARCH 2022 — DAY 4

Morning session	**BEST PRACTICE & CASE STUDIES: UNIVERSITY OF PAVIA AND MUNICIPALITIES**		
09.00 - 09.30	Sustainability at UNIPV: the role of OSA-Office for sustainable actions	Andrea Zatti *Office for sustainable actions (OSA) - Pavia*	Oral presentation
09.30 - 10.00	Between valorization and innovation, between reuse and new buildings: the strategies of the University of Pavia for the building heritage	Alessandro Greco *Building delegate - University of Pavia*	Oral presentation
10.00 - 10.30	Historic Buildings sustainable reuse: establishing passive barriers in office buildings - a case study	Luisa Pereira *University of Coimbra*	Oral presentation
10.30 - 10.45	DISCUSSION		
Morning session	**CULTCITIES PROJECT**		
11.00 - 13.00	Opening of the meeting	Marco Morandotti *University of Pavia*	
	EC2U and CultCities project	Maria Spitti *Pavia Europe Office Coordinator*	
	Municipality of Pavia	Mara Latini *Head of the Public Works, Maintenance, Expropriation and Mobility Department*	
	Municipality of Hildesheim	Fritz Ahrberg *Tourism Manager of Hildesheim Marketing*	
	Municipality of Turku	Joanna Kurth *Municipality of Turku - Project manager*	
	Municipality of Coimbra	Joana Gouveia Loureiro *Municipality of Coimbra - Cultural Officier*	
	Grand Poitiers Urban Community	Florence Cazals *Chargée de mission ingénierie de projets européens et internationaux*	
	Municipality of Iasi	Elena Farca *Head of International Affairs Office*	
	Municipality of Salamanca	Rubén Tostado González *Coordinador general Fundación Salamanca Ciudad de Cultura y Saberes*	
	Municipality of Besançon	Marieke Steenbergen *Head of international relations*	
Afternoon session	**STUDENTS FOCUS GROUP** ABOUT TOPIC 4		
14.00 - 17.00	Working group	Students focus group	Student activities
17.00 - 18.00	DAY'S WORK PRESENTATION Students roundtable		

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FRIDAY 4TH MARCH 2022 — DAY 5

Morning session	**WINTER SCHOOL FINAL PRESENTATION AND CLOSING**		
09.15- 10.00	Online didactic activities within the B.SuRe School: methods and results	Anna Magrini *University of Pavia*	Oral presentation
10.00 - 10.30	Cultural heritage digital asset management. A forthcoming revolution	Marco Morandotti *University of Pavia*	Oral presentation
10.30 - 10.45	EC2U 4th Forum in Pavia 4-7 April 2022	Giulia Falchi *Project Officer and local coordinator of EC2U project at the University of Pavia*	Oral presentation
Break			
Morning session	**ROUND TABLE*** * LANGUAGE: ITALIAN		
11.00 - 12.30	*Rigenerazione, riuso, valorizzazione. Nuovi paradigmi nella prospettiva dello sviluppo sostenibile*	Marco Morandotti *University of Pavia* Antonio Bobbio Pallavicini *Deputy mayor and councillor for Public Works, Mobility and transport of the city of Pavia* Augusto Allegrini *President of the Order of Engineers of Pavia* Gianluca Perinotto *President of the Order of Architects of Pavia* Alberto Righini *President ANCE Pavia*	
12.30	**CLOSING OF THE EVENT**		

CLOSING EVENTS: B.SURE WINTER SCHOOL

VENERDÌ 4 MARZO - FRIDAY, 4TH MARCH
9:15-13:00 - ITALIAN LOCAL TIME

UNISCITI ALL'EVENTO! - JOIN THE EVENT!

https://us02web.zoom.us/j/87655650479?pwd=SnIvVDhkL0tzL0VzRys5ekRkbGZBQT09

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