RÖCK
Cultural Heritage
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U-LAB BOLOGNA

A STORY OF PARTICIPATION AND INCLUSION TO THE CULTURAL HERITAGE OF THE UNIVERSITY DISTRICT

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ABSTRACT

At a time of plummeting citizen participation, Bologna stands out as a city where the boundaries between the municipality and its citizens are ever more blurred. Building upon its long-standing fame of melting pot, of place where the exchange of ideas is everyday practice, Bologna can yet be seen as a living research institute where initiatives to help innovative proposals sprout from the bottom and allow citizens to co-create solutions for the city's challenges.

In this context, the city of Bologna distinguished itself for its attempt to promote culture, and its cultural heritage in particular, as an exceptional lever for economic, social but also sustainable development.

From this vision arises the ROCK Project (Regeneration and Optimization of Cultural heritage in Knowledge and creative cities), funded by the Horizon 2020 research and innovation program of the European Union, which launches a new season of observation, design and experimentation in support of the project actions. The project focuses on historic city centres as extraordinary laboratories to demonstrate how Cultural Heritage can be a unique and powerful engine of regeneration, sustainable development and economic growth for the whole city.

Such an effort needed, however, a tool capable of activating collaborations and promoting widespread experimentation conceived and designed by the actors of the territory. These actions had to respond to concrete needs and, therefore, merge from bottom-up listening and planning phases. These are the roots of U-Lab, born to recognize and strengthen the specific identity of the U-area as a cultural, creative and sustainable district by improving safety, turning social conflicts into new opportunities, increasing the accessibility of the area, attracting visitors and tourists, entrepreneurs and private investments.

INTRODUCTION

With a budget of nearly €2mn for the city of Bologna, ROCK is an innovative initiative co-financed by the EU H2020 programme whose main goal - which is also replicated in other European cities - is to transform historic city centres characterised by social conflicts and decay in unique and powerful engines of regeneration, sustainable development and economic growth for the whole city.

The European project is managed by the Municipality of Bologna with the scientific support of the University of Bologna, whereas the local project is managed jointly by the Municipality of Bologna, the University of Bologna and the Foundation for Urban Innovation, through an innovative and balanced relationship between political and educational institutions. The cooperation between the city and its university also resulted in the creation of a joint ROCK office, where staff from the two entities can work together.

The same collaborative approach is the pillar upon which ROCK is founded, based on the idea that historic city centres are extraordinary living laboratories where all stakeholders can share their needs, share proposals and suggestions, and co-design solutions, participating in a common effort to address and solve the challenges faced by the city.

From a local perspective, ROCK aims at regenerating the University area of Bologna, located in the core of the city center and characterised by ancient and well rooted social conflicts between the different communities who claim rights over it. Indeed, while students are part and parcel of Bologna's own identity, their relationship with residents has not always been idyllic. Therefore, a project based on research-action alone could not be a solution but rather a contribution to face the challenge according to a new paradigm: a set of cross-cutting transversal activities whose main goal was to create, prototype, validate and test products, services, systems and technologies to be applied in the University district.
So the entire area was transformed into a living open-air laboratory - the U-Lab - encouraging participatory practices to co-design actions of cultural regeneration, such as the greening of city squares, the mapping of urban areas to improve their accessibility or the re-design of public lighting. In parallel, the city has installed sensors to monitor the flows of people, both before and after the initiatives of cultural regeneration, allowing to collect large amounts of data on experiments to draw lessons from them, ensuring they are replicable also in other contexts.

The preliminary phase dates back to the second semester of 2017, with the definition of the local stakeholders mapping, while the implementation phase, including the creation of the U-Lab and the organisation of its events started in 2018. Upon finalisation of the stakeholder map, a 4-phase methodology was developed to efficiently ensure the participation of all stakeholders in the co-design of innovative experiments to test within the U-Zone. The phases, which will be described in the first paragraph, include:

● An **observation phase**, where stakeholders share their needs and discuss ideas and proposals with the aim to identify a medium term common vision to address the issues at hand and regenerate the area of interest.

● A **co-design phase**, in which stakeholders transform ideas into concrete action plans, developing a variety of thematic initiatives to make the city more sustainable, more accessible, more welcoming, etc.

● An **experimentation phase**, which includes the selection of the best proposals and the allocation of funds to implement them.

● A **monitoring phase**, which envisages the use of technologies and the installation of sensors to monitor the flows of people, both before and after the initiatives of cultural regeneration, allowing to collect large amounts of data on experiments, ensuring they are replicable also in other contexts.

1. U-Lab: a Living Lab for the city of Bologna

Nestled in the midst of the city centre, Bologna's university district - from now on called U-area - has been for a long time considered a place characterised by social conflicts and a certain level of urban decay and noise pollution. It is a hybrid place whose main peculiarity is the coexistence of different communities (students, residents, tourists, business owners) trying to face the respective needs and challenges, and for a long time. This multiplicity provides many opportunities but is also challenging as different communities are passing through the same public realm without actually engaging in any interaction or even producing conflictual situations.

Then, thanks to the ROCK project's vision, the Municipality took up the chance to transform the area in the so-called **U-Lab, a living laboratory to co-design actions aimed at regenerating the urban fabric** and **strengthen the specific identity of the U-area as a cultural, creative and sustainable district** by improving safety, turning social conflicts into new opportunities, increasing the accessibility of the area for all, attracting visitors and tourists, entrepreneurs and private investments.

Within ROCK, Bologna aimed at increasing the perception and to widespread the image of the city and its heritage, as a common good to which every citizen must have access, contributing to its knowledge, governance, conservation and transformation.

The goal was to develop co-designed cultural and sustainable initiatives in this area, to create ownership over the Zamboni District, empowering both students and residents to regenerate the area through culture, and to test a wide set of technologies to increase the potential of the area. The systemic approach aimed at not overlapping but synergically intertwining with cultural initiatives in the Zamboni district and other initiatives previously developed by the City or by formal and informal institutions. By combining conservation of cultural heritage, innovation and environmental protection, ROCK Bologna developed shared actions between those who live, those who attend and those who animate the U-area, mixing visions, knowledge and skills.

Improving the knowledge about the area, enhancing stakeholders' participation and the physical transformation of the public spaces, represented the pillars upon which the Foundation for Urban Innovation (FIU) together with Fondazione Rusconi and the Municipality of Bologna, put the basis for the creation of U-lab.

2. U-Lab: process description

2.1 Phase one: Listening and co-design

U-Lab was born officially in 2017 as a hub for collaborative practices targeting the University district of Bologna. Its main goal was to link different expertise and sectors to work together on the regeneration of the entire area, developing new ideas and experimenting new methods to use public spaces and services.

Through U-Lab, Bologna launched a season of observation, conception and co-production involving the direct protagonists: students, residents, representatives of the business sector and other actors active in the area.

The living lab actions started with a mapping of the local stakeholders. Then, to experiment direct actions and events in the area, but also to create new uses, U-Lab launched an open call for proposals targeting associations, collective of citizens, informal groups etc. to propose activities, initiatives and events. The call received 47 proposals. The 16 winners animated the cultural and public spaces of Zamboni through some experimental events *(experimentation phase)* organised during the spring 2018 with 60 experimental events.

In the **first months of 2018**, a series of **public meetings and workshops with stakeholders or representatives of the territory** have been held to ease the dialogue between different communities and to highlight their necessities and perception on the area. The process included a series of **thematic meetings** open to invited participants and focused on meetings focused on *accessibility, sustainability,* and *collaboration for new productions*, and a series of **public meetings focused on specific places and areas**, namely *Scaravilli Square, Rossini Square, the area surrounding the Municipal Theater, and Via delle Moline*. Moreover, a number of

workshops have been held in the area to further analyse the potential benefit deriving from the use of technologies applied to the urban environment (lights, sounds, greening interventions, innovative devices to be installed in the area...).

The first meetings cycle dedicated to the accessibility, sustainability, and collaboration for new productions themes has been held from January to February 2018, while the meetings dedicated to the places have been organised from March to April 2018.

2.1.1 Working on themes: accessibility, sustainability, and collaborations and new partnerships

The listening and co-design phase started with a 4 meetings cycle and the participation of some of the most important stakeholders of the U-Area having a specific expertise or competence with respect to the themes discussed. They mainly pertained to the following categories:

- Institutions (Municipality, University, Theater, Cultural Institutions...);
- University and Research;
- Associations and Third sector;
- Communities (formal and informal) of citizens and students;
- Enterprises and connected associations.

Each of the meeting corresponded to a theme: accessibility - considered as physical, cultural, and relational accessibility, and as a necessary element to ensure inclusiveness and personal security - sustainability - with particular attention to climate change and resilience issues - and collaboration for new productions - as a mean to increase the activation of new partnership (being those PPP, including associations, formal and informal groups...).

The last meeting has been dedicated to an in-depth discussion on the reflections emerged and a final restitution of the results.

Methodology: how the participatory process has been organised to increase participants engagement

The thematic meetings have been organised following a specific methodology and a shared work, and saw the participation of 50 people on average per meeting.

During the plenary phase that opened each of the meetings, participants have been instructed on the contents of a specific dossier focused on the U-Area. Through maps and data analysis, the dossier specifies the demographic characteristics of the U-Area and declines each of the three themes according to different visions. It also gives an overview of the projects implemented in the area as a source of inspiration for the participants.

Accessibility is described according to the chance and level of access to different urban areas - namely public spaces, cultural institutions and contents, university buildings and learning events, transports, services, community life, technologies, and commercial places - and it's strictly connected to the security issue as a place which is not considered safe is logically not an accessible place. According to the principles of Universal Design and the 2006 UN Convention on Disabilities Persons Rights, an Accessible City is the one that "take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems, and to other facilities and services open or

provided to the public, both in urban and in rural areas. These measures, which shall include the identification and elimination of obstacles and barriers to accessibility". The discussion around this delicate and fundamental issue for the creation of a new vision of the city and the historical-cultural centre laid the foundations for the birth, in 2019, of **U-Area for All (par. 2.3)**, whose aim was to make the cultural district of Bologna universally accessible.

Sustainability is intended as the capacity of the urban tissue to face climate change impacts through greening interventions, and to integrate the use of technologies to monitor environmental data (air and light pollution, noise) on standard conditions and during specific mass events. Sustainability is also considered as the capacity to associate a sustainable action to each adaptive intervention, to host a sustainable and alternative mobility, and the capacity to progressively modify the behaviour of local stakeholders to properly manage places and resources as part of the urban common goods.

Finally, **Collaboration for New Productions** included two main areas of action: the first one focused on the REVEALED U-Area, including the cultural heritage, the well-known institutions (university, museums, libraries, theaters), and functional structures and services used by citizens, tourists, and students. The second one was the SUBMERGED U-Area, as those place where things that we could not see anymore lies (historical memories, elements that had an impact on the life and image of Via Zamboni, forbidden places...), and where those things that we could still not see, or we still do not know, are hidden (bottom-up initiatives promoted by students and association, hidden treasures, cooperation forms between actors, self-managed services...).

During the meeting, speakers having a specific knowledge on the topic or the area shared their view on the theme and contributed to the discussion.

The second phase of each meeting has been characterised by a 1 hour working group session made up of 10-15 people, under the coordination of a facilitator. Participants analysed the U-area context with respect to a specific theme, trying to create a unique definition of it, and to highlight cricalities and opportunities deriving from discussing the topic. One of the output of the discussion was the creation of specific guidelines to strategically manage the future transformation of the area.

Results

The results have been collected in the following tables.

A more colorful U-Area. The prerequisites to increase Accessibility[1]:

a. Safety and inclusiveness

General necessities	Project guidelines	Management guidelines	Indicators
Making the U-Area more attractive and popular by different communities, increasing safety perceptions in particular for disabled people and fragile persons.	Realize a "Public lightening plan" to ensure a good visibility on the area as a fundamental element to increase safety perception, in particular for thieves persons and to guide visitors towards break places. Re-thinking the paving and the potential of public squares. Physically improve the pedestrian crossings and easing interventions finalised to increase respect towards pedestrians.	Creating a shared programme of events studied to favor the constant presence of different communities in the U-Area. Develop a specific waste management strategy for the U-Area in order to reduce the perception of degradation. Increase the cultural offer.	Increasing in percentage of the public lightening. Number of participants to informal events. Number of exhibitors/spaces/public places that adopt the Italian Sign Language in their communication campaigns. Number of exhibitors/spaces/public places that adopt texts translated using the language of thieves. Number of persons who withdraw money after 8pm. Increasing number of investments in the area.

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[1] Ginocchini G., Bigi M., Fabbrica F., Beolchi S., Naldi G., Caruso E., Paolazzi S., Gianfrate V., Massari M., Lorenzo V., Boulanger S., U-Lab incontri tematici Report, (2018) Available at: http://fondazioneinnovazioneurbana.it/images/PROGETTO_ROCK/20180326_Report_ULab_ESE.pdf

b. Airworthiness

General necessities	Project guidelines	Management guidelines	Indicators
Ease the access to everybody to move and reach all the areas of the districts using guide technologies.	Realise a universally accessible signage. Creating an interconnected path without architectural barriers. Equip the area with places where fragile persons could take a break or rest and enjoy the area. Equip the area with urban furniture designed for childs. Eliminate the hierarchisation of means of transport in order to guarantee the coexistence of buses, bicycles and pedestrians.	Realise a coordinated communication plan for the cultural offer of the U-Area. Create an IT system for the area to overcome the linguistic barriers and ease a multi-accessible communication. This should be calibrated to the cognitive capacity of the persons and should use graphics to ease the comprension. Improve the logistics of merchandise transports through alternative means.	Increasing number of cycles in the area. Number of disabled persons who participate in informal events. Number of exhibitors/spaces/public places that adopt the Italian Sign Language in their communication campaigns. Number of exhibitors/spaces/public places that adopt texts translated using the language of thieves. Perception of the informal event attended. Number of persons who download the app to move around the area. Decrease of abandoned waste. % of signs with an accessible graphic design. Increase in pedestrian crossings. Number of Wi-Fi connections. Number of Wi-Fi acces per hour, in the public spaces and cafès of the area

c. Welcoming community

General necessities	Project guidelines	Management guidelines	Indicators
Promoting processes dedicated to "fragile" persons (migrants, women, childs, lgbt communities...) whose needs are the starting point to re-plan the area and promoting a new cultural offer.	Ease the dialogue on the transformation of the area and the increase on communications before, during and after the interventions. Including on the projects the specific necessities of pets, in particular dogs, by planning green places dedicated to them. Equip the area with video translated in the Italian Sign Language for thieves and open a local information office for disabled persons. Create a permanent space dedicated to ease the networking, providing information and increasing self autonomy in enjoying cultural heritage with the final aim to increase the self attachment to the area.	Provide cultural institutions workers with a basic knowledge of Italian Sign Language for thieves and the instruments to overcome cultural barriers towards disabilities. Promote the integration between daily and nocturnal cultural and commercial offer, by modifying the opening hours. Realise educational processes towards public spaces. Diversifying and communicating the local offers (commercial, cultural, creative).	Number of exhibitors/spaces/public places that adopt the Italian Sign Language in their communication campaigns. Number of exhibitors/spaces/public places that adopt texts translated using the language of thieves. Number of thieves/blinds cards used each month in cultural places. Number of women, migrants, childs, lgbt participants to informal events. Number of materials translated in different languages and availables in the libraries. Number of new collaborations between operators specialised in accessibility. Number of doggy parks and green areas for service dogs. Number of communication campaigns to increase the sensibility towards blind persons in the area. % of reviews of Apps and existing technologies. Number of newborn social streets.

d. Economic accessibility

General necessities	Project guidelines	Management guidelines	Indicators
Guarantee the economic access to cultural offer and restaurants offer.	Realising info and supporting points to differentiate economic activities in the area and increase the employment rate.	Stimulating the restaurants offer to favour the alimentary inclusion (gluten free). Making economically accessible the local cultural offer (in particular the Opera), Rethinking the price policies to ease the access to cultural initiatives. Realising a programme of the cultural events available for free for students. Easing the access to the local job offers through internships and school-work alternation.	ncrease of the flows in cafes that promote offers and discounts. Number of conventions between the university and exhibitors. Number of students subscriptions to the Theatre and other cultural centres. Monitoring the use and fruition of the Student discount card. % reviews of Apps and existing technologies.

2.1.2 Working on places: Piazza Scaravilli, Piazza Verdi and the Municipal Theatre area, Piazza Rossini

To the listening and co-design phase, which started with 4 thematic meetings, followed a 4 meetings cycle focused on the most significant urban spaces located in the U-area, namely: Piazza Scaravilli, Piazza Verdi, Piazza Rossini, and via Moline-via Righi.

The meetings, open to everybody who had an interest in urban transformation, have been hosted on buildings which are particularly significant for their role or their history within the U-Area.

Methodology

As for the first meetings cycle, the meetings focused on places started with a plenary session functional to discuss the U-area dossier. The second part of the meetings was dedicated to organise working tables, coordinated by a moderator, to analyse a specific place, the projects implemented, and to set the management guideline for the area. Each proposal emerged should have been related to the three key themes: accessibility, sustainability and collaboration for new productions.

The first meeting has been dedicated to Piazza Scaravilli, a parking lot reserved to the University staff, that since June 2017 has been gradually converted in a dynamic garden and a permanent pedestrian square through two different micro-projects ideated within the ROCK framework: Malerbe and Concrete Utopy involved 45 students from the Sociology, Architecture, Political Science, Agrarian, and Engineering Departments of the University of Bologna, and represented the starting point for manage the discussion of the working tables organised during the meetings. It's interesting to underline that all the projects proposed during the working sessions followed the guidelines on accessibility, sustainability and collaboration for new productions emerged during the first meetings cycle.

The second meeting has been dedicated to the area surrounding the Municipal Theatre that has been at the centre of an open call for ideas, published in June 2019, while the third meeting has seen at the centre of the debate the use of public lighting on Piazza Rossini and the different concept of public space. Finally, the fourth meeting has been dedicated to Via Righi e Via Moline, characterised by a series of criticalities and possible revamping intervention highlighted by Fondazione Rusconi.

Results

All the above places have been selected to host and test urban regeneration actions. The first one concretised in the transformation of Piazza Scaravilli: the former parking space has been turned into a green, open and co-designed public space for students of the university district. The transformation was conducted via a participatory process, calling for students' inputs and creativity. The foyer Respighi of the Municipal Theatre is now constantly open for reading, listening or studying.

Among the most impacting interventions which could be seen as resulting fro\m the U-Lab participatory process, and specifically the "Five square" event, the transformation of Piazza Rossini in a pedestrian square is for sure the most relevant **(see paragraph 2.4.1 "Piazza Rossini: green please" for an in-depth description)**.

To have a clear vision and better-tailor the actions, U-Lab performed sociological and ethnographic surveys on the area and its visitors and mapped the key elements (institutions and cultural buildings, productions, initiatives, actors) that characterize the area. This allowed to create a precise knowledge-base, to be continuously updated with the actions on the area. The results of this mapping are featured in the ZONA-U Atlas, a constantly updated map describing the heritage, the transformations taking place, the key players in the process.

2.2 Experimentation

As the first U-Lab stage has been characterized by a listening and co-design phase, this has been followed by the implementation of activities focused on the specific themes emerged during the meetings with the stakeholders, and the test of specific technologies. This second phase involved a larger stakeholders ecosystem, which could be considered as a functional part of U-Lab, and has been typified by actions and targeted involvement.
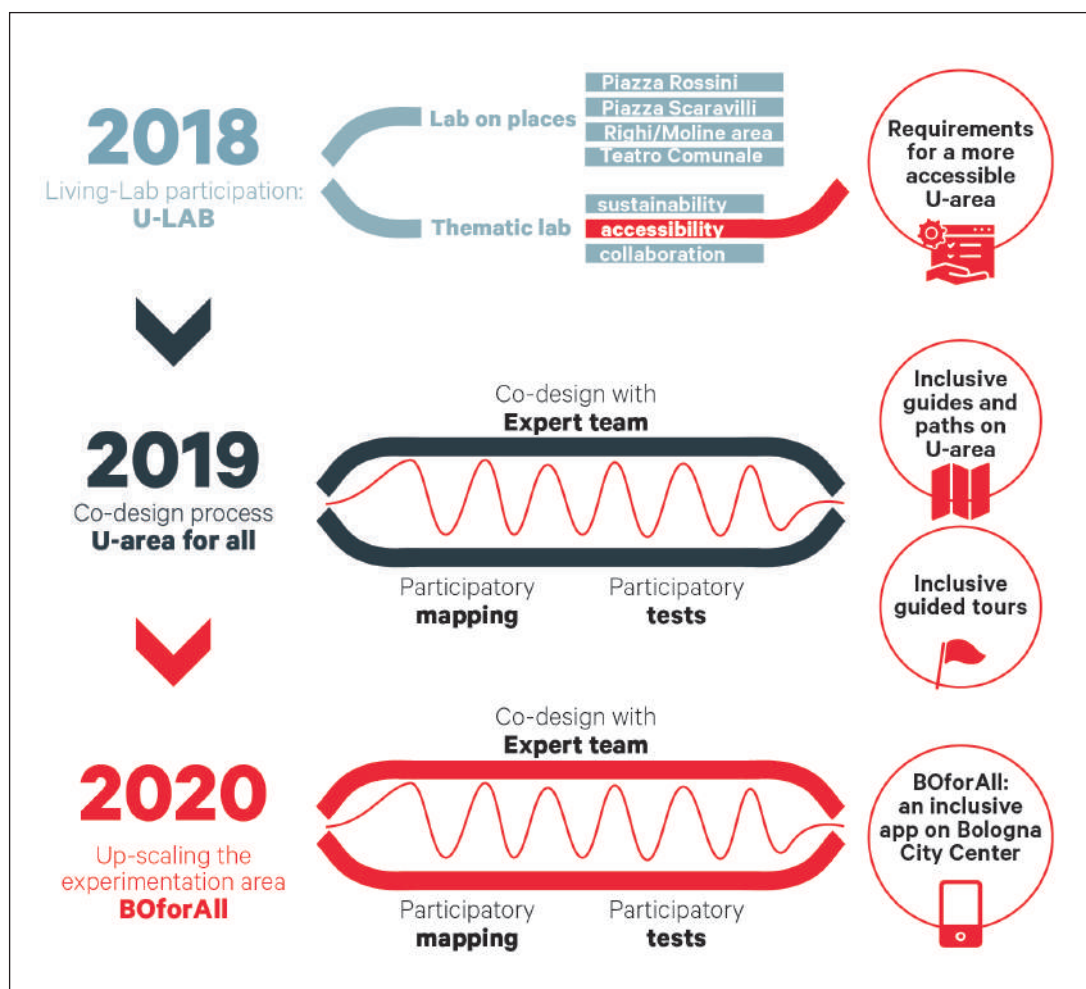
2.2.1 Making Bologna an Accessible City

The ROCK project has tried to highlight how culture is one of the most important elements of Bologna and a pillar of its reputation in the world - as the city's offer is multifaceted and ranges from music concerts, cinema festivals, and performative art exhibitions. The decision to position the city as one of the epicentres of contemporary culture rises from the acknowledgement that culture is both a competing market and a chance that should be given to everyone to enrich his existence. Yet, experiencing culture means being part of our society, as it brings people together, and it should be universally granted. This vision found a fertile ground in Bologna, as in the last 5 years, it has successfully trialled an urban innovation model based on circular subsidiarity and civic collaboration: the collaborative city. This means Public Administration governs not only on behalf of citizens, but also with citizens, basing its policies on the two concepts of City as commons and citizens as a great source of energy, talent, resources, capabilities, knowledge and ideas in support of urban regeneration.

From these perspectives, the discussions activated within the thematic meetings of U-lab, have given a concrete contribution in highlighting how accessibility is one of the greatest challenges facing local Cultural Heritage sites today. Following the discussion with citizens and local stakeholders within U-Lab, the City started to remove any physical, sensorial and cultural barrier that could impede or discourage the access to the University area. In doing so, all the institutions and actors involved relied on the co-design method to create a service with the ultimate aim to make the University area a Cultural District universally accessible. In line with the ROCK vision, it has been recognised the importance to involve people also in co-design interventions, services and policies to concretely make the urban context, and all its elements - Cultural Heritage included - universally accessible.

Three years after the ROCK project began, its effort to reduce inequalities and consider cultural participation as a key factor for promoting the inclusion of all people is clear. To this end, and within U-Lab, it provided tools to fostering participation to cultural life and capacity building activities, opening of hidden treasures, promoting alternative/public use of private spaces, foster innovation through culture and tools linked to CH as analysis of people flows, tracking of accessibility barriers and threats, virtual/augmented reality applied to CH, educational interactive video games for schools and young people especially dedicated to discover hidden treasures of the city, and sensors monitoring indoor and outdoor environmental parameters.

Thanks to a process initiated within U-lab, and with the support of the technological tools tested within the process, accessibility is now part of this vision and a central node for the Public Administration so that the City of Bologna is working, together with the Foundation for Urban Innovation, "to promote the accessibility culture and to guarantee the equality and participation of persons with disabilities". This effort finds its climax in the application to the 2021 Access City Award, with the aim to promote a worldwide recognition of Bologna as a universally accessible City thanks to the active collaboration between Public Administration, citizens, associations, and researchers through the Universal Design principles.

2.2.2 U-Lab Technologies

One of the founding characteristics of U-lab, in addition to being able to activate collaborations and to bring out silent or long unheard needs, has been the ability to exploit some technological devices made available by the partners of the ROCK project. These tools have been used both during the U-Area for All process, to map architectural barriers and to highlight points of interests and existing routes (see par. **2.3.1 TUe: mapping the U-District to track barriers and increase accessibility to the area)**, and for the entire duration of the U-Lab process to monitor the impacts of the actions implemented and foreseen, both on people and the public urban spaces. Among these: sensors monitoring the reaction of people to different events, devices measuring the increase in people flows, environmental multi-parameter tools, GPS tracks, and information on the capacity of public places to deal with an increase in people access.

Thanks to the traditional Living Lab approach, stakeholders have been included in the whole process and technologies, which are embedded in the LLs and their activities, served as enabling tools capable to implement and evaluate the experimentations which, in turn, are the result of the listening and co-design process.

DFRC Sensors' locations within the U-Area

T3 - INTEGRATED CH ANALYTICS (cultural heritage & people perception)
Partner name: VGTU

Video Neuroanalytics is a technology used to analyse public spaces and people inside them. It comprises two different components (Video Neuroanalytics and Opinion Analytics) and a set of systems supporting smart decisions (Multiple Criteria Cultural Heritage Analysis and Recommender System, Healthy Built Environment Multiple Criteria Analysis and Recommender System, Effective Regeneration and Adaptive Reuse Decision Support System, ecc.).

Video Neuroanalytics can rate cultural heritage according to the viewers valence, arousal and emotional state (pleasure, displeasure, etc.) and give recommendations (effective management of the spaces, attract residents, businesses, students, tourists, cultural operators and events, etc.) to different stakeholders on ways to improve sustainability, effective regeneration and adaptive reuse of a particular cultural heritage asset.

Opinion Analytics, detects in real-time opinions expressed in articles, reviews, surveys, comments, opinions, notices, papers, research, studies, blogs, online forums, Facebook, Twitter and other social media channels, thereby allowing visualisation of opinions citizens hold towards issues of urban cultural heritage. By applying Opinion Analytics it is possible to understand and monitor opinions, thoughts, sentiments, attitudes, emotions and preferences of urban citizens and allow city officials to make decisions. Integrated Cultural Heritage Analytics is the result of the combination of Opinion Analytics with Video Neuroanalytics and a range of intelligent decision support systems (Multiple Criteria Cultural Heritage Analysis and Recommender System, Healthy Built Environment Multiple Criteria Analysis and Recommender System, Effective Regeneration and Adaptive Reuse Decision Support System, etc.).

T5 - LBA Sense - LARGE CROWD MONITORING TOOL (safety)
Partner name: DFRC

LBA Sense system uses a network of sensors in the demonstration areas, analyses data over time and provides real-time insights on activity and mobility patterns within the monitored area. This combination of sensors allows the system to perform a more comprehensive reading of the crowd's nature, enabling end-users to access demographics figures and mobility patterns on a wider scale, in ordinary and extraordinary conditions (i.e. festivals and events). The goal is to determine footfall in real-time and change rate in the crowd size, besides dwell time, revisit and flow patterns and distribution, as well as any abnormality, in the overall area under monitoring, with an additional focus on selected key-locations. LBA Sense uses two different types of sensors: 1) Detector IEEE 802.11 which is able to detect cell phones using the Wi-Fi protocol as those mobile devices using info on the access point with the aim to increase the geolocation, and 2) Cellphone Detector, which is able to detect the Country Code of the mobile device.

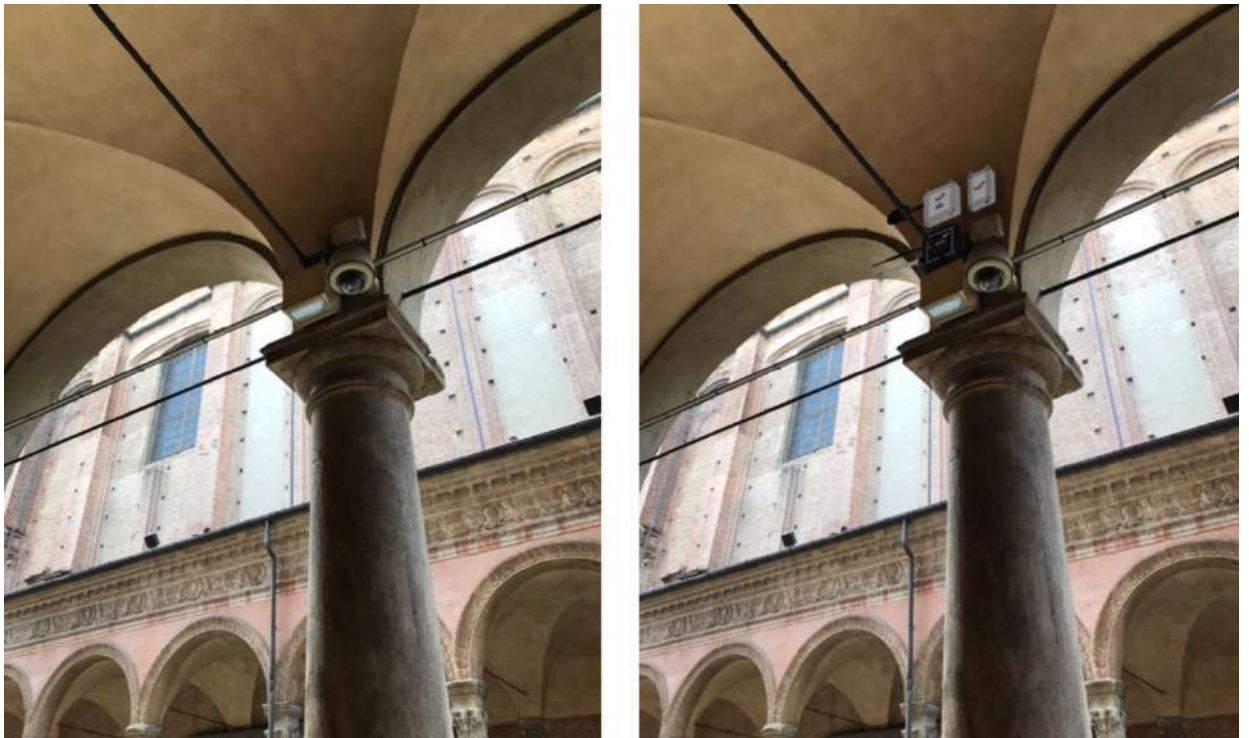### T6 - OUTDOOR MULTI-PARAMETER TOOL (environment & climate)
Partner name: ACCIONA

The tool monitors environmental parameters of the experimental site, specifically: air quality, climate, air and noise speed (included those produced by people flows). The solution includes the selection and integration of the most appropriate sensing devices, power and communication systems, in the historic demonstration areas, together with the smart gateway for data collection. Monitored data are transmitted to ROCK cloud platform, providing a business intelligence tool to enable visualization and

analysis of data, thus supporting decision-making processes about regeneration. None of this data is about or could be associated with personal data.

Sensors located in Giovanni Bentivoglio II Porticoes. The pictures illustrate the wall before and after the sensors' location.

Sensors located in Malvezzi Campeggi Palace. The pictures illustrate the wall before and after the sensors' location.

T8 - INDOOR MICROCLIMATE MONITORING (environment & conservation)

Partner name: University of Bologna (UniBo)

IMM is a predictive tool to know the environment character and the user behavior that allow to set solutions to guarantee (or to improve) the indoor microclimatic parameter. The solution includes: 1) indoor microclimate monitoring (IMM), of all the rooms where manuscript, book or artifacts are stored; 2) a specific microclimatic monitoring system installation on site; 3) definition of a specific 'Alert-range" to advise if indoor environment physics variables are out of specific ranges to let/recommend corrective actions; 4) delivery of a specific 'indoor microclimate management Protocol (IMMP)' of manuscript, book, library and rooms where the exhibition is taking place (according to the 'Alert-range' above described).

T9 - THE CULTURE OF LIGHT (environment & conservation)

Partner name: Viabizzuno (VBZ)

The culture of light specifically deals with the universal value of light as a language to discover places, and a tool of social inclusion. Light design does not simply answer sustainable and environmental issues, reducing energy demand using a new generation of led based bodies, but aims to become a way to transfer information. Innovative sensors and devices will be integrated in the lighting element to dialogue with people via app and smart mobile for enabling a new access (also for disadvantaged users) to CH in many different expressions (books, buildings, events) erasing the distance between sight and touch. Technological solutions will be the tools to make light a construction material for CH-led regeneration and in the meantime the project will contribute to people's sensitization towards the value of the most appropriate light design that is really an expression of the culture of light. Light experiences have been part of temporary and permanent actions in the tree replicator cities.

T10 - PEOPLE FLOW ANALYTICS (environment & mobility)

Partner name: TU/e

This tool provides location-based analytics mainly based on Global Positioning System (GPS) tracking (using GPS trackers). It's a computer program called "Trace Annotator" (TA). TA takes GPS trace data as input and generates activity-travel diary data of users. TA simultaneously differentiates between a certain transportation mode and an activity episode. The GPS based diary data creates plenty of information on activity types, travel distance, time, duration and route. By using an online questionnaire platform developed at DDSS group and the location-based social network service data, we enrich the GPS data trajectories with background information of users and improve the semantic meaning of GPS trackers. Combination of these data is used for the choices and differences between a variety of users such as gender, income groups and age groups and also understanding the meaning and opinions attached to the CH area. The aim is to extract spatial and temporal patterns with additional socio-demographic and opinion/meaning data. In particular, this tool can be used for people flow-analysis to identify the attractive areas, places of interest, landmarks, comparison of behavioral patterns of different user communities or user travel preferences (route selected, distance, and transport mode). The tool has been used for mapping the U-Area in a specific process and series of events organized to involve citizens and stakeholders and to increase the accessibility of the District.

The different technological tools used within the ROCK project, take into account and are adapted to both the context and the specific goals pursued by the project. Specifically, they look for an optimal integration between new technologies and the historical centre's contextual constraints (with no disruption/disturb for people, historic buildings and artifacts).

The validation process of the technological tools was ensured by project partners (especially Municipalities) - that tested the beta version of the products during the ROCK meetings (i.e. WP1 activities), and local communities who performed "users' tests" during participatory initiatives (i.e. Living Labs), to suggest adaptive calibration to specific local context. This interactive validation process will guarantee high quality and a crucial support to the development of the CH-led regeneration process. All the market expectations of ROCK partners will be taken into account in the market strategy of ROCK (WP6) to ensure a competitive positioning for the ROCK partner companies, considering tasks/cost/time needed to launch the products/services in different countries.

Data have been collected during the monitoring phase and could be divided into two different types: the first one includes data collected by ROCK instruments (i.e sensors) located in different demonstration areas and targets people flows, crowds' analysis, and people's perceptions analysis; the second one comes from on-the field studies, as research analysis and observations, surveys.

All data will be shared on a web platform that will collect and manage datasets on the City's cultural heritage, individual behaviors, and urban flows, and will be used in aggregated and anonymous form by the Public Administration to understand the potentiality of the public places where experimentation took places.

2.3 U-Area for All

The second phase of U-Lab started in March 2019 with "U-Area for All", a co-design process to create and experiment a service in the form of guided tours which are inclusive and accessible to both tourists and people who frequent the area on a daily basis or just for vacation or recreational purposes. The service considers accessibility as autonomy, empowerment over information about the use of public space. The main goal is not only to ease the access to the U-area to people with disabilities but to design innovative and inclusive ways to discover the U-area and its vast amount of Cultural Heritage.

To guarantee the widest basin of users and stakeholders to be involved in the co-design process of the service, a call for proposals has been launched by the Foundation for Urban Innovation. Hence, the call for proposal should be considered not as a method to collect ideas but as a concrete tool to guarantee inclusiveness from the very beginning: associations, single proponents, informal groups and entrepreneurs responded to the call opened in March 2019.

The winning team was a consortium led by Accaparlante Centro di Documentazione Handicap, with La Girobussola Onlus, Fondazione Gualandi, Istituto Cavazza and MUVet ASD, that took part to a co-design process, concluded on October 2019, that involved institutions and local stakeholders, together with students, citizens, members of association of blind and deaf people, people with reduced mobility, who are residents or city users.

The use of technologies **(see par. 2.2.2)** to investigate and address the accessibility theme, has been just one of the many instruments employed to increase the usability of the U-Area with the final aim to increase the physical perception of the area and the surrounding environment using all the 5 senses.

In fact, during the process, a Design Thinking tool - PERSONAS - has been used to increase the participation allowing the attendees to first of all prioritise their necessities and, in a second phase, to transfer these necessities to an imaginary person who virtually becomes the spokesman

of these requests. In sum, the idea is to create imaginary persons able to reflect concrete needs.

The process has highlighted the urgency to intervene on a wider scale than the local panorama, in particular in the analysis of the relationship with institutions, in the definition of working tools and in the transversality of the issues and needs of people with visual and hearing disabilities. One of the expected outputs, that after months of hard work we could proudly say it has been achieved, was to make the cultural heritage of the area accessible to everyone, from residents to students and tourists. Therefore, the service did not have the ambition to create a new offer from scratch, but it tried to systematise the various actions that had already been carried out by the various actors in the area on the theme of accessibility: for example, the maps of the museums carried out by the municipality with some trade associations were made accessible and reachable by the guides' connections, while Bologna Welcome will most probably be the official distributor of this service as well as of the other tourist services in the city.

 As part of the "Take care of U" cultural exhibition, on 29th September 2020, the mobile "BOforAll" and two inclusive guides were presented and tested in Piazza Rossini, designed and produced with the aim of making Bologna's cultural heritage increasingly accessible, with particular attention to people with disabilities. The BOforAll app has been developed by ITcares in collaboration with the project MIA Musei Inclusivi e Aperti (Inclusive and Open Museums) which produced the contents on the Cultural District area (Quadrilatero della Cultura), replicating the model developed on the U-area. It provides information and curiosities about places of historical and artistic interest in the city, in particular the university area and the Quadrilatero della Cultura, (i.e. the area around Piazza Maggiore), indicating accessible services.

With BOforAll you can follow different inclusive routes or freely visit the areas discovering monuments, museums, churches and other places of interest. BOforAll contains useful information for everyone and some instructions and content designed to make cultural heritage more accessible to people with disabilities. Like the app, the inclusive guides are also designed to inform about the accessibility of the cultural heritage that characterises the university area, suggesting contents that can be used by people with visual, hearing and motor disabilities. They provide useful information to reach the places of culture and to visit the area following two thematic routes, one historical-artistic and the other scientific-environmental.

Both of these tools are hence the result of the U-Area for all, which in turn born within the U-Lab process, involving the different realities of the area by bringing together the needs of the many associations dealing with disabilities in the city. It was an effort of imagination, planning and field experimentation of a new system that could go beyond the standard. A starting point, towards a more participatory, sustainable and creative urban reality, where cities are made not only of places, but also of people who live in those places and who preserve their importance. This is an effort that the city has taken on working towards Bologna's candidacy for the Accessible City Award.

2.3.1 TUe: mapping the U-District to track barriers and increase accessibility to the area

The use of technological devices has been an integral part of U-lab and, specifically, the U-area for All process. The co-design phase of U-area for All has yet been followed by a participatory mapping experience of the area designed to highlight the existing routes, point of interests, and architectural barriers, thanks to a specific device, prototyped by the Eindhoven University of Technology (TU/e). The device tracked the routes and geolocalized the feedback of those involved in the mapping experience with regards to the places visited.

To the event participated 36 persons who responded to an open call published on the website of Fondazione Innovazione Urbana and promoted by multiple communication and social channels, including those of the City of Bologna.
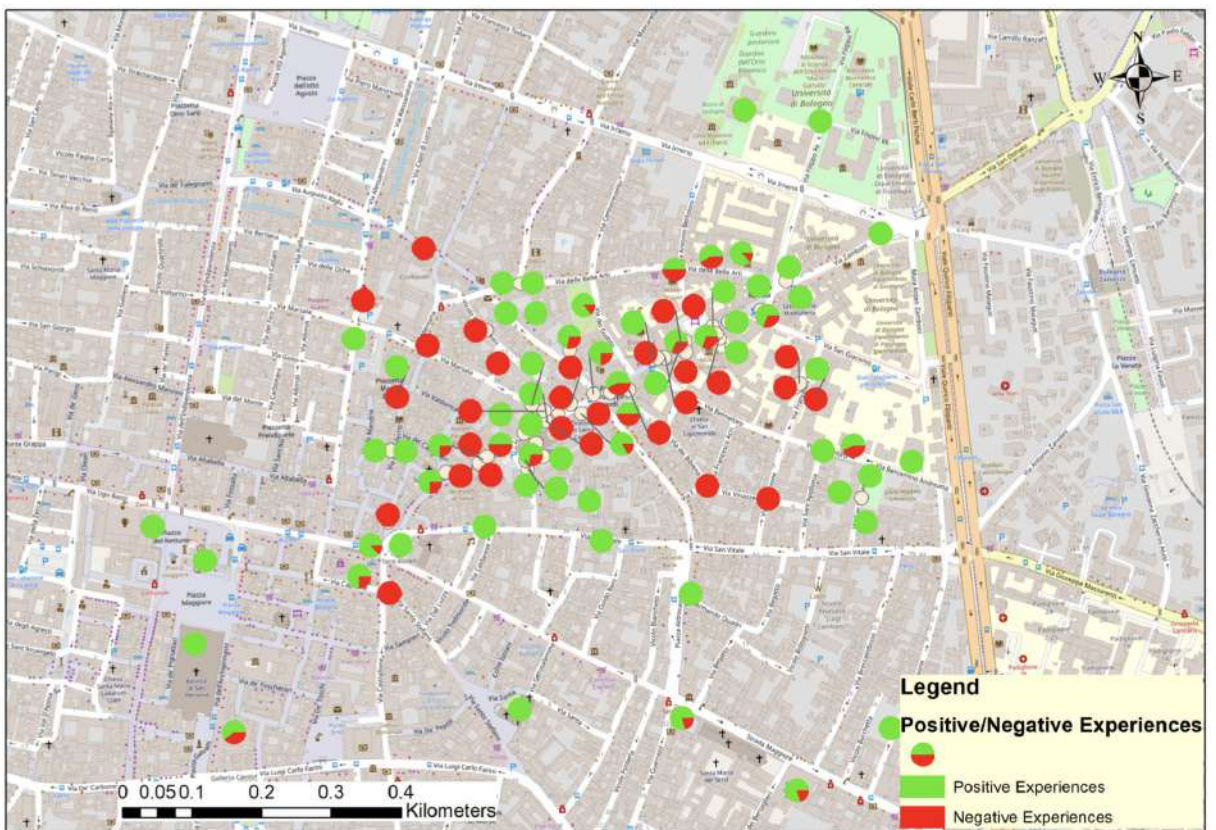
According to a report provided by TUe and available on the ROCK website, the geo-survey gave the information about Gender **(Female 47%, Male 53%)**, Age **(18-30 56%, 31-50 17%, 50+ 27%)**, Employment **(Student 44%, Employed 33%, Retired 23%)**.

In total **273 experiences** have been registered: 75% were positive (curiosity/interest, fun, joy, inspiration, relax, surprise), 25% negative (confusion, disgust, irritation/anger, boredom, fear) experiences. Most experiences have been registered in Via Zamboni (21), Piazza Verdi (16) and Piazza Scaravilli (13). shows the distribution of total experiences and at each Point of Interest, and represents the distribution of total experiences and ration of positive/negative experiences at each Point Of Interest (POI), respectively.

Total number of experiences in Points of Interest (POIs)

Ratio of positive/negative experiences in POIs

If, on the one hand, the long-term objective is to physically intervene on the architectural barriers widespread in the city, the event has been useful to mapping them and create a consistent tourist route.
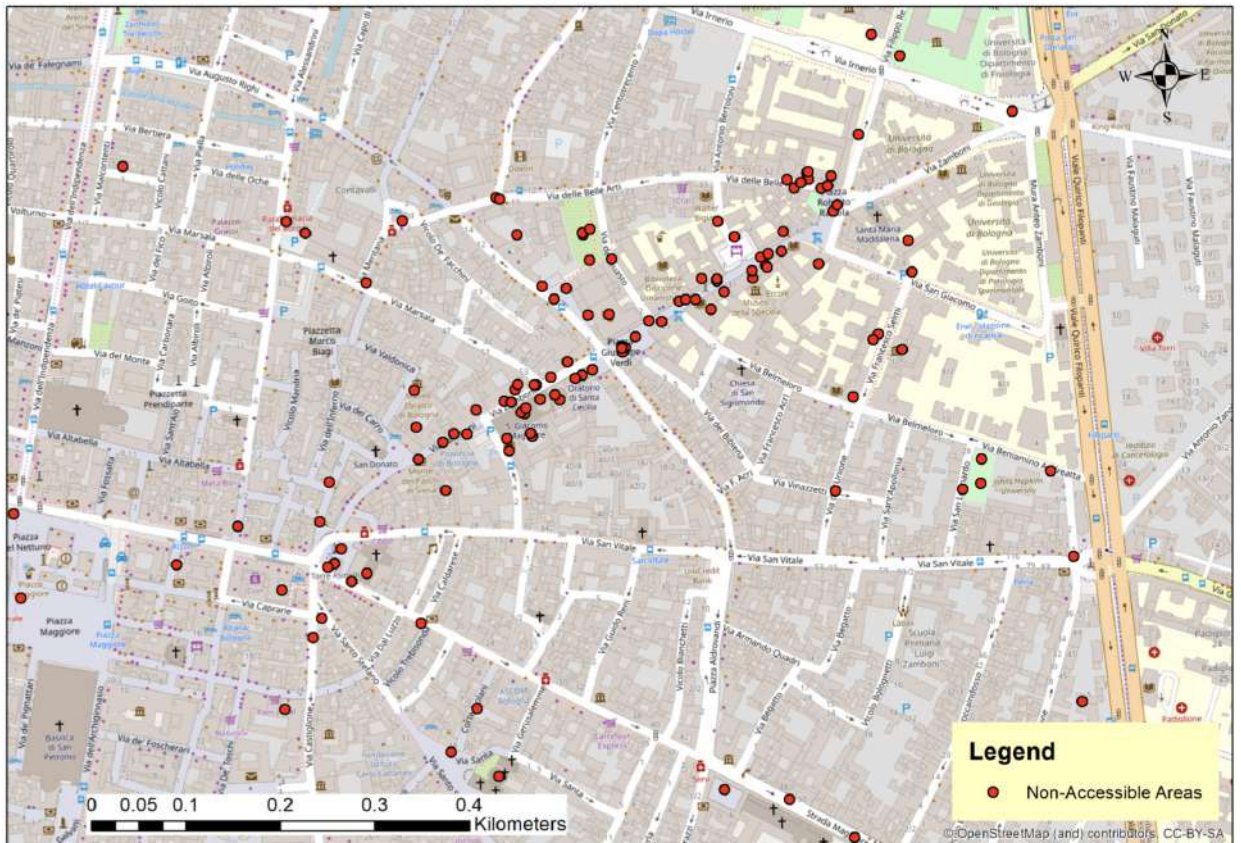

Fig.9: Distribution of not-accessible areas.

The use of technologies to investigate and address the accessibility theme, has been just one of the many instruments employed to increase the usability of the U-Area: starting from Design Thinking methodologies, technological devices and participatory experiences, to the creation of hard copies leaflets to support tourist guided tours, a wide range of languages, both physical and artistic, have been explored with the final aim to increase the physical perception of the area and the surrounding environment using all the 5 senses.

The experimentation phase included a training for the official tour guides to allow them to properly manage the access to the tour to people with disabilities and to make them aware of the different languages and methodologies when dealing with deaf or blind people.

The results of the whole experimentation phase have been useful to define and finalize the guided tours service, tested on November 15th, and the related leafleat, that in turn will be promoted by Bologna Welcome, the tourist agency of the City of Bologna.

2.4 Five squares

U-Area for All represented an instrument to increase the accessibility and spread the knowledge about the U-Area. At the same time "The Five Square", - whose name refers to Porta Ravegnana Square, Rossini Square, the Municipal Theatre terrace facing Piazza Verdi, Scaravilli Square and Puntoni Square - was the second experimental program implemented in Bologna within the U-Lab framework. Following a set of experimental actions developed within the ROCK framework on Scaravilli Square (Malerbe, Concrete Utopia, SLAB), its main goal was to make people conceive the area not as a number of disconnected open spaces but as an interconnected organism, rich of hidden and often unknown cultural heritage treasures, whose squares represent its multiple hearts.

A premise is necessary to frame the context of the operation. A first attempt to redefine the core of the U-Area, was made on the summer 2018 when the Municipality of Bologna, in line with the positive experiences of Amsterdam (NDSM) and London (Box Park) approved the creation of the "Guasto Village": a system of 11 containers hosting cultural activities, enogastronomy experiences, workshops, a radio and multiple showrooms, that connected Piazza Verdi and the Municipal Theatre that, notwithstanding the clear physical connection, have been always characterized by divergences within the communities that live the area.

"The Five Square" could be described as a 6 days festival, held on September 23rd-28th 2019, whose attempt was to highlight the importance to take care of the public space, evaluate urban regeneration intervention, cultural heritage promotion and accessibility, while taking in continuous consideration the sustainability issue and the participatory approach. Events, workshops, activities and exhibitions involved, in all their phases, students, citizens, associations, institutions and a wide set of local stakeholders.

2.4.1 Piazza Rossini: "green please". How public places could represent a concrete response to the sanitary emergency

The more successful exhibition, promoted by the Foundation for Urban Innovation together with the Architecture Department of the University of Bologna, the Bologna Municipality the Bologna Design Week and Unipolis Foundation, involved Rossini Square, whose location - at the beginning of Via Zamboni - makes it the open scenery of the U-Area. The square, transformed decades ago in a parking lot, is characterised by cementification and urban heat waves.

As a result of the U-Lab listening phase, when participants highlighted the importance to re-valorize Rossini Square and the surrounding space, and thanks to the work of students, associations and institutions, the Square has been covered with a green carpet and presented to the Public during the "Five Square event". The square has been enriched by *Maxxi Poppy*, a floor standing artistic light fitting for outdoor use, which has been provided by Viabizzuno. The lamp is made of a fibreglass diffuser fitted to a powder painted steel pole, to be fixed to a special 535mm high steel ground anchor - that donated new light to the square allowing users to see it from a kaleidoscope of different perspectives.

DFRC sensors have been installed and returned a set of interesting data highlighting the importance of returning public spaces to the city's users: 196.398 persons passed through Rossini Square from September 25th and October 1st for a total of 30 ppl/day (people per day).

Daily Reports (25 Sep 2019 — 01 Oct 2019)	
25 Sep 2019 (Wed)	25.798
26 Sep 2019 (Thu)	26.459
27 Sep 2019 (Fri)	36.125
28 Sep 2019 (Sat)	30.706
29 Sep 2019 (Sun)	23.728
30 Sep 2019 (Mon)	25.113
01 Oct 2019 (Tue)	28.469
Total	**196.398**

Data on people flows on Rossini Square, provided by DFRC sensors.

The change in a pedestrian plaza was such a success that the Municipality of Bologna decided to make it permanent, elaborating a project of reassessment of the public space. An intervention that acquires more and more importance during the Covid and post-Covid emergency, when the discussion on the multiple role of public space is vibrant and inserted in a wider discussion on how to make urban areas ready to respond to the current and potential, future, sanitary emergencies.

Yet, the Covid emergency highlighted the importance to live differently the urban areas and public spaces at large, in particular those characterised for their high level of social interactions. The proximity dimension and the presence of widespread public spaces in the city contribute to increase city users' life quality and a concrete answer to the necessity to guarantee an adequate social distance between people without impeding social relations.

The transformation of Piazza Rossini hence responds to all the above requirements while guaranteeing the achievement of four main goals:
- increasing the quality and number of widespread public places;
- strengthening proximity networks;
- reducing air pollution;
- increasing the capacity of the urban area to respond to climate change impacts (e.i heat waves).

During the lockdown period, the Municipality of Bologna, together with the Foundation for Urban Innovation, the University of Bologna and a group of architects and experts, worked to give a new temporary asset to the square, in response to the Municipality decision.

A 300 m2 grass carpet, elevated above the ground in order to install an irrigation system was placed to cover the concrete. The area is accessible for people with disabilities via a specially designed staircase, while a 1.5-meter corridor on the North-West section of the square will allow the free movement of all visitors.

On the green carpet, there are planters containing an array of herbaceous and shrubby plants, which are accompanied by key messages on the importance of taking care of the public space and the role of vegetation in urban areas, by transforming the square in a communication tool. Urban and vegetation elements acquire yet both the role of urban decors and messages on the importance to preserve public spaces and respect green elements and urban biodiversity.

Enriching the square with plants has both an aesthetic and conservation meaning, particularly, preserving biodiversity in the urban area. Species have been selected for being native and their low water and maintenance needs. Urban decor elements will be positioned in such a way that they do not disturb the ancient look of the square. Particular attention has been given to public lighting thanks to the placement of Maxxi Poppy, a design lamp provided by Viabizzuno.

Notwithstanding the undoubtable importance of giving public spaces new roles and increasing importance, "the project - in addition to the spatial transformation of the public square and its changing perception - generated a heated debate among architects, urban planners, intellectuals, art historians, citizens and citizens associations, on issues such as the compatibility between the character of the historical urban structure and the proposed greening intervention, the opportunity to respond to the need for relationships, sociability, and community spaces toward the risk of improper uses" (Boeri et al.[2]).

The square was presented to the City in July 2020 and a group of experts is currently working to give the square its final design.

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[1] Temporary transformations to access and experience sustainable city public spaces" for the conference: sustainable city 2020 - wessex institute 14th international conference on urban regeneration and sustainability to be held on 22–24 september 2020 online

2.5 Bologna MAMbo: a participatory experiment to measure art's emotions

A further use of ROCK technologies has been represented by the attempt to combine technology innovation with art fruition. The chance to experiment this use was an event held on July 30th at MAMbo
(Bologna Museum of Modern Art), connected with Julian Charrière's exhibition "All We Ever Wanted Was Everything and Everywhere" where visitors took part of the artistic installation through a mapping of their emotions in front of the artworks People engagement and participation to the open event has been ensured by both a communication campaign on social and communication channels of the organisers, and ad hoc invitations sent to U-Lab stakeholders. The Video-Neuroanalytics (VN) technology provided by the Vilnius University uses thermal imagers to detect visitors' sensations, in order to evaluate how they perceive cultural heritage, and specifically: emotional status (happiness, angriness, sadness, wonder, fright, disgust, neutral status); affective approaches (boredom, interest, confusion); physiological status (average face temperature, heart frequency, breath frequency). Data collected are useful for cultural institutions, artists, and events' organisers, to increase the sustainability, the regeneration potential and the successful adaptive re-use of cultural heritage with the final aim to make more efficient the management of public spaces thanks to the real-time feedback provided.

2.6 The Municipal Theatre: a call for re-launching the area

The Municipal Theatre is located in the historical centre of Bologna along the old Strada di San Donato.
Based on a design by Antonio Galli Bibbiena, construction began in 1756 on the site of Palazzo dei Bentivoglio, which was reduced to ruins in 1507 (giving rise to the toponym 'guasto'). The Theatre is at the centre of an area characterized by buildings of great architectural and testimonial value, amid open and porticoed spaces used for transit and to access important functions present in this part of the city.

Starting with previous experiences and considering the basic criticality represented by the partial sharing of strategies established for this part of the territory, the ROCK project views the U-Area, and specifically the area surrounding the Theatre, as a place for experimentation with multi-level regeneration practices based on enhancing the cultural heritage. Again, the tool used to involve local stakeholders, enabling the exchange of information about activities that each had planned, and building a common medium-term vision, was U-Lab.

For the Rock project partners involved in the co-design of the University area of Bologna, renewing the Municipal Theatre meant to reinforce the central role the Theatre plays as an internationally recognized cultural institution and transforming it into a 'contemporary theatre' ready and capable to welcome the entire City. To this end, from June 20th to September 16th 2019, the Municipality of Bologna, together with the Foundation for Urban Innovation, the Rusconi Foundation and the Architects Association of Bologna, launched "R-accordi in Teatro", an international call for ideas, published on the online platform of the Architects Association of Bologna, to renew the Municipal Theatre main building, and the surrounding urban context. The call benefit of a 2.8 million euro financement provided by the Pact for the Metropolitan Bologna - Development and Cohesion Fund 2014-2020.

According to the call, the winning proposal should have worked to increase the accessibility of the Theatre, with particular attention to people with disabilities, while redesigning services and spaces to activate new connections with both the physical and social context of the surrounding environment.
Among the 15 proposals received, the Evaluation Committee selected 5 projects (3 classified as winners and 2 nominees) which have been awarded for their capacity to think on a Contemporary Theatre having a positive impact in terms of environmental and social sustainability, that will represent an active actor capable to increase the livelihood of the U-Area.

3. Conclusions: lessons learned and future developments

Modern urban contexts call for innovative and sustainable operating models and strategies which should include Cultural Heritage as a fundamental element to be acknowledged and properly valorized.

In the last 3 years, the actions activated in Bologna have been thought as a mixture of research and actions finalised to strengthen the identity of the University area, located in the core of the City centre, and mitigate decades of social conflict due to the coexistence of communities with different roles, desires, needs and visions.

Therefore U-lab represented an attempt to fortify, or create where they did not yet exist, networks of knowledge and action able to intervene in the area both conceptually and through widespread experimentations. These networks are attributable to the community of stakeholders who, in the last 3 years have worked together to facilitate the emergence of desires and needs that have long been unheard or unable to emerge.

From this perspective, and thanks to an already fertile context represented by the long tradition of Bologna in citizens engagement, U-Lab main result is the rise of inclusive processes where citizens have been concretely enabled to participate in the design, implementation and evaluation of actions testing practices which could feed the definition of cultural policies and programmes, through the Living Lab approach. It widely contributed to make Bologna, and all the cities involved in the project, inclusive, safe, resilient and sustainable by working on tangible and intangible CH and fostering local sustainable development.

Co-planning, co-design, self-construction and co-management yet became fundamental steps for experimental urban transformation processes, which found in Bologna - with its long lasting experience of community participation in the care of urban commons - a fertile ground to mature and achieve long-term results through demonstrative, pilot and temporary actions. This process soon generated new dynamics in the public space use, providing effective solutions to tackle social tensions, climate change impacts, evaluate city users' discomfort, improve outdoor microclimatic conditions, enhance Cultural Heritage accessibility and knowledge, and fostering responsibility for the common good while providing new solutions in term of space fruition during the sanitary emergency caused by the Covid pandemic.

Starting from U-Lab, viable solutions based on community needs and urban accessibility through the co-creation of shared services have been tested and brought to changing behaviours, modified space layout and a re-consideration of CH as a universal right. Accessibility is now connected to all the aspects that determine the possibility to fully participate in urban life: overcoming physical and economic barriers, perception of safety, equal access to institutions, cultural productions, participation and empowerment of citizens, information and opportunities. U-Lab ROCK demonstrates how urban accessibility needs to be discussed and co-designed within communities and not only inside the traditional institutions, in order to make it really universal. In doing so, all the institutions and actors involved in the U-Lab process relied on the co-design ROCK method to create a service with the ultimate aim to make the University area a Cultural District universally accessible and now the Public Administration is working to remove any physical, sensorial and cultural barrier in the entire City.

The co-design and self-construction interventions on Piazza Rossini, for example, represent a temporary transformation with long-term impacts both in terms of citizens' expectation and urban planning, unfolding and revealing the unexpressed potential of a public space, stimulating the public debate and challenging local communities in going beyond the traditional concept of "public square".

The use of technological tools for the detection of the flows of people in the U-area, the collection of indoor and outdoor climate data, and the mapping of the area has also contributed to the construction of an archive of data useful for the ex-post evaluation of the project, as well as providing useful material to evaluate the results of the actions while in progress.

After a rich summer cultural festival organised in the U-area in 2019, and a dense series of cultural appointments through the years, the health emergency caused by the spread of the COVID-19 has put in serious difficulty the final phase of the process, and its method characterised by a continuous activation of the local stakeholders, at a time when it was important to return the results of a long process of listening and widespread experimentation.

However, even the COVID-19 pandemic which literally locked down the World for months, turned to be an opportunity to test the U-lab method, reasoning on the different unconventional uses public spaces could cover, and re-design our historical center to promote new forms of social interactions.

U-lab provides new ways to access CH and to promote perception of shared heritage as collective property, fostering the usability of spaces to all and improving CH functions from a user perspective. For all the above, U-Lab demonstrated to be not only an instrument born within a EU funded project but a common tool to be used to increase knowledge, participation and ease the transformation of City centres in permanent Laboratories keening to evolve according to modern challenges.

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