

The Urban Book Series

Eugenio Arbizzani · Eliana Cangelli ·
Carola Clemente · Fabrizio Cumo ·
Francesca Giofrè · Anna Maria Giovenale ·
Massimo Palme · Spartaco Paris *Editors*

Technological Imagination in the Green and Digital Transition

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The Urban Book Series

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ISSN 2365-757X

ISSN 2365-7588 (electronic)

The Urban Book Series

ISBN 978-3-031-29514-0

ISBN 978-3-031-29515-7 (eBook)

<https://doi.org/10.1007/978-3-031-29515-7>

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This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

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Foreword by Antonella Polimeni

Good afternoon to all participants, ladies and gentlemen, and welcome to Rome.

On behalf of the Community of Sapienza University of Rome, it is a real pleasure to welcome all of you to the first edition of the International Conference “Technological imagination in the green and digital transition”. I am also pleased to give my best welcome to Dr Antonio Parenti, Head of the European Commission Representation in Italy, and to Prof. Mario Losasso, President of the Italian Society of Architectural Technology, as well as to all guests, students and colleagues.

The conference that we are about to open, organised by the Department of Architecture and Design and directed by Prof. Alessandra Capuano in cooperation with Sapienza Foundation, is to be a moment of methodological debate about built environments and the rise of contemporary urban challenges, so engaging for public and private institutions at national and international level.

The proposed key points of this conference—namely Innovation, Technology, Environment, Climate Changes and Health—are all interconnected priorities that cannot be further postponed, representing in the meantime strategic research and education activities for our University, perfectly aligned with the Italian National Recovery and Resilience plan, to be implemented in Italy as well as European member States, in order to overcome the present financial and social challenges.

I truly believe that Universities are, by definition, places of imagination, where planning the future is intended as an unavoidable “existential condition” as well as an essential moment of collective participation for an accomplished society.

Thank you for your attention, and I wish you a fruitful continuation of the conference.

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Foreword by Eugenio Gaudio

My warmest greetings to Dr. Antonio Parenti, Head of the European Commission Representation in Italy, to the President of the Italian Society of Architectural Technology Mario Losasso, to the Director Alessandra Capuano, and to Pietro Montani who will open with a Philosophical Lecture the Conference “Technological imagination in the green and digital transition”.

A special greeting to Prof. Anna Maria Giovenale, my dear colleague and friend, who invited me to be here today. Thank you Anna Maria.

Let me also greet all other speakers as well other participant that will follow this Conference organized by the Department of Architecture and Design, together with the Fondazione Roma Sapienza.

From the very beginning, as President of the Fondazione Roma Sapienza, I supported the initiative of an international Conference on the theme of “Technological Imagination” having clear in mind that human imagination is inseparable from the “technical practice” with which it is entangled from the earliest origins of mankind, as Pietro Montani states in his book, *Technological destinies of the imagination*.

When the contents of the Conference were increasingly defined and focused around the areas of the green and digital transition, I realized that the very core of the Conference was becoming an attempt to respond to the contemporary challenges of the National Recovery and Resilience Plan, in their key role of revitalization for Research and University.

In this sense, the potential of technological culture is reaffirming its role of strategic tool for the conceiving, design and validation of future scenarios.

The sessions into which the Conference is structured, namely: Innovation, Technology, Environment, Climate Changes and Health, identified in order to outline the evolutionary scenarios of architectures and cities, allowing us to reflect at different levels on innovative models of building and management process, as well as design and products.

The goals of promoting digital transformation, supporting innovation in the production system, improving sustainability and ensuring an equitable environmental transition, find their clarification in the elaborations and experimentation presented through the contributions in the different sessions.

Modern technological innovation allowing multiple possibilities in all areas: nowadays digital technologies are enabling us to interact with people and things, all over the world.

There are astonishing, yet untapped potentials, suggesting that digitization, rather than a strict sense adaptive development, should be seen as an important evolutionary phenomenon and in the meantime a great opportunity.

Innovations connected with new technologies can provide to civil society a better quality of life, both at indoor and urban scale settings, addressing scientific development toward an effective culture of sustainability, reuse and security.

The employment of new technologies, a careful approach to the containment of land consumption as well as a careful consideration towards soil coverage modality and urban density, the recycling strategies and technological and typological redevelopment of degraded areas and buildings applying an energetic and eco-systemic approach, are the key elements for the conception of healthy and resilient urban habitats, able to adapt to the present global changes, as well as promoting prosperity, inclusiveness and social equity.

Last but not least, “health” issues, that need to be conceived at the very core of the potential determined by technological innovation and processes of ecological and digital transition.

The structure of the Conference is rooted on all these interrelated themes, and on that same basis also research needs to be reoriented.

I am confident that this first edition of the Technological imagination conference will contribute to pave the way of an innovative and interdisciplinary scientific approach to technology and policies for built environments, considered the real human challenge of the twenty-first century.

Thank you so much for your attention and enjoy the Conference.

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Foreword by Antonio Parenti

New European Bauhaus

Good morning,

*Magnificent Rector of Sapienza University of Rome Professor Antonella Polimeni
President Fondazione Roma Sapienza Professor Eugenio Gaudio,
Director Department of Architecture and Design Professor Alessandra Capuano
and others.*

Ladies and Gentlemen,

It is my pleasure to address you today and to open this International Conference “Technological Imagination in the digital and green transition” organized by Sapienza University of Rome.

Let me say that the title, the contents, and the proposals envisaged by the Conference match perfectly with the main pillars of the flagship initiative shaped by the President Ursula von der Leyen and launched in September 2021: the New European Bauhaus.

The New European Bauhaus is by nature transdisciplinary: it invites architects, designers, artists, scientists, engineers, artisans and citizens to share their expertise in preparing for the future.

With the New European Bauhaus, we want to make the European Green Deal tangible and “palpable”.

We want to add a cultural dimension to the economic and technological transformation. This is essential to achieve our overarching goal: making Europe the first climate neutral continent by 2050. And thus reconciling our way of life with nature.

To get there, we need both: a real transformation of our economy and society, and a debate about how we can live in respect of nature and our planet.

The historical Bauhaus was founded in Weimar and Dessau. It turned into a worldwide movement. This did not happen by chance. Some ingredients of what made the historical Bauhaus a success can also be an inspiration for the New European Bauhaus.

Let me mention three.

The first ingredient: The historical Bauhaus was created in a time of **profound transformation**. People were facing the challenges of industrialisation. Gropius and the founders wanted to respond to the emerging needs of a new era. They aimed for solutions that were functional, affordable, but also beautiful. With this principle in mind, they shaped buildings, fabrics and furniture. They always aimed higher than just innovative design. The New European Bauhaus is also striving for this mix of aesthetics and affordability. But we want to add another element: sustainability. Because the New European Bauhaus wants to match sustainability with style.

Now, the second ingredient: **The historical Bauhaus boldly promoted new materials like steel and cement**. Today, we also need to look into new building materials. But this time, it is about sustainability. It is about materials that need less CO₂ in their production process. The New European Bauhaus wants to accelerate the transition of the built environment. It wants to scale up nature-based materials, to support circular design and architecture. Buildings are responsible for 40% of our energy consumption. And if we manage to change this, we have a chance to keep global warming below 1.5 degrees.

The third important element from the historical Bauhaus is **interdisciplinarity**. We want to convene people from different backgrounds and with different competences to share and grow their ideas and visions. We can create a better tomorrow, if culture and technology, innovation and design go hand in hand.

For our New European Bauhaus, the European Commission needs scientists, activists, artists, designers, architects and entrepreneurs. We want to include the ideas and perspectives of all ages and all backgrounds.

Today, at this conference we can contribute to this evolving New European Bauhaus network.

This project is a project of hope. It is a project of change and of economic transformation.

So I hope that this conference can contribute further to making the transformation happen and to connecting more and more people who want to make it happen.

Thank you very much and have a great conference.

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Foreword by Mario Losasso

Presentation of CONF.ITECH 2022

The green and digital transition represent in the contemporary research field the two new challenges for the evolution of technology within the themes of sociotechnical innovation. Consequently, technology and innovation in contemporary world must adapt to this general objective. Innovation in its hard and digital components once again becomes a central factor in the experimental propulsion that the project is assuming within a processuality and technologies that enable its conception and implementation.

Today, research is increasingly characterised by the need to focus on specialisms that lead to and contribute to the advancement of knowledge and the predictive value of what is studied in the disciplinary fields. However, with respect to the evolving complexity of phenomena, research requires continuous disciplinary interactions to be developed because we understand that one disciplinary field cannot alone address the most important challenges of contemporary society.

New forms of coexistence must be organized in a vision of interdependence and connection, while the green transition requires the definition of the limits of design action and the characteristics of the transformation processes. The new perspective of co-evolution will have to express a design attitude that allows to repair and, where necessary, rebuild the lost links between man, technology and nature.

The green and digital transition represent the two new challenges for the evolution of technology within the themes of social innovation. The Italian society of architectural technology SITdA has been working for a long time on the topics of the relationship between technology and urban and building development within a process-oriented and eco-systemic approach. In the field of technological design of architecture, the scientific society of the technology of architecture has activated research and training sensitivities on the themes of design experimentation framed within process and ecosystem dynamics, aimed at optimising the efficiency of products and processes by reducing inefficiencies and waste.

The SITdA supports research and spin-off outcome on territories through the activities of its scientific clusters. The Scientific Society SITdA has granted its patronage to the CONF.ITECH 2022 Conference, sharing its importance and topicality in view of the new challenges identified in the urban construction and environmental fields by the Next Generation EU Programme and the implementation programmes in the various nations of the European Union.

The topics that will be addressed during the three-day conference are fascinating and challenging, linking innovation, technology, environment, climate change and health.

These topics are strongly interrelated themes in which we are realising that it is impossible to deal with them separately, arriving in the most recent reflections at considering a single health for human beings and for the entire environment which is their living environment.

I would like to remind that the topic of digital culture, nature and technology was the central topic of the SITdA Naples 2020 Conference held last July with a delay due to pandemic difficulties, while the 2022 Conference of the Scientific Society is focused on the topic of the centrality of processes. As we can see, the work carried out in the Departments of Architecture and by the Scientific Societies in the area of architecture is an activity that has picked up significantly, foreshadowing new approaches, new fields of enquiry and new paradigms necessary for the new complexities that constitute the reference scenario of the future.

The experience of this Conference can provide a significant contribution to the sustainable and environmental evolution of the design area in its trans-scalar, multidisciplinary and challenging dimension, overcoming technocratic responses to a demand that requires the integration of the humanistic and technical-scientific dimensions.

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Foreword by Orazio Carpenzano

Welcoming Address from the Dean

On behalf of the Faculty, I wish to thank the organisers for asking me to give this opening address, while congratulating them on their efforts to bring together, in an international encounter, various perspectives on topics of such decisive importance for the future of our respective territories, as well as their people, living organisms and architecture.

My thanks go to Anna Maria Giovenale, Fabrizio Cumo, Eugenio Arbizzani, Carola Clemente, Eliana Cangelli and Francesca Giofrè, who will be giving talks on technological innovation, the environment, climate change and public health.

Thinking of energy in terms of how it relates to architecture during the green and digital transition means cultivating a *technological imagination*, a topic which leads to the broader question of the man–nature relationship and the possibility that architecture, by applying innovative ideas and concepts while promoting a growing social and emotional intelligence of its own, can contribute to inventing of new types of habitat for mankind on the planet earth, under a new pact for survival that allows all elements, both artificial and natural, to coexist in a sustainable balance which can serve as a preventive measure against the intrinsic destructive force of the Cosmos, an especially pressing problem where mankind has neglected certain methods for dissipating the energy of calamitous events made available by both ancient wisdom and scientific advances.

The 2021 Architecture Biennial, entitled “How Will We Live Together?”, implicitly drew the attention of visitors to the need for a new approach to the man–nature relationship, following a thorough review of its historical and ethical premises. Hashim Sarkis, the curator of the exposition’s seventeenth edition, passed on the following message: “In a scenario of exasperated political divisions and growing economic inequality, we call upon architects to imagine spaces in which we can all live in fruitful fellowship”.

The man–nature relationship has always been a distinctive feature of humanistic and artistic thought on things technical, expressed in the construction of the *civitas*, the physical and political synthesis of civilisation. Medieval mysticism viewed nature as a foreboding wilderness, while the Renaissance redeemed the sense of *technè*, and the Romantic Period, with its high-strung, emotive outlook, led to the elaboration of the concept of the sublime.

Controlling and putting to use the energy generated by nature through sources of heat and movement (wind, sun, water), first through manual effort and then using the tools and machines produced by human ingenuity, was also a topic and challenge that led architecture to express, during the Modern Movement, boundless enthusiasm for the theories of Taylorism, which Corbusier summed up by interpreting human dwellings as machines of habitation.

But it is from the time of Vitruvius that architecture, engaged more or less explicitly with the triad of *utilitas-firmitas-venustas*, has addressed the problem of dissipating heat (or thermal inertia), as well as kinetic and elastic energy (in the case of earthquakes), at various latitudes of the globe, drawing on the available resources and raw materials. Historic Italian buildings, for example, built with walls roughly a metre thick and a structural layout measuring 4×4 or 5×5 m, have offered excellent thermo-hygrometric performance (in terms of energy consumption), as well as structural dependability (against seismic risk). In both cases the objective is to “mitigate”, a term used by many modern-day scholars, the dissipation of different types of energy.

The history of architecture is filled with archetypes that need to be updated and reinvented. Think of the ingenuity it took to build Venice atop a giant underwater forest, or the aesthetic quality of the Tu’rat walls constructed by Southern Italian peasants, the windmills of Northern Europe and countless other magnificent examples of *swarm intelligence* collected by Bernard Rudofsky in his well-known book *Architecture without Architects: a short introduction to non-pedigreed architecture*, published by Doubleday & Company Inc., Garden City, (in 1964), following an exhibition at New York’s Museum of Modern Art. Though, in truth, Roberto Pane and Gino Capponi had already touched on the topic in articles on the architecture of Ischia published in “Architettura e Arti decorative” in 1927, as did Giuseppe Pagano at the Milan Triennial “Rural Italian Architecture”, published in the Notebooks of the Milan Triennial by Hoepli in 1936.

Looking beyond the confines of architecture, a recent reconsideration of the topic of Cinema and Energy can provide potentially useful points of affinity with architecture, especially in the collection of essays found in issues 7 and 8 of the periodical *Imago*, under the title *Cinema & Energy. Interdisciplinary Outlooks Combining Science, Aesthetics and Technology*, edited by Marco Maria Gazzano and Enrico Carocci (and published by Bulzoni in 2013). In an essay entitled *Dissipation and Aesthetic Experience*, the physicist Giuseppe Vitiello, in commenting on the film *TransEurope Hotel* by Luigi Cinque, writes: “The brain [which leads me to think of *swarm intelligence*] is described as an open system engaged in continuous exchanges

with its surrounding environment. In both models and films, antinomies such as information/knowledge, feeling/knowing, blend with each other in the aesthetic experience, the favourable connection between ‘me and the object’ that characterises our existential dimension.”

Dissipation, therefore, should be seen as part of the evolution of our ecosystem, of our contemporary habitat. It gauges the possibilities for losing and exchanging, through a rekindling of collective emotional intelligence and technical and intellectual micro-revolutions. It is a risk that we must continue to face, as otherwise architecture will die, depriving man of an indispensable tool for managing the complexity of the physical habitat through creativity, in order to transfigure energy in a way that, at times, can prove so unreal, and yet so effective and indispensable, that it leads to the construction of new values and sublime beauty.

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Acknowledgments

Thanks to:

The Magnificent Rector of the Sapienza University of Rome, Prof. Antonella Polimeni, and to the President of Foundation of the Sapienza University, Professor Eugenio Gaudio;

Dr. Antonio Parenti, Head of the European Commission's Representation in Italy, to Prof. Mario Losasso, President of the Italian Society of Architectural Technology, and to Prof. Orazio Carpenzano, Dean of Faculty of Architecture of the Sapienza University of Roma;

All the patrons of the conference: the Ministry of Ecological Transition; the European Commission; the Italian Society of Architectural Technology; the European Association for Architectural Education; Eurosolar; Healthy Urban Environment;

The Sponsors: CEFMECTP, the Joint Body for Construction Training and Safety of the City and Province of Rome; the Construction Pension Fund of the City and Province of Rome;

The Scientific Committee, all the reviewers and the Organizing Committee.

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Part V

Session | Health

The topic of people's health is relevant to the full range of potential ushered in by technological innovation and processes of ecological and digital transition, touching on all its component factors. In international conventions, the definition of health has evolved to "a state of complete physical, mental and social wellbeing", and not simply "an absence of illness or infirmity", so that it is now viewed as "a resource for everyday life". Health is a proactive concept whose promotion is not relegated exclusively to the medical sector's ability to meet the population's needs, but rather represents the measures through which "an individual or group must be able to identify and to realize aspirations, to satisfy needs, and to change or cope with the environment" (WHO). Health, the result of a complex system that is both adaptive and dynamic, evolves through interaction between the potential of individuals and the social and environmental determinants to which they are subject.

The session is organized as a discussion of how the environmental determinants of health, along with their 'tangible manifestations', can be characterized and examined within the framework of architectural technology, at the various working scales, as well as through an osmotic dialogue with other disciplines. The challenge is to draw up visions of planning, decision-making, design, and execution that focus on people, foreseeing the short-, medium-, and long-term impacts on their health.

Chapter 80

Healthy and Empowering Life in Schoolyards. The Case of Dante Alighieri School in Milan



**Valentina Dessì, Maria Fianchini, Franca Zuccoli, Raffaella Colombo,
and Noemi Morrone**

Abstract This paper presents a participatory process aimed at improving outdoor education in a primary school in Milan. The rationale of this work was that the psychophysical benefits for children from outdoor living could be enhanced through outdoor education. Indeed, open-air environments are fit for supporting learning experiences, bringing out different abilities and improving well-being. Moreover, during the COVID-19 pandemic, schoolyards turned out to be a resource for overcoming physical distancing. Nevertheless, the availability of flexible physical environments and proper equipment for the educational goals is a basic condition for overcoming difficulties in the extensive use of outdoor spaces in schools. The purpose of this work was to support the school in designing new outdoor educational environments with a focused vision on the pedagogical context. Thus, the process was developed by a multidisciplinary team with the involvement of the students and the teaching staff. By the initial analytical stage, site and use conditions as well as emerging needs were enlightened. These outcomes were assumed to develop a design solution both suitable for the innovation goals and attentive to environmental aspects. The proposal was selected for funding by the Municipality and implemented. Finally, a three-year post-occupancy evaluation program started in the earliest stages of use. In conclusion, by the first monitoring activities, it emerged that outdoor educational

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E. Arbizzani et al. (eds.), *Technological Imagination in the Green and Digital Transition*,
The Urban Book Series, https://doi.org/10.1007/978-3-031-29515-7_80

experiences increased and diversified from the past, together with students' perception of opportunities and benefits achieved from more frequent and longer work in external environments, and their expectation of involvement in proposing further implementations.

Keywords Outdoor learning · Children well-being · Healthy life · Environmental education · Monitoring process

80.1 Introduction

Life in the open air is essential for the psycho-physical development of children and teenagers, for the benefits and stimuli deriving from contact with nature and the opportunity to overcome sedentary lifestyles that favor obesity and limitation of social relations (Muñoz 2009; Knight 2013). However, most of their day is spent inside the school building, with limited time in the schoolyards, mostly for recess. Outdoor education favors the development of children's multiple skills; in particular, direct experience, practical exercises and interaction with the surrounding environment promote learning and school performance, as well as well-being and social inclusion. At the same time, they reduce the risk of discomfort and disease (Dessì and Fianchini 2021; Faskunger et al. 2018).

Various national and international experiences focused on the problem and promoted initiatives to encourage outdoor activities in the school's outdoor spaces and enhance them (Broda 2011; Gamson 2010). The new configuration of outdoor school spaces should help teachers overcome operational difficulties and imagine new ways of working (Bellomo 2019; Dessì and Piazza 2020; Gilbertson et al. 2006; Boston Schoolyard Initiative 2013).

In the years of the COVID-19 pandemic, the classrooms arrangements returned to fixed and outdated solutions; thus, schoolyards were rediscovered as resources for overcoming physical distancing. Providing flexible environments and equipment suitable for teaching objectives is a fundamental condition for overcoming cultural resistance and operational difficulties in the extensive use of outdoor spaces in schools. However, it is not always enough to set up the places; it is also necessary to promote awareness-raising paths on the potential that different school contexts can offer and involve the school communities in designing the most suitable solutions.

The case study of the new outdoor learning environments in the Dante primary school in Milan is an example of place adaptation and practice innovation. It has been done through the synergy between different disciplines, the development of design visions anchored to the context but open to the future, the renewal of decision-making and operational processes.

The Dante Primary School is part of the Rinnovata Pizzigoni Comprehensive School, where the Pizzigoni Educational Method is followed. This is an early XX century experimental program aimed at reforming learning methods, for whose application a new school was purposely built, with all classrooms opening onto a large



Fig. 80.1 Aerial view of the three schools of the Rinnovata Pizzigoni Comprehensive School (Dessi and Piazza 2020)

well-equipped garden, to offer children various opportunities for direct experiences through observations and practical activities (Pizzigoni 1914).

The Dante School is located on the third floor of a traditional school building, located on the opposite side of the road (Fig. 80.1). Since the method was adopted, the spaces and special equipment available in the Rinnovata Pizzigoni school have been shared with them, causing an increase in use and greater access difficulties. Hence, the need to adapt the external spaces of the Dante school to Pizzigoni's educational approach and thus rebalance the school's resources.

80.2 Process Development: Methodology and Results

The enhancement of the outdoors of the Dante school through new equipment for educational use is the result of a process started without a precise plan, but developed step by step with a multidisciplinary scientific approach and experimental participation practices.

In 2017, as part of the activities of the Ambiente Scuola team of the DASTU dept. of the Politecnico di Milano in collaboration with the Department of Human Sciences for Education “Riccardo Massa” of the University of Milano-Bicocca, a research agreement was stated with the Rinnovata Pizzigoni school. Then, the process started to analyze the site, identify users’ needs and expectations (students and teachers) and define project proposals by university students of the School of Architecture (2017–2018).

In July 2020, a competitive call by the Municipality of Milan for the “support of projects aimed at the innovation of learning environments for the first cycle of education schools in Milano area” gave the chance to resume the project and deepen it, also to meet a pedagogical plan. The project proposal got funding, so the new learning environments were built in the early 2021 and occupied in April 2021, while the monitoring process started a month later.

80.2.1 Phase 1. Analytical Activities

During the collaboration with the Rinnovata Pizzigoni Comprehensive School, some activities were carried out on the external spaces of all its schools.

Some of these didactic experiences were aimed at defining guidelines and design proposals for outdoor learning in the Dante and Puecher schools. However, the close connection between all schools often prompted to include the Rinnovata Pizzigoni school in the analysis as well. The works have been developed through a method based on the enhancement of spaces, starting from a careful process of knowledge from different points of view. According to this approach, strategic lines of intervention have been proposed, that must take this into consideration:

Functional aspect. Flows between the school building and the open space, flows among the three schools, the entrances.

The maps in Fig. 80.2 show the external space of the Rinnovata school compared to the other ones. The balance between close and open spaces in this school encourages the use during break time and outdoor learning activities and the pavilion type offers more chances of moving from indoors to outdoors than in the Dante school, that is located on the third floor and consequently with few connections. Space functions are less in this latter and, apart from the vegetable garden, the outdoor space is more suitable for play than for learning. For this reason, flows are mainly from the Dante school to the Rinnovata one, which shares special spaces (a farm, a science pavilion, a greenhouse).

In Dante, once the outdoor experience related to the observation or contact with natural elements is over, the lack of a gathering space for the class is evident.

Physical aspect. The resources, in terms of vegetation, equipment, and the relationship between permeable/waterproofed surface (analysis of materials).

Combination of different analysis in the three school buildings

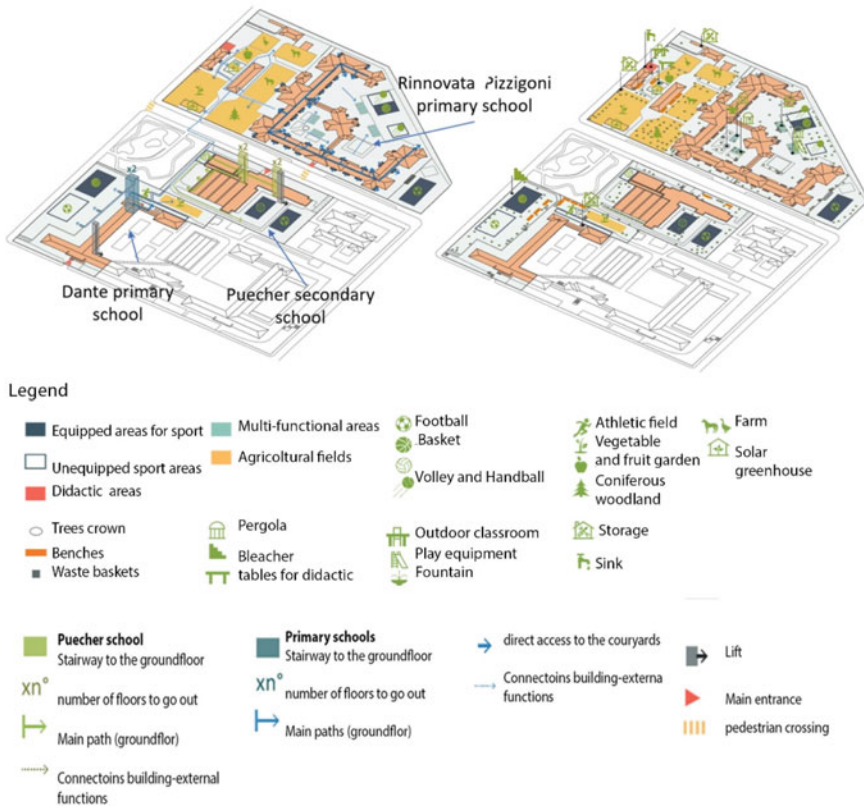


Fig. 80.2 Maps of the School Institute combining different aspects: learning/sport areas with pedestrian flows/accessibility (left) and with equipment (right) (Dessi and Piazza 2020)

In the three schools, there is a high percentage of draining lawn flooring, but also a part of waterproof, in asphalt; the existing concrete or earth sports fields present critical issues both for the type of activity (no suitable paving materials) and in the moments after rainfall or, on the contrary, when it is too dry because of the dust. At the main entrances of the schools, there are concrete tile floors, while the concrete sidewalks run all around the school buildings (Fig. 80.3).

Energy aspect and environmental comfort. Identifying areas with more potential to host/equip specific functions.

It can be done with a series of assessments of the microclimatic conditions that change according to the urban morphology, the orientation, the materials, and the vegetation. The abacus of the vegetation reports, among others, the characteristics of the size and shape, necessary to build the models for the simulation.

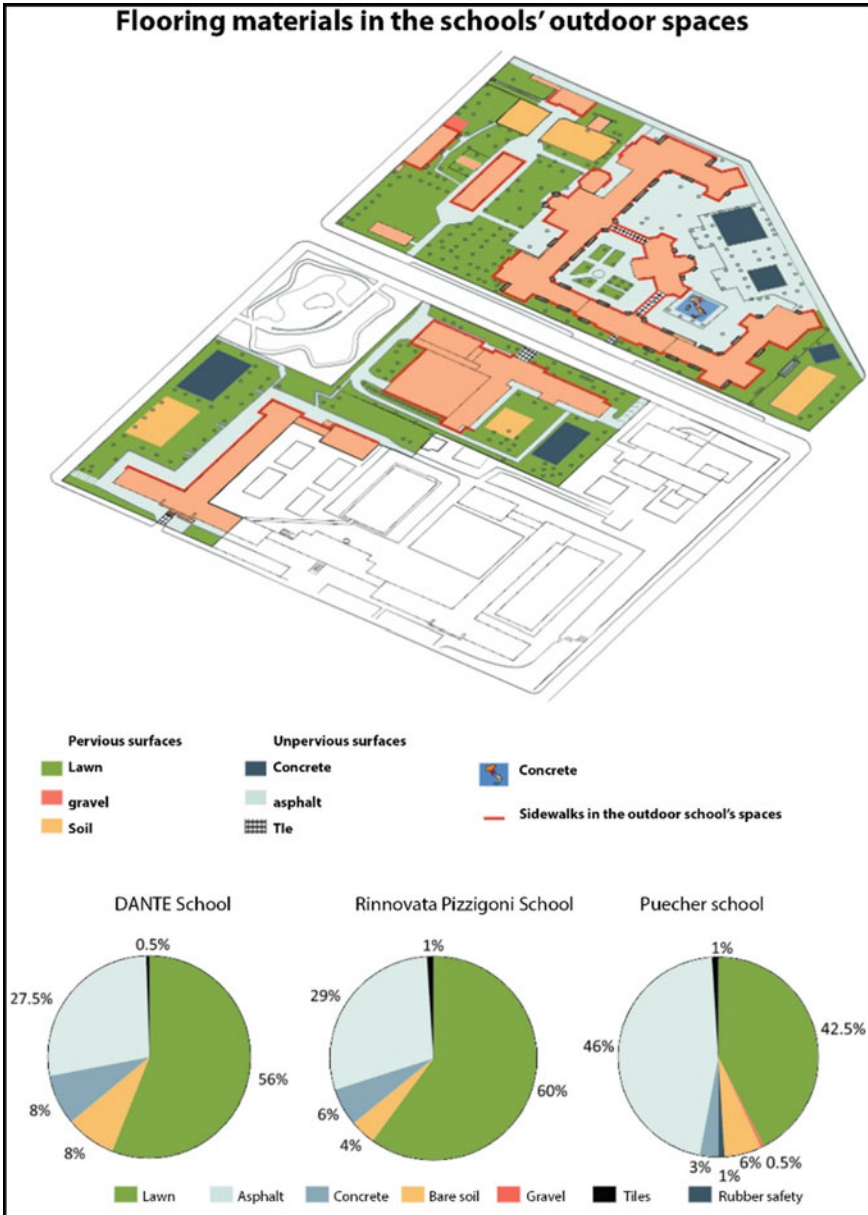


Fig. 80.3 Distribution of pervious and waterproof materials in the three schools. *Source* (Dessì and Piazza 2020)

The first campaign of microclimatic measurements was carried out in spring (March 2017) and made it possible to calibrate the OTC model simulation tool. Through simulations, the thermal comfort conditions were assessed with the UTCI comfort indicator (comfort conditions is in the range 9–26 °C and up to 32 °C with a slight discomfort) in three seasons and three hours/day (Fig. 80.4).

Thermal comfort conditions are strongly conditioned by the component of solar radiation incident on the ground, and by the coating material of the irradiated surfaces. The solar radiation control, the shading, and the materials choice (including vegetation and water) are the main strategies to improve comfort conditions and give a distinctive sign to the project. The maps (Fig. 80.4) show a spring day (1 pm), the summer solstice (2 pm), and the winter solstice (12 noon), i.e., times when the children are at school.

Considering the maps of the UTCI comfort indicator, in the part concerning the area of the Dante Alighieri school, it emerges that in the spring (1 pm), the two most used areas have different behaviors depending on the position with respect to the solar radiation. In spring, at 1 pm, the two sport fields and the area next to the vegetable garden—suitable for placing an outdoor classroom—are mostly sunny and in the

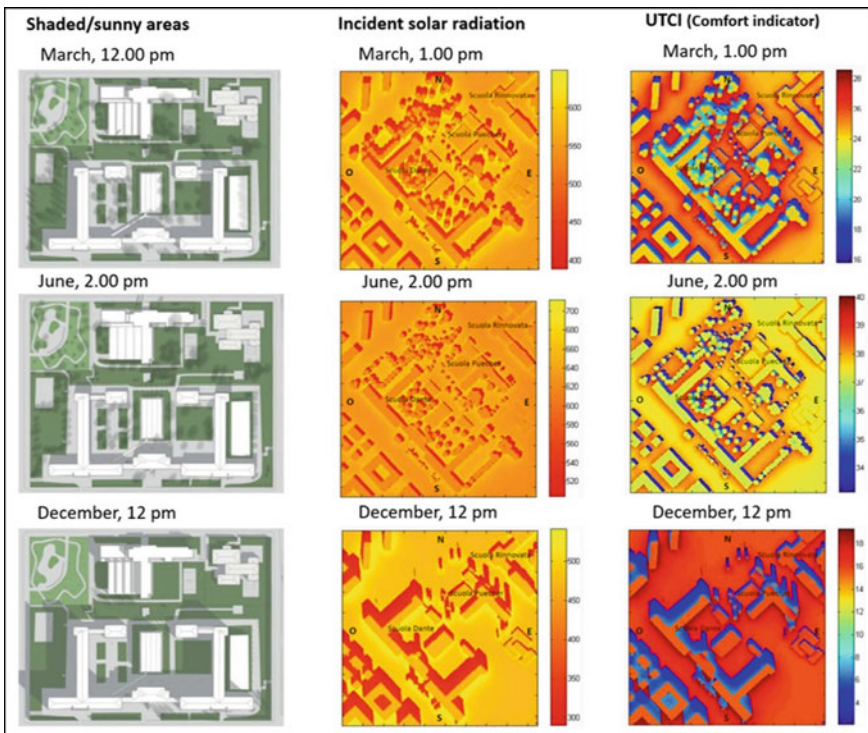


Fig. 80.4 Simulations of the shadows, of the incident radiation, and the comfort conditions in the Dante and Puecher schools (Dessi and Piazza 2020)

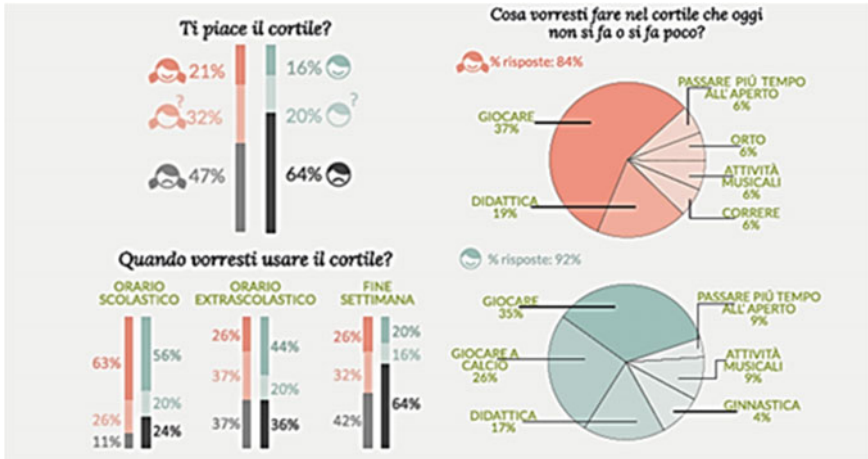


Fig. 80.5 Students’ questionnaire, answers on the appreciation of the schoolyard, the time to spend outdoor, and suggestions on possible uses (play, vegetable garden, music, run, learning activities gym) (Dessi and Piazza 2020)

shade only near the trees and result in comfort conditions. In summer, the lack of shaded areas, high air temperature values, and high solar radiation intensities cause unsatisfactory thermal comfort conditions, with UTCI values above 32 °C. In winter, this area is shaded in the morning by the building and trees; the air temperatures and UTCI values are low and out of comfort conditions even when in the sun.

The users’ point of view. The needs expressed by users (teachers and students of primary and secondary schools) through the questionnaires on the use of the outdoor space and suggestions for improving it (Fig. 80.5).

The proposed questionnaires differed according to the student age. Answers from pupils of the Dante school have brought out interesting aspects regarding the space and functions. In general, those of the first grades express the need to play and run and have areas equipped to do so. The children of the last classes require more vegetation, more spaces for outdoor learning, and more benches. They appreciate the basketball court, but find critical the concrete floor that makes it little usable.

The curbs between different types of pavements are dangerous especially when children run. Children have diverse ideas about the timing of use. Although the majority favor the use of space during school hours, they are less favorable to using it after school hours and on weekends.

80.2.2 Phase 2. Project and Realization

The analysis results were essential for responding quickly, effectively, and successfully to a municipal tender aimed at funding new learning spaces and plans able to

strengthen educational effectiveness and at the same time approach the pandemic limitations.

According to the pedagogical vision of this school, the open-air classroom was intended as a bridge between the primary and the lower secondary schools, to experiment the Pizzigoni's method in an innovative way and to guarantee physical distancing by outdoor activities, while involving the whole school community in its development. Thus, the place was expected to be full of significant and significative elements, to enhance the relationship between learning and experience (Pizzigoni 1921). In fact, outdoor lessons and observation of nature have been hallmarks of this school long before the pandemic emergency made these practices necessary for school life. Specifically, the new space should have had a hybrid and innovative function in which all the pupils could experience new ways of learning through peer education and cooperative learning.

Consistently with the school pedagogical objectives and with the technological-environmental approach, the new project was oriented not only to the search for flexible and adequate solutions for the foreseen use scenarios, but also to the promotion of users' well-being, the implementation and enhancement of the natural resources, the integration of new spaces in the physical and functional system, and the search for solutions with low environmental impact.

The new learning environment was built in a marginal area, on the limit of the courtyard of the Dante school near the connection path to the lower secondary school (Fig. 80.6). It consists of two spaces with different features and functions, available both for parallel activities of different classes, and the joint use of larger and heterogeneous groups, in line with the peer education program. The first space (Fig. 80.7) is about m^2 75, and it is fitted with fixed equipment (a gazebo with a steel frame that supports a packable waterproof roof, wooden flooring and fence) and furnished with tables and stools. The second one (called the "bucolic classroom") (Fig. 80.8) is smaller and more informal; it is bordered by benches made with tree trunks placed under some olive trees, to which are added a dozen seats in wooden blocks. Both are fully integrated into the larger green area of the schoolyard and in connection with the vegetable garden (Fig. 80.9).



Fig. 80.6 Site before the intervention (left) and in the project rendering (right) (elaborated by E. Cusato and A. Esposito)



Fig. 80.7 Use of the open-air classroom with (left) and without (right) tables



Fig. 80.8 Use of the Bucolic classroom during a learning activity (left) and during recess (right)

80.2.3 Phase 3. The Monitoring Process

The Municipality tender required a three-year monitoring program with annual reports.

The proposal assumed a multidisciplinary methodological approach, and a mix of references, both from the post-occupancy evaluation (Way and Bordass 2005) and from the operational and methodological activation of the Student Voice (Cook-Sather 2002, 2009; Flutter et al. 2004). Three objectives were focused: to highlight the educational changes achieved through the of the physical environment modification (Imms et al. 2016); to bring out experiences and encourage comparison between different groups of users, for an expansion of the outdoor learning plan and project; to point out initial critical issues and outline possible interventions.



Fig. 80.9 Partial view of the vegetable garden

In May 2021, the monitoring process was launched through field observations and focus groups with students. It emerged that both spaces had already been used in different ways, especially the main one, whose fittings are very flexible, both for the furniture that can be easily moved by the students (Fig. 80.10) and for the opening roof of the gazebo. The lower secondary students occupy this space in a deeper and more natural way than the primary ones, while standing, moving, sitting on the floor, etc. Conversely, the bucolic classroom is used both for more concentrative activities and during recess. The different but connected use of this pair of spaces typically occurs in peer tutoring activities between secondary and primary classes. The students' most appreciated conditions are: to stay outdoors/in nature; the possibility of looking around, breathing, and seeing schoolmates from other classes; materials other than the internal classrooms and the use of timber.

A second phase was opened in February 2022, when teachers were engaged through two surveys: by electronic questionnaires delivered to all staff and internal interviews to the staff of just the Dante school. Forty teachers from the primary schools and sixteen from the secondary one answered the questionnaires. It resulted that over 70% of them have used the new outdoor learning environments, but only 10% regularly.

As about the activities, the same done inside prevail, followed by those that need larger spaces or in relation with natural elements. It seems significant that better well-being and health conditions than in indoor environments are the main reasons



Fig. 80.10 Pupils put away the stools at the end of their activity

to work outdoors, followed by the greater interest and participation on the part of students, and by the available space and equipment. Conversely, the most highlighted criticality is the disturbance from other classes in the courtyard, followed by feeling cold in autumn.

About half of the teacher sample changed the setting according to the different activities, while a minimal percentage used the coverage opening system to regulate the shading. Finally, almost all the teachers consider these environments as an opportunity to be further enhanced. From the focus with the Dante school teachers more intensive and diversified use of both outdoor environments has emerged, due to the opportunity to experience the school environment differently, in contact with nature, with ample freedom of movement. Again, the most underlined criticalities are the noise from the other classes, the cleaning and furniture keeping, and thermal comfort in the later spring.

80.3 Conclusions

The opportunity of realizing the new outdoor learning environments was offered by the pandemic emergency, which prompted the municipality to invest in innovative fit-out projects to improve school environments and limit risks of contagion. However, a school community already oriented toward an experimental education and open to academic research, together with a base of knowledge previously developed, were the actual conditions to meet this objective in such a short time as the result of careful evaluations from the different points of view.

From the monitoring activities, it emerged that outdoor educational experiences increased and diversified from the past, together with students' perception of opportunities and benefits achieved from more frequent and longer work in external environments, and their expectation of involvement in proposing further implementations.

The process of enhancing the outdoor environments of the Dante school is still in progress, both in terms of the space layout and the operational conditions. Future goals will include favoring a more extended use, to be pursued by both dealing with emerged criticalities and enhancing the evidence of appreciation brought by students and teachers that experienced them with great awareness of the benefits got in terms of greater freedom and psycho-physical well-being.

Acknowledgements We thank Anna Ferri, the principal of the Rinnovata Pizzigoni Institute for promoting the implementation of the outdoor classroom project in the Dante school and supporting this research work.

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