ENVIRONMENTAL DESIGN

4th International Conference on Environmental Design

9-11 May 2024

MDA
MEDITERRANEAN DESIGN ASSOCIATION

ENVIRONMENTAL DESIGN

Conference proceedings of the
4th International Conference on Environmental Design

Environmental Design: IVth International Conference on Environmental Design
Edited by Mario Bisson, Associate Professor at Politecnico di Milano, Department of DESIGN

Proceedings (reviewed papers) of the IVth International Conference on Environmental Design,
Mediterranean Design Association | www.mda.center | info@mda.center
9-11 May 2024, Ginosa, Italy

Graphic design and layout: Federico De Luca and Giulia Alvarez
Cover image: Federico De Luca
ISBN 978-88-5509-634-8

Palermo University Press | Printed in the month of June 2024

President

Federico Picone

Scientific Director

Prof. Mario Bisson

Industry Relations Manager

Dr. Giorgio De Ponti

Organization

Giulia Alvarez
Andrea Cavaliere
Federico De Luca
Alessandro Ianniello
Benedetta Meretti
Stefania Palmieri
Dario Russo

Scientific Committee

Prof. Lina Ahmad - College of Arts and Creative enterprises Zayed University, Abu Dhabi - UAE
Prof. Tiziano Aglieri Rinella - IUAV Venezia, Italy
Prof. Giuseppe Amoruso - Politecnico di Milano,Italy
Prof. Venanzio Arquilla - Politecnico di Milano, Italy
Prof. Antonino Benincasa - Libera Università di Bolzano, Italy
Prof. Alessandro Biamonti - Politecnico di Milano, Italy
Prof. Mario Bisson - Politecnico di Milano, Italy
Prof.sa Cristina Boeri - Politecnico di Mlano, Italy
Prof.sa Monica Bordegoni - Politecico di Milano,Italy
Prof.sa Daniela Calabi - Politecnico di Milano, Italy
Prof.sa Rossana Carullo - Politecnico di Bari, Italy
Prof. Mauro Ceconello - Politecnico di Milano, Italy
Prof. Giovanni Maria Conti - Politecnico di Milano, Italy
Arch. Riccardo Culotta, Italy
Prof. Clice De Toledo Sanjar Mazzilli - Faculdade de Arquitetura e Urbanismo da USP, Brasil
Ing. Giorgio De Ponti - Politecnico di Milano, Italy
Prof. Barbara Del Curto - Politecnico di Milano, Italy
Prof. Dincyrek Ozgur - Eastern Mediterranean University , Cyprus
Prof. Elisabetta Distefano - Università degli Studi di Palermo, Italy
Prof. Luca Donner - American University in the Emirates, United Arab Emirates
Prof. Michele Fiorentino - Politecnico di Bari, Italy
Dr. Luca Fois - Politecnico di Milano, Italy
Prof. Claudio Gambardella - Università della Campania Luigi Vanvitelli, Italy
Prof. Franca Garzotto - Politecnico di Milano, Italy
Prof. Luca Guerrini - Politecnico di Milano, Italy
Prof. Sandra Hipatia Nuñez Torres - Universidad Técnica de Ambato, Ecuador
Dr. Lisa Hockemeyer - Politecnico di Milano, Italy
Prof. Alessandro Ianniello - Delft University, Netherlands
Prof. Lorenzo Imbesi - Università la Sapienza - Roma, Italy
Prof. Matteo Ingaramo - Politecnico di Milano, Italy
Prof. Tomasz Jelenski - Cracow University of Technology Poland
Prof. Andres López Vaca - Universidad Internacional SEK, Ecuador
Prof. Giuseppe Lotti - Università degli Studi di Firenze, Italy
Prof. Carlo Martino - Università la Sapienza Roma, Italy
Prof. Diana Navas - PUC - San Paulo, Brasil
Prof. Valentina Nisi - University of Madeira, Portugal
Prof. Nuno Jardim Nunes - University of Lisbon, Portugal
Prof. Stefania Palmieri - Politecnico di Milano, Italy
Prof. Frida Pashako - Epoka University - Tirana, Albania
Prof. Pier Paolo Peruccio - Politecnico di Torino, Italy
Prof. Silvia Piardi - Politecnico di Milano, Italy
Prof. Savita Raje - Maulana Azad National Institute of technology Bopal, India
Prof. Pinto Reaes - Università LUSIADA lisbona portogallo, Pourtugal
Prof. Francesca Rizzo - Politecnico di Milano, Italy
Prof. Garcia Rubio Ruben - Tulane university- New Orleans, USA
Prof. Dario Russo - Università degli Studi di Palermo, Italy
Prof. Francesca Scalisi - Università degli Studi di Palermo, Italy
Prof. Antonio Scontrino - Bowling Green State University, USA
Prof. Marco Sosa - Zayed University, United Arab Emirates
Prof. Cesare Sposito - Università degli Studi di Palermo, Italy
Prof. Paolo Tamborrini - Università di Parma, Italy
Prof. Toufic Haidamous - American University in the Emirates, United Arab Emirates
Dr. Diego Vainesman - New York, Usa
Prof. Sonsoles Velais - Tulane University- New Orleans, USA
Prof. Min Wang - China Central Academy of Fine Arts, China
Prof. Cui Wei - Beijing Institute of Fashion Technology, China
Prof. Francesco Zurlo - Politecnico di Milano, Italy

Special Thanks to

Città di Ginosa

With the patronage of:

POLITECNICO MILANO 1863

Politecnico di Bari

ArCoD dipartimento Architettura Costruzione Design

Universidades Lusíadas

FAUUSP Faculdade de Arquitetura e Urbanismo Universidade de São Paulo

Universidad Indoamérica

Universidad Técnica de Ambato UTA

Università degli Studi di Palermo

Ordine degli Architetti Pianificatori, Paesaggisti e Conservatori della Provincia di Taranto

ADI ADI ASSOCIAZIONE PER IL DISEGNO INDUSTRIALE DELEGAZIONE PUGLIA E BASILICATA

INTRODUCTION

SUSTAINABLE DEVELOPMENT

SOCIAL INNOVATION

TECHNOLOGY APPLICATIONS

HEALTHCARE AND WELLNESS

POLICY AND GOVERNANCE

ALTERNATIVE FUTURES

MADE IN...

Introduction

by Mario Bisson

> *"Everyone engaged in devising courses of action aimed at transforming current situations into more desirable ones is essentially involved in design. Whether in fields such as engineering, medicine, business, architecture, or painting, the focus is not merely on what is necessary but on what is possible. These disciplines concern themselves with envisioning alternative futures, exploring potentialities rather than accepting things as they are. In essence, they are concerned with design."*
>
> - Herdbert Alexander Simon

Progress necessitates a proactive approach, one that involves researching and understanding our environment with a view toward shaping future outcomes. We often find ourselves immersed in discussions about environmental issues such as pollution, traffic, and consumption, yet active participation is not always as prevalent.

The Environmental Design Conference serves as a platform for shedding light on the outcomes of research efforts across various fronts. It fosters scientific discourse among researchers, making visible both theoretical frameworks and empirical evidence. Moreover, it aims to raise awareness among public institutions and businesses about the necessary steps for a sustainable future, ultimately enhancing personal well-being and community welfare.

Engaging in discussion, analysis, and proposal is imperative in navigating the challenges that lie ahead. By inviting scientific luminaries from diverse backgrounds and distinguished research institutions, the conference facilitates the exchange of ideas, fostering innovation and driving progress. It provides an invaluable opportunity for emerging scholars to showcase their research on an international stage, fostering collaboration and enriching the collective vision of the MDA community, dedicated to enhancing the quality of life.

MDA periodically hosts conferences open to researchers worldwide who share an interest in contributing to the ongoing dialogue on improving quality of life. The 2024 Conference held in Ginosa saw participation from researchers from different disciplines. The outcomes of this event have been documented in a volume accessible on the association's website (mda.center), serving as a testament to the collective efforts toward a better future.

Green design for resilient urban pathways

Davide Bruno[1], *Felice D'Alessandro*[2]
davide.bruno@polimi.it, felice.dalessandro@unimi.it

[1]*Politecnico di Milano, Department of Design, Italy*
[2]*Università degli Studi di Milano, Department of Environmental Science and Policy, Italy*

Keywords
Green design
Nature
Art
Sustainable infrastructure

Abstract

This article explores the strategies outlined in the Master Plan aimed at revitalizing a culturally rich and historically significant area in Milan, aligning with European directives addressing climate and environmental concerns. The focus is on fostering dialogue across disciplines to promote climate-adaptive urban design, serving as a platform for research into innovative strategies and cultural models to facilitate the green transformation of urbanized landscapes.

Introduction

The concept of "green design" was initially introduced in Ernst Friedrich Schumacher's book "Small is Beautiful" (1973), in which the German economist, philosopher, and writer challenged the prevailing modern Western paradigm centred around consumption, large-scale industry, and centralized organization. Schumacher foresaw emerging ecological themes that would gain significance in the ensuing decades. He highlighted the unsustainable depletion of nature's resources due to humanity's unchecked consumption, warning against the illusion of infinite resources. This critique emphasized the flaws of a materialistic economy driven by the relentless pursuit of individual wealth, which disregards the finite nature of the environment.

We could be approaching a time of crisis in urban life, and the Invisible Cities are a dream sprung from the heart of unlivable cities. Today, we insist both on the diffusion of the natural environment, and on how frail our great technological systems are, thus capable of triggering cascade failures which can paralyze entire metropolises. The crisis of too large cities is the other side of the crisis of nature (Calvino, 1973, p. 42).

Inspired by these insights, the study discussed in this article aims to explore and implement innovative project solutions that harmonize the natural environment with urban development. It seeks to address the pressing need to integrate green spaces and ecological considerations into built environments, thereby mitigating the adverse impacts of urbanization on nature and human well-being.

Cities present an ideal arena for testing the resilience of urban systems

in the face of climate change (Kane & Shogren, 2000). While urban systems generate negative externalities that contribute to climate change, they also offer a unique opportunity to innovate and implement mitigation practices to counteract their own environmental impacts (Musco & Patassini, 2012). Thus, the urban environment serves as a distinctive stage for observing and understanding the evolving needs and aspirations of contemporary society. Recent trends in the design of public spaces and infrastructure have prioritized the integration of natural processes within urban settings, fostering a regeneration process centered on the emergence of new social and environmental functions inherent to cities (Perrone & Russo, 2019).

Within this cultural context, and by examining the provisions outlined in the Master Plan (MP) for the Cadorna area in Milan, this article revisits various design strategies aimed at revitalizing the urban fabric. It aims to propose new directives that strike a balance between preservation and the contemporary imperatives of resilience, sustainability, transformation, and the utilization of public spaces (UN General Assembly, 2015, 2017; Rockefeller Foundation, 2015). These efforts align with principles of multifunctionality, connectivity, and transcalarity as advocated by the European Commission (2013).

This article takes a "biophilic" approach to design (Marshall & Williams, 2019), offering a contemporary perspective on the concept of green spaces as multifunctional and strategic elements in fostering resilient processes within densely built environments (Forman, 2014). Emphasizing the ecological efficiency of green areas, it highlights their crucial role in performing ecosystemic functions (Rigillo, 2016) and opening new avenues for research. The need for achieving a dynamic equilibrium among various environmental factors, ecosystemic capabilities, and evolving social needs becomes apparent. Adaptive urban design presents an opportunity to rethink the relationship between human-made structures and nature, while embracing change rather than resisting it and leveraging instability and crises to create new opportunities. Concepts such as adaptability, transformability, and reactivity emerge as essential requisites that, in terms of adaptive capacity, can harmonize the ecological efficiency requirements of human habitats (Angelucci, Di Sivo, & Ladiana, 2013).

The structure of this article consists of five distinct sections. The first section introduces the project's motivations and the origin of its concept, in alignment with European and international reference models. The second section outlines the methodological and operational approach employed. The third section underscores the importance of reconnecting with nature and art within urban environments, emphasizing the significance of continuity within a contemporary design culture. Following this, the fourth section examines the identified obstacles and constraints of the project, along with its dissemination as a noteworthy example of best practices. Drawing from an analysis of selected international case studies, the fifth section centres on the validation of the project concept. Concluding the article are the final sections, which summarize key findings and insights gained, and provide directions for future visions and endeavours.

Adopting an integrated perspective influenced by European and international frameworks

Railway stations are grappling with an identity crisis, often existing as "non-places" amidst sometimes picturesque landscapes (Augé, 1992). To

address this, they must seamlessly integrate beauty, functionality, usability, and sustainable operation. As cities strive to reclaim their identities, these "non-places" within their landscapes offer opportunities to shape communities, experimenting with the creation of new renown and reputation in the region. Evolving stations are becoming more competitive, offering users unprecedented services and diverse opportunities. Thoughtful spatial planning creates welcoming environments where a wide range of offerings permeates every corner, catering to a society with limited time. Aligned with the challenges faced by cities, the station plays a pivotal role in urban reorganization and serves as a symbol of sustainable mobility. Assuming a leadership position in the urban fabric, it functions as an interchange centre with both economic and cultural significance. Efforts are directed towards minimizing the impact of railway lines on urban areas, transforming them into assets. Train tracks transition from barriers to connecting elements within the urban landscape.

Our analysis reveals that the role of railway stations in the cities of the future will be multifaceted: they will serve as hubs of mobility, as well as dynamic spaces for experimentation and events, and as places for physical, intellectual, and cultural rejuvenation. Each revitalized station will enable the city to reshape itself and create new focal points, thus overcoming its own limitations. Cities possess a remarkable resilience, capable of evolving without outward expansion by optimizing existing, neglected, yet high-potential areas. Viewed from this perspective, the railway context emerges as a developmental model that catalyses the urban reconsideration of other parts of the city.

The railwa

y context aspires to become a new centre, a contemporary iteration of the Agora. Railway buildings represent tangible landmarks deeply integrated into the locales they serve, fostering a symbiotic relationship with the city. Their central location serves to orient travellers within the urban landscape, mitigating the disorientation caused by rapid changes in location (Giardiello, 2011). Consequently, railway buildings act as bridges between disparate worlds, offering opportunities to redefine functions, structures, strategies, and establish new focal points within the urban fabric.

The Master Plan (MP) for the Cadorna area is integrated into the broader European plan for cohesion (European Commission, 2011), focusing on collective transportation arteries and infrastructures, including local railway stations, to redefine the utilization of "non-places" at a regional scale. The scope of the MP is comprehensive, spanning from theoretical research and analysis of international case studies to practical implementation on the ground. This involves employing co-design methodologies and engaging local stakeholders in decision-making processes to ensure social inclusion and foster community participation. The overarching goal is to promote citizenship engagement and social inclusion throughout the planning and implementation stages.

The main challenge lies in revitalizing Milano Cadorna railway station in a manner that respects its inherent sensitivity and potential for creativity. The objective is to transform it into an immersive, highly communicative space, enriched with both digital and traditional elements capable of conveying several key messages to visitors:

- A balanced dissemination of media information, aiming to prevent semiotic overload.
- Innovative approaches to celebrate the local landscape and highlight the beauty of the surrounding area.

• Reinforcement of the central role of contemporary art forms within the station environment.

At the core of the project is the concept of offering visitors a dual experience. On one hand, there's a vibrant, dynamic station characterized by the precision and transparency of its industrial operations. On the other hand, there's a more contemplative, monolithic station, evoking the imagery of a docked ship, poised for departure. This dual-speed approach aims to cater to different visitor preferences and create a multifaceted experience within the station space.

The project also introduces a new architectural element, serving as a mediator between the past and the present, by incorporating novel functions, materials, and forms to establish a connection between the central part of the square and the Triennale park. This initiative aims to harmonize two distinct areas of the city, creating a unified space that serves as a gathering point and a refuge. This architectural element takes the form of a grand hydroponic green corridor, supported by a lightweight tensile structure. It features grass-covered areas and immersive pathways adorned with artworks, installations, and technological exhibits (Figure 1).

Figure 1. The intervention area

To address the logistical challenges posed by the flow of movement between the inner and outer areas, an overhead pathway has been designed. This elevated route, situated in the open air, re-establishes connectivity between different parts of the city.

Figure 2. Perspective and section drawings of the buildings, the new canopy, and the underground rail system

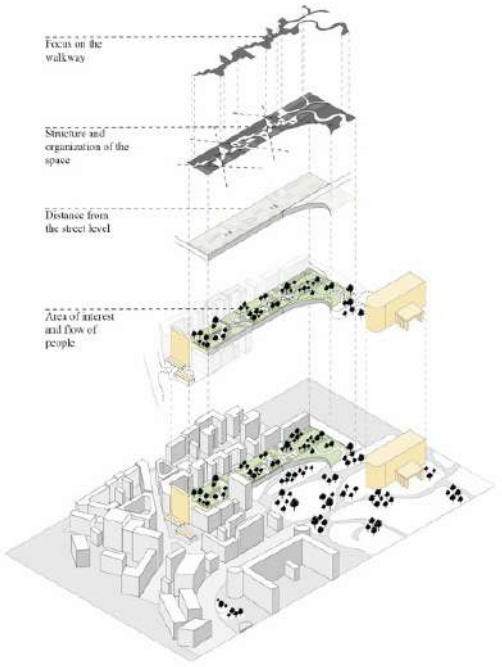
It serves as a prime example of a highly porous and open system, seamlessly linking to the Triennale gardens (Figure 2).

The canopy serves as both a functional and visually striking feature, providing coverage for the railway tracks (Figure 3).

Figure 3. Internal view of the new canopy

Seamlessly blending into the existing urban fabric, it assumes a fluid quality, with its unity and orientation towards the Triennale park constantly evolving (Figure 4). The station takes on the appearance of a docked ship, with six sails adorning the canopy, enhancing the impression of fluidity reminiscent of gentle waves' rocking motion. The architectural design revolves around the movement of the station and its passengers. The spaces between the sails serve as natural connectors among the various services within the building, ingeniously integrated by the architecture itself. This seamless continuity between different areas, along with an architecture that embraces its surroundings, and a cohesive material palette that ties together all elements within the structure, conveys a sense of organic unity.

Figure 4. Main layers of the new natural and built-up environment, in relation to the status quo



The prominent inclusion of green spaces aligns with European guidelines advocating for greener policies. The process of reconnecting two urban areas is facilitated by the construction of a 380-meter-long canopy-bridge spanning across Via Leopardi and the Triennale park, encompassing nearly 32,000 square meters over railway tracks and secondary streets. This infrastructure forms the foundation of a hydroponic green corridor, fostering immersive paths adorned with design and technology installations. Specifically, the concept of a cultural eco-systemic pathway from Cadorna station to Triennale Milano aims to strengthen the connection between the natural environment and the built environment, fostering a new symbiotic relationship. In one of Milan's most evocative, historic, and monumental contexts, this vertical garden, interwoven with green pathways, will serve as an imaginative oxygen factory for the city. Additionally, the collection and reuse of rainwater will enhance water resource management and mitigate extreme precipitation effects, reflecting a circular approach to natural processes aimed at improving both environmental and socio-economic conditions.

In the heart of the city, architecture transforms a station, previously perceived as a "non-place", into a dynamic and evolving structure, effectively eliminating the rift created by outdated urban designs. Instead, it introduces a new, highly permeable system that seamlessly integrates with the Triennale gardens and intermingles with the surrounding buildings as a fluid element (Carta, 2013). The greening intervention serves as the chosen tool to translate the guidelines of the Master Plan into tangible actions, particularly in a historical context where physical transformations of spaces are often challenging (Boeri et al., 2017; Dessì et al., 2017). This pioneering and visionary project aims to reconnect the city with its natural environment by creating high-quality, highly liveable public spaces, aligning with the accessibility goals of the revamped Milano Cadorna Station to cater to the needs of commuters. The project harmoniously combines natural elements with man-made structures, integrating biological cycles with building processes, and blending tradition with innovation. This integration results in a new standard of technological, ecosystemic, and efficient offerings, enriched by artistic and cultural influences (Figure 5).

While the focus of the Master Plan (MP) is specific and localized within the context of Milan, its multidisciplinary approach, thorough examination of state-of-the-art practices, and evidence-based design principles establish a foundation of knowledge that can be applied to various contexts, both nationally and internationally.

Methodology

The unique contribution of this study can be discerned from its dual approach, both methodological and operational. Methodologically, it focuses on achieving balance within the framework of a "non-place", reconciling the demands for conservation with the emerging imperatives of resilience, sustainability, transformation, and the utilization of communal spaces. This is achieved through an integrated examination of the existing context, generating value through a project layer that organizes overlapping layers of urban stratigraphy, such as railway tracks, canopy structures, and green corridors. To address the research question, this study has delved into knowledge, projects, and experimentation influenced by the European context. Notably, reference cases including the pedestrian Promenade Plantée in Paris (also known as Coulée verte René-Dumont), the High Line in New York, and the overhead garden of Sants in Barcelona have been selected. These case studies represent significant projects aimed at reinterpreting the urban fabric, establishing connections between the built environment and the network of

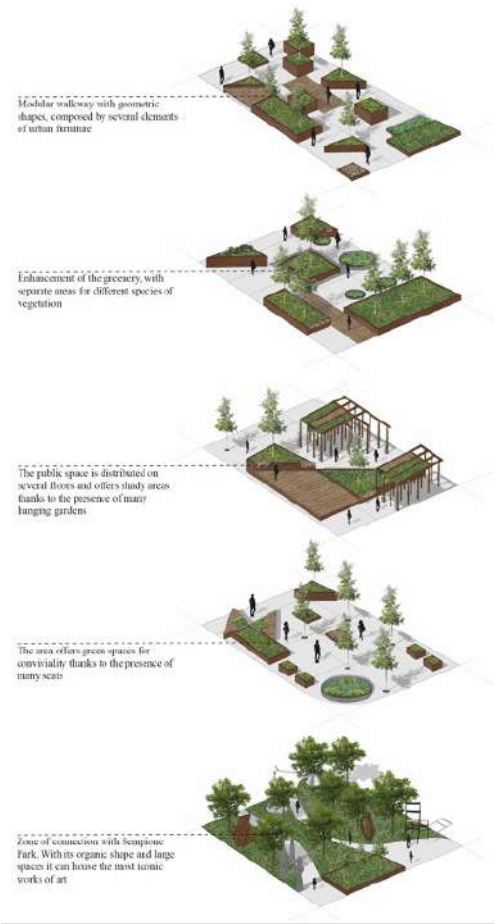


Figure 5. Union between the natural environment and sustainable artificial elements

environmental and social processes within cities. Through analysis, shared methodologies and design objectives have emerged, leading to the exploration of innovative solutions. Initially, an exploratory analysis examines the technical solutions employed by greening systems to promote the repurposing of grey infrastructure, foster psycho-physical and social well-being within local communities and facilitate sustainable integration between buildings and the environment.

The equally innovative aspect lies in the "operative" dimension, where the visionary depiction of the contribution manifests in the intricate design elements that transform the landscape in the eyes of observers. The project introduces a diverse array of industrial, artistic, and technological components, creating a narrative that spans from historical influences on contemporary innovations and future projections. This meticulous and continuous design process encompasses everything from the early conceptualization by master designers to the utilization of cutting-edge materials and techniques. It encompasses the transformation of raw materials into cultural artifacts, culminating in a sustainable green process.

The originality of the contribution lies in the seamless integration of cultural, green, technological, and design elements, forming a multidisciplinary approach aimed at presenting a best practice model. This model serves as a tool for prefiguration and as a reference point adaptable to various urban contexts.

Human-nature-art concept

The relationship between humans and nature has been depicted and explored through various mediums such as literature, philosophy, and art,

reflecting both harmony and contradictions throughout history. One of the key objectives of the Master Plan (MP) is to emphasize the significance of the natural element and its social implications. Can nature, in collaboration with art, bear witness to and actively participate in human history, driving change? And if so, how? The project seeks to provide a space for contemplation on the relationship between humans, nature, and art, fostering awareness of the ethical dimensions and the shared destiny that binds nature and humanity. This stands in opposition to the notion of infinite resources, acknowledging the fragility of the ecological environment. Given this fragility, it becomes imperative and urgent to commit to conservation efforts and promote mindfulness and sensitivity within an ethics of responsibility. The green pathway leading towards the Triennale park serves not only as an outdoor museum but as a relational space where art and life intersect, where nature and human artifacts coexist. By incorporating nature as an aesthetic element, art assumes an active role, imbuing the landscape with highly symbolic works and objects that blend tradition with avant-garde Italian design, thereby anticipating future artistic revelations.

Figure 6. Design and art elements on a hyper-scale

Figure 7. Integrated simulation of the new intervention in relation with the buildings and urban context

Limits of the project

The project faces several challenges primarily stemming from the intricate coordination of diverse competencies across various levels, both during the design and execution phases. This entails the integration of structural engineering and management engineering with aspects of civil architecture, interior design, object population design, and the establishment of an "open-air museum system" aimed at bridging and connecting two urban areas like a hinge. Without a highly qualified direction emphasizing a multidisciplinary approach, the complex interplay of these activities could pose significant constraints to the project's success.

Moreover, political and economic issues, commonly encountered in environmental and territorial contexts similar to this case study, present potential obstacles to project implementation. Additionally, the layering and integration of a new project into the existing reality pose challenges. In the execution phase, it becomes essential to develop a sustainable development model that ensures the operation of the station without compromising the quality and efficiency of the services provided.

Conclusions

This article outlines the results of a project aimed at establishing a new eco-systemic and cultural pathway from Cadorna station to Triennale Milano, with the goal of environmentally and socially revitalizing a strategically significant area of the city, rich in historical and monumental heritage (Figure 7).

The project proposes the introduction of a new design layer as a means to honor the historical significance (artistic and monumental heritage) while integrating contemporary needs such as sustainability, well-being, and inclusion. The intention is to position the project at the forefront of an effective cultural development process. Embracing an upcycling approach, the original functions will be enhanced with new creative uses that better align with the needs of citizens and have a more pronounced impact on the economic and social dynamics of a modern city (Ferlenga, Biraghi & Albrecht, 2012).

The potential applications of the Master Plan and its associated synergies have the capacity to serve as fruitful pilot projects, stimulating the creation of new initiatives and projects aimed at adapting built environments to the challenges posed by climate change. Additionally, they can promote mitigation solutions in contexts inclined towards green regeneration. Adopting green infrastructures equipped with water-saving and reuse systems, alongside the utilization and/or provision of renewable energy supported by digital solutions, becomes imperative within an urban circularity framework (Carli & Scrugli, 2021).

Another positive aspect highlighted in the article is the collaboration between universities and institutions, enabling multidisciplinary contributions and translating research and experimentation into opportunities. This collaboration fosters scientific discourse within a vision that supports the development of solutions for urban resilience in the context of ecological transition.

While this article provides a qualitative exploration of the potential of green infrastructures, it is imperative to complement this with a quantitative analysis to present a more comprehensive understanding of their strengths and weaknesses. Implementing nature-based solutions with a high techno-

logical component could facilitate:

• Investigation of the technical aspects of plants as design materials, including their performances, durability, and maintenance requirements.
• Identification of plant species that best suit the need for shade and evapotranspiration, aligning with the climatic characteristics of the site.

In a broader context, conducting an analysis incorporating quantitative data could contribute to enhanced environmental, economic, and social sustainability by developing structural elements intricately linked to the surrounding territory. It is essential to note that the outcomes of this project do not aim to simplify the cross-disciplinary complexity of the subject, nor do they intend to exhaust the available information or establish a singular process. Instead, future studies focusing on the interplay among these aspects could reveal new disciplinary collaborations or methodological frameworks to better understand the necessity of establishing a symbiotic relationship between the natural environment and built spaces.

Acknowledgments

This article is the results of collaborative efforts between the authors. The conceptualization of this study is credited to D. Bruno, who served as the scientific director of the project and coordinated scientific activities at the Design Department and the Foundation of Politecnico di Milano.

References

1. *Angelucci, F., Di Sivo, M. & Ladiana, D. (2013). Responsiveness, adaptability, transformabil-ity – The new quality requirements of the built environment. Techne | Journal of Tech-nology for Architecture and Environment, vol. 5, pp. 53-59. [Online] Available at: doi.org/10.13128/Techne-12801.*
2. *Augé, M. (1992). Non lieux – Introduction à une anthropologie de la surmodernité, Ed. du Seuil. Librairie du XXIe siècle, Paris.*
3. *Boeri, A., Longo, D., Gianfrate, V. & Lorenzo, V. (2017). Resilient communities – Social infra-structures for sustainable growth of urban areas – A case study. International Journal of Sustainable Development and Planning, vol. 12, pp. 227-237. [Online] Available at: witpress.com/elibrary/sdp-volumes/12/2/1458.*
4. *Calvino, I. (1973). Italo Calvino on Invisible Cities. Columbia – A Magazine of Poetry & Prose, vol. 8, pp. 37-42.*
5. *Carli, P. & Scrugli, P. (2021). UNPARK – La seconda vita di un'infrastruttura in un contesto urbano ad alta densità | UNPARK – The second life of an infrastructure in a high-density urban environment. Agathón | International Journal of Architecture, Art and De-sign, vol. 9, pp. 72-81. [Online] Available at: doi.org/10.19229/2464-9309/972021.*
6. *Carta, M. (2013), "Il paradigma della città fluida", in Carta, M. (ed.), L'Atlante dei Waterfront – Visioni, paradigmi, politiche e progetti integrati per i waterfront Siciliani e Maltesi, DARCH, Palermo. [Online] Available at: iris.unipa.it/retrieve/e3ad8916-9305-da0e-e053-3705fe0a2b96/238%20Fluid%20City%20Paradigm%20%28Waterfront%20Atlas%2c%20 2013%29.pdf [Accessed 12 July 2022].*
7. *Dessì, V., Farnè, E., Ravanello, L. and Salomoni, M. T. (2017), Rigenerare la città con la na-tura – Strumenti per la progettazione degli spazi pubblici tra mitigazione e adattamento ai*

cambiamenti climatici, Maggioli Editore, Santarcangelo di Romagna.
8. *European Commission (2011). Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, COM(2011), 144 final. [Online] Available at: eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:EN:PDF.*
9. *European Commission (2013). Communication from the Commission to the European Par-liament, the Council, the European Economic and Social Committee and the Commit-tee of the Regions – Green Infrastructure (GI) – Enhancing Europe's Natural Capital, document 52013DC0249, 249 final. [Online] Available at: eur-lex.europa.eu/legal-content/EN/TXT/?u-ri=CELEX:52013DC0249.*
10. *Ferlenga, A., Biraghi, M. & Albrecht, B. (2012). L'architettura del mondo – Infrastrutture, mo-bilità, nuovi paesaggi, Compositori, Bologna.*
11. *Forman, R. T. T. (2014). Urban Ecology – Science of Cities, Cambridge University Press, Cambridge. [Online] Available at: doi.org/10.1017/CBO9781139030472.*
12. *Giardiello, P. (2011). Waiting, spazi per l'attesa, Clean Edizioni, Messina.*
13. *Kane, S. & Shogren, J. F. (2000). Linking Adaptation and Mitigation in Climate Change Poli-cy, in Kane, S. M. and Yohe, G. W. (eds), Societal Adaptation to Climate Variability and Change, Springer, Dordrecht, pp. 75-102. [Online] Available at: link.springer.com/chap-ter/10.1007/978-94-017-3010-5_6.*
14. *Marshall, A. J. & Williams, N. S. G. (2019). Communicating Biophilic Design – Start with the Grasslands. Frontiers in Built Environment, vol. 5, issue 1, pp. 1-11. [Online] Available at: doi.org/10.3389/fbuil.2019.00001.*
15. *Musco, F. & Patassini, D. (2012). Mitigazione e adattamento ai cambiamenti climatici – Va-lu-tazioni di efficacia di piani e politiche in Usa, in Europa e in Italia, in Pierobon, A. (ed.), Nuovo manuale di diritto e gestione dell'ambiente, Maggioli, Rimini.*
16. *Perrone, C. and Russo, M. (eds) (2019). Per una città sostenibile – Quattordici voci per un manifesto, Donzelli Editore, Roma.*
17. *Rigillo, M. (2016). Infrastrutture verdi e servizi eco-sistemici in area urbana – Prospettive di ricerca per la progettazione ambientale \| Green Infrastructures and Ecosystem Servi-ces in ur-ban areas – Research perspectives in environmental design", in Techne \| Journal of Technology for Architecture and Environment, vol. 11, pp. 59-65. [Online] Available at: doi.org/10.13128/Techne-18402.*
18. *Rockefeller Foundation (2015). City Resilience Index. [Online] Available at: rockefeller-foun-dation.org/wp-content/uploads/CRI-Revised-Booklet1.pdf*
19. *Schumacher, E. F. (1973). Small is beautiful – A study of economics as if people mattered, Blond & Briggs, London.*
20. *UN – United Nations (2017). New Urban Agenda. [Online] Available at: habitat3.org/wp-content/uploads/NUA-English.pdf*
21. *UN – United Nations (2015). Transforming our world – The 2030 Agenda for Sustainable Development. [Online] Available at: refworld.org/docid/57b6e3e44.html*
22.