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Architecture that Listens: Unlocking Sustainability through Social Awareness

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Keywords: sustainable architecture, social sustainability, assessment framework, SWOT, SROI

Abstract: How can social sustainability be assessed and boosted in architecture? To address this question, this paper discusses two integrated assessment frameworks aimed at the strategic evaluation of social sustainability in design processes, combining different approaches to manage critical steps better, avoid biases, and allow for better evaluation and management of resource allocation. The two frameworks aim to assist the designer and the decision-maker in the analysis, graphical visualization, and evaluation of the social sustainability of architectural projects. Both frameworks combine three methods: Strengths, Weaknesses, Opportunities, Threats analysis, Stakeholder Analysis or the Multi-Values Appraisal Methodology, and the Social Return of the Investment. These integrated frameworks were applied to two projects of expansion and internationalisation of a university campus in Italy: the "Polytechnic House of Culture" and "Torino Esposizioni". The research shows how these frameworks support the design process and reports some possible output design strategies to address social sustainability in architectural projects.

1. Introduction

To effectively address the challenges of sustainability, it is essential to integrate the concept into both architectural and urban design. This integration encompasses economic and environmental dimensions, whose harmonious development alongside social aspects is crucial for creating cities and buildings that are sustainable and beneficial to their inhabitants (Lei and Dong, 2024; Lami et al., 2024a). Addressing it means deciding what matters, turning those elements into design strategies, identifying stakeholders, aligning their interests, setting priorities, and measuring the value of change (Schroeder, 2018). Sustainable architecture depends on structured thinking: design scenarios must be built through a clear and organized process, supported by a solid analytical framework that helps manage complexity and guide decisions when objectives pull in different directions.

Over the past two decades, in the context of urban and architectural sustainable development assessments, the social dimension has gained a more recognised and explored position (Mecca, 2023). Although among the three pillars of sustainability, this dimension remains the least defined (Mehan and Soflaei, 2017; Shirazi and Keivani, 2017; Lotfata and Ataöv, 2019), since the beginning of the 21st century, social issues have gained more relevance (Alaie et al., 2022). Given the increasing prominence of this topic, this paper focuses on assessing social sustainability within urban and architectural contexts. Pursuing social sustainability in architecture means creating spaces that improve spatial qualities for all, promoting a sense of belonging, making spaces flexible, improving engagement in public spaces, and emphasizing identity (Kefayati and Moztarzadeh, 2015). The paper aims to explore physical improvements in new constructions and redevelopment projects, bridging different disciplines through a multidisciplinary perspective. Many studies have analysed the link between social sustainability and the built environment, emphasizing the need to consider both social and spatial aspects to enhance the quality of life (Jenks and Jones, 2010; Barelkowski, 2017; Fatourehchi and Zarghami, 2020; Grum and Kobal Grum, 2020; Yıldız et al., 2020). A city that promotes “beauty” through the complexity and emergence of its public spaces tends to foster social cohesion, accessibility and collective well-being (Cozzolino and Moroni, 2025). A crucial issue remains how to measure and promote social sustainability effectively. Previous research has proposed frameworks based on specific criteria and indicators to help stakeholders, architects, and planners choose the best actions to strengthen social sustainability (Omann and Spangenberg, 2002; Glassom and Wood, 2009; Landorf, 2011; Almahmound and Kumar Doloi, 2014; Rashidfarokhi et al., 2018; Atanda, 2019).

Building on this existing literature and adapting Lami and Mecca’s (2021) assessment framework – based originally on Kefayati and Moztarzadeh (2015), which identifies five key criteria for assessing

social sustainability – we introduce a second integrated framework, comparing it with the previous one. Both frameworks combine multiple approaches to manage critical phases, reduce bias and improve resource allocation in architectural projects. Each framework comprises three steps: a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis as the first step and a Social Return on Investment (SROI) analysis as the final step. They differ only in the intermediate step: the framework initially proposed by Lami and Mecca (2021) uses Stakeholder Analysis, while the one introduced in this paper employs a combined approach of Strategic Choice Approach and Analytical Hierarchy Process, resulting in the Multi-Values Appraisal Methodology (MuVAM), named after the for its application the software designed for its application.

The SWOT analysis identifies internal and external factors influencing decision viability and highlights sustainable design strategies. Then, Stakeholder Analysis helps identify and prioritize actors who influence or are influenced by the project. Alternatively, MuVAM actively engages stakeholders in defining goals, priorities, constraints, and project requirements. The key difference between these methods is technical: MuVAM directly involves stakeholders, whereas Stakeholder Analysis evaluates them indirectly. Finally, the Social Return on Investment analysis integrates social, environmental, and economic factors into the decision-making process, clarifying potential benefits for quality of life, despite potentially high implementation costs.

Through two Italian case studies, the creation of a new cultural centre for the Politecnico di Torino and the city, and the transformation of the "Torino Esposizioni" complex for a new Campus of Architecture and a Civic Library, the paper shows the application of the two frameworks, discussing some academic projects developed by students of MSc in Architecture. The paper is organised as follows. Section 2 sets the research framework to study and interpret the academic projects and provides a description of the integrated assessment proposed; Section 3 illustrates the case studies and the tests of the assessment frameworks; Section 4 highlights the key outcomes of the applications; and lastly, Section 5 summarizes the conclusions.

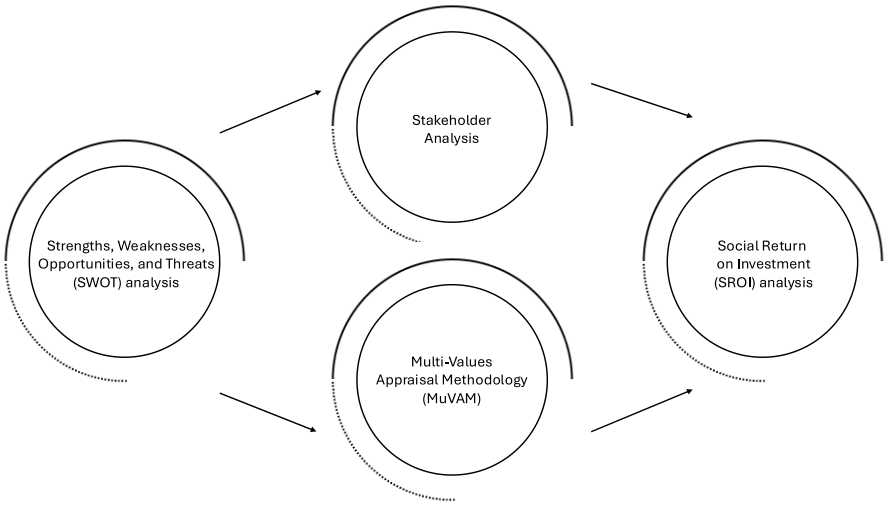
2. Research framework

In this research, we consider the five social sustainability criteria suggested in architecture as key factors of a sustainable project, considered in Lami and Mecca (2021) and based on Kefayati and Moztarzadeh (2015):

- Social interaction, as the presence or absence of space for interacting, constitutes a human need and the key to increasing or decreasing social capital;
- Architectural identity, as the sense of social identity consolidated in the culture and history of a place, has to be pursued in the design of spaces with a deep-rooted identity through architectural features;
- Sense of security, as designing spaces that are protected and safe and that will create a sense of security for the citizens;
- Flexibility, which allows the multifunctional use of spaces according to needs and lends to the architecture adaptability and long-term usability proportional to the changes in time;
- Social participation, namely the process and willingness of individuals to take part in social, cultural, and recreational activities, that arise within the community or place of interest thanks to the inclusion of spaces to increase the possibility of socialization.

These key factors address how architectural projects can create value through enhanced social interaction, architectural identity, sense of security, flexibility, and social participation, emphasizing the connection between value creation and the analytical methods informing design decisions. To operationalize this, two structured assessment frameworks are proposed, each integrating three methods across distinct stages (Figure 1).

Figure 1 | Research framework



Both frameworks begin with a SWOT analysis to examine contextual factors influencing project viability and conclude with a Social Return on Investment analysis to quantify social, environmental, and economic impacts. Their key difference lies in the intermediate step: the one presented in Lami and Mecca (2021) employs Stakeholder Analysis to identify and prioritize actors involved in or affected by the project; the one proposed in this research uses MuVAM, a multi-methodology that directly engages stakeholders in defining design choices according to established goals, priorities, and constraints. In practice, these methodologies integrate qualitative explorations at the outset – clarifying problems and objectives – and quantitative analyses in later phases, ensuring structured, informed decisions throughout the design process.

2.1. SWOT analysis

The SWOT analysis originated from research conducted in the '60s (Humphrey, 2005), aimed to identify issues with corporate planning and develop a new system for managing change. It is a strategic tool (Learned et al., 1969) used to assess an organisation, project or situation, in terms of endogenous factors, namely Strengths and Weaknesses, that constitute the internal element of the system that should be modified, developed or removed, and Opportunities and Threats, exogenous factors, that depict the external variables of the organization that can influence the whole process and should be placed under control. The SWOT is commonly used to rationalize the decision-making processes, since it helps in making decisions and planning strategies, based on the collection of a huge quantity of information. In particular, the SWOT analysis represents a consolidated approach to environmental assessment (Helms and Nixon, 2010), with an increased interest in recent years in analyzing alternative urban and territorial projects and programs, aimed to improve knowledge according to the influence of different factors on the decision context.

In pursuing social sustainability and sustainable architecture, SWOT analysis offers key benefits by identifying internal and external elements to leverage or improve, directly linked to the five core sustainability factors. Recognizing which components—strengths to enhance, weaknesses to address, opportunities to exploit, or threats to mitigate—most influence social sustainability helps prioritize architectural decisions. Thus, a targeted SWOT analysis provides concrete support in developing informed design strategies for areas, infrastructures, or buildings' transformation.

2.2. Stakeholder Analysis and MuVAM to support the development of the design solutions

The second stage of the assessment framework, which supports the development of design solutions, employs Stakeholder Analysis in one case and MuVAM in the other. Both methods help in the legitimization of the design choices in different ways: the Stakeholder Analysis enables a comprehensive understanding of the interests, power and objectives of all the actors involved in the process that affects and are affected by the project and therefore by the choices behind it; the multi-methodology in MuVAM supports in structuring the architectural problem to identify alternative strategies and suitable courses of action, to be compared pairwise and hierarchically ordered to make a choice possible.

Stakeholder Analysis constitutes a valuable tool carried out during the project development. Indeed, scholars consider it as a method or approach that supports decision-making processes and strategy formulation. As reported by Yang (2014) most definitions of Stakeholder Analysis in the literature focus on identifying stakeholders, understanding their interests and analysing their impact: only in this way can stakeholders be properly empowered in urban development decision-making. Cities, by their nature, are complex systems in which economic, social and political interests intersect, making a structured method to identify and manage stakeholders involved in urban transformation projects essential.

The objective of Stakeholder Analysis is to identify the actors involved, assess their level of influence and interest, and define strategies for their involvement and management (Yang, 2014). In the first case study hereafter, the application of the students was meant to focus on and perform the "power/grid" technique revised by (Ackermann and Eden, 2011). With this approach, the grid is made up of four quadrants let to identify the power and the interest of each stakeholder. The main advantage of this approach is its clarity in visualizing stakeholder relationships, facilitating the identification of key actors who should be actively managed or closely monitored during the project (Bryson, 2004). Specifically, stakeholders with high power and high interest represent priority groups requiring direct involvement and regular communication, whereas those with low power and interest might require less immediate attention. Understanding who the stakeholders are, and what they want, is crucial for architectural decisions. Good choices must satisfy not only the powerful but also those whose voices are quieter. Stakeholder Analysis helps reduce conflicts by clarifying different interests and guiding projects toward solutions that benefit everyone involved (Mecca et al., 2020). A private investor will naturally seek rapid, profitable projects, maximizing short-term gains and minimizing costs. In contrast, public stakeholders pursue broader, long-term interests: projects should reflect public value,

respect the environment, enhance community traditions, and often require greater investment of time and resources. Publicly-led projects, therefore, more easily align with sustainability—environmental, economic, and especially social—strengthening relationships between people and their surroundings, creating identity, promoting social interaction, and enhancing safety. For private investors, sustainability is often viewed narrowly: adaptability and flexibility to new uses, reducing future costs and interventions may be the only aspects truly valued in the long run (Abastante et al., 2021). Stakeholder Analysis can enhance project design by helping to legitimize decisions (Reed et al., 2009). It allows gathering diverse information and perspectives, potentially providing a more robust foundation for sustainable architecture and contributing to strategies oriented toward common interests.

The Multi-Values Appraisal Methodology has been recently introduced into the literature (Lami and Todella, 2023), and uses a new software developed by the first author of this paper and DEM Future company, namely MuVAM. It originates from the combination of the Strategic Choice Approach, and the Analytic Hierarchy Process.

The Strategic Choice Approach (Friend and Hickling, 1987, 2005) is a planning approach centred on the management of uncertainty in strategic situations, which aims to facilitate the identification of relationships between apparently unrelated sectors of a problem, to structure it and commit for action. The method is part of the so-called Problem Structuring Methods (PSMs) (Rosenhead, 1996; Rosenhead and Mingers, 2001), flexible approaches to tackle complex problems by representing the situation in a structured way to develop innovative solutions. These methods are conducted in groups, with a consultative and iterative process (White et al., 2015) whose aim is to structure problems rather than directly solve them. The Strategic Choice Approach recognises different stakeholders and viewpoints, significant elements of uncertainty and substantial lack of information. The application of the method is a continuous shift between different and complementary ways of approaching the decision-making activity, which in this case is distributed in a series of different phases: the shaping mode, in which the problem is articulated; the designing mode, in which alternative options are proposed; the comparing mode, in which a relative assessment is proposed among pairs of alternatives; the choosing mode, in which a commitment for action is proposed. Recently, specific reflections and applications of the method in urban and architectural contexts have been developed (Todella, 2023; Fregonese et al., 2020; Lami and Tavella, 2019; Lami and Todella, 2019; Tavella and Lami, 2019; Todella et al., 2018).

In MuVAM, the first two modes of the Strategic Choice Approach are integrated in a multi-methodology with the Analytic Hierarchy Process (Saaty 1980, 2003). This is a multi-criteria methodology which consists of three fundamental principles: the division of a problem into several

sub-problems hierarchically organised; the pairwise comparison among alternatives through defined criteria, and the synthesis of the emerging preferences. From a theoretical point of view, we consider the approach to comparison developed in the Strategic Choice Approach as quite open in evaluating the alternatives, and we argue that a multi-criteria decision analysis such as the Analytic Hierarchy Process can work better than comparing and choosing modes (Lami and Todella, 2023). Moreover, as Friend and Hickling state, the comparing mode in the Strategic Choice Approach can be described as essentially a multi-criteria approach (Friend and Hickling, 2005, p. 45), with comparisons between pairs of selected alternatives.

The MuVAM multi-methodology, supported by dedicated software, is structured in four steps and can be applied either in person or remotely. In the case presented here, the remote application mode was used.

In the first step (Shaping mode of the Strategic Choice Approach), participants individually identify decision areas using the software. They can then review, vote on, and comment on the decision areas proposed by others. Each participant individually maps connections between decision areas, creating their own decision graph. The software then aggregates these individual graphs into a unified version, automatically highlighting the most critical issues based on collective responses.

In the second step (Designing mode of the Strategic Choice Approach), participants propose potential options for each identified decision area. They again review, vote on, and discuss proposals. The software generates grids to identify incompatibilities between options. Individual grids are combined automatically, resulting in a single comprehensive "option tree".

In the third step (Weighting and Pairwise Comparison in the Analytic Hierarchy Process), participants select and vote on the most relevant solutions to evaluate in depth. They also define evaluation criteria and assign weights to each criterion. Solutions are compared pairwise through a structured process that minimizes redundant or inconsistent judgments.

In the final computational analysis step, the software integrates all individual evaluations, producing graphical outputs that clearly illustrate overall solution rankings, as well as specific rankings according to each evaluation criterion. Participants can also review individual results for detailed analysis.

MuVAM, as well as Stakeholder Analysis, aims to build strategies that lead to the realization of a common interest as well as the objectives of individuals. In this sense, it enriches the development of the design process and anticipates some evaluations to be further carried out in the subsequent analysis.

2.3. Social Return on Investment for sustainable architecture

The assessment frameworks end with the Social Return on Investment analysis. In a context where measuring social and environmental benefits is becoming increasingly important at both public and private levels (Lami et al., 2023; Lami et al., 2024b), the method serves as a valuable tool for understanding and reporting on social, environmental, and economic impacts (Millar and Hall, 2013), thereby facilitating the mapping of change. The Social Return on Investment analysis quantifies a project's outcomes in monetary terms. It is part of the broader cost-benefit analysis family but places particular emphasis on stakeholder participation throughout the evaluation process (Millar and Hall, 2013). By translating social and environmental outcomes into economic values, it offers a structured, six-step approach (SROI Network, 2012). It can be used either to forecast potential social value (provisional SROI) or to assess actual outcomes after project completion (evaluative SROI).
Once a project strategy is defined – as a result of the SWOT, and the Stakeholder Analysis or MuVAM, the Social Return on Investment analysis allows to explore and understand the social impact in monetary terms, through a combination of quantitative and qualitative approaches. Accordingly, this method is considered a tool to develop social sustainability (Vluggen et al., 2020), since it helps to understand sustainability performance and make it operative (Rotheroe and Richards, 2007). Through the use of different performance indicators, it allows to measure and evaluate different aspects, among which potential key aspects of social sustainability. They are not only enumerated but localised and developed according to the architectural characteristics of the building under design and consequently produce a series of results or effects on the society that uses them. We emphasise that monetising these types of variables is not straightforward and requires the use of financial proxies – such as the Total Economic Value paradigm, normally used for public goods (Pearce and Turner, 1990).

3. Case Studies

The two case studies investigated in this paper are part of a broader Masterplan launched in 2017, aimed at supporting the strategic expansion and internationalisation of Politecnico di Torino. Specifically, the cases are the "Polytechnic House of Culture", located near the main campus, and "Torino Esposizioni", close to the Valentino Castle, home to the architecture and planning departments. Politecnico di Torino has taken on an increasingly central role in Turin's cultural transformation—from a historic identity as the "City of the Automobile" to its current vocation as a

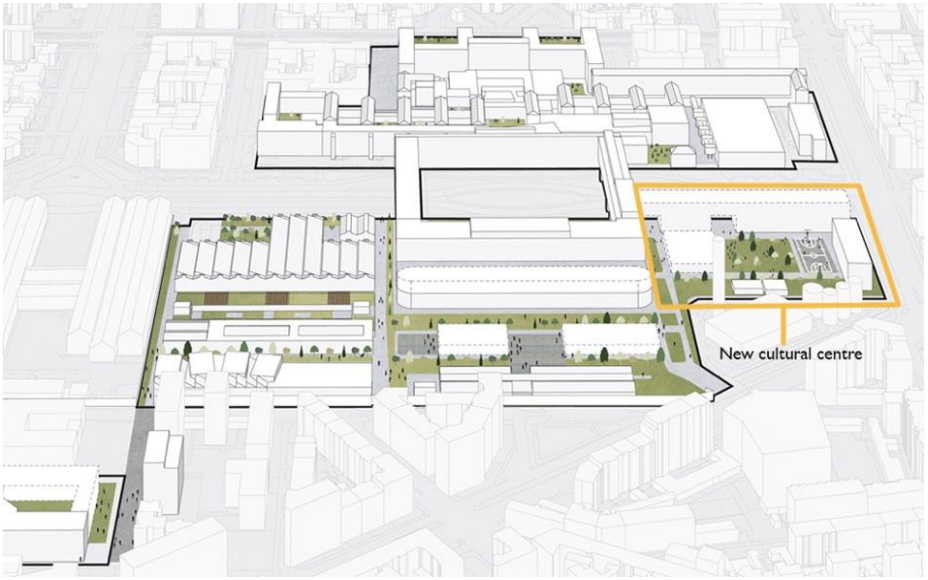
leading university city (Barioglio et al., 2018). Within this context, the Masterplan seeks to strategically reorganise and revitalise university spaces, combining diverse skills and cultural perspectives to guide the transformation of its campuses. These two projects present complex decision-making challenges because they have the potential to significantly improve urban, environmental, cultural, economic, and social conditions. For these reasons, they were selected as case studies in an MSc Architecture workshop focused on urban economics, coordinated by the authors. During two semesters, students developed 24 projects in small groups, applying the assessment frameworks presented in this paper.

3.1. The Polytechnic House of Culture

The first case under investigation is the project of a new cultural centre (Figure 2) presented as part of the general transformation programme, with the aim of creating a new service, a new cultural pole for the Institution as well as for the entire city.

This case has been addressed through the assessment framework involving the use of the SWOT, Stakeholder Analysis and the Social Return on Investment analysis to identify a valuable design solution.

Figure 2 | The new cultural centre



Source: Authors' Elaboration from Politecnico di Torino, http://www.masterplan.polito.it/.

A total of 59 students, organized into groups, explored the case study to propose design solutions integrating technical and environmental aspects—such as energy systems, transport, and waste management—with social considerations, including the well-being of students, professors, and citizens who use the facility. The economic viability of the proposed transformations was also assessed. Another important dimension is the project's cultural relevance. Culture plays a crucial role as a catalyst for sustainable development and should thus be explicitly integrated into sustainability concepts and decision-making processes. Tangible and intangible cultural assets are not merely sources of economic and social value; they represent essential cultural value in themselves (Throsby, 2017).

Accordingly, the case study of the "Polytechnic House of Culture", as a new cultural pole for the Politecnico di Torino and the city, allows the development of reflections related to the social issue, considering themes related to heritage, values, lifestyles and socialization, in order to give rise to a sustainable architecture.

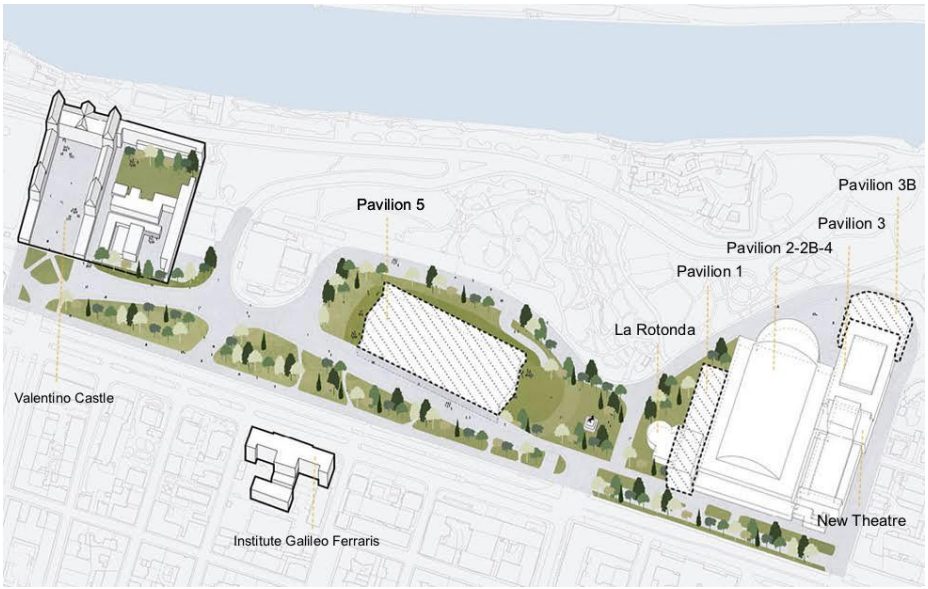
3.2. Torino Esposizioni

The second case study under investigation is the project for a new School of Architecture within the Torino Esposizioni complex, owned by the Turin municipality (Figure 3). The latter is considered a monument of the Modern movement, located in the Valentino Park and in a barycentric position among the different university poles of the city of Turin.

This case has been addressed through the assessment framework involving the use of MuVAM and related to the redevelopment and restoration of an existing public and cultural space. The building, constructed in 1938 and damaged during the war, was later entrusted by the city to the "Torino Esposizioni" entity—at that time majority-owned by Fiat—which renovated it to showcase Turin's automotive industry. In 1948, Torino Esposizioni inaugurated the XXXI Automobile Exhibition and, during the next decades, became the venue not only for it but also for other fair events. In 1989 the fair activity was relocated and moved to Lingotto and since 2011 the complex, used only for temporary uses and events until 2016, is in a state of abandonment. Starting from a tender in 2015, proposing a "City of Architecture and Design" and a Civic Library, a process of negotiation between Politecnico di Torino, the City of Turin and the Superintendence was active for the transformation of the complex. Today, the complex is under transformation, with the complete re-functionalisation of the former exhibition complex, with an urban repolarisation role in the development of a cultural axis in the park.

Similarly to the previous case, in a real-world context of negotiation and debate, 34 students working in groups applied the proposed assessment framework, SWOT, MuVAM, and the Social Return on Investment analysis, to identify effective design solutions. Again, the cultural value of the project was central.

Figure 3 | The new School of Architecture



Source: Authors' Elaboration from Politecnico di Torino, http://www.masterplan.polito.it/.

The goal was to enrich the Architecture Campus by creating a Civic Library and spaces accessible not only to the academic community but also to citizens, tourists, and young people. The emphasis was on quality of life and social well-being, making the area attractive for diverse groups to gather. Architectural identity and flexibility were essential, given the transformation of an existing building recognized as a monument. Finally, the project's location—currently perceived as unsafe due to abandoned or underused buildings—highlighted the importance of strategies designed to improve security.

4. Discussion

To support the theoretical discussion, we selected specific issues that emerged during the application of the assessment framework, linking them directly to practical design strategies. Using concrete examples from both case studies, we illustrate how the framework can generate effective architectural solutions addressing social sustainability. The two cases – the Polytechnic House of Culture and Torino Esposizioni– are presented together to highlight similarities and differences.

4.1. Social interaction

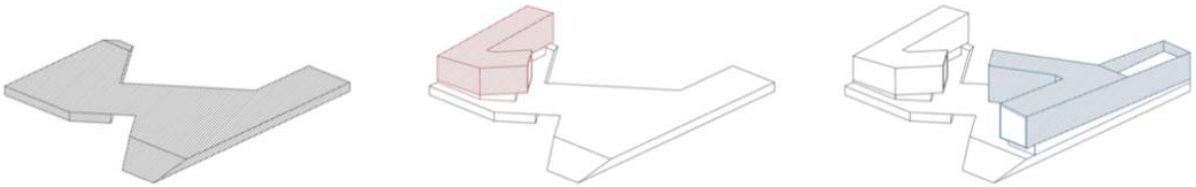
This key factor, related to spaces which favour aggregation and social interaction, is translated into output strategies related to public and social space, new functions and sharing. In the Polytechnic House of Culture (Table 1), the creation of such spaces is reached through two different types of strategies. Some projects propose different blocks for private (Politecnico) or public-private (City-Politecnico) functions and, consequently, the creation of distributed spaces for a functional mix (ground floor shared spaces, library, expansion, auditorium). Some others propose instead different shared/public uses around a distribution space, and, in this case, the variety of functions is reached through different uses at distinct floors for a functional mix. From a spatial point of view, the first strategy implies a modular model, the second one a monolithic one. In Torino Esposizioni (Table 2), the pre-existing and large building entails a sole strategy of different and distributed blocks for private (Politecnico) or public-private (City-Politecnico) functions, inserted inside the enclosure of the former building. In this sense, what is important for managing social interaction in the project is more a matter of distribution and links among pavilions. In the two cases, different strategies for sustainable architecture can be therefore synthetically reconducted to the possibility of a new construction – that can be modular or monolithic – or to the need for an adaptive reuse – that implies maintaining the pre-existing enclosure.

Table 1 | Social interaction in the Polytechnic House of Culture

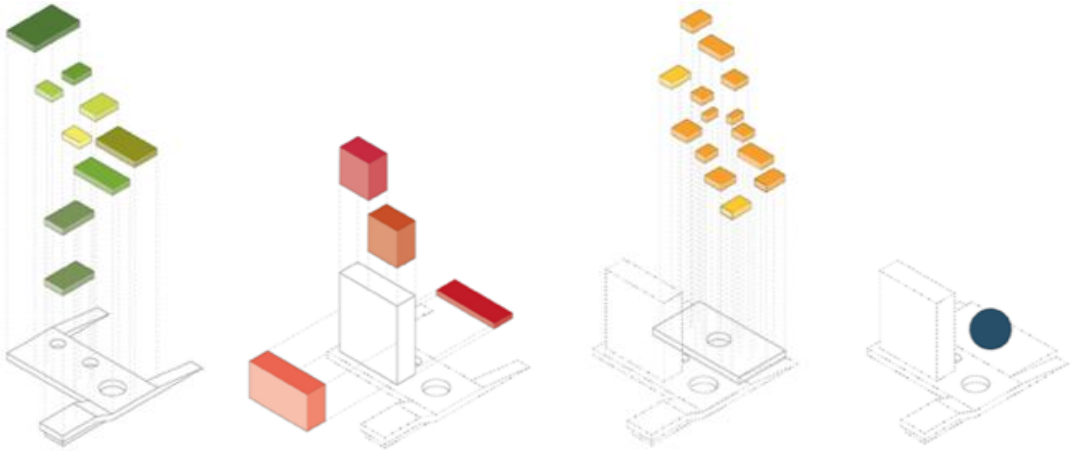
Examples of Issues in the Design Process		
SWOT	Stakeholder Analysis	SROI
S: unobstructed street frontage and immediate connection to main roads S: new functions to unify the complex S: new public and social space W: absence of sharing areas W: exclusive use by students W: permeability constrained by faculty timetables W: lack of spaces for the city O: creation of spaces for residents O: opening the area to the city O: development of the campus and the neighborhood	Residents ▪ benefit from certain public functions ▪ obtain housing and social benefits Politecnico / Students / Residents / City ▪ cultural center (library and leisure areas) ▪ public and private functions ▪ outdoor spaces	City / Residents / Students ▪ new high quality public spaces ▪ redevelopment of public spaces City / Residents ▪ increased open/green spaces ▪ more involvement of citizens (book-café) ▪ new networks of friends (relaxation area)

Examples of Output Design Strategies

Different blocks for private (Politecnico) or public-private (City-Politecnico) functions



Distributed spaces for a functional mix (ground floor shared spaces, library, expansion, auditorium)



Different uses at different floors for a functional mix



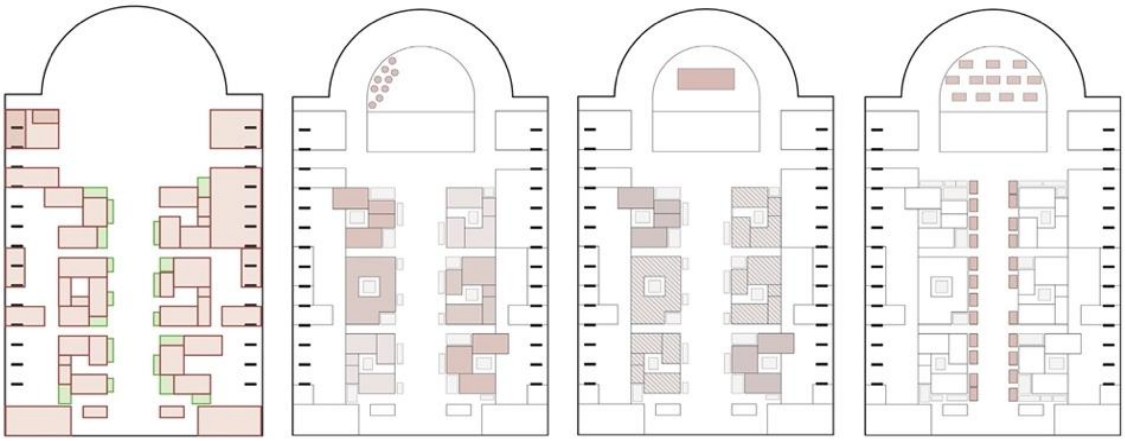
Different shared/public uses around a distribution space



Table 2 | Social interaction in Torino Esposizioni

<table>
<tr><th colspan="3">Examples of Issues in the Design Process</th></tr>
<tr><td>SWOT</td><td>MuVAM</td><td>SROI</td></tr>
<tr><td>S: proximity to a park and a river
S: area with many services
S: accessibility on all sides
W: limited connection between pavilions
O: centralization of the school of architecture
O: tourist attraction
O: economic and social regeneration of the neighborhood</td><td>SCA
▪ division / connections of internal spaces
▪ connections between different functions
▪ distribution between halls
▪ public / private functions

AHP
▪ public and private functions
▪ central axis and mixed functions</td><td>City / Residents
▪ redevelopment of public spaces
▪ expansion of cultural spaces</td></tr>
<tr><th colspan="3">Examples of Output Design Strategies</th></tr>
<tr><td colspan="3">Distribution and links among pavilions

Different and distributed blocks for private (Politecnico) or public-private (City-Politecnico) functions
</td></tr>
</table>

4.2.Social participation

This key factor is related to the spatial and distributive strategies to host specific functions aimed at involving the community – e.g., cultural, music or sports events, or co-working spaces for external

actors. In the Polytechnic House of Culture (Table 3), the strategies to let these functions enter the project are two, afresh related to the alternative modular or monolithic strategies: in the first case, the spatial choice is a distribution space (public-private) ground floor that connects the different blocks; in the second case, there is a distribution space (public-private) in a central void that allows to connect/separate the different functions. Moreover, there is the possibility of open and green shared spaces, that are part itself of the project in its indoor-outdoor relation. In Torino Esposizioni (Table 4), the choices are all related to the same space inside the enclosure, in which specific functions assigned (both for the university and for public uses) coexist. In this sense, there are mixed possibilities of distribution space (public-private) ground floor or in a central void in each of the pavilions. Here again, the different strategies for sustainable architecture depend on the character of new construction or reuse.

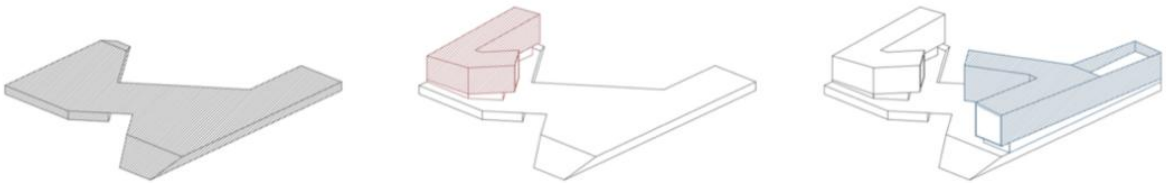
Table 3 | Social participation in the Polytechnic House of Culture

<table>
<tr><th colspan="3">Examples of Issues in the Design Process</th></tr>
<tr><td>SWOT</td><td>Stakeholder Analysis</td><td>SROI</td></tr>
<tr><td>S: new spaces for student projects
S: creation of public spaces to integrate the university and the city (e.g., auditorium)
S: possibility of green areas
S: connecting voids and thus creating usable open areas

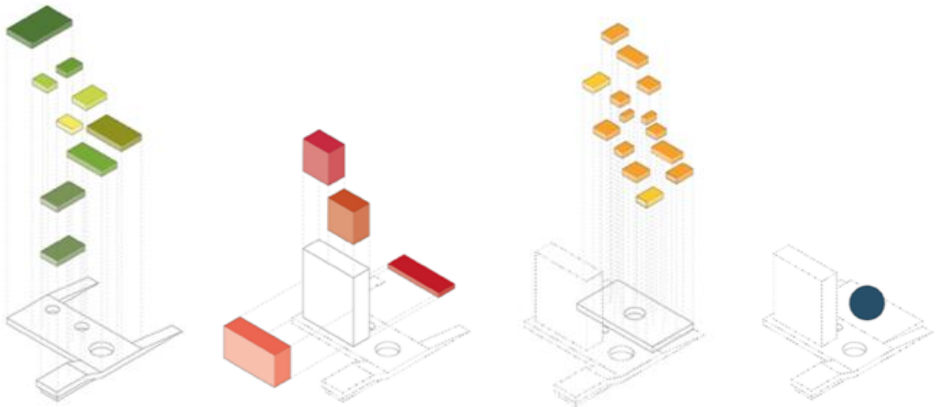
W: monofunctional area
W: lack of multifunctional spaces
W: exclusive use by students
W: discontinuity with the city
W: lack of available open spaces
W: lack of green spaces

O: presence of many public services in the immediate vicinity
O: multipurpose space/functions for the city</td><td>Resident / City / Students / Politecnico
▪ different spaces for different users
▪ multifunctional space (box / enclosure and distribution by floors)
▪ collective functions on the ground floor or in the common plate

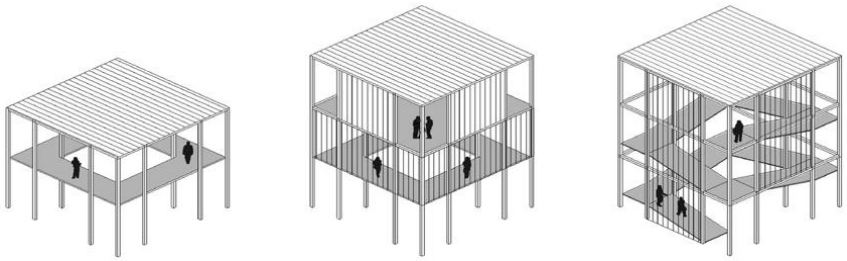
Students / Politecnico
▪ use of specific spaces (fixed functions)</td><td>Resident / City / Students / Politecnico
▪ inclusion of new facilities for students and residents (exhibition halls, gyms, library)
▪ more conferences and speeches (auditorium)
▪ co-working (more involvement of citizens)
▪ space for professional activities (co-working spaces

Students / Politecnico
▪ increased individual study spaces (fixed functions)
▪ new spaces that can be used 24 hours a day (study rooms)</td></tr>
<tr><th colspan="3">Examples of Output Design Strategies</th></tr>
<tr><td colspan="3">Distribution space (public-private) ground floor
</td></tr>
</table>

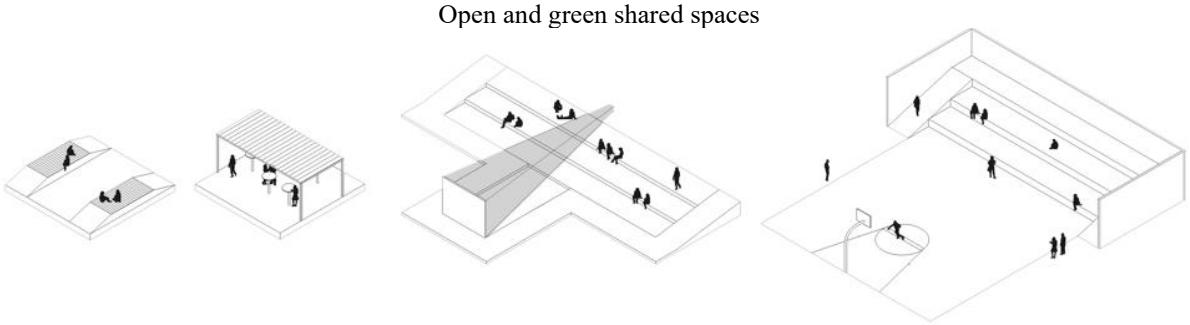
Distributed spaces for a functional mix (ground floor shared spaces, library, expansion, auditorium)



Distribution space (public-private) in a central void



Open and green shared spaces



Specific functions assigned (both for the university and for public use)

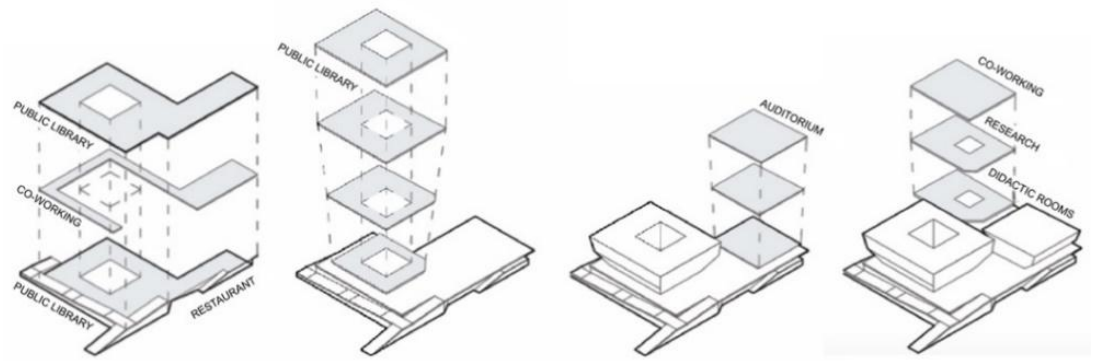


Table 4 | Social participation in Torino Esposizioni

<table>
<tr><th colspan="3">Examples of Issues in the Design Process</th></tr>
<tr><td>SWOT</td><td>MuVAM</td><td>SROI</td></tr>
<tr><td>S: strategic distribution of different functions
O: rental spaces for activities outside the University
O: presence of sports and cultural associations
O: multifunctionality of the structure
O: involvement of different stakeholders</td><td>SCA
▪ type of users involved
▪ type of functions
▪ public and private spaces
▪ different possible uses

AHP
▪ functions dedicated to students</td><td>Politecnico / Students
▪ new university innovative facilities
▪ City / Residents
▪ redevelopment of public spaces

Investors
▪ use of some spaces</td></tr>
<tr><th colspan="3">Examples of Output Design Strategies</th></tr>
<tr><td colspan="3">Distribution space (public-private) ground floor or in a central void

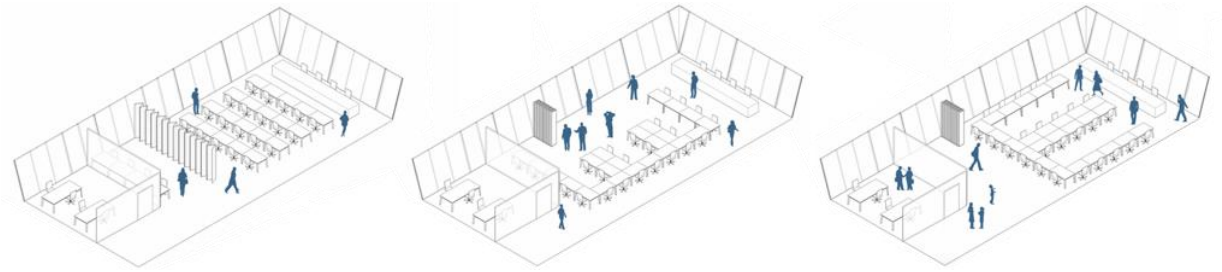
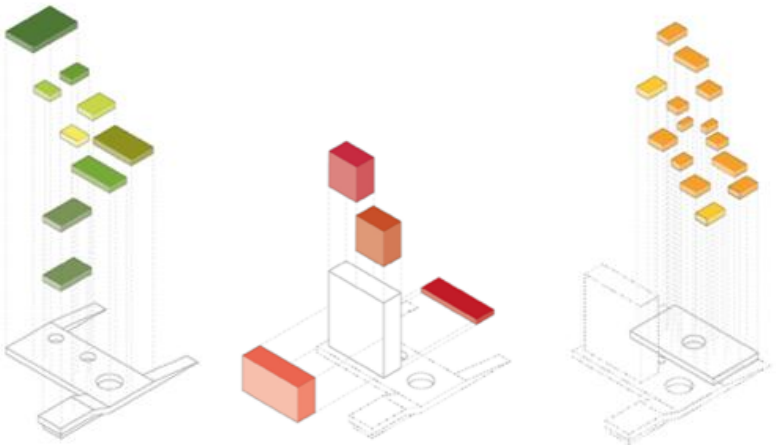
Specific functions assigned (both for the university and for public use)
</td></tr>
</table>

4.3. Flexibility

This key factor is related to the possibility to accommodate new uses, responding to possible future changes and needs. In these cases, the main need is to accommodate spaces for innovative teaching methods, together with the possibility to respond to the expansion of the campus in the future. Both in the Polytechnic House of Culture (Table 5) and in Torino Esposizioni (Table 6) a matter of flexibility is articulated with both strategies that relates the uses, with multifunctional spaces, and

strategies that relates the space itself, with a box in the box approach. Moreover, projects in both cases articulate the transformation with an expansion in different phases (that in the case of Torino Esposizioni also relates to temporary uses). Therefore, in terms of flexibility approaches the two cases are very similar in pursuing this key aspect of sustainable architecture.

Table 5 | Flexibility in the Polytechnic House of Culture

<table>
<tr><th colspan="3">Examples of Issues in the Design Process</th></tr>
<tr><td>SWOT</td><td>Stakeholder Analysis</td><td>SROI</td></tr>
<tr><td>O: expansion of the university campus
O: inclusion of flexible functions
O: new forms of innovative teaching</td><td>Students / Politecnico
▪ transformable buildings
▪ multifunctional spaces
▪ use of specific spaces (fixed functions)
▪ realized in phases with different sectors</td><td>Students / Politecnico
▪ participation in innovative teaching
▪ buildings that change according to the teaching method</td></tr>
<tr><th colspan="3">Examples of Output Design Strategies</th></tr>
<tr><td colspan="3">Multifunctional spaces

Box in the box
</td></tr>
</table>

Expansion in different phases

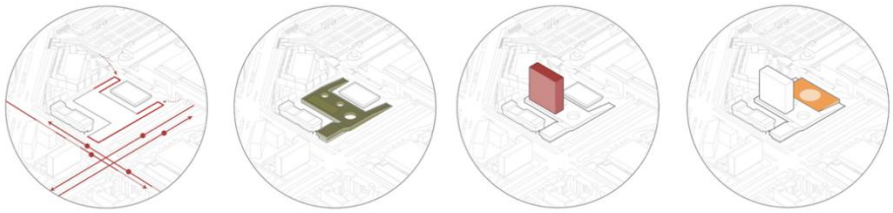
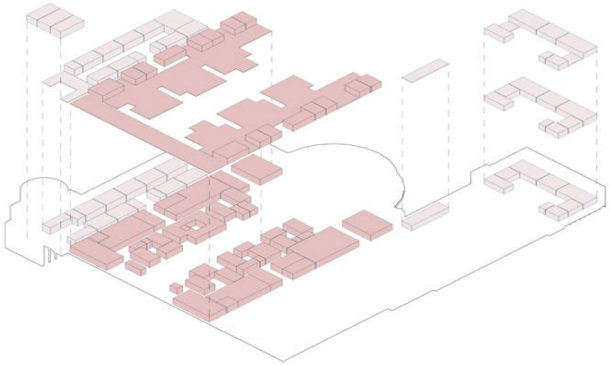


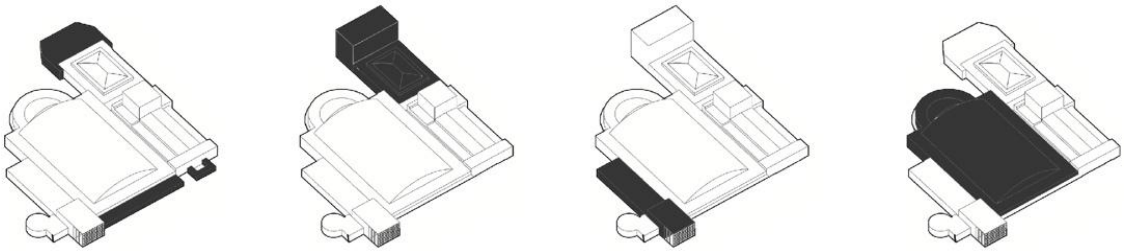
Table 6 | Flexibility in Torino Esposizioni

Examples of Issues in the Design Process		
SWOT	MuVAM	SROI
S: presence of large spaces S: adaptability and flexibility of spaces W: Superintendence constraints O: existing buildings	SCA ▪ intervention phases ▪ strategy to restore or demolish AHP ▪ box-in-box solutions due to large volumes ▪ mixture of fixed and mobile boxes ▪ phased intervention	Politecnico / Students ▪ participation in innovative teaching ▪ buildings that change according to the didactics ▪ temporary events Investors ▪ project in phases to attract financiers in temporary uses
Examples of Output Design Strategies		

Multifunctional space in the same enclosure (e.g., box in the box)



Expansion in different phases (and temporary uses)



4.4. Architectural Identity

This key factor, related to the aim of strengthening the identity of the space, embodies the need for an identification with highly symbolic elements, for both the Politecnico and the city. In the case of the Polytechnic House of Culture (Table 7), an iconic and recognizable object is often proposed with pure and compact forms, to be a symbol in the overall transformation project, usually accommodating public uses. Torino Esposizioni (Table 8) is considered as a cultural heritage for the city, and sustainable choices relates here ways of promoting the reuse of an abandoned or underused asset. In these projects, the pre-existing building is hardly transformed, with strategies of building box in the box in the pre-existing enclosure, or at most underlining the new constructions, as new façades to increase visibility. In this context, the contrasting nature of the two cases leads to very different approaches to the key aspect mentioned above.

Table 7 | Architectural Identity in the Polytechnic House of Culture

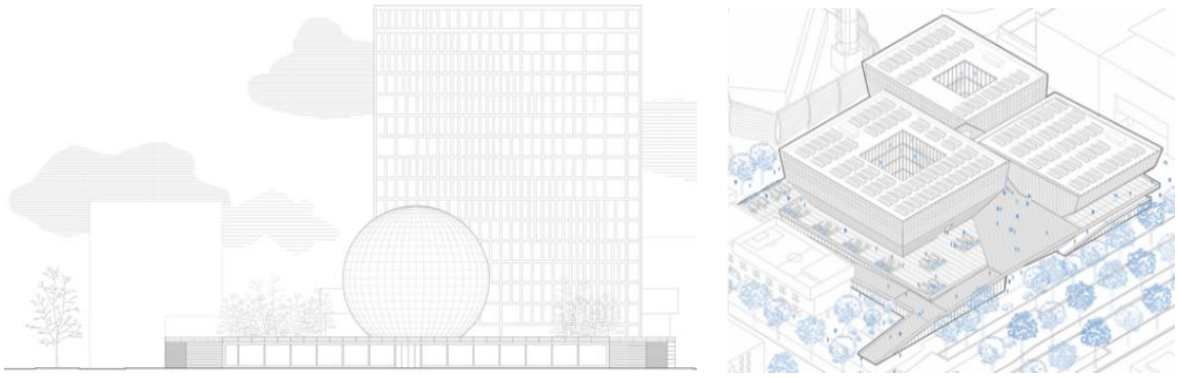
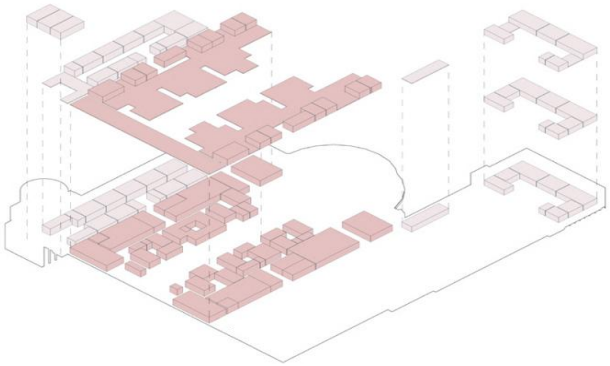
Examples of Issues in the Design Process		
SWOT	Stakeholder Analysis	SROI
S: identification with a key element S: overlooking the street / visibility S: new urban front S: creation of a symbolic building O: completion of the University's overall image in the city context O: enhancement of the campus and the neighborhood	Politecnico / City ▪ symbolic building ▪ pure and compact form ▪ iconic object ▪ public functions	Politecnico / City ▪ iconic space for events ▪ University and City promotion
Examples of Output Design Strategies		
Iconic and recognizable object 		

Table 8 | Flexibility in Torino Esposizioni

<table>
<tr><th colspan="3">Examples of Issues in the Design Process</th></tr>
<tr><td>SWOT</td><td>MuVAM</td><td>SROI</td></tr>
<tr><td>S: historical and cultural relevance

O: recovery of historical memory
O: adaptive reuse of existing spaces
O: increased visibility of a major new university site</td><td>SCA
▪ demolition and reconstruction
▪ design constraints and relation with the pre-existence

AHP
▪ street front
▪ outer skin</td><td>Politecnico / City
▪ new pavilions façade
▪ redevelopment of public spaces

Investors
▪ interested in redevelopment for economic or image reasons</td></tr>
<tr><th colspan="3">Examples of Output Design Strategies</th></tr>
<tr><td colspan="3">Box in the box in the pre-existing enclosure

Underlining the new constructions
  </td></tr>
</table>

4.5. Sense of security

This key factor is related to the level of security of the area or building and implies different levels of intervention to provide safe spaces to the city. Strategies in this sense are marked by issues of accessibility and flows. This focus has somehow to be counterbalanced to the social interaction and social participation factors since it is related to the different uses in the area. In the Polytechnic House of Culture case (Table 9), the opportunity to design a new building enables early planning of functional access control for different user groups, as well as spatial strategies focused on the

boundaries of the intervention area. In Torino Esposizioni (Table 10), the pre-existing structure implies a reasoning on the existing access and to articulate different target, uses and access strategies in a complex system of pavilions. Again, transforming an empty area or a pre-existing building implies very different strategies of pursuing sustainable architecture.

Table 9 | Sense of Security in the Polytechnic House of Culture

<table>
<tr><th colspan="3">Examples of Issues in the Design Process</th></tr>
<tr><td>SWOT</td><td>Stakeholder Analysis</td><td>SROI</td></tr>
<tr><td>S: improving urban quality
S: highly frequented area during the daytime

W: area not used at night
W: scarcity of services

O: use in all time slots
O: 24-hour opening for students

T: access control
T: overcrowding
T: openness to external users
T: difficult management</td><td>Politecnico / City
▪ different levels of accessibility above and below the public plaza
▪ some parts closed to the public, others open 24-hours
▪ student and external user flows
▪ day and night use and permeability</td><td>Politecnico / City
▪ spaces for evening and night-time activities
▪ some parts closed at night</td></tr>
<tr><th colspan="3">Examples of Output Design Strategies</th></tr>
<tr><td colspan="3">Access control for different uses

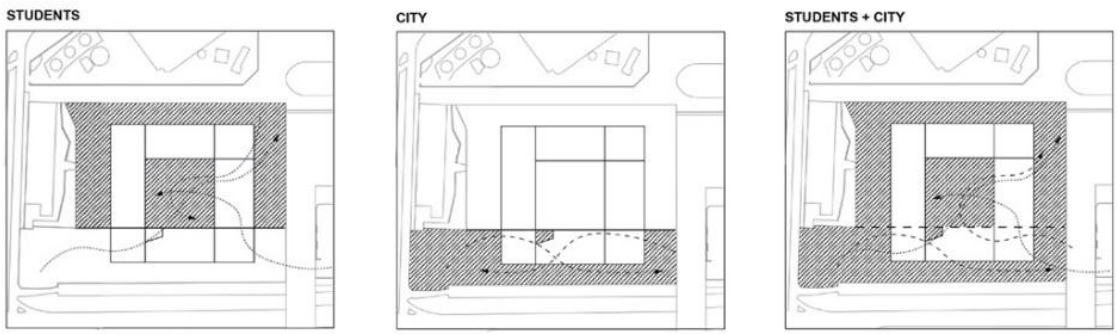
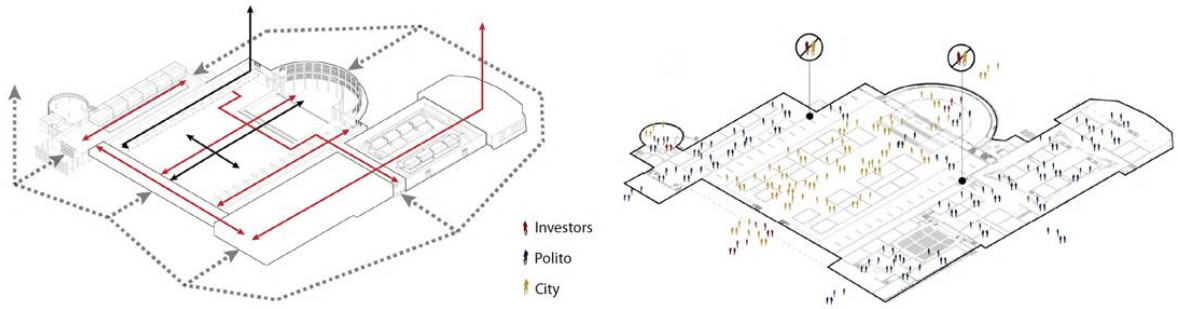
Different strategies at the boundaries
</td></tr>
</table>

Table 10 | Sense of Security in Torino Esposizioni

Examples of Issues in the Design Process		
SWOT	MuVAM	SROI
S: accessibility on all sides T: use of the area at all hours of the day T: access control	SCA ▪ access regulation AHP ▪ 24-hour opening	Politecnico / City ▪ visits to the site, at different times
Examples of Output Design Strategies		
Different target, uses and access strategies  		

5. Conclusions

Understanding and enhancing social sustainability in architecture calls for more than good intentions—it requires systematic methods and reliable tools. This study presents and examines a second integrated framework, positioning it alongside an earlier one introduced in the literature (Lami and Mecca, 2021). Both are designed with the same purpose: to evaluate how architectural design choices reverberate across social, economic, and environmental dimensions.

Each tool serves a specific function in structuring the decision-making process. SWOT analysis offers a clear and systematic understanding of the context. In both case studies, it helped students identify key site characteristics and align design strategies with principles of social sustainability. Stakeholder Analysis provided insight into the roles, goals, and relationships of the actors involved in the process—a critical step, as cities are shaped by a complex network of economic, social, and political forces. In parallel, MuVAM supported the structuring of the architectural problem, guiding students in identifying strategic alternatives, comparing them pairwise, and establishing a hierarchy of priorities. By making stakeholder positions explicit, MuVAM enabled a deeper understanding of

objectives, constraints, and trade-offs. Both tools contributed to building a stronger knowledge base for sustainable design. Finally, the Social Return on Investment analysis allowed students to estimate the broader impact of their proposals—measuring the potential value generated in economic, social, and environmental terms. Through visualisation of project outcomes, students could evaluate whether their design effectively improved quality of life at the community, city, and environmental levels.

These applications addressed social sustainability through culturally significant architectural projects, where cultural value shaped both context and design intent. While social and cultural sustainability are closely linked, future research could further explore how to evaluate cultural dimensions alongside social ones. Despite the limited number of academic case studies, the proposed framework offers a structured, transferable method to support strategic decisions in sustainable architecture.

Acknowledgments

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