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Assessing Social Sustainability for Achieving Sustainable Architecture

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Abstract: Sustainability is an inherent urban and architectural problem. It is simultaneously characterized by many different dimensions, pursuing heterogeneous and often conflicting objectives. To help address these complexities in a structured way, this paper illustrates an integrated assessment framework to tackle social sustainability, in order to support the decision-making process towards sustainable architecture. This integrated decision support framework was applied to a case study concerning a new cultural centre at the Politecnico di Torino in Italy. The aim of this paper is to propose a decision support methodological framework for the analysis, graphical visualization and evaluation of social sustainability of architectural projects. It combines three methods: first, Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis, to get a guided understanding of the project and detect the best design strategies; second, the Stakeholder Analysis (SA), to develop a strategic view of the actors involved; third, the Social Return of the Investment (SROI) as a methodological tool for social impact assessment. This framework, presented through the discussion of some project solutions, helps us to analyse the architectural material effect of social sustainability and answer the question: Are we investing properly and creating spaces sufficiently functional to build better conditions for our community and our city?

Keywords: sustainable architecture; social sustainability; SWOT analysis; stakeholder analysis; graphical SROI

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1. Introduction

Sustainability is an inherent urban and architectural problem: It is simultaneously characterized by many different dimensions (economic, environmental and social), pursuing heterogeneous and often conflicting objectives. In order to properly meet all the needs of urban and architectural projects (complex, heterogeneous and potentially energivorous) is therefore crucial to understand the problem, i.e., what are the elements to take into account in order to transform them into design strategies, who are and how to align the stakeholders involved, and how much value is produced by the transformation [1]. Therefore, the definition of objectives and project alternatives should be the result of a framed effort to design appropriate solutions from a perspective of sustainable architecture.

To help address complexities in a structured way, the use of a framework for the analysis can play an important role in structuring and supporting architectural choices with multiple and often conflicting objectives.

Sustainable development became a central concept in the global strategy within the Brundtland Report in 1987 and was defined by three pillars, i.e., economic, environmental and social [2]. In the 1980s, the environmental dimension was the most relevant aspect, but after the end of the 1990s, the economic pillar also achieved greater weight and, together with the environmental component, dominated the debates on sustainability. Only in the last decades, social sustainability has gained attention as a fundamental component of the sustainable development [3]. In this paper, we mainly refer to the latter, which remained less explored for years, until the 2000s.

Although social sustainability represents the least developed and conceptualized element compared to the triad of sustainable development [3–5], it has been considered an integral part of sustainability since the 21st century [5]. Within the debate on social sustainability, we can distinguish two critical groups [4]: The first argues that the three components of sustainable development are closely interlinked and must necessarily be considered with integrative approaches in order to achieve sustainable goals; the second group, known as revisionist, argues the need for a more comprehensive theoretical and practical framework of sustainable development, proposing, for instance, structures with four or more pillars. However, both recognise the social element as a fundamental and integral component of sustainability [4].

A further element to be considered concerning social sustainability is its generic conceptualization: A clear and unique theoretical definition is lacking [4,6]. Indeed, social sustainability is defined in different ways according to the disciplines in question, and therefore, there is a lack of a solid framework applicable to all scales and contexts. This void, however, can be seen as a positive element, one which favours the development of various theoretical approaches adapted to the context and place of reference [4].

In this paper, we will refer to social sustainability within the urban context, which has acquired its relevance in the debates and assumes a multidisciplinary character aimed at investigating the links between the different disciplines, in order to provide physical improvements on new construction and redevelopment [4]. In the literature, there are several analyses and applications regarding the correlation of social sustainability and the built environment, whose aim is to link social and spatial identity in order to improve the quality of social and human life [5,7–11].

The crucial question we address in this paper is how sustainability can be measured and assessed in urban and architectural contexts.

Since 2015, the sustainable environmental, economic and social development is measured and monitored in all countries through the Sustainable Development Goals (SDGs) outlined in the United Nations Agenda 2030, with the aim of observing progress and leading global sustainable development [12]. In particular, SDG 11 focuses on the urban context ("make cities and human settlements inclusive, safe, resilient and sustainable") and tracks sustainable development within cities with 10 targets and 14 indicators at a global level [13], which are declined differently at the national level [14]. These indicators tend to be statistical and with little reference to the architectural dimension: Particularly as regards the social aspect, these indicators refer mainly to social equity, justice and equal distribution of resources, giving less attention to social interaction, well-being and quality of life, which are more subjective variables and yet key objectives of sustainable development.

Sustainability assessment is a form of evaluation with the aim of informing and improving strategic decision-making [15]. The evaluation of sustainability is based on the proposal and the application of different investigation and measurement methods in order to produce information relevant to the choice, as they provide data necessary to assess the consequences of human actions for sustainable development [15].

In the literature, several studies have focused on the analysis of social sustainability in urban and architectural contexts in order to develop evaluation tools based mainly on criteria and indicators that can support stakeholders, architects and planners in identifying the best actions and strategies to increase social sustainability [3,16–24]. In this context, also the use of multi-criteria methodological frameworks for assessing social sustainability started gaining attention in recent decades; for example [25] proposed the concept of social multi-criteria evaluation as a useful framework for the application of social choices to difficult and complex contemporary problems and [26] reported numerous examples of multi-criteria methods including social aspects. Since the urban environment is a multidimensional system, projects need to consider different points of view in order to create sustainable cities and architectures, and therefore, multi-criteria evaluation is an appropriate framework to address them [27].

The purpose of this paper is to provide an integrated decision support framework for strategic decisions and evaluation about social sustainability in architectural intervention: it could allow us to evaluate and communicate the allocation of resources by integrating different approaches in order to better handle critical steps and avoid biases. In particular, this paper proposes a decision support methodological framework consisting of three methods, i.e., Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis; the Stakeholder Analysis (SA); and the Social Return of the Investment (SROI). Starting from the concept that the better the conditions you create in your community, the greater the effect on quality of life, the framework considers a SWOT analysis as a first step in order to analyse the crucial point of the project and to detect the best design strategies that will lead to conditions for sustainable and valuable development. Moreover, since cities are the stage of several economic, social and political actors that are involved in developments, an SA is useful to investigate who affects or is affected by a project, in order to reinforce the design strategies. Finally, we propose the SROI analysis for measuring the change and provide the history of how the change has been created through the quantification of the project's outcomes. It allows us to understand whether the expected potential development, though it may have high costs, will return great benefits in terms of quality of life, environmental safety and economic activities.

Through an Italian case study, the creation of a new cultural centre for the Politecnico di Torino and for the city, the paper shows the application of the different tools of analysis combined, discussing some academic project developed by students of MSc in Architecture. Culture constitutes the background of the project: as we will explain later, reflections on social sustainability in a cultural context promote scenarios aimed at improving the well-being and quality of life of users.

The paper is organised as follows. Section 2 presents the overall theoretical background; Section 3 provides a description of the methodological background of the integrated assessment framework proposed; Section 4 illustrates the case study and the test of the assessment framework; and lastly, Section 5 summarizes the conclusion.

2. Theoretical Background: Social Sustainability and Sustainable Architecture

Cities represent the crucial nodes of intervention for sustainable development, where the concept of sustainability has proven to be a lens through which conceptualize the different environmental, economic and social challenges in urban and architectural design [1]: Sustainability is translated and transformed into specific practices aimed at its own materialization. In this regard, the urban SDG 11 tracks progress towards achieving and materialising sustainability within cities by a framework of indicators [13].

Sustainability is no longer considered as a single environmental concern but as a broad concept that also includes economic and social dimensions [28,29]. As mentioned above, the social dimension of sustainability with regard to the environmental and economic pillars is the least studied, with more uncertainties in definition and measurement methods [15,30,31]. However, in general terms, social sustainability strategies are aimed at improving the quality of human life and pay therefore attention to well-being and the most relevant human needs, such as cultural and psychological ones, adaptability and growth [20].

The social sustainability of a city is defined as *"development (and/or growth) that is compatible with harmonious evolution of civil society, fostering an environment conducive to the compatible cohabitation of culturally and socially diverse groups while at the same time encouraging social integration, with improvements in the quality of life for all segments of the population"* [32] (p. 15). Social sustainability can also be defined as a combination of social principles in which basic needs, viz housing and health, equality and social justice are realised, combined with new concepts such as a sense of place, happiness and quality of life [15]. Sustainable societies, in turn, are those in which a sustainable community lives, i.e., *"places where people want to live and work, now and in the future. They meet the diverse needs of existing and future residents, are sensitive to their environment, and contribute to a high quality of life. They are safe*

and inclusive, well planned, built and run, and offer equality of opportunity and good services for all" [33] (p. 8).

In the literature, we observe that urban social sustainability refers to social equity [28,34], well-being and quality of life [6,35,36]. Social equity denotes justice and hence the equal distribution of resources: From the urban point of view, it refers to societies where there is no social and environmental exclusion; from the geographical point of view, it is representative of equal access to services in geographical areas [28]. Strong societies are characterised by social cohesion and inclusion, based on social interaction, where well-being and quality of life are considered key objectives of sustainable development [36]. Well-being is a broad concept that refers to the state of being happy and healthy from the physical, mental, spiritual and social points of view [6,36]. Since mental and physical health is considered crucial for people's satisfaction, well-being is considered a key variable for pursuing the development of sustainable societies.

As human actions take place in spaces and areas with opportunities for interaction, the urban and architectural spaces are crucial nodes for the improvement and achievement of social sustainability.

"We shape our buildings and afterwards our buildings shape us"

(W. Churchill in his speech in the House of Lords, 28 October 1943)

In this sense, architects through the design of the built environment play an essential role in improving environmental, economic and social sustainability [37]. The environmental crisis is a design crisis due to the way in which buildings and landscapes are designed and used [38], so in the Anthropocene era, the design and realization of the built environment cannot be thought apart from their impact on the environment and on the people who occupy or will occupy such spaces: Designing is not a simple act of generating a physical place [34].

Sustainable architecture is conceived as an architecture that follows a design driven by human behaviour and needs to ensure a "sustainable" relationship between human beings and built environment, i.e., an architecture in which spaces are compatible with human behaviour and ways of life for as long as possible [20]. As a result, the role of the architect appears crucial: Sustainable cities and spaces do not happen by chance but must be intentionally and correctly shaped according to specific values, so that they can positively affect and influence people who live there. Designing socially sustainable spaces means giving rise to physical spaces that people want and that meet the social and economic conditions of the context in which they are located [31,39].

In order to deeply understand and analyse the topic, we observed in the literature how the theme of social sustainability is contextualized in the built environment and how social sustainability is measured and assessed. The review was conducted using academic databases—Scopus, ResearchGate and Google Scholar—observing the scientific papers of the last twenty years. The keywords "social sustainability assessment" and "architecture" or "urban context" were used to guide and narrow down the review. The list of scientific documents was scanned according to two criteria: relevance to the topic of measurement/evaluation of social sustainability in the built environment and presence of criteria, indicators or key factors for evaluation.

It is worth noting that each selected document reports a set of key factors using different designations. Therefore, for the purpose of a coherent and clear narrative, a summary reasoning was applied to aggregate the different key factors under six key factor categories. Specifically, this means that social equity includes factors as equity, social justice, accessibility and level of institutional stability; social network involves factors such as social participation, social interaction, integration, social cohesion and social inclusion; basic needs aggregates factors as provision of social infrastructures, employment, education and skills, objective and subjective satisfaction of basic needs and human needs; well-being includes factors such as quality of life, physical and psychological comfort and happiness; safety involves factors as social security, sense of security and health and safety; finally,

design aspects aggregates factors such as architectural identity, flexibility, sense of place, identity, townscape design and preservation of local characteristics.

Table 1 reports a limited number of documents selected according to the characteristics required for our analysis, highlighting the key factors used to assess social sustainability in relation to their reference context.

We observe that the selected papers address the issue of evaluation in different contexts and urban scales (urban renewal projects, urban environment, historic urban environments, construction projects, architectural design, land use planning processes, green building), and they all share the use of key factors, sometimes declined in specific indicators and sometimes not, to assess social sustainability in urban and architectural terms. The common objective can be identified in the will to detect characteristics, key design aspects that could and should be included in design and planning aiming at social sustainability. The recurring themes are investigation of the components that influence social sustainability in order to extract the components that influence the built environment; the research of parameters that potentially influence and enhance social sustainability in urban contexts; and finally, the selection of categories and indicators that can support the sustainable assessment of buildings.

Based on this analysis, we decided to consider the key factors proposed by [20] as the central themes of the application of our framework. This choice is due to the similar context of reference: In addition to considering the key factors related to the security and social network (social inclusion and participation), which tend to be shared by the majority of the papers analysed in the table, they propose as design aspects the criteria of architectural identity and flexibility, which are generally significant in an architectural context and particularly relevant to our case study. Therefore, we report below the five social sustainability criteria in architecture suggested by [20], as key factors of a sustainable project:

1. **Social interaction**, namely, the presence or absence of space for social interaction which constitutes a human need that can be the key to increasing or decreasing social capital;
2. **Architectural identity**, because the sense of social identity is consolidated in the culture and history of a place, the design of spaces with a deep-rooted identity is thus a unique architectural feature that influences social sustainability;
3. **Sense of security**, designing spaces that are protected and safe and that will create a sense of security of the space in favour of the development of social sustainability;
4. **Flexibility**, which allows the multifunctional use of spaces according to needs and lends to the architecture an adaptability and a long-term usability proportional to the changes in time;
5. **Social participation**, considered as the process and willingness of individuals to take part in decision-making processes concerning the *milieu* that influences them. This implies involvement in social, cultural and recreational activities with the aim of participating in issues that arise within the community or place of interest. From this perspective, contributing to the community through active social participation means to increase the well-being of individuals, and it can thus be enhanced by the inclusion of spaces for various activities in order to increase the possibility of socialization.

Formulating appropriate design strategies to achieve sustainable architecture requires an integrated approach to design. In order to comprehend how to explore the context, understand the objectives and develop solutions with a positive social impact, this paper suggests a methodological framework for the analysis and evaluation of architectural design in respect of social sustainability.

Table 1. Social Sustainability key factors used in the built environment.

Reference	Context	Social Equity	Social Network	Basic Needs	Well-Being	Safety	Design Aspects
Chan and Lee 2007 [40]	Urban renewal projects	•		•	•		•
Colantonio 2009 [15]	Urban environment	•	•	•	•	•	•
Landorf 2011 [18]	Historic urban environments	•	•	•			
Almahmoud and Kumar Doloi 2014 [19]	Construction projects	•	•		•	•	
Kefayati and Moztarzadeh 2015 [20]	Architectural design		•			•	•
Mehan and Soflaei 2017 [3]	Urban context	•	•	•	•		•
Rashidfarokhi et al. 2018 [21]	Land use planning processes	•	•			•	
Atanda 2019 [22]	Green building	•	•	•		•	

3. Integrated Assessment Framework

This paper proposes an integration of three different methods in order to provide an operational framework able to support strategic design choices for achieving sustainable architecture. These methods of analysis and evaluation are used to inform the design process from the very beginning, with the identification of the problem and the objectives by means of a qualitative investigation, followed in the end by a quantitative analysis. In particular, it combines the SWOT analysis, to rationalize the decision-making process and to improve the knowledge about the context; the SA to identify the actors involved in the process, with their objectives and their interactions; and finally, the SROI evaluation as a methodological tool for the assessment of the social impacts and of the changes. The SROI has been developed in respect of the most significant stakeholders, assessing the social, economic and environmental benefits of the new urban project.

Table 2 highlights the pros and cons of each method proposed, which will be presented in detail in the following paragraphs. It is worth underlining that the whole assessing framework has been developed in a graphical way and has been illustrated on panel to support the project, for the purpose of justifying the decision-making process that led to the choice and the development of a specific project idea.

Table 2. Pros and cons of the adopted methods in the framework.

	SWOT	SA	SROI
Pros	SWOT is easy to communicate, can be constructed quickly and helps identify the most influential factors that affect the project.	The technique helps to identify the powers and interests of the actors involved.	Taking into account the social, economic and environmental benefits, the tool provides more information than just the financial projections.
Cons	The simplicity of the methodology can lead us to consider it as a superficial list, making it vague and simplistic in its structure.	SA analysis requires special efforts for identifying the right stakeholders and their interrelationships.	The long and complex process for defining the monetary value of the intangible aspects could led to inaccurate values.

3.1. Strengths Weaknesses Opportunities Threats (SWOT) Analysis

The SWOT analysis was described by [41] as a tool for planning strategies, in order to collect the huge quantity of information to rationalize the decision-making processes. This framework has been commonly used for business management, and in the recent years, it was also used for analysing alternative scenarios of urban development and for assessing urban and territorial project and programs. Based on the fact that the SWOT analysis intends to provide the influence of different factors on the decision context, it also represents a consolidated approach in the field of environmental assessment [42].

SWOT analysis has the potential to be a significant tool for providing successful strategies, since it involves the collection of all the Strengths, Weaknesses, Opportunities and Threats that affect and impact on the program. Strengths and weaknesses constitute the endogenous factors, namely, the internal element of the system that should be modified,

developed or removed, whereas the opportunities and threats depict the exogenous factors, hence, the external variables of the organization that can influence the whole process and should be placed under control to limit the negative aspects and exploit the positive ones. It is worth underlining that SWOT analysis is highly known for its simplicity, but it is not only a list: simply listing the output reduces the potential of the tool [43].

The key benefits of using the SWOT analysis for pursuing social sustainability and sustainable architecture lies in the fact that collecting information on the internal and external context and identifying the project components can allow the identification of those elements to be exploited or improved in order to contribute to the development of the five key factors, identified in Section 2, for achieving sustainable architecture. Indeed, knowing the components that influence social sustainability can be useful in identifying the architectural aspects on which to invest, whether they are strengths to maximize, weaknesses to overcome, opportunities to exploit, or threats to mitigate. For each key factor, some questions need to be addressed:

- From the perspective of social interaction, we should question whether there are places active and known by the community as places of aggregation and interaction that could be a strength for the new project, or whose absence could represent a weakness and consequently an urgent issue to be discussed.
- From the perspective of social participation, investigating the spatial and distributive characteristics of the area, infrastructure or building can make us aware of the possibility (or impossibility) to allow space for activities that differ from the original ones for which the new project has been conceived, such as social, cultural and recreational activities for society in favour of interaction and social participation. This can be understood, for example, as spaces designed for public meetings on issues that arise within the community, places of interaction for the development of projects and services in the pertinent area or neighbourhood of, and spaces intended to host associations, cultural, sports, musical or religious groups whose existence can promote the involvement of the community contributing to the well-being and the socialization of the individuals involved. The development of such spaces will certainly be a strength for the project towards social architectural sustainability, as they promote participation and involvement of users and citizens.
- In the case of intervention on an existing product, the investigation of spatial and architectural qualities will lead us to highlight the possible flexibility of spaces to accommodate new uses: As society evolves, spaces are also constantly employed afresh for new uses, so having flexible spaces that can easily reshape themselves to new social uses constitutes a strength for the project, because it provides a long-term use proportional to changes over time.
- Acting on an underused or unused area, infrastructure or building can be an opportunity for sustainable social design, since the improvement and re-appropriation of urban spaces within the city, which promote activities aimed at education, creativity and respect and promote the physical, mental and social well-being of the community that uses them, will contribute to the development and strengthening of the identity of the space and thus the sense of architectural identity.
- Finally, investigating the current level of security of the area, infrastructure or building will allow us to catalogue this aspect as an element for or against the new project in order to understand the level of security intervention necessary to provide the city with safe spaces where users can feel protected.

Therefore, analysing the strengths, weaknesses, opportunities and threats of the area, infrastructure or building undergoing transformation in a coherent way related to the key aspects for social sustainability will help us develop conscious design strategies aimed at achieving sustainable architecture. In the application described in this paper, the SWOT analysis has been integrated with SA in order to have a wide vision of the relevant objectives.

3.2. Stakeholder Analysis (SA)

In the strategic management process, introduced by [44], stakeholders are considered as the actors who affect or are affected by a project. Strategic management should not focus on each stakeholder individually but on all different stakeholders that influence each other in multifaceted interactions.

Urban planning is a complex process that faces the challenge of different risks and issues due to the project characteristics, where the interrelationships between stakeholders can lead to conflicts of interests, concerns and to a complex decision-making process [45,46].

In this context, SA as a technique analysing the quantitative and qualitative information constitutes a valuable tool carried out during the project lifecycle, which helps identify, classify and assess the stakeholders involved in the process [47].

According to [44], we need to answer three questions, namely, who the actors involved are, what their objectives are and how they are going to accomplish them. Considering these aspects, by performing a SA, it is possible to manage the process minimizing the potential negative impacts of the stakeholders and maximizing the positive ones [48]. There are numerous approaches to developing a SA [49]; in the application to the case study hereafter, the students were asked to focus on and perform the "power/grid" techniques revised by [50]. With this approach, we can identify the power and the interest of each stakeholder through the use of a grid made up of four quadrants that correspond to four types of stakeholders: the ones with the deepest interest but not powerful are defined "Subjects", the high interest and high-power ones are identified as "Players", then we have the potential actors such as the "Crowd" with low interest and low power, and the "Context setters" who are powerful but disinterested. The first step consists therefore in providing this grid as a good structure for the identification of the power/interest of all stakeholders involved. The second step entails the disaggregation of stakeholders in order to investigate their disposition in greater depth: whether they are inclined to support or to sabotage the project. In this way, reflection can be given on how to shift stakeholder interests and power: for instance, examine strategies to decrease the interest or to neutralize the power of influential actors who are negatively inclined toward the project or consider actions to increase the power of actors who are positively inclined toward the project, for instance through encouraging coalitions with other more influential actors [50]. The third step involves exploration of potential multiple or independent interactions between stakeholders, through a "Stakeholder Influence Network Diagram" (for more detail, see [50]) that is performed as a sociogram and highlights through different ties both formal and informal relationships. The fourth step entails the analysis of the basis of power and of interest for each crucial stakeholder and is performed through the "Stakeholder Management Web" (for more detail, see [50]). For an application about the requalification of a district facing an urban and social decline in a European city, see [51].

Identifying and analysing the stakeholders involved in a decisional problem is relevant for architectural choices, since different points of view allow us to imagine different possible solutions, different ways of intervention in order to satisfy not only the most powerful actors but all those involved in the process.

It is clear that the stakeholders have very different motivations, interests and objectives, and the reasons why they invest in a given project can also be different in relation to time: As real estate markets are cyclical, interactions and relationships between various stakeholders change over time, and objectives change, and stakeholders' expectations can be different according to whether they want to achieve benefits in the short or long term [52].

All real estate developments are related to specific interests and needs, which differ depending on whether they are in a private or public context. With the former, a private investor will be legitimately interested in maximizing profits and minimizing costs, so s/he will be oriented towards profitable project developments, quick in the short period and involving a simple and not too expensive a maintenance in the long period. Instead, concerning the public sector, the objectives should be aimed at pursuing good planning,

investing in projects that are of public interest, with low environmental impact, that respect and promote tradition and values in the community interest.

Therefore, facing a transformation of a public nature, it seems easier to pursue the concept of sustainability, not only environmental and economic but social as well. Indeed, the public sector is certainly inclined to invest in an architecture that guarantees a sustainable relationship between users and the built environment that promotes a sense of architectural identity and in which spaces offer opportunities for interaction and social participation and well-being and communicate a sense of security. These aspects can potentially be lacking in the interests of a private investor, whose primary objective is, generally, economic sustainability and therefore profits. The flexibility of space might be the only factor that could directly interest a private investor in a long-term vision, precisely in terms of costs and revenues: the greater the adaptability and flexibility of a space to new uses, the greater will be the ease of transformation for new activities and the lower will be the interventions and costs to be incurred [53].

Sometimes, urban and architectural projects involve both public and private sectors. Since only in an ideal situation their interests and objectives can coincide, it is necessary to be able to find a mediation and take them all into account. SA is therefore well suited as a useful tool to reduce conflicts between the parties by bringing to light different interests that may lead to the creation of profitable and sustainable solutions [54]. SA aims to help us identify all the objectives and interactions between the different actors in the will of building strategies that lead to the realization of a common interest as well as the objectives of individuals. Hence, the choice in the application presented in this paper, to integrate the SA with the SROI analysis: The latter investigates not only economic and financial aspects but also environmental and social ones, highlighting the income and outcomes of the project for each main stakeholder involved in the process. SA accordingly enriches the development of the project design and planning, since it legitimises the decisions that are made [49]: It allows us to detect information and perspectives from different sources, therefore entailing on us a more robust knowledge on which to build sustainable architecture.

3.3. Social Return of the Investment (SROI)

Following up from the previous paragraph, the third methodology that underpins the integrated assessment framework in this paper is the Social Return of Investment. The SROI evaluation arises within the context of the social entrepreneurial, where it is relevant to investigate not only the economic and financial aspects, but above all, the social and environmental ones [55]. Moreover, in a context where the need to measure social and environmental benefits is growing and is increasingly important at both public and private levels, the SROI represents a valuable tool for understanding, managing and reporting the social, environmental and economic impacts in order to map the change, improve the quality of the works, and get effective interventions from a viewpoint of sustainable architecture.

The SROI measures the change and provides the history of how the change has been created through the quantification of the project outcomes in monetary terms. This tool of assessment is based on the principles of the cost-benefit analysis, but it assigns monetary value to the social and environmental aspects and explicitly seeks to involve stakeholders [55,56]. The method is thus part of the Cost Benefit Analysis family but is more focused on the issue of stakeholders' participation at every stage of the evaluation process. It allows us to calculate a percentage of benefits and costs. For example, a 3:1 ratio indicates that an investment of 1 € generates 3 € of social value.

Two types of SROI can be performed: The evaluative type, as an ex post analysis of the process, based on objectives already reached or the forecast type to assess how much social value will be created if the project meets the intended outcomes. Both are structured in six phases [57].

The SROI analysis is considered a tool to develop social sustainability [58]. Once a project strategy is defined as a result of the SWOT analysis and once the main stakeholders involved in the process have been defined with their aims and objectives, the SROI allows us to define a framework to explore and understand in monetary terms the social impact, through a combination of quantitative and qualitative approaches. This analysis is not a definitive answer to the measurement of sustainable development but helps us understand the management of sustainability performance and make it operative [56]. Indeed, it allows us to observe the cause-and-effect chains that lead to the creation of social value: From the urban and architectural point of view, we identify the cause in the project outputs (i.e., the spaces, the architectural object or the design strategy) and the effect in the outcomes (i.e., the impacts on society).

In this sense, carrying out a SROI analysis means measuring and evaluating precisely the key aspects of social sustainability mentioned above, using different performance indicators. Indeed, following a design process built on the basis of the concepts of social inclusion, architectural identity, sense of security, flexibility and social participation, the use of the SROI analysis means to make operative the measurement in monetary terms of the performance of the same key factors that are the basis of the design idea. This means that the key factors are not only enumerated but localised according to the architectural characteristics of the building under planning. This consequently produces a series of outcomes or effects on the society that uses them in terms of quality of life, well-being, sense of belonging, security and opportunities for interaction and social participation. It is worth noting that monetizing these types of variables is not easy and requires the use of financial proxies, whose quantification often requires the use of techniques such as contingent valuation, the techniques of preferences detected and travel costs or the hedonic pricing method.

In this sense, the SROI analysis enables us to capture the impact of the design in terms of social sustainability, and investigating the effectiveness and usefulness of the project allows us to express a judgment of positive or negative architectural sustainability.

4. Case Study: The Polytechnic House of Culture

The architectural problem under analysis concerns the need for a structured way to help addressing its complexities and to construct an appropriate solution from a perspective of sustainable architecture. The case under investigation is the project of a new cultural centre at the Politecnico di Torino (Figure 1).

The growth in the number of students, which amounted to 33,000 last year, in addition to the academic and administrative body, for a total of 35,000 people, leads us to identify the Politecnico as a city within the city [59]. Politecnico di Torino achieved an increasingly important role for the city of Turin, which shows a new clear cultural vocation: from "City of the Automobile" to "Turin University City" [60]. In this context, a strategic programme of rethinking and re-centralisation of the existing spaces and offices of the Politecnico di Torino was launched [60,61], one in which the Masterplan of the "Polytechnic House of Culture" is 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. Thus, the Politecnico Masterplan was born as a new original and complex path, which integrates cultures and skills in the development of the strategic project with the aim of outlining strategies and transformation policies for university campuses. Therefore, the reason why this area represents a complex decision-making challenge is linked to the fact that the Masterplan is an element of novelty and innovation at national and international level, contributing to a quality improvement of the urban, environmental, cultural, economic and social context.

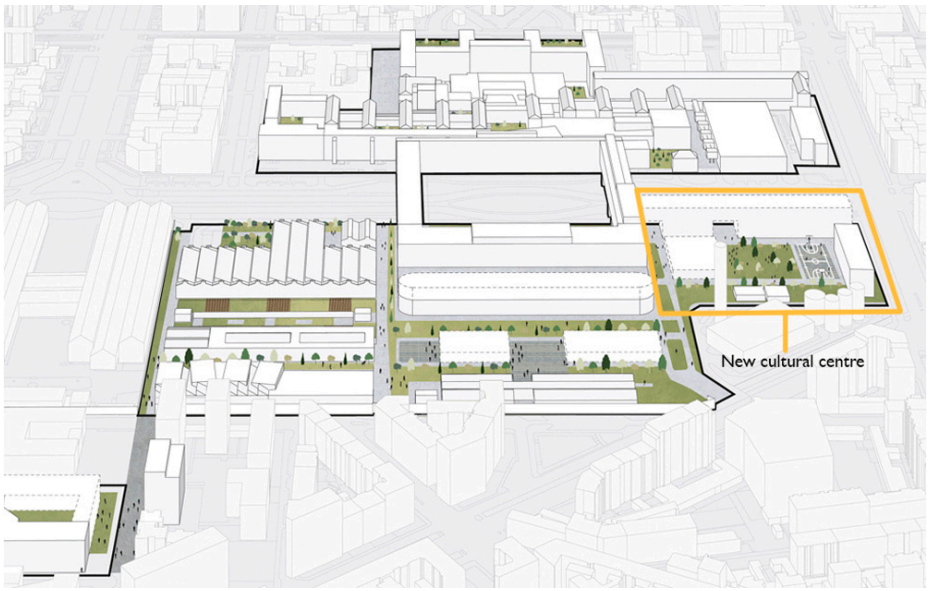

Figure 1. Overall strategy (our elaboration from Politecnico di Torino, http://www.masterplan.polito.it/).

The activity of the working group is not yet complete. It consists of a steering group (composed of members of the Politecnico Government) and a project team (made up of professors and members of the departments of Architecture, Design and Planning). They have to interact with a large variety of actors, from the internal members of the Politecnico to the local stakeholders (i.e., City of Turin, Metropolitan City, Piedmont Region, Superintendence, economic and social institutions and actors, etc.).

The mandate of the Masterplan group also includes an integration of the process with educational and didactic objectives of the Politecnico itself [60]. This is why this case study was chosen in a workshop of design and urban economics at the MSc in Architecture (where the first author was the professor of the economic module and the second author was the collaborator), resulting in the elaboration of 16 projects developed in small groups, and as many applications of the evaluation scheme proposed in this paper. Within the real discussion of the general aspects of the "Polytechnic House of Culture", the 59 students were asked to prefigure design solutions that address different aspects, from functional and symbolic instances to economic and energy performance. Above all, the new cultural centre should address the sustainability issue in its broadest sense, integrating technical aspects related to energy solutions, transport and waste management, with those relating to the well-being of students, professors and citizens towards whom the structure is open. Operatively, students were grouped and were asked to investigate the case study by performing the assessment framework proposed for identifying a valuable design solution.

The cultural relevance of this case study constitutes a significant element to be highlighted. Indeed, tangible and intangible assets not only have an economic and social value but also present and embody a cultural value [62]. Culture can be considered a facilitator of development and it is therefore necessary to integrate it into the concept of sustainability and into decision-making processes related to sustainable development [62]. As mentioned above (Section 1), some scholars argue the need to redefine the pillars of sustainability, extending them from three to four or more pillars: One of the pillars to be included within sustainability is precisely cultural sustainability [4,63]. The latter has often been considered a component of social sustainability, though it is an integral part of the existence of a society and allows for changes from the perspective of sustainable development [63]. As reported by [64], culture embraces a social dimension (social network, family structure, identity, etc.) and an ideological dimension (values, norms, ideals, standards, etc.), and therefore, in this sense, the influence of the social structure and of its key aspects on culture is evident.

According to this, the case study of the "Polytechnic House of Culture", as a new cultural pole for the Politecnico di Torino and the city, lends itself well to reflections to be undertaken at the social level, such as heritage, values, lifestyles and socialization, in order to give rise to a sustainable architecture. As reported by [65], social and cultural sustainability are closely linked when referring to the improvement of well-being and quality of life of users: The latter represent the key concepts of the application of the framework object of this paper. Although in this application the issue of cultural sustainability is not addressed in terms of evaluation and measurement, culture represents the background and the driving force behind the project.

4.1. Application of the SWOT

This section shows how the SWOT analysis has been used as a tool to inform the definition of the objectives and the strategies. Students have been asked to analyse in detail the features of the area, first of the current state and then of the proposed project of the Masterplan Team through the SWOT analysis. Figure 2 shows an example of this application.

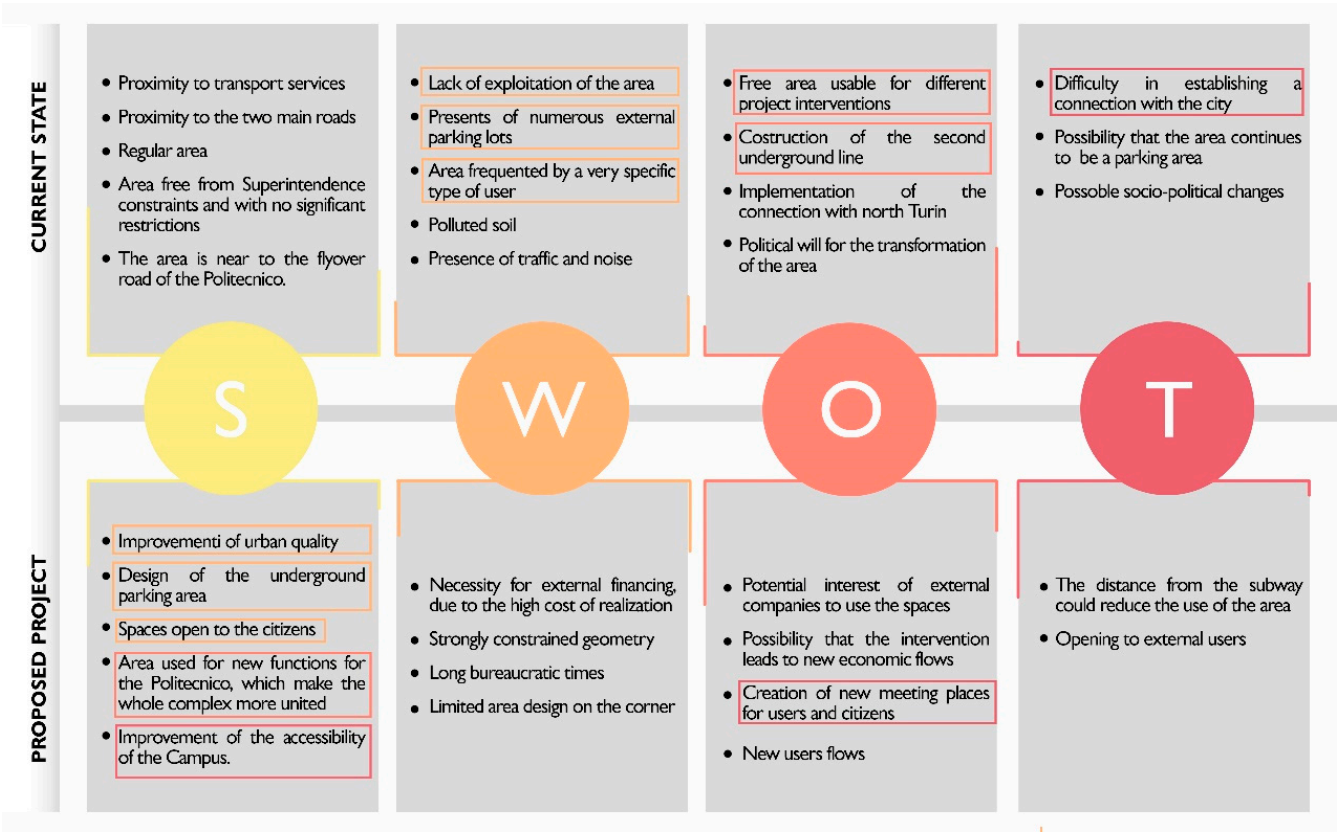

Figure 2. Example of SWOT analysis.

Comparing these two analyses, students underlined the main strengths and weaknesses of the area, and then, they investigated whether these points had been exploited or solved by the project Masterplan, developing new opportunities and enhancing strengths. Indeed, on a closer look referring to Figure 2, students highlighted that some of the weaknesses of the area had been addressed and exploited by the new project: for instance, the large amount of outdoor parking lots that precludes the possibility of carrying out new activities has been solved through the improvement of the new urban quality, with new open spaces and the insertion of a new underground parking area. This choice leaves the possibility of exploiting the space for new useful functions from the perspective of promoting social interaction and social participation as key elements to increase the social capital

and the development of social sustainability. Moreover, the weakness of having an area frequented by a very specific type of user would be surmounted by the inclusion of new spaces open to the citizenship that will widen the potential users. This aspect favours again one of the 5 key factors for the development of social sustainability (Section 2): creating new spaces open to various people encourages social participation and consequently social interaction between users. The SWOT analysis related to the current status (upper part of Figure 2) highlights the characteristic of the site to have a large free space that lends itself to be an excellent opportunity to be used for many design solutions. As we observe from the SWOT analysis related to the proposed project (lower part of Figure 2), this opportunity was indeed grasped and exploited by the Masterplan Team, which in order to make the whole Politecnico campus more united, decided to include many activities and functions compatible with the realization of the new cultural centre, making this feature a strength of the new project. The use of this site allows the re-appropriation of an urban void promoting the improvement of urban, cultural, economic and social quality; moreover, by creating a cultural symbol for the campus and the city, the project contributes to the development and strengthening of the sense of architectural identity, which, as explained above (Section 2), is firmly embedded in culture and in the history of a place.

This brainstorming exercise helped students understand the potential of the SWOT analysis as a significant tool for providing successful strategies. Detecting the positive and negative factors of the area in the current situation and of the real strategy undertaken by the Masterplan Team in relation to the key aspects for social sustainability, they were able to understand which element has to be modified or removed. Furthermore, the analysis allowed them to deeply understand the site and the context in order to exploit opportunities for detecting their own best design strategy solution that combines the highest number and solves the instances for achieving sustainable architecture.

4.2. Application of the SA

According to the SA, the relevant actors involved in the realization of the cultural centre were identified. To facilitate this step, several exponents of the Politecnico Government, the professors and members of the departments of Architecture participating in the process, were invited during the course to discuss with students. The latter likewise interfaced with some experts from outside the academy, such as private investors, companies, citizens and public administrations.

According to [50], each group of students investigated the stakeholders and their interests, in order to provide a structured power/interest grid. Moreover, they explored the significant formal and informal interactions between stakeholders providing a clear and exhaustive Stakeholder Influence Network Diagram, as shown in Figure 3, that lets us visualize the direct, indirect or two-way relations between the actors involved in the decisional problem.

Starting from the power/interest grid, they performed the Stakeholder Management Web (Figure 4), which highlights the power and interest bases and the connections between the main stakeholders, allowing us to deeply understand the manifestations of the stakeholder's actions and the intensity of their interest and power in the process. For example, from Figure 4, we can observe how students, professors and all academic staff represent stakeholders with the greatest interest as the principal users and beneficiaries of the new spaces, although they do not have any kind of power in terms of available resources to be allocated for the development of the project. As such, in the interests of social sustainability, the project should pay particular attention to their well-being and quality of life on campus, creating spaces fulfilling their needs and focusing on where they want to live and work. Furthermore, it emerges that the "Politecnico", as an institution headed by the academic rector, the board of directors and the academic senate, represents the stakeholder with the greatest power in the decision-making process. Since the new project is aimed at creating a cultural symbol both for the campus (as a public institution) and for the city, it must be developed around objectives of public interest. Consequently, it should give

particular attention to environmental and social sustainability, promoting an architecture that guarantees a sustainable relationship between users and the built environment. In other words, it means investing in the creation of spaces that guarantee the development of a sense of architectural identity and security, based on the concept of flexibility allowing long-term use for future instances and opportunities, and inspire interaction and social participation.

It is worth highlighting that this academic application did not consider how to shift and change the interests and power bases of the stakeholders, since both the will and interests of the less powerful actors and those of the main Decision Makers converge towards an architectural project with high qualities of social sustainability. In this sense, no particular opponents of the project to be neutralized or minimized were found. However, the project solutions developed by students with related analysis of the social return on investment were presented to the main actors of the process in an exhibition at the Politecnico di Torino. This enabled a debate with the academic rector, pro-rector and some representatives of the decision-making bodies, and encouraged reflections in favour of sustainable architecture.

Given the wide possibilities of development of a project, supporting its generation process through the SA allows us to obtain a knowledge base concerning the objectives, resources and interactions of the different stakeholders, and therefore, to exclude some possibilities and orient the project towards more fulfilling scenarios for the stakeholders involved in the decision-making process.

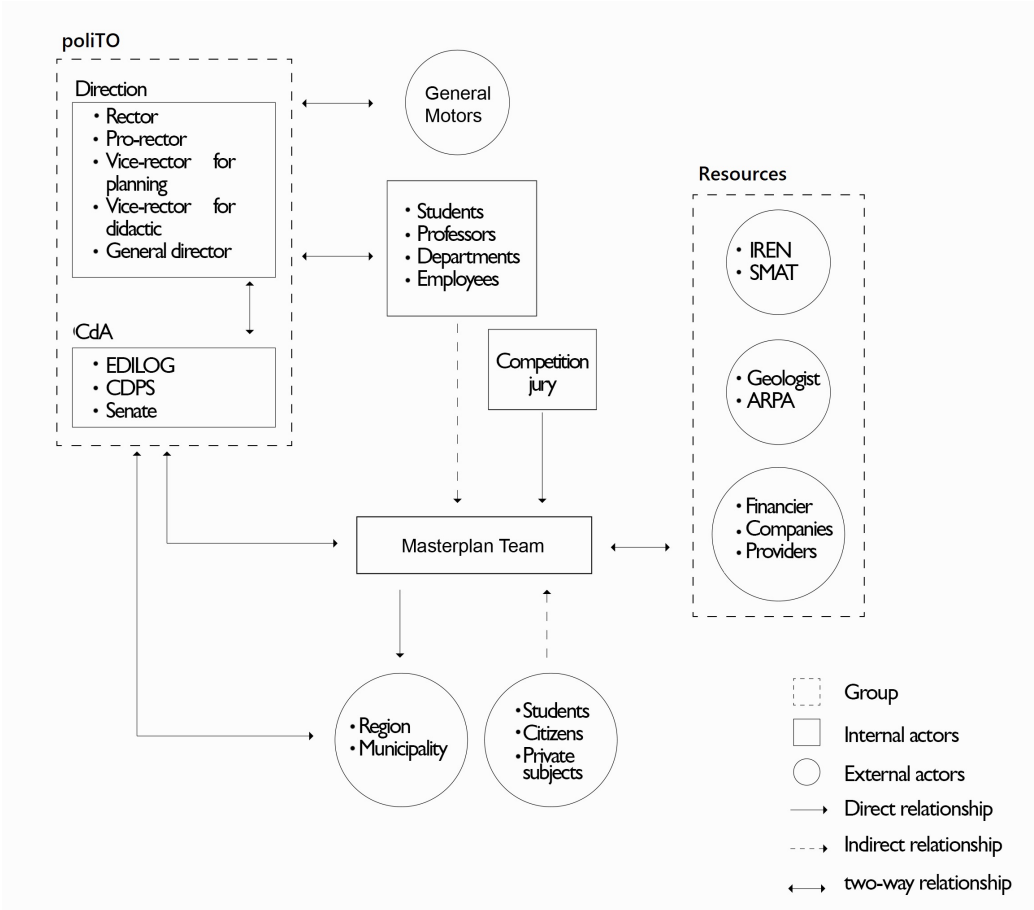

Figure 3. Example of Stakeholder Influence Network Diagram.

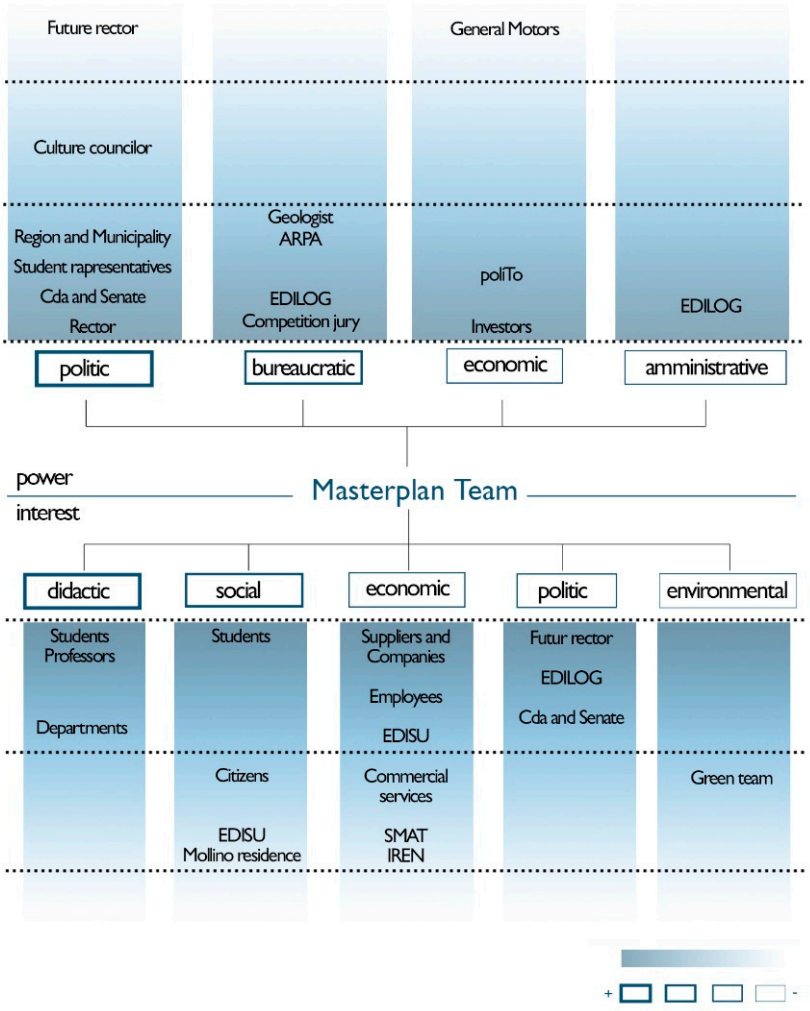

Figure 4. Example of Stakeholder Management Web.

4.3. Application of the SROI

By choosing to act sustainably, the integrated framework proposes as last step of the assessment the SROI evaluation as a methodological tool for measuring the social sustainability and the impacts due to the new urban project.

After developing their vision for the buildings, the environment and the services of the new cultural centre, and after identifying the main stakeholders of the process, students were asked to provide the Impact Map of the transformation, following the principles of [66]. First, according to the outputs of their project, they identified the potential outcomes of the transformation and estimated the total impact value: Since they performed a forecast evaluation, the analysis was based on data coming from similar experience or applications, and the monetary value was attributed through direct interviews or questionnaire and through traditional indirect evaluation methods (detected preferences, hedonic prices, travel cost/time value). Second, they measured the inputs of the transformation through a detailed estimation of the intervention costs. Third, through the ratio of these two values, they provided the SROI ratio in order to observe the cost-effectiveness of the project.

As an implementation of the method, because the nature of the transformation is architectural, the outcomes of the project have been spatialized and therefore represented graphically in the project. In this way, there is a direct and intuitive correlation between the monetary value of the social impact and the designed spaces. Each group of students was free to interpret this concept of spatialisation in the way they considered most appropriate for their project; therefore, in Figure 5, we report some examples.

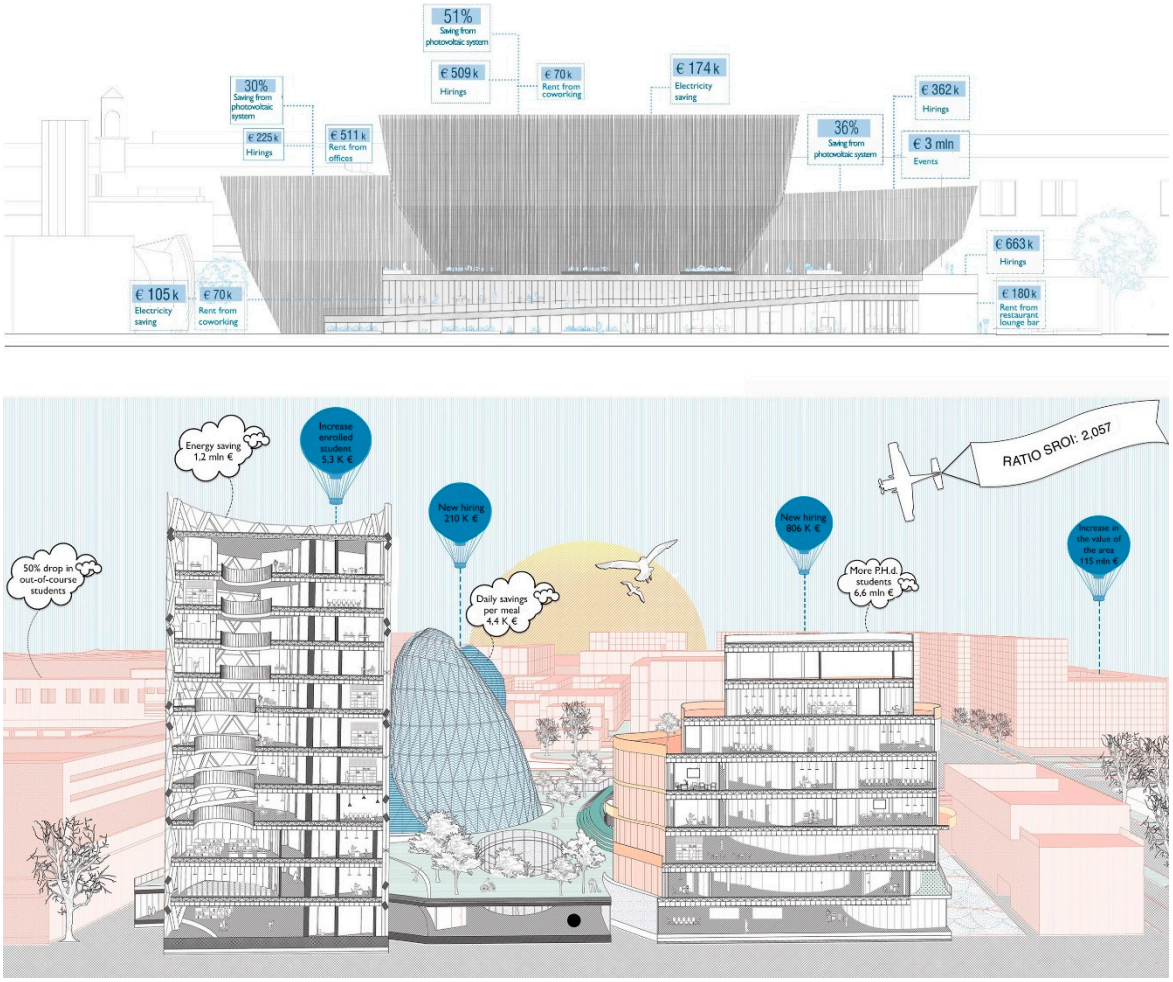

Figure 5. Examples of the graphical representation of the SROI analysis.

Since the transformation in question involves the creation of university services for students, professors and citizens, there is no direct economic return of the investment for the Politecnico di Torino, so the SROI assessment allowed students to understand and compare the costs with the real potential social and environmental benefits. They realized whether their project was too expensive in terms of social and environmental impact, becoming able to answer the following question: Are we investing properly and creating spaces sufficiently functional to build better conditions for our community and for our city?

From the examples shown in Figure 5, we observe the main outcome quantified within the Impact Map. Although the traditional economic aspects generated by the urban transformation, such as the increase in the market value of properties in the surrounding area and the profits from space rentals, represent fundamental outcomes to be assessed, they are not the only ones. Indeed, it is also crucial to observe aspects related to the social and environmental sustainability of the project, which, although most sensitive and complex data in terms of monetary quantification, represent essential outcomes worthy of observation and measurement in a context of sustainable architecture.

Thanks to previous analyses on the understanding of the problem, objectives, strategies and related actors, with the SROI analysis the students observe a particular attention in the quantification of environmental outcomes related for example to the use of renewable sources such as photovoltaics, the saving of water and energy consumption and the improvement of air quality. Moreover, in addition to these, primary importance has been accorded to social outcomes. Indeed, from a social sustainability perspective, the project

observes and monetises different aspects, namely, the improved qualities of study and research offered by the new spaces (study rooms open 24 h a day, new open shelf bookshops, new places for socialization and exchange of ideas); the better physical and psychological comfort due, for example, to the creation of open spaces and green spaces where to spend relaxing moments; the possibility for students to have healthy and cheaper meals thanks to the new lunch rooms; and finally, the will to open the doors of the campus to the city involving citizens through new co-working or restoration spaces.

Creating this type of space focused on satisfying and increasing well-being and quality of life will potentially lead to the development of a more cohesive, interactive and participatory academic community within the Polytechnic House of Culture. Moreover, the increase in well-being will lead to the achievement of the objectives of the main developer, the Politecnico di Torino: The well-being of its users should lead to better work and academic performance, which will occasion an increase in the prestige of the University itself; this, together with the sense of identity of the place and the sense of security guaranteed by careful and iconic design, could lead to the potential identification of the architectural object as a cultural symbol for the campus and the city.

5. Key Findings and Future Development

In this section, we highlight the key outcomes of this application. The proposed framework seeks to address the complexity of an architectural problem in a structured way in order to support the decision-making process aimed at achieving sustainable architecture. The proposed techniques are combined with the aim of providing a framework that supports the analysis, graphical visualization, evaluation and communication of social sustainability in architectural projects, and therefore, each of them contributes differently to the design process. As illustrated above, the whole application considers five key factors—social interaction, social participation, flexibility, architectural identity and sense of security—as guiding values of the design idea (in SWOT and SA) and at the same time as criteria for assessing the social sustainability of the project (in SROI). In this sense, each technique supports the design process in relation to the five key factors of social sustainability. Table 3 shows for each technique the type of assessment—qualitative, quantitative or monetary—and how it supports the design process in relation to the five key factors.

Table 3. Key outcomes of the integrated decision support framework in design process.

	Type of Assessment	Key Factor of Social Sustainability	How It Supports the Design Process
SWOT	Qualitative analysis	Social interaction	Identify the presence/absence (strength/weakness) of places and spaces for the community, which favour aggregation and social interaction.
		Social Participation	Investigate the spatial and distributive characteristics of the area, respect to the presence/absence of spaces intended to host associations, cultural, sports, musical or religious groups whose existence can promote the involvement of the community.
		Flexibility	Analyse the spatial and architectural qualities in order to highlight the possible flexibility of spaces to accommodate new uses, arising from possible future society's changes.
		Architectural identity	Strengthen the identity of the space promoting the reuse of abandoned or underused asset and encouraging activities in favour of physical, mental and social well-being of the community.
		Sense of security	Investigate the current level of security of the area, infrastructure or building in order to catalogue the level of intervention necessary to provide safe spaces to the city.
SA	Qualitative analysis	Social interaction Social Participation Flexibility Architectural identity Sense of security	SA aims to help in identifying all the objectives and interactions between the different actors in order to detect who is inclined to support the project and who to sabotage it, and whether or not their interests promote and enhance the five key aspects of social sustainability. Moreover, SA helps develop strategies to influence and change the negative interests and power bases of stakeholders in favour of the development of a sustainable architecture.
SROI	Quantitative, monetary analysis	Social interaction Social Participation Flexibility Architectural identity Sense of security	SROI analysis helps measuring and evaluating precisely the five key aspects of social sustainability, using different performance indicators. SROI analysis makes operative the measurement in monetary terms of the performance of the five key factors, which constitute the basis of the design idea.

In this application, the theme of social sustainability in architectural projects is addressed with regard to a case study of cultural relevance, which constitutes the background and driving force behind the project. Although social and cultural sustainability are closely related [63,65], a possible future development of research could be to address the issue of cultural sustainability in terms of evaluation and measurement together with social sustainability.

6. Conclusions

Are we investing properly and creating spaces sufficiently functional to build better conditions for our community and for our city?

This research proposes an integrated assessment framework to answer this question. The framework is based on joint application of the SWOT analysis, the SA and the SROI in order to support the development of sustainable architectures, with a particular focus on social sustainability.

We report in the paper the experiment on the application of this framework during the master's course in Architecture in respect of the case study of the urban expansion of the Politecnico di Torino campus through a new cultural centre.

This assessment framework has been conceived to tackle social sustainability as an inherent architectural problem; indeed, it seeks to estimate the impact of design on society, economy and on the environment. Through the simple steps presented, the potential utility of the qualitative and quantitate methods proposed can be observed. First, the SWOT represents a valuable tool for detecting the endogenous and exogenous factors of the site project in order to get a deep and guided understanding of the area and of the context in which it arises, thereby contributing to the development of sustainable architecture. Specifically, in this application, by developing the analysis both on the current state and

on the project currently in progress, it allows us to consider this method as a valid tool that allowed students to observe the strategies adopted by the Team Masterplan and to try to further mitigate the weaknesses and threats within their project proposal, trying to combine and solve all instances from a socially sustainable point of view. Second, the SA analysis let us obtain knowledge about the actors involved in the urban process and about their goals and their interrelations. This constitutes a crucial point for the development of the project, since cities do not act alone: They are the stage for several economic, social and political actors. In other words, therefore, the SA allows us to have more robust knowledge on which to build sustainable architecture. The SA is also relevant and useful to tackle the third step of the framework, the SROI assessment, which is focused on stakeholders' participation in every stage of the process. This method allows us to measure the change and to provide the history of how the change has been created, and enables us to calculate the economic, social and environmental benefits. Performing this last step, students were able to understand and observe whether their design solution was sufficiently functional to create better quality life for the community, for the city and for the environment, in accordance with the new 2030 global Agenda for sustainable development. Moreover, the graphical spatialisation of the project outcomes allows us to directly and intuitively visualize which spaces result in certain social, environmental or economic benefits.

We recognise the main limitation of the research, namely, the few applications of the framework (of which only one has been illustrated in this article), all of them, moreover, in academic settings that limit the generalizability of the framework. However, we proposed a detailed methodological path for exploring social sustainability in architectural phenomena and for measuring its impacts, so that it can be considered a transferable framework to support strategic architectural choices for sustainable architecture.

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