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Article

Visionary Nature-Based Solutions Evaluated through Social Return on Investment: The Case Study of an Italian Urban Green Space

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Abstract: Cities are facing challenges in adaptation to, and mitigation of climate change. Urban Green Spaces (UGS) have a pivotal role in this transformative process and are almost always coupled with digital tools. The deployment of digital solutions, encompassing Information and Communication Technology (ICT) and the Internet of Things (IoT), seeks to increase awareness of UGS benefits across a wider range of users. This study is part of a Horizon 2020 project that aims to measure the social impact of Visionary Solutions (VS), i.e., combined Nature Based Solutions (NBSs) and Digital Solutions (DSs), in UGSs located in seven European cities. The project proposes a novel application of the Social Return on Investment (SROI) methodology to forecast the impact of VS implementation in the case of an Italian demonstration. The three main objectives are: (i) establishing a causal chain for transformation through the Theory of Change (ToC) tool; (ii) quantifying the expected change by developing two monetary alternatives; and (iii) comparing these alternatives to assess which is more influential in stakeholders' decision-making. The authors reviewed a range of financial proxies of social outcomes from other SROI case studies. The result of the Italian demonstration is that, for each euro invested in project solutions, two euros of social return are generated. The analysis reveals these monetized intangible outcomes.

Keywords: Social Return on Investment; impact assessment; urban green spaces; co-benefits; visionary nature-based solutions; digital solution



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1. Introduction

Cities are centers of innovation and cultural growth, attractors of people in search of basic services, such as education, employment, and healthcare facilities, but at the same time represent places challenged greatly by the effects of climate change, further characterized by conflicts among stakeholders and by social inequalities. The global urban population is predicted to increase to 68% [1], and to 75% in Europe, by 2050 [2]. Population growth, and therefore associated human activities, determine a series of negative effects on the environment, and as a consequence, the loss of green space and biodiversity in cities directly affects the health and wellbeing of people [3]. Given the current situation, UGSs and blue areas became more than ever an essential resource in the built environment, since their preservation and enhancement, especially via the implementation of adequate actions, such as NBSs, represent key elements in climate change mitigation and adaptation strategies.

The study conducted in the present paper is part of the Horizon 2020 Project VARCHI-TIES, which aims at increasing citizens' health and wellbeing by operating at the urban scale in a holistic and integrated manner, through the implementation of actions that combine, for the first time, the separate approaches of the Sustainable city, driven by NBSs, and the Smart city, guided by DSs [4,5], the latter including Information and Communication

Technologies (ICT) and the Internet of things (IoT). The latter tools are applied to raise awareness of ecosystem services (ESs) and are accompanied by stakeholder-centered activities for decision-making [6]. The project proposes the employment of an SROI Analysis, aiming to align with the growing recognition of the relevance of these co-benefits among a project's positive results. The purpose of the project is to capture the impact generated for civil society based on expected outcomes. The results of detailed findings is overseen from a social perspective, rather than via a pool of data related merely to the fulfillment of technical Key Performance Indicators (KPIs).

1.1. Positive Effects Provided by UGSs

UGSs are areas associated with a multitude of positive functions for cities concerning water management and changes in microclimatic conditions [7–9], while they also provide benefits for the health and wellbeing of citizens, including recreational and restorative effects, stress reduction, an increase in time spent outside [10–13], and social interaction [14,15].

Our cities face complex challenges that require alternative solutions to traditional mono-functional infrastructures, providing simultaneously benefits that exceed the main scope of the intervention, also called co-benefits, which range from environmental to economic and social benefits. These can be defined as: “the positive effects that a policy or measure aimed at one objective might have on other objectives, irrespective of the net effect on social welfare” [16]. A relevant family of interventions that generate co-benefits is NBSs, an umbrella term [17–19] that embeds the ES as a funding element. The co-benefits, however, need to be quantified and communicated clearly to accelerate NBS mainstreaming, to the point of substituting for to-date solutions [17], by creating partnerships with local stakeholders [20]. To achieve this goal, the integration of DSs represents consistent support by displaying to final users key information on the transformation brought about in cities, or real-time data on environmental and local climatic characteristics [21], thus ensuring a more rewarding experience of the physical world through interaction with digital components by developing a “phygital” experience [5].

In fact, despite these positive impacts, it needs to be observed that urban green space is in competition with the parallel development of new buildings and transport infrastructure [22,23]. Therefore, it is essential to promote the co-benefits deriving from UGSs in order to direct decision makers, such as municipality heads, planners, and members of civil society, to guarantee that conscious decisions are taken in the future. De facto, these co-benefits, although recognized, are often not quantified, are vaguely named, and seldom monetized, therefore they are difficult to account for. Aside from the latter limitation, social benefits are the least widely studied [12], in addition to a lack of empirical works in support of nature-based interventions linked to health [11], and an insufficient number of case studies that perform evaluative research on co-benefits [14].

1.2. Communicating Co-Benefits and the Role of Stakeholders

Studies demonstrate that stakeholders do consider the added value of co-benefits, and their potential in decision-making [10,24]. A work conducted by [25] on health-related co-benefits highlights as categories of intervention within climate adaptation “Knowledge, perceptions and behavior” and “Monitoring and Evaluation and warning systems”, pointing out the importance of communicating intervention intents with stakeholders to better estimate local impacts, in order to achieve a higher success rate in the long run. Evidence is given concerning the correlation between the low value attributed to non-cultural ESs, together with the cognitive gap regarding the latter and the lack of interest in UGS interventions [26], therefore only demonstrating a minor use [27]. Another study highlights the necessity of introducing the co-benefit approach to facilitate the implementation of UGS transformation in cities, and identifies the lack of information among stakeholders on the contribution of co-benefits within adaptation and mitigation strategies as a prime

barrier [28]. Amid efforts to promote transparency, citizen participation, and accountability, DSs demonstrate a favorable impact on increasing trust in innovative interventions [29].

Participating approaches are continuously advancing new methods for urban development projects. Decision-making tools, such as Spatial Multi-Criteria Decision Analysis (MCDA), which counterpose with more long-established methods, show that there are multiple possibilities for reinventing stakeholders' engagement and making it more stimulating and interactive [30].

1.3. Importance of Assessing UGS Interventions: Synergies between NBSs and DSs

Higher awareness of UGSs' co-benefits can be raised by adequate communication through rigorous assessment frameworks [17], capable of analyzing their positive or negative effects from a holistic perspective, embedding environmental, economic, and social aspects. The latter component is often left behind or not sufficiently investigated with traditional evaluation tools, such as Cost-Benefit Analysis (CBA). A recent study highlights the very limited quantitative evidence on the health and wellbeing co-benefits related to sustainable urban transformation, since case studies usually report them qualitatively, recognizing the major challenge of quantifying them in monetary terms [20].

As the project's actions are a novel concept, the evaluation techniques found in current studies were broken down into DS and NBS interventions.

Literature on DSs within Smart City actions reports efforts made towards the monetary quantification of co-benefits by employing CBA, while the monetization is based on the stakeholders' stated Willingness to Pay (WTP). These methods were found effective in supporting the acceptance of technological devices in energy efficiency projects to create a more comprehensible understanding of the DSs and overcome implementation obstacles [31,32].

On the NBS side, the importance of assessing co-benefits from a cost-efficiency perspective as well as stakeholder engagement throughout the whole NBS implementation process are key steps in the seven-stage framework to assess NBS proposed by [33]. To date, the most widely consolidated economic evaluations regard intangible assets within ESs for decision-making [34,35].

1.4. Aim and Scope

This study proposes a novel application of the SROI methodology, which is deemed to contain the most suitable tools to establish social impact assessments, as it can express in a clear form, i.e., monetary terms, the complex relationship between UGSs and effects on health and wellbeing. In the analyzed case study, the investigation is a thorough assessment of the social welfare created, which goes beyond a common performance measurement based on KPIs defined in the incipient project phase. Using SROI allows direct confrontation with key stakeholders' experience of either benefits or trade-offs, derived from the project's implementation.

This specific application also represents a distinct case compared to other SROI implementations for UGS projects, since the present study focuses on outcomes that, to date, have not been treated in other research, striving to go beyond the standard features accounted for in the literature. The latter is still connected to CBA practice regarding the built environment, such as an increase in revenue, property values, or less spending [36–40]. The attention in the proposed paper shifts to outcomes related to health, wellbeing, community knowledge, and citizens' empowerment.

To sum up, the evaluation framework contemplated in the present paper takes a step forward compared to previous studies by bringing in three main innovative factors: (i) it considers the integration between the NBSs and DSs, which were to date considered as separate research streams, and (ii) it analyses them from a social perspective; finally (iii) the impact produced by the VSs is defined through direct stakeholder engagement with the definition of the material changes they would be likely to experience. The results obtained will guide local decision-making and be a way of building trust with key stakeholders.

2. Materials and Methods

2.1. Methodology

2.1.1. SROI in UGS Applications

The SROI is briefly defined as a tool developed to allow accounting for interventions that have an added social, economic, and environmental value [41]. The fact of being rooted in business-oriented Return on Investment (ROI), and even more so in CBA [42], encouraged SROI's use in urban regeneration social impact evaluations, shifting from the methodology's original scope. The SROI was born from not-for-profit organizations' necessity to demonstrate the social value produced compared to other competing parties [43].

The framework was first devised by the Roberts Enterprise Development Fund (REDF) in the 1990s [44]. To date, the methodology is regarded as one of the most complete social assessment tools, mainly for its capability in proposing a robust set of applicative steps for reporting results, "using 'return on investment' language that is familiar with investors and commissioners" [45].

The implementation of SROI represents a challenge; however, its use has been suggested as a suitable framework that can provide an incorporated view of health, wellbeing, social, and environmental outcomes in economic evaluations [38].

SROI implementation is conventionally divided into six consequent stages [41] that have been further grouped in the present research paper into three themes (see Table 1). The first theme is developed in the initial two stages of the framework, and it consists of the ToC definition, where the causal chain among stakeholders, investment, activities, and expected changes is identified. From the third to the fifth SROI stage, "outcomes' monetization" is developed, as outcomes are quantified by using indicators and financial proxies. Finally, the third theme regards the dissemination and use of the results.

Table 1. SROI methodological stages. Source: own elaboration based on [41].

Objective	SROI Stages	Description
Theory of Change Definition (ToC)	Stage 1—Establishing scope and identifying key stakeholders	Prioritization of a main goal and placing at the center the local actors who will experience the changes that a project aims to achieve.
	Stage 2—Mapping outcomes	Constitution of a causal chain between the outcomes hypothesized for stakeholders, the measurable activities proposed, and the investments made.
Outcomes' Monetization	Stage 3—Evidencing outcomes and giving them value	Quantification of outcomes by associating to each of them an indicator, a duration of the effects, and assigning a financial proxy.
	Stage 4—Establishing impact	Discount of the value obtained by considering four context-related factors: deadweight, displacement, attribution, and drop off.
	Stage 5—Calculating the SROI	Calculation of the social return of each euro invested.
Report and Use of Results	Stage 6—Reporting, using, and embedding	Dissemination of the analysis results in a transparent way to guide the decision-making process.

2.1.2. CBA and SROI: Cross Comparison

Before SROI began to be employed in urban projects, CBA was the preferred framework to support decision-making. Many of the CBA steps are mirrored in the SROI, given that CBA is the widespread consolidated framework from which SROI originates [46], although with consistent variations, given the distinct scope of their development. SROI has been defined as a localized CBA [47], since it focuses solely on the social impact of interventions, while the "returned value" is a direct consequence of the material changes expected (ex-ante evaluation) or experienced (ex-post) by those affected by the project.

Table 2 proposes a comparison between the two frameworks, shedding light on the main divergences, based on [41,47–49]. The scale at which they are predominantly implemented, the prevalence of ex-ante and ex-post applications, and the way outcomes and beneficiaries are accounted for in the process present evident differences. Both methodologies are necessary for decision-making, but while CBA is mainly employed to agree among multiple possible future options, SROI is used to assess specific interventions and generate information databases set up via stakeholders' feedback to improve the state of the art. The latter feature makes it interesting regarding the application suggested in the present study, i.e., an accurate, specific, and transparent social impact assessment.

Table 2. Cross comparison between the CBA and SROI. Source: own elaboration based on: [41,47–49].

Objective	CBA	SROI
Predominant scale	Large scale: Public projects, policies, and programs	Local scale: Organization scale
Evaluation time	Ex-ante preferred	Ex-post preferred
Beneficiaries	Society as a whole	Specific local stakeholder groups
Outcomes determination	Determination through analyses run by experts	Determination through key stakeholder engagement
Intangible benefits value determination	Determination of shadow prices and WTP approach: predominantly the revealed preference method	WTP approach: Predominantly the stated preference method
Discount rates	Social Discount Rate (SDR)	Conventionally used 3.5%—Discount rate established by the HM Treasury's Green Book
Determination of the counterfactual	Business as usual scenario (BAU) Do minimum scenario	Deadweight Attribution Displacement
Indicators	Economic Net Present Value (ENPV) Economic Return Rate (ERR) Benefit/Cost ratio	Net Present Value (NPV) Benefit/Cost ratio
Risk determination	Sensitivity analysis Qualitative risk analysis Probabilistic risk analysis Risk prevention and mitigation	Sensitivity analysis Payback Period

2.1.3. Methodological Steps

The research outlined in this paper is the result of an empirical study run between December 2021 and July 2022 accompanied by a parallel literature review on existing SROI implementations in support of the activities carried out in the field.

The methodology implemented is built on the SROI backbone, and it is articulated in two main parts (see Figure 1):

- (i) "Part I of Application", in which the intervention's ToC is determined by engaging with local stakeholders and project partners.
- (ii) "Part II of Application", which foresees the development of an improved SROI method within the monetization phase, i.e., Monetary Alternative 2, compared to the first solution developed, Monetary Alternative 1. A comparison between the two monetary alternatives in "Part II of Application" is performed, and it will be discussed in the Section 3, to determine which of the two is more suitable to lead decision-making processes. Additionally, the analyzed case studies provide ranges of values associated with some of the VARCITIES outcomes.

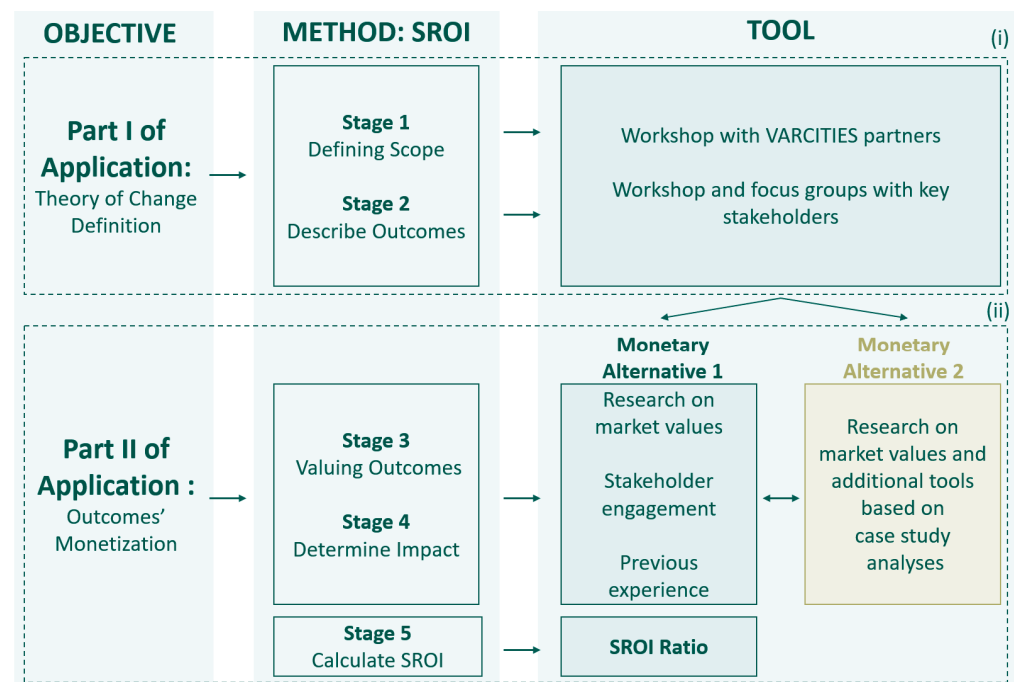


Figure 1. Methodology and SROI stages. Source: own elaboration based on [41].

2.1.4. The Case Study

The area object of intervention is a small town in Northern Italy. This is a 19th-century garden of the Villa Bolasco (see Figure 2), reopened in 2018 thanks to restoration work managed by the University of Padua and recently designated as one of the most beautiful gardens in Italy. This historical garden lies in proximity to the city's ancient medieval castle and close to relevant medical facilities, including the Alzheimer's Day Center ATTIVAMENTE, the Domenico Sartor Elderly Center, and the IOV oncological hospital. Thus, the garden is a reference place for vulnerable groups who visit it to seek wellbeing from a walking experience in the quiet and beauty of the place. Its position, history, and aesthetic attributes paved the way for the proposal for the Healing Garden for young, elderly, and people with Alzheimer's developed within the European H2020 VARCITIES project (as shown in Video S1).

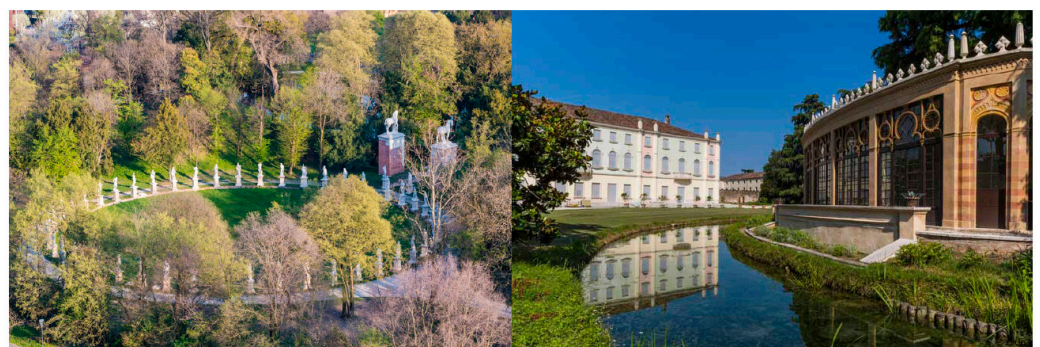


Figure 2. Villa Bolasco Park. Source: <https://ilbolive.unipd.it/> (accessed on 10 December 2023).

Despite being frequently referred to as a “gem” in the city's heart, there are architectural barriers that prevent access to this location. First, the garden is encircled by a tall brick outer wall that is a part of the historical complex which blocks the view to the inside. The garden is not at all noticeable along the street which links Villa Bolasco to the railway station. Second, the entrance gate is placed in the north-western corner of the park, which is difficult to find and close to a not well-paved area for car parking. Also, the garden is

only open for visitors on weekends and on Fridays, which is seen by locals as a significant fruition limitation, and internal gravel paths are not suitable for wheelchairs (Figure 3).

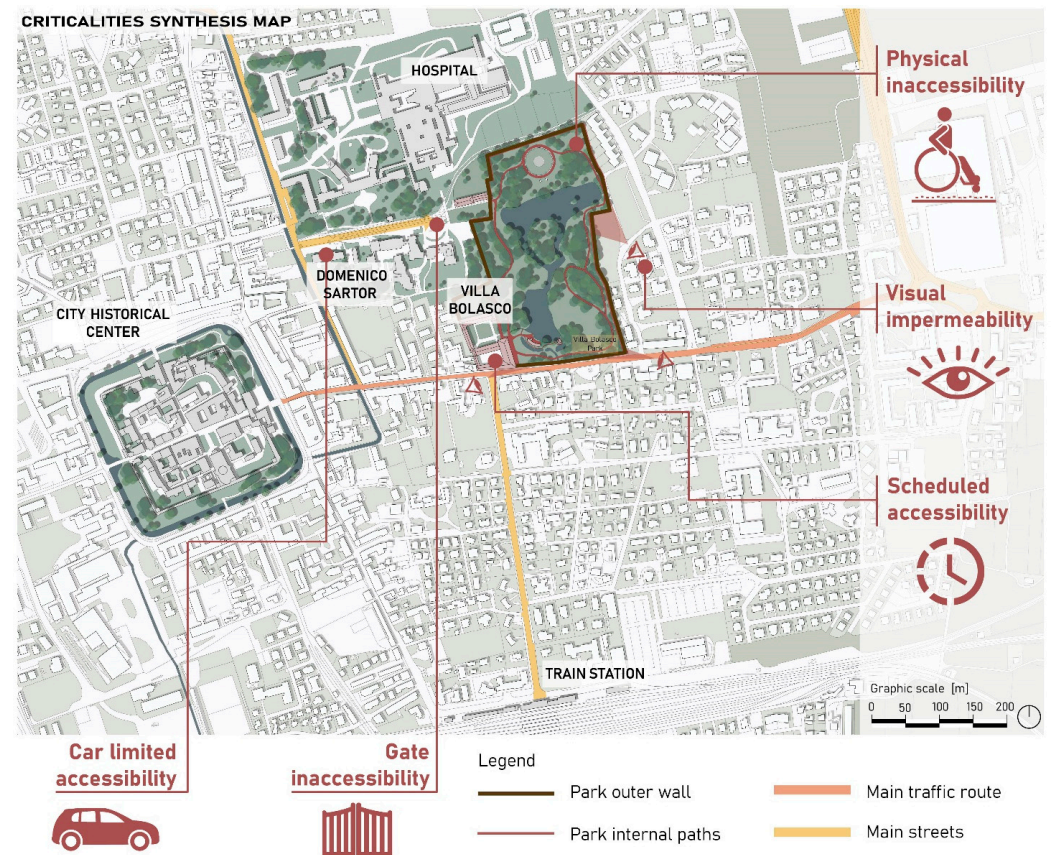


Figure 3. Site Analysis: synthesis of pilot area criticalities. Source: own elaboration.

2.2. SROI Application for Visionary Nature Based Solutions

On the demonstration site, the VARCITIES project is going to implement a set of six VSs to extend Villa Bolasco Garden's UGS-related benefits, with the twofold aim of achieving, on the one hand, a better visiting experience of the park, and on the other to provide knowledge of ESs and, finally, to promote citizens' and associations' active participation in similar initiatives. During the first introductory meeting held on the 14 December 2021 with local project partners, the six VSs were discussed, to determine which would be the most appropriate to include in the subsequent discussion with stakeholders. The result of the internal discussion is reported in the following Table 3, including a brief explanation of all the solutions. Only the VSs that directly impact the community have been analyzed, excluding VS2 and VS3, that are of interest especially to the scientific researchers, playing a supporting role to other VSs rather than being considered alone. The identification of financial resources involved in designing and implementing the aforementioned VSs serves as the reference point for calculating the investment/social value ratio. The total value of the project is €1,771,049.4, for which the SROI analysis considers one year out of the ten-year operational life duration, thus one year of costs and one year of social value were calculated. The primary sources of funding are detailed in Table 4.

Table 3. Pilot area solutions.

	Description	SROI Inclusion
VS1	Creation of accessible paths and building of new parking lots to facilitate the access to the park	x
VS2	Monitoring of the psychological and physiological wellbeing of the elderly and people with Alzheimer's in relation to environmental conditions to support evidence-based information on the positive effects of UGSs.	
VS3	Monitoring of microclimatic and environmental conditions in the different areas of the garden, necessary as project's database support.	
VS4	Development of guidelines for the re-design of green public spaces as a useful tool to guarantee the project's results upscaling and future exploitation; establishment of the Local Landscape Observatory in the building close to the entrance of the park.	x
VS5	Movement tracing smartphones and sensor-equipped benches for the assistance of visitors with disabilities to increase safety.	x
VS6	Intelligent and adaptive information systems to offer a more enriching and rewarding visiting experience (the so-called "virtual window" on the garden).	x

Table 4. Financial Inputs.

Inputs	Value
Total financial inputs, including operating cost and subtracted revenues per year	1,141,500.0 €
Total direct personnel costs	456,252.0 €
Total indirect costs	173,297.4 €
Total	1,771,049.4 €

2.2.1. Part I of the Application—Theories of Change definition

Part I of the SROI application concerns the definition of a ToC given the investment in VSs. Within this phase, two stages are identified related to the same number of questions: (1) who are the stakeholders, and (2) what are the changes that VSs' implementation would bring to them?

To answer the first question, possible park visitors were considered, grouped into stakeholder categories. After an iterative exercise, three groups were chosen: non-fragile visitors, fragile visitors (i.e., elderly people, Alzheimer's patients, and people with mental or physical disabilities), and finally the caregivers who oversee the latter category. For each group, citizens were invited belonging to the mentioned categories based on contacts available to the municipality, encompassing local association representatives. Out of 93 total invitations, 30 came to the workshops.

Concerning the second question, a preliminary series of ToCs was decided in a workshop held with VARCITIES partners. In this phase, the VSs were associated with outcomes. The ToCs were then validated during three focus groups conducted in May 2022, one for each of the stakeholder categories.

Each focus group was organized in three main moments: first, a presentation of the VARCITIES project and the SROI methodology, to secure quality answers. Second, a 10-min questionnaire, in which attendees were asked to rate the outcomes on a 5-point Likert scale with text motivation, considering how much the project actions were relevant to them and how long they would last over time. The third part was organized as an oral discussion to actively debate the questionnaire answers. All ratings were displayed on an Excel spreadsheet showing the average rating derived from participants' answers. Further all outcomes were discussed, both those with a higher score and a lower score. The key stakeholders were invited to provide additional motivation for their answers when ratings for the same outcome were discordant, i.e., one person would give the maximum "5" rating, while another would give a "1" or a "2". The first workshop series ended with the final

lists of outcomes, choosing only the most relevant based on the scores received and in agreement with the participants.

The data collected at the end of the engagement gave insights into local dynamics and perceptions of the historic garden within the community.

2.2.2. Part II of the Application—Outcomes' Monetization

“Stage 3” and “Stage 4” in SROI Analysis aim at quantifying and monetizing the outcomes established in the ToCs by defining outcome indicators, financial proxies, discount factors, and outcome durations. The information was collected partly from desk research and partly from the direct engagement of stakeholders. In fact, to achieve “Monetary Alternative 1”, a series of three workshops were organized, while “Monetary Alternative 2” is a contractual hypothesis regarding monetary attribution elaborated by the authors on a desk research basis.

The outcome indicator used in “Monetary Alternative 1” is “the number of subjects hypothesized to experience the changes”. This has been calculated by using data gathered from national databases and primary data on the number of visitors provided by the Villa Bolasco Park Management Office. This has allowed a precise estimation of the total number of subjects for each stakeholder category. However, the final values were further discounted after consulting the stakeholders.

During each workshop, two exercises were carried out, one of which was the identification of the percentage of people likely to like the outcomes on a 5-point Likert scale. The other exercise permitted the determination of the Attribution discount factor (see values in Table 4). The chosen Attribution values in Table 4 are significantly higher compared to other SROI case studies analyzed, as can be seen in the examples provided in the Appendices A–F. The choice of a high Attribution was defined both as weighted on stakeholders' answers and to provide a credible conservative future scenario.

The discount factors were completed by finding the deadweight based on research into national and regional registered trends. No displacement was deemed material, while the drop-off is not applicable for one year of duration.

The financial proxies were assigned by following the anchoring technique consisting of the determination of a financial value, the “anchor”, one for each stakeholder group. The values for all the other outcomes outlined in the ToC were retrieved by multiplying the “anchor” by the relevance score obtained from the engagement with stakeholders. Anchor values can be seen in Table 8, Table 9 and Table 10. In the non-fragile visitors' group, the anchor value chosen was attributed to the “Increase in knowledge and awareness in relation to the benefits of ecosystem services” outcome, deemed the most relevant, with the worth of an “Annual subscription to National Geographic magazine”, i.e., 50 €. For the fragile subjects, it was evaluated as the “Greater psycho-emotional wellbeing” outcome by associating as a proxy a local “Monthly yoga course” of €45. Finally, the most representative outcome for the caregivers was the “Reduction of stress and anxiety associated with the caregiving experience” estimated as the “Minimum cost of a couple session of stress management” of €45.

The “Monetary Alternative 2” is meant to analyze each outcome and give a value to the most difficult-to-assess co-benefits. To achieve the pilot's outcomes' translation into monetary terms, a set of 11 relevant case studies were considered, giving an overview of how the same outcome can be associated with different monetary values. Five project outcomes were found to have been analyzed in the literature, while the other four outcomes were specific to the project and had not yet been analyzed elsewhere.

One of the aspirations of SROI practitioners is to create a more standardized approach [50] when it comes to evidence-based monetization. Financial proxy databases are proof of this willingness to optimize the process by referring to benchmarks, and the most well-known indexes are Social Value International, HACT (Housing Associations' Charitable Trust) Social Value Bank [51], and the Social Value Portal [52]. However, the values registered in these databases do not reflect geographical area specificities, this being

a main deficit for their spread use [53]. In the demonstration case's SROI, the HACT Social Value Bank was useful in the resolution of the “Strengthening of active citizenship through participatory decision-making processes” outcome.

To develop the “Monetary Alternative 2”, case studies were selected based on the analyzed outcomes, selecting those that were quantifying the same changes as in the pilot's ToCs. The comparison among case studies helped in choosing the most suitable type of financial proxy among all the different examples proposed in the consulted literature. Most of the monetary values were assigned by using the revealed preference method, thus each of the outcomes were associated with the market prices of services that would have provided the same kind of change as the VSs, while the health outcome connected to an increase in physical activity was calculated by using the Health Assessment Tool (HEAT) [54] proposed by the World Health Organization (WHO). The latter tool works on the principle of the value of years saved by considering a lower risk of premature deaths due to a combination of chronic diseases.

The determination of Attribution and Deadweight exceeds the “Monetary Alternative 2” investigation scope, as values for discount factors can be defined exclusively after involving stakeholders. The two discount factors, were, however, extrapolated from case studies in analysis tables for benchmark value comparison. Details of other parameters considered in case studies are available in the Appendices B–F.

3. Results

3.1. Part I of Application—Theories of Change

This research is based on the combination of qualitative methods and quantitative data, both necessary to grasp the social impact of VS interventions. The first block of focus groups outlined stakeholders' perceptions compared to the VARCITIES partners' vision of future changes. The initial meetings organized were also essential for analysts to better understand the territory they were operating in and to gather information on stakeholders' additional local challenges and expectations. These provided some useful insights and suggestions on how to improve the proposed VSs, as briefly summarized in Figure 4.

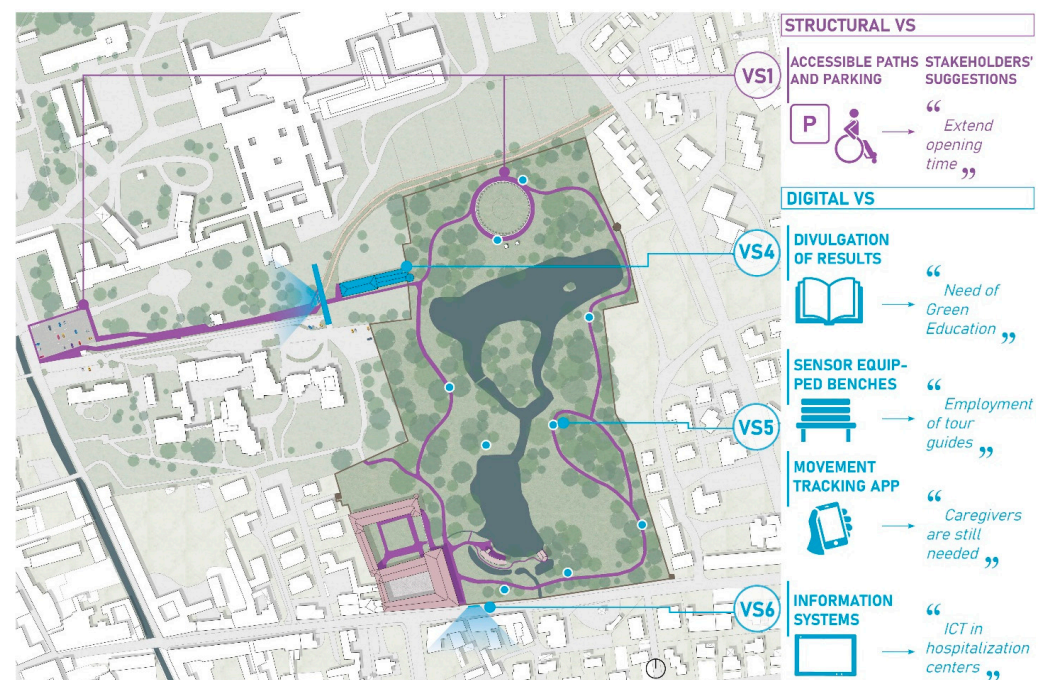


Figure 4. Spatial representation of the VSs and stakeholders' feedback. Source: own elaboration.

The following Figures 5–7 depict the first draft of the ToCs determined by partners. The green highlighted tabs are the final outcomes agreed upon with key stakeholders.

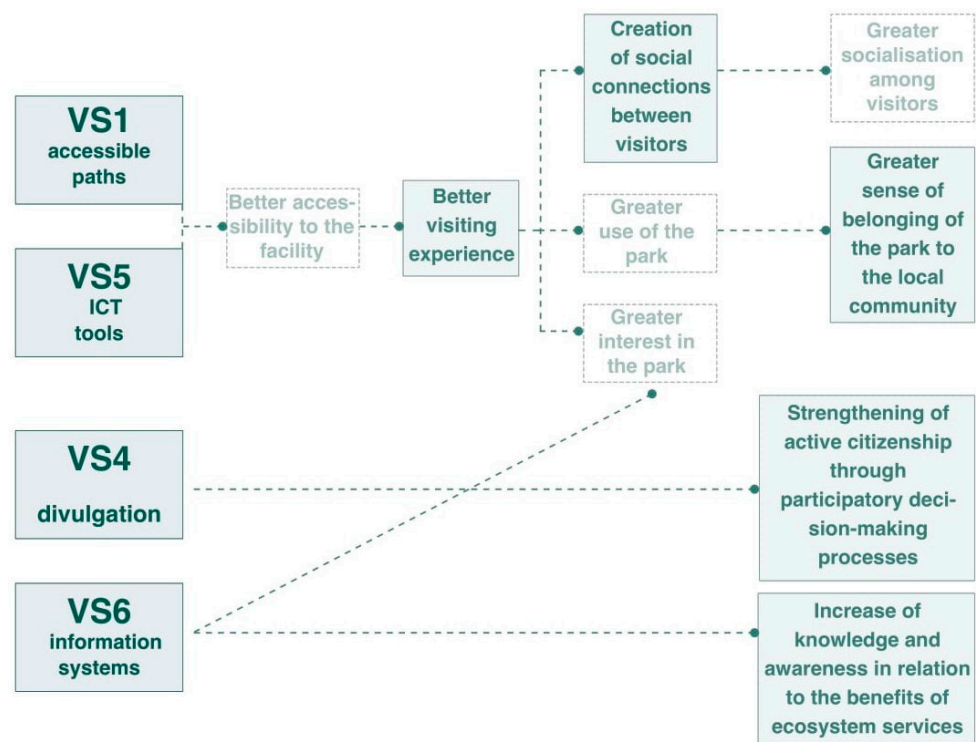


Figure 5. Final version of the non-fragile visitors' Theory of Change (ToC).



Figure 6. Final version of the fragile visitors' Theory of Change (ToC).

3.1.1. Focus Group 1—Non-Fragile Visitors

Twelve non-fragile visitors' representatives took part in this focus group, the participants belonging to local associations operating in environmental preservation, cycle mobility, volunteering, alpine sports, and retired people socialization centers.

The group agreed on outcomes related to an increase in knowledge and awareness deriving from the VS implementation, considered by stakeholders the most relevant changes that could occur: the strengthening of active citizenship and a better visiting experience, the possibility of creating social connections, and the contribution to the sense of the park belonging to the local community, were chosen. The outcomes mentioned, although recognized by the literature, were found to be difficult to quantify [10,12].

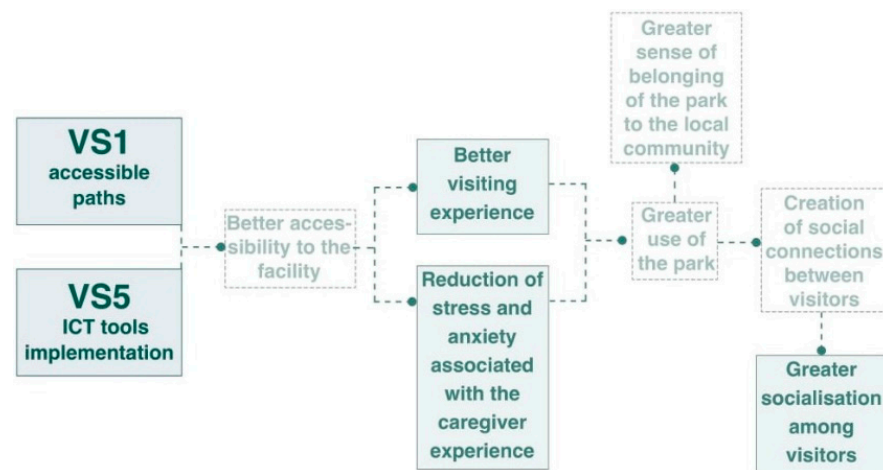


Figure 7. Final version of the caregivers' Theory of Change (ToC).

3.1.2. Focus Group 2—Fragile Visitors

The second focus group gathered 11 participants. Given the fragile condition of the group addressed, it was not possible for mentally disabled citizens to take part; instead, the participants were representatives of local associations and centers that take care of these patients daily. The institutions included were centered on Alzheimer's treatment and research, support for the neuro-diverse, elderly care centers, and volunteering.

The fragile stakeholder group represents a category with specific needs, which develop in a different manner of fruition compared to the non-fragile group, as some of the VSs are more relevant than for other people, and therefore have more impact. The re-paving of the garden trails and the addition of parking lots (VS1) were deemed as more influential from the perspective of people with severe motor limitations due to age and diseases. In fact, these subjects would need adequate parking lots to accommodate vans for the transportation of equipment for the motor disabled and, in general, all not-fully-independent visitors that reach the park by car. For these subjects, being able to arrive at the park by car, or having a green lung accessible through a comfortable pedestrian lane in proximity to their homes, would make, according to participants, a considerable difference. Other VSs studied specifically for fragile subjects, such as sensor-equipped benches and the movement tracking application (VS5), were rated as significant given the total length of the trails amounting to more than one kilometer and a half, but also for visual enjoyment, as the benches are placed at strategic viewpoints.

The scarcity of recreational opportunities for this stakeholder category strengthens the consideration of outcomes related to an increase in health and wellbeing, greater socialization, and reduction of loneliness. Other outcomes were discarded, either because they were overlapping or because they were not considered sufficiently material.

3.1.3. Focus Group 3—Caregivers

The last focus group involved seven professional caregivers working in the healthcare facilities and associations near the Villa Bolasco historic garden. The represented institutions were centered on Alzheimer's treatment and research, support for the neuro-diverse, and elderly care centers.

The third stakeholder group agreed that the main outcomes are the reduction of stress and anxiety associated with the caregiving experience, as the improved accessibility foreseen by the project would solve the issue of insufficient and inadequate parking, as well as having safer pedestrian lanes to connect to the park entrance. Another outcome deemed relevant was the opportunity to socialize with other caregivers, especially in the form of training and peer knowledge exchange events.

The outcomes hypothesized in the ToC drafts proved to align with stakeholders' perspectives. However, many of the outcomes were discarded in the final selection. This

result was positive, as it avoids overlapping and consequently a possible overclaiming of the outcomes' impact.

3.2. Part II of Application—Outcomes' Monetization

3.2.1. Monetary Alternative 1

The SROI Map in Table 5, derived from the three focus groups, the three workshops, and parallel desk research, contains all the information necessary to calculate the SROI ratio. In the demonstration case's application, for every euro invested in VSs (distributed over 1 year), there are slightly more than two euros of social return.

Table 5. SROI Map—simplified.

Stakeholder	Description	Outcome			Discount Factors			Impact
		Total Quantity	Discounted Quantity	Ranking	Value (€)	Deadweight	Attribution	Value (€)
Non-fragile visitors	Increase of knowledge and awareness in relation to the benefits of ecosystem services	3609	2165	4.45 (100%)	48.9	30%	40%	44,473.0
	Strengthening of active citizenship through participatory decision-making processes	3609	2165	3.82 (85.8%)	41.9	20%	80%	14,521.8
	Better visiting experience	12,032	9144	3.64 (81.7%)	39.9	25%	20%	219,015.8
	Creation of social connections between visitors	3609	2093	3.55 (79.7%)	38.9	30%	80%	11,405.7
	Greater sense of belonging of the park to the local community	3609	2093	3.45 (77.5%)	37.9	10%	60%	28,576.8
Fragile visitors	Reduction of loneliness	645	419	4.20 (101.2%)	45.5	30%	80%	2673.1
	Greater psycho-emotional wellbeing	645	535	4.15 (100%)	45.0	35%	80%	3131.8
	Better visiting experience	645	439	4.05 (97.5%)	43.9	25%	20%	11,556.9
	Greater socialization among visitors	645	419	4.00 (96.3%)	43.4	30%	80%	2545.8
Caregivers	Reduction of stress and anxiety associated with the caregiving experience	720	468	4.29 (100%)	45.0	20%	80%	3369.6
	Better visiting experience	720	540	4.14 (96.5%)	43.5	25%	20%	14,094.0
	Greater socialization among visitors	720	468	4.05 (94.4%)	42.5	30%	80%	2784.6

In Table 6 the Sensitivity analysis highlights the robustness of the process; in fact, the analysis setting allows high variations in the Deadweight and the Displacement factor before the bottom-line value becomes negative.

Table 6. Sensitivity analysis.

Considered Scenario	SROI Ratio	New Scenario	SROI Ratio *
Displacement assumed 0%	1:2.04	Displacement is raised to 40% for all outcomes.	1:1.22
Deadweight is below 60%	1:2.04	Deadweight is raised to 60% for all outcomes	1:1.08

* SROI Ratio calculated based on “New Scenario” assumptions.

In Figure 8, it can be observed that the outcome which had the greater influence on the overall value created is the “Better visiting experience”, which would generate € 244,666.70, roughly 64% of the total social impact. The result conforms to the higher number of stakeholders associated with the outcome and contemporarily to the fact that it is in minor part dependent on external variables; therefore, low discount factors were applied to it. Another noticeable outcome is the “increase of knowledge and awareness in relation to the benefits of ecosystem services”, which was rated by participants as the most relevant, generating €44,473.0, 18% of the non-fragile category value. The latter result confirms the initial hypothesis on the importance of knowledge increase related to VS implementation. The outcome deemed by all the stakeholder groups as less likely to fully develop in virtue of the VARCITIES project interventions is that related to socialization among visitors, at €16,736.1, 5% of the overall project value.

The data obtained from the engagement activities consist of high-quality information collected from representatives of the main associations located in the pilot’s territory. However, the number of stakeholders remains limited compared to the total target. Another barrier encountered in the SROI process was the engagement of severely fragile subjects that could not be directly interacted with, instead, their caregivers offered perceptions of the VSs from the fragile park visitors’ perspective.

3.2.2. Monetary Alternative 2

Monetization in SROI analysis is one of the most critical parts, but at the same time it is that with the highest potential for being consistently improved in the future by building benchmarks through a more conspicuous implementation in UGS case studies.

Based on the case studies to date, in Table 7 a comparison of the value ranges to date, attributed to outcomes accounted in the VARCITIES SROI analysis, was outlined. The case studies are for the most part based in the UK, but there are also case studies from Ireland, Italy and China. All financial proxies were considered based on a short-term experience, i.e., outcomes referring to weekly, rather than annual, values, as the park will be experienced in single visits. For details regarding the calculations, consult the Appendices B–F. The only exception is the outcome related to the increase in physical activity, whose value is considered only in Monetary Alternative 2, and which was defined on an annual basis, since a small group of fragile subjects were targeted to experience a regular activity connected to the VARCITIES project. Generally, the range of values is wide for all the outcomes analyzed, up to 14 times between the lowest and the highest value, as can be seen in the “Greater psycho-emotional wellbeing” for the fragile category group. The lowest range was registered instead in the “Reduction of stress associated to the caregiving experience”. The latter outcome is linked to a specific stakeholder group, which can be the reason for a more precise assignation compared to the others. However, the values found within the two Monetary Alternatives explained in Tables 8–10 are found in the ranges from case studies.

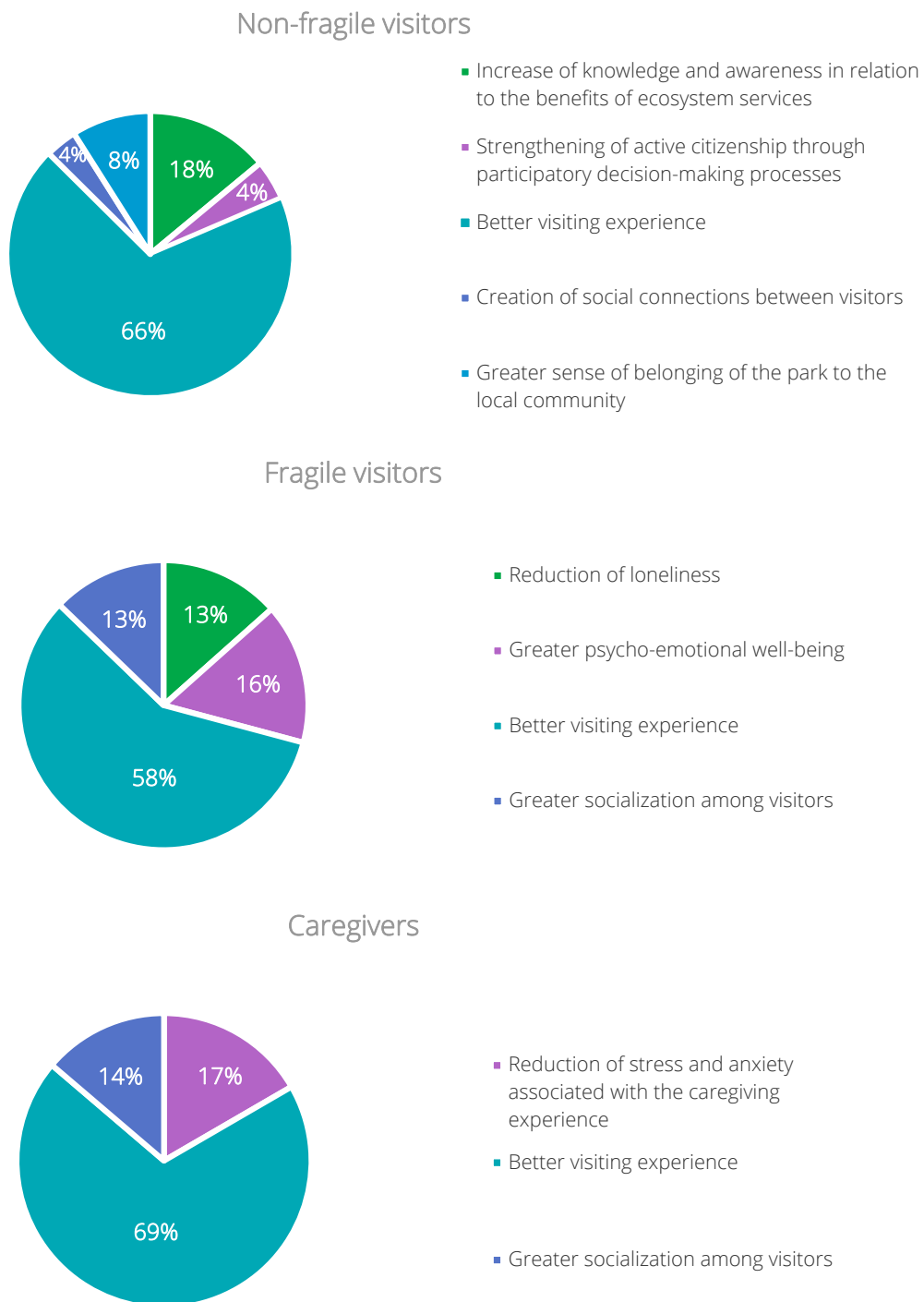


Figure 8. Disaggregated social value for each outcome.

Table 7. Outcome value ranges derived from case study analyses. See Appendices B–F.

Stakeholder Group	Outcome	Type	Monetary Value Range (£)
Non-fragile visitors	Creation of social connections between visitors	Weekly	1.04–10.00
	Greater psycho-emotional wellbeing	Weekly	7.15–102.60
Fragile visitors	Greater socialization among visitors	Weekly	1.04–10.00
	Better accessibility to the facility, i.e., increased physical activity	Annually	111.84–11,562.73
Caregivers	Reduction of stress associated to the caregiving experience	Weekly	10.00–23.38

Table 8. Monetary Alternative 1 and Monetary Alternative 2—non-fragile visitors.

Outcomes	Monetary Alternative 1			Monetary Alternative 2					
	Financial Proxy	Reference	Value (€)	Financial Proxy	Reference	Value (€)	Financial Proxies from Case Studies	Case Studies Used	Financial Proxies from Market Prices
Increase of knowledge and awareness in relation to the benefits of ecosystem services	Annual subscription to National Geographic magazine	National Geographic website	48.9	One hour of guided visit on Ecosystem Services learning	Botanic garden website	50.0			X
Strengthening of active citizenship through participatory decision-making processes	Calculated from anchor value	N/A	41.9	Value of being active among tenants	Housing Associations' Charitable Trust (HACT) Social Value Bank	10.0			
Better visiting experience	Calculated from anchor value	N/A	39.9	The cost of a local sensorial and/or digital guided tour garden	Sensorial and/or digital garden websites	8.0			X
Creation of social connections between visitors	Calculated from anchor value	N/A	38.9	Cost of one day of vacation in 2020	ISTAT (Italian National Statistical Institute) 2020	76.0	X	[55–59]	
Greater sense of belonging of the park to the local community	Calculated from anchor value	N/A	37.9	NOT FOUND					

Table 9. Monetary Alternative 1 and Monetary Alternative 2—fragile visitors.

Outcomes	Monetary Alternative 1			Monetary Alternative 2					
	Financial Proxy	Reference	Value (€)	Financial Proxy	Reference	Value (€)	Financial Proxies from Case Studies	Case Studies Used	Financial Proxies from Market Prices
Reduction of loneliness	Calculated from anchor value	N/A	45.5	Minimum cost of an individual session of stress management	According to the Italian Order of Psychologists' tariff	35.0	X	[55,56,59–63]	
Greater psycho-emotional wellbeing	Monthly yoga course	Local yoga website	45.0						
Better visiting experience	Calculated from anchor value	N/A	43.9	The cost of a local sensorial and/or digital guided tour garden	Sensorial and/or digital garden websites	8.0			X
Greater socialization among visitors	Calculated from anchor value	N/A	43.4	Cost of one day of party in the square	Elderly club tariff	26.5	X	[55–59]	
Better accessibility to the facility—increased physical activity		N/A	Not considered	Yearly value of elderly people making mild physical exercise	HEAT (Health Assessment Tool) from World Health Organization	2362.4	X	[38,56–59]	

Table 10. Monetary Alternative 1 and Monetary Alternative 2—caregivers.

Outcomes	Monetary Alternative 1			Monetary Alternative 2					
	Financial Proxy	Reference	Value (€)	Financial Proxy	Reference	Value (€)	Financial Proxies from Case Studies	Case Studies Used	Financial Proxies from Market Prices
Reduction of stress and anxiety associated with the caregiving experience	Minimum cost of a couple session of stress management	According to the Italian Order of Psychologists' tariff	45.0	Minimum cost of a couple session of stress management	According to the Italian Order of Psychologists' tariff	45.0	X	[62–64]	
Better visiting experience	Calculated from anchor value		43.9	The cost of a local sensorial and/or digital guided tour garden	Sensorial and/or digital garden websites	8.0			X
Greater socialization among visitors	Calculated from anchor value		43.4	Cost of a day of vacation in 2020	ISTAT (Italian National Statistical Institute) 2020	76.0	X		

For the non-fragile visitors' group, in in Table 8, the values were determined by finding market prices of services that would have given stakeholders the same level of benefit as the VSs.

Only "Creation of social connections between visitors" was found in the case studies considered. For "Greater sense of belonging of the park to the local community", even though rated as material, no associations with monetary worth were found, suggesting the need for further evidence on aspects relevant to society, but whose value is not identified in economic evaluations.

In Monetary Alternative 2, the financial proxies vary substantially, both among each other and in comparison to Monetary Alternative 1. The main differences are registered for "Strengthening of active citizenship through participatory decision-making processes" and "Better visiting experience", which are lower than all the other outcomes.

For the fragile visitors' group, compared to Monetary Alternative 1, "Better accessibility to the facility" was chosen for inclusion and counted as "Increased physical activity" outcome (Table 9), as the latter was considered significant in all the analyzed case studies related to walking experiences in UGS, and there is evidence of the correlation between physical changes in the built environment and changes in stakeholders' habits [23,65,66].

As for the non-fragile visitor group, "Better visiting experience" has the lowest value in Monetary Alternative 2. The value related to physical activity was calculated by employing the HEAT proposed by the WHO online platform (www.heatwalkingcycling.org, accessed on 17 July 2022). The appraisal does not, at first sight, align with the other values, the latter being noticeably higher, i.e., €2362.4 (Table 9). However, the number of stakeholders considered was significantly lower compared to other outcomes, i.e., 5% of non-active fragile people, which in turn are 54.8% of the Italian population (www.epicentro.iss.it, accessed on 4 August 2022). Out of the total of 645 (see Table 5) subjects identified in the municipal territory, 18 were the final number determined. Thus, when considering yearly values, this has the same order of magnitude as the other proxies.

The values associated to the caregiver category were aligned to the non-fragile visitors regarding the visiting experience and the greater socialization hypothesized due to the VSs.

4. Discussion

The implemented actions within the UGS have irreversible consequences for future cities. Shedding light on the co-benefits UGS interventions supply is essential to raise stakeholders' awareness and influence decision-making by providing evidence on the improvement they bring directly to citizens' health and wellbeing compared to non-green use of land. The evaluation of co-benefits is key to increasing climate sensitivity in future urban resource management. Communication needs to be clear and, most importantly, to point out the changes that local actors are interested in at the individual level, rather than specifying the performance achieved only from a KPI perspective. In fact, people do not act driven by environmentally rational motivations [67]; rather, they need to be provided with an understanding of how their daily lives would change, especially when considering urban transformation and policy change occurrence [68].

From the experience of applying the SROI in the present study enriching elements emerged from the analysis: (i) the ability to construct a storyline around expected changes through a robust set of steps, discussing stakeholders' needs; (ii) the collection of the key points for each outcome, both positive and negative, gave project partners a clear view on how to improve VSs; (iii) stakeholders' direct suggestions and data checked by the latter constitute the strength of the whole process; (iv) the creation of a solid narrative for the project itself; (v) the building of trust thanks to transparency and clear "language"; (vi) the facilitation of co-design practices; (vii) the acknowledgment of the fact that workshop executions in the field are as important as the preparation of the questionnaires: stakeholders are different to each other, and the elderly can be more demanding, therefore graphic representation of concepts is necessary to accelerate comprehension.

Moreover, the two monetization processes performed in the case study highlighted relevant aspects of the SROI analysis implementation; among these the crucial factors are:

- The monetary values can significantly vary based on the proxy chosen, whilst the relevance of the body of knowledge gained from the engagement with stakeholders stays unchanged.
- The financial proxies assigned can guide decision-making by identifying the outcomes linked to a higher social value, without overlooking stakeholders' perceptions.
- Monetary value is not the main focus of the SROI; nonetheless, having more precise financial proxies can empower the decision-making process based on the performed analysis and increase credibility.
- While, in Monetary Alternative 1, the values are similar to each other, as they express a weighted value rather than a market price or direct stakeholders' willingness to pay, and the impact depends mostly on the number of people that will experience each outcome and on the discount factors, Monetary Alternative 2 gives better guidance on where to direct investments, since it counts as independent variables not only the stakeholders' rankings, the qualitative information obtained, and the discount factors, but also the monetary worth. Therefore, Monetary Alternative 2 gives a more credible basis for the prioritization of one outcome compared to another.

It is worth mentioning that the methodology has limitations in its application due to its subjective nature and lack of model case studies; nonetheless, its potential is overseen by international organizations such as the WHO, in the context of the Health 2020 and the 2030 Agenda [69], which considers it an adequate framework to promote the understanding of the co-benefits to health and wellbeing that actions for sustainability can provide.

Interesting future developments are overseen in the work of Richard on Sustainable Return on Investment (SuROI), which embeds within SROI the Ecosystem Services Assessment (ESA) methodology using social metrics [53].

5. Conclusions

The study, developed in the framework of the EU project VARCITIES, in the analysed Italian city, provides an innovative application of the SROI methodology for the evaluation of an urban project, by supporting a bottom-up assessment process. Local stakeholders have been involved in estimating the perceived value of innovative socio-digital-natural solutions aimed at solving usability issues for a historical garden, difficult to access because of both physical and management factors. The SROI methodology proposed proved to be a bridge between the project goals and the stakeholders' voice on the intervention. Two monetization alternatives have been performed: the first by following the "anchoring technique", using a financial proxy assignment, the second using the standard method foreseen by the SROI methodology, i.e., each of the outcomes was associated with a distinct monetary value. However, the objective of running an SROI analysis not the achievement of a monetary estimation; it is, instead, the engagement process and the quality of the data obtained, that justify the SROI employment as a social performance evaluation of projects. Moreover, the latter evaluation exercise has shed light on the complexity of finding adequate values for social outcomes related to innovative solutions and urban transformation projects in general. In fact, the SROI framework was only recently, and rarely, explored from the perspective of urban interventions, and the link between the benefits derived from the interaction between human beings and nature has not yet been developed in the literature from an evaluative point of view. The results of this research paper contribute to the acknowledgment of the gaps in the current scientific literature and suggest ways how to improve the framework by integrating already consolidated tools and methods to make the SROI a more suitable evaluation technique for UGS interventions.

The use of SROI in the evaluation of Nature-based Solutions combined with Digital technologies is only just beginning. Further lines of research may involve both methodologies for engaging stakeholders (through digital, gamification, and immersive or augmented reality tools in foreshadowing transformations), and insights into the creation of a database

of proxies and monetary values for use in similar contexts; in addition, the explicit use of MCDA in combination with SROI deserves better investigation.

Supplementary Materials: The following supporting information can be downloaded at: Video S1: <https://www.youtube.com/watch?v=Z8nNXhOu5r0> (accessed on 17 April 2024).

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Abbreviations

BAU	Business as Usual
CBA	Cost Benefit Analysis
DS	Digital Solutions
ENPV	Economic Net Present Value
ERR	Economic Return Rate
ES	Ecosystem Services
ESA	Ecosystem Services Analysis
HACT	Housing Associations’ Charitable Trust
HEAT	Health Assessment Tool
ICT	Information and Communication Technology
IoT	Internet of Things
KPI	Key Performance Indicator
MCDA	Multi-Criteria Decision Analysis
NBS	Nature Based Solutions
NPV	Net Present Value
ROI	Return on Investment
SDR	Social Discount
SROI	Social Return on Investment
STK	Stakeholders
SuROI	Sustainable Return on Investment
ToC	Theory of Change
UGS	Urban Green Spaces
VS	Visionary Nature Based Solutions
WHO	World Health Organization
WTP	Willingness to Pay

Appendix A

Eleven case studies were selected as best fitted to provide benchmark monetary values for SROI outcomes. The criteria for choosing them were the outcomes, the activities proposed, and the stakeholder groups analyzed.

Five out of all the outcomes defined within the Theories of Change (ToC) were found in the literature and a full comparison among them was possible. The value ranges of these outcomes are described in Table 7. A set of steps needed to be considered to establish comparable values:

- All values have been transformed in the same currency, i.e., “€”
- Values referred to different durations of the activities and therefore of the benefits, thus it was decided to consider weekly values, as the outcome indicator is the number of visitors, without information on the recurrence of the visits of the same stakeholders. Only in the outcome related to an increase in physical activity an annual value was used.
- In all cases where the benefits were expressed annually, the values were transformed into a weekly value, dividing the proxies by the number of weeks in a year simplified into four per month, therefore 48 weeks. Vice versa, in case values were expressed in weekly terms, they were multiplied by 48. The proxies that described a single session of an activity were considered as weekly values.

Table A1. Analyzed case studies table.

Case Study	Reference
Case 1	[38]
Case 2	[55]
Case 3	[56]
Case 4	[59]
Case 5	[58]
Case 6	[57]
Case 7	[62]
Case 8	[60]
Case 9	[63]
Case 10	[61]
Case 11	[64]

Appendix B

Table A2. Case study analysis for: Non-fragile visitors’ group—“Creation of social connections between visitors” outcome.

	Case 2	Case 6	Case 4	Case 5	Case 3
Outcome	Walkers have more social contacts and are now more confident, experience less isolation and take part in new experiences	The project increased candidates’ ability and confidence to meet new people	Improved interpersonal relationships	Feeling happier as a result of increased opportunities, meeting new people, establishing new friendships and social connections	Walkers have more social contacts and are now more confident, experience less isolation and take part in new experiences
Output	18 walking groups—35 walking sessions a year	min 20 h outside—4 challenges to accomplish in discovering a natural site	mobile walking application	30 walking sessions provided each year	30 sessions of walking groups a year

Table A2. Cont.

	Case 2	Case 6	Case 4	Case 5	Case 3
Outcome Indicator	No of walkers reporting additional social contacts	Number of new opportunities for socializing and meeting people	No of people experiencing more walks with family and friends	No of walkers reporting additional social contacts	No of walkers reporting additional social contacts
Quantity	137 persons 90%	56 times (8 days × 7 candidates)	1455 persons 10%	24 persons 75%	66 persons 26%
Financial Proxy	average cost of joining a club/organization in Glasgow	Average weekly spend on social activities (broken down from annual average spend)	Weighted average of budget and activities for achieving same level of outcomes: Scenario A/B/C	Average cost of various different local sports and social clubs	cost of a sports social club in Stirling
Value (£)	£50.00	£10.00	£50.06/56.64/106.70	£5.00	£320.00
Deadweight	7%	10%	62%	0%	7%
Deadweight Determination	- research - experience - STK feedback	- experts assumption	- STK feedback through online questionnaire	- expert assumption based on STK feedback	- research - experience - STK feedback
Attribution	5%	25%	51%	0%	10%
Attribution Determination	- research - experience - STK feedback	- expert assumption based on STK feedback	- STK feedback through online questionnaire	- expert assumption based on STK feedback	- STK feedback - consultation

Appendix C

Table A3. Case study analysis for: Fragile visitors' group—"Greater psycho-emotional wellbeing" outcome.

	Case 9	Case 2	Case 4	Case 3	Case 8	Case 10
Outcome	Regular attendance brings mental stimulation, a more positive outlook, and reduced levels of anxiety and depression	Walkers and walk leaders who have experienced mental health problems are able to engage in physical activity and feel happier and positive	Stress relief	Walkers who have experienced mental health problems are able to engage in physical activity and feel happier and positive	Greater propensity in carrying out recreational activities—Isolation Reduction	Emotional wellbeing (LEAF)
Output	art classes	35 walking sessions provided each year	mobile walking application	30 walking sessions provided each year	caregiving assistance	caregiving assistance
Outcome Indicator	No. reporting feeling less down, depressed, or hopeless; No. reporting improved concentration; No. reporting reduced use of anti-depressants.	"No. of walkers with clinically diagnosed mental health problems who have an increased sense of wellbeing"	No of people stating that walking makes them feel less worried and stressed, while feeling more energetic and that The Cathay Walker campaign relieves work stress	No. of walkers with clinically diagnosed mental health problems who have an increased sense of wellbeing	No of persons who experience the change	No of persons who experience the change
Quantity	68 persons 98%	60 persons 39%	5527 persons 39%	16 persons 6%	1.196 persons 100%	110 persons 56%
Financial Proxy	Weekly stress counselling sessions	75% increase in average spend on social trips out	Weighted average of budget and activities for achieving same level of outcomes	Increase in spend on social trips and events	value of hours spent on recreational activities and/or participation in social life (monthly)	Value for relief from depression and anxiety (adult)
Value (£)	£2080.00	£43.20	£4925.00	£655.20	£40.00	£353.00
Deadweight	17%	15%	64%	7%	35%	0%
Deadweight Determination	- STK feedback—through interviews	STK feedback	- STK feedback through online questionnaire	- research - experience - STK feedback	STK feedback	experts' assumption based on LEAF questionnaires
Attribution	19%	21%	50%	10%	20%	50%
Attribution Determination	- STK feedback—through interviews	STK feedback—consultation	- STK feedback through online questionnaire	- STK feedback - consultation	- STK feedback	- conservative estimation: - experts' assumption

Appendix D

Table A4. Case study analysis for: Fragile visitors' group—"Greater socialization among visitors" outcome.

	Case 2	Case 6	Case 4	Case 5	Case 3
Outcome	Walkers have more social contacts and are now more confident, experience less isolation and take part in new experiences	The project increased candidates' ability and confidence to meet new people	Improved interpersonal relationships	Feeling happier as a result of increased opportunities, meeting new people, establishing new friendships and social connections	Walkers have more social contacts and are now more confident, experience less isolation and take part in new experiences
Output	18 walking groups—35 walking sessions a year	min 20 h outside—4 challenges to accomplish in discovering a natural site	mobile walking application	30 walking sessions provided each year	30 sessions of walking groups a year
Outcome Indicator	No of walkers reporting additional social contacts	Number of new opportunities for socializing and meeting people	No of people experiencing more walks with family and friends	No of walkers reporting additional social contacts	No of walkers reporting additional social contacts
Quantity	137 persons 90%	56 times (8 days × 7 candidates)	1455 persons 10%	24 persons 75%	66 persons 26%
Financial Proxy	average cost of joining a club/organization in Glasgow	Average weekly spend on social activities (broken down from annual average spend)	Weighted average of budget and activities for achieving same level of outcomes (annual values) Scenario A/B/C	Average cost of various different local sports and social clubs	cost of a sports social club in Stirling
Value (£)	£50.00	£10.00	£50.06/56.64/106.70	£5.00	£320.00
Deadweight	7%	10%	62%	0%	7%
Deadweight Determination	- research - experience - STK feedback	- experts assumption	- STK feedback through online questionnaire	- expert assumption based on STK feedback	- research - experience - STK feedback
Attribution	5%	25%	51%	0%	10%
Attribution Determination	- research - experience - STK feedback	- expert assumption based on STK feedback	- STK feedback through online questionnaire	- expert assumption based on STK feedback	- STK feedback - consultation

Appendix E

Table A5. Case study analysis for: Fragile visitors' group: "Better accessibility to the facility, i.e., increased physical activity" outcome.

	Case 6	Case 3	Case 4	Case 3	Case 1	Case 5
Outcome	Candidates are more physically active due to use of the outdoors for recreation	Walkers with diagnosed physical medical conditions are able to engage in physical activity and as a result feel fitter and become healthier	Better physical health	Walkers are fitter and have improved physical health as a result of becoming more regularly physically active	Health improving	Maintaining or not eroding current physical health and fitness levels
Output	min 20 h outside—4 challenges to accomplish in discovering a natural site	30 walking sessions provided each year	mobile walking application	30 walking sessions provided each year	The construction of a greenway	30 walking sessions provided each year

Table A5. Cont.

	Case 6	Case 3	Case 4	Case 3	Case 1	Case 5
Outcome Indicator	“Number of hours candidates report they are more physically active”	No. of walkers reporting clinical improvements in their medical condition	“Helps get into habit of exercise/walking. Feel more energetic and less fatigued. Better cardiovascular function Lose weight Lowered BMI”	No. of walkers who report improved levels of physical fitness	Percentage of inactive population at baseline that begins making physical activity	Number of participants reporting an Increase in fitness levels
Quantity	7 persons 100%	16 persons 6%	5850 persons 42%	99 persons 40%	hypothesis: 5%—60 persons	32 persons 100%
Financial Proxy	Equivalent of paying to attend a gym	20% reduction on spend on health per year	Weighted average of budget and activities for achieving same level of outcomes (weekly value)	Cost of a swimming session	Multiplying the total number of deaths each year, for each disease by the value of a statistical life	Cost of a swimming session as a form of low impact physical activity
Value (£)	£5.73	£67.60	£413.28	£120.00	£11,562.73	£2.33
Deadweight	0%	7%	64%	7%	0%	15%
Deadweight Determination	- experts assumption	- research experience - STK feedback	- STK feedback through online questionnaire	- research experience - STK feedback	- expert assumption	- expert assumption based on STK feedback
Attribution	25%	10%	49%	10%	0%	0%
Attribution Determination	- expert assumption based on STK feedback	- research experience - STK feedback	- STK feedback through online questionnaire	- research experience - STK feedback	- expert assumption	- expert assumption based on STK feedback

Appendix F

Table A6. Case study analysis for: Caregivers: “Reduction of stress associated to the caregiving experience” outcome.

	Case 9	Case 11	Case 7
Outcome	Family members worry less about their loved one	Carers experience a reduction in stress and burden of care	Reduction of stress and anxiety
Output	art classes	group activities, and games	transportation service to hospital patients
Outcome Indicator	No. of instances of worry or concern for the older person in an average week; No. reporting a more positive outlook about the older person’s prospects.	Proportion of carers reporting decrease in stress over worrying about their relative wellbeing.	percentage of persons who declared this outcome happened
Quantity	64 persons 89%	10 persons 100%	88%
Financial Proxy	Stress counselling sessions	Average cost of mental health services per individual per year (anxiety and depression).	Cost of a cycle of individual stress management sessions
Value (£)	£480.00	£1122.47	£735
Deadweight	5%	66%	45%
Deadweight Determination	- STK feedback—through interviews	- external data	- STK feedback through questionnaires
Attribution	0%	50%	20%
Attribution Determination	- STK feedback—through interviews	- assumption by experts	- STK feedback through questionnaires

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