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Highlights

- The paper deals with the regeneration of abandoned rural buildings in a UNESCO site
- The focus of the paper is on local community involvement and co-design aspects
- The intervention integrates stakeholders' analysis with a stated preference method
- Community members provided input to both problem structuring and solving
- The paper contributes to the debate about how to innovatively co-design alternatives

Co-designing the solution space for rural regeneration in a new World Heritage site: a Choice Experiments approach

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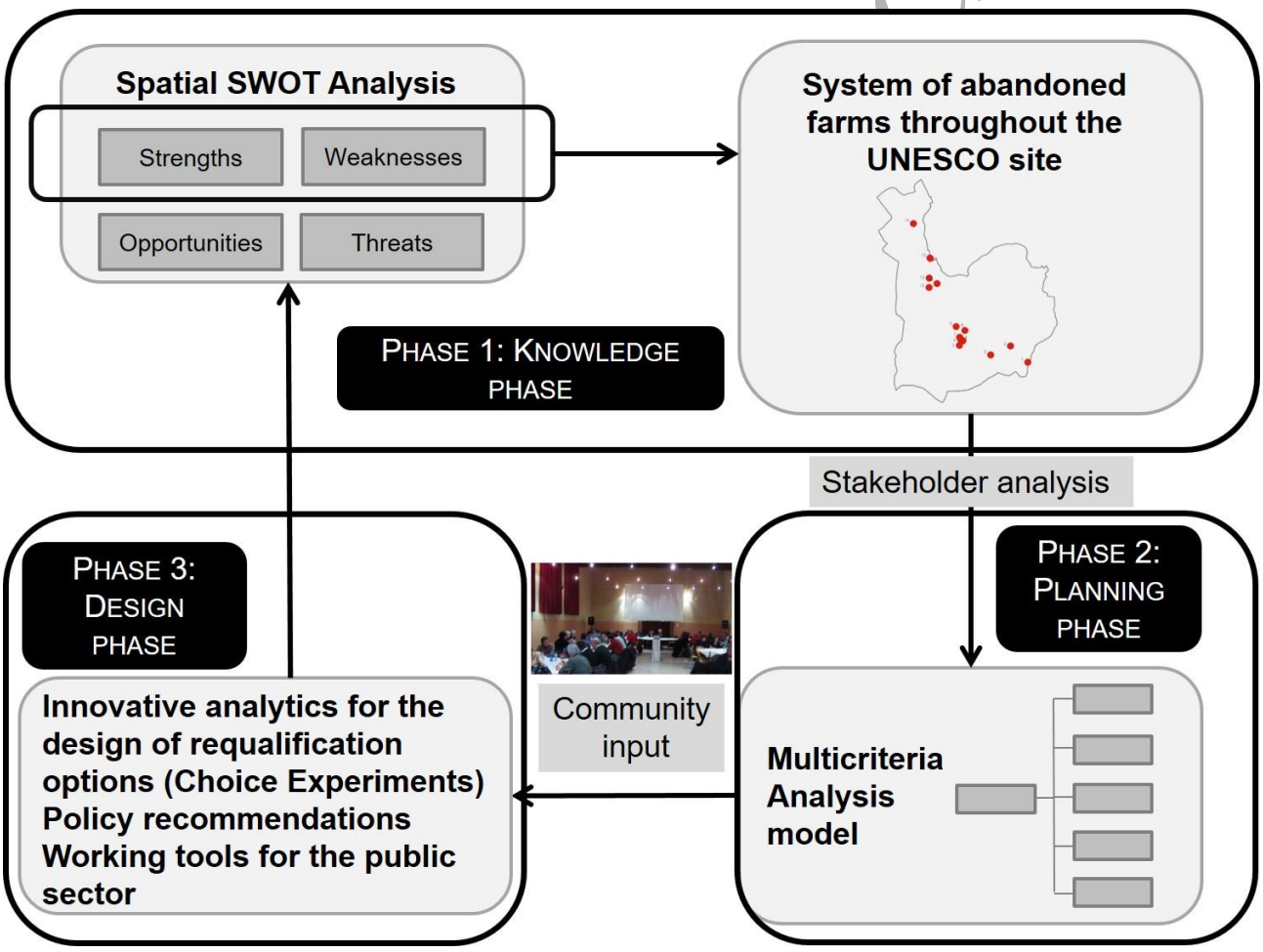
Graphical abstract



Abstract

This study develops a participatory multi-methodology intervention designed and deployed to support planning and management of a new World Heritage site, the vineyard landscape of Langhe, Roero and Monferrato, in Northern Italy. The purpose of the study was to support community involvement in the design phase of urban regeneration alternatives. The ultimate objective was to propose practical recommendations

for a sustainable regeneration strategy to the Municipal Authority of La Morra, one of the villages located within the core area of the World Heritage site.

The analysis context represents a complex territorial system and a challenging decision-making environment due to the presence of: (i) conflicting needs co-existing in the same geographical area, i.e. preservation needs of the World Heritage on one side, and new development needs on the other, (ii) many stakeholders (i.e. residents, tourists, territorial authorities, tourism associations and environmental advocates), and (iii) presence of marginalized communities that are at risk due to the strong trend towards the abandonment of rural areas for big cities. Within this context, the authors propose the use of Stakeholders' Analysis and Choice Experiments to co-design, together with stakeholders and the local community, feasible strategies for the regeneration of the abandoned rural buildings scattered across the core World Heritage Site. Indeed, the community issue of abandoned rural heritage emerged as both an important weakness of the territorial system under analysis and as an interesting opportunity for rural regeneration.

The results obtained illustrate the importance of integrated approaches for the development of accountable public decision processes and consensus policy alternatives.

Keywords: Community OR; multi-methodology; cultural heritage; discrete choice models; Spatial SWOT Analysis.

1. Introduction

The United Nations Educational, Scientific and Cultural Organization (UNESCO) seeks to encourage the identification, protection and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity. This is embodied in an international treaty called the Convention Concerning the Protection of the World Cultural and Natural Heritage, adopted by UNESCO in 1972. What makes the concept of World Heritage exceptional is its universal application: World Heritage sites belong to all the peoples of the world, irrespective of the territory on which they are located (UNESCO, 2017).

There are several types of dangers for both natural and cultural properties which can threaten the conservation of World Heritage Sites, such as the serious decline in the population of an endangered species caused by human activities, the deterioration of materials, structure, ornaments or architectural coherence, the abandonment of buildings, development projects, armed conflicts, insufficient management systems or changes in the legal protective status of the properties.

Monitoring the presence of abandoned buildings and infrastructures within these areas of outstanding universal value is thus of crucial importance to increase international awareness of threats and to encourage counteractive measures.

Indeed, abandoned buildings may represent an important aesthetic, cultural and economic resource and provide available spaces for new activities, supporting sustainable local development and regeneration processes (e.g. Ferretti and Degioanni, 2017; Shipley et al., 2006; Zavadskas and Antucheviciene, 2007).

Their reuse is thus worldwide increasingly seen as an important means for reducing the consumption of land and natural resources.

Within this context, the identification and evaluation of feasible alternatives for the requalification of disused buildings represents a complex decision making problem. Indeed, reusing abandoned buildings means dealing with partially conflicting goals of maximizing land value, minimizing remediation costs, preserving the buildings characteristics for historical and aesthetic reasons and fostering urban and rural regeneration.

Within this context, an approach that has recently emerged as particularly promising is Community-Based Operational Research (CBOR, Johnson, 2012), a new sub-discipline within Operational Research (OR) and Management Sciences (MS). CBOR and related mixed-methods approaches within OR/MS synthesize previous practice and research traditions within OR/MS to address problems in the public sector that are often of a localized nature, address the concerns of disadvantaged populations, and are solved using diverse qualitative and quantitative methods. The closest antecedents of CBOR are the well-studied fields of Community Operational Research (Midgley, et al., 2018, Midgley and Ochoa-Arias, 2004), problem structuring methods (Rosenhead and Mingers, 2001), and soft systems methodologies (Checkland and Poulter, 2006).

Methods in CBOR may vary widely, from traditional instances of prescriptive math models to a combination of qualitative and quantitative methods that may have much in common with related disciplines such as community planning, public health, and criminology.

In common with Community OR (Midgley and Ochoa-Arias, 2004), CBOR benefits from multi-method, cross-disciplinary, comparative approaches and appropriate technology rooted in OR/MS (Johnson, 2012a).

The recent trend in quantitative and prescriptive modeling called analytics (French et al., 2007; Libertore & Luo, 2010; Tsoukiàs et al., 2013) represents a substantial contribution to CBOR as it supports a notion of generalized insight into problems of operations, uses a wide variety of quantitative methods, and is intended to support changes in policy and practice (Johnson, 2012a).

This paper discusses a multi-methodology intervention deployed to support planning and management in a new World Heritage site. In particular, the discussion will focus on the design phase of alternative regeneration strategies for abandoned rural heritage within the UNESCO area of Langhe, Roero and Monferrato in the Piedmont Region of Italy, taking into account the preferences and expectations of the local communities through a collaborative process.

The research outlined in this paper contributes to the debate about how to design innovative alternative solutions (Colorni and Tsoukiàs, 2013), by proposing and implementing a tool for co-designing alternatives together with the local community.

The remainder of the manuscript is organized as follows: Section 2 discusses the state of the art of the research in the field of alternatives generation and design and provides the rationale for selecting Choice Experiments in the present intervention, while Section 3 illustrates how the proposed tools have been applied to support planning and management in the UNESCO area of Langhe, Roero and Monferrato. Section 4 concludes by discussing insights and implications for policy and practice.

2. Designing the solution space in public policy making

Recent international trends have recognized that a key challenge for policy making and decision theory refers to the design of alternative options (Colorni and Tsoukiàs, 2013). Indeed, no matter how good and sophisticated the evaluation is, if all the options under analysis are weak, the result will be a recommendation for a weak option.

Most emphasis in the operational research and decision analysis streams has indeed been on evaluation of alternatives, resulting in the development of guidelines for public policy evaluation at different levels (e.g. the Green and Magenta Books of the UK Government[1] and the Public Policy Assessment Book of the UK Government[2]), but with limited consideration to support policy design (Ferretti et al., under review).

Surprisingly, most decision problems discussed in the literature consider the set of alternatives as "given", although in practice such a set frequently needs to be constructed. There is little in the literature addressing this problem (see Belton and Stewart 2002 for a brief overview), despite the awareness of it (for example, Keeney 1996; Goodwin and Wright 1998; Keller and Ho 1988; Newstead et al., 2002). Simon (1955) discussed this cognitive activity in his seminal work, without providing operational and/or formal methods for addressing it. There have also been suggestions for value-focused brainstorming of decision alternatives (e.g. Keeney, 1996), an approach which is resonant with Corner et al. (2001) dynamic decision problem structuring. Finally, insights on how to understand and structure a decision-making problem together with its possible strategic directions have been developed within the stream of Soft System Methodologies (e.g. Eden, 2004).

A first attempt to identify common points between design theory and decision aiding has been developed by Lue (2015). Indeed, both the design and OR communities faced a crisis linked to the application of systematic mathematical methods to real world problems. The two communities reacted in different ways, because of the expertise and background of their respective researchers and practitioners. However, they share the same underlying challenge, i.e. designing or aiding decisions in problems which are, by definition, wicked (or ill-defined, or messy). Moreover, a need for formalized methods to aid the design process seems to have emerged in the design community and at the same time a need for "innovative" tools outside the usual toolbox of the OR practitioner seems to have been highlighted in OR community (Lue, 2015).

Preliminary investigations are currently being conducted to understand which tools can be used to support alternatives design in public policy making, which work better and when. Ferretti (2016a) has identified three promising approaches for alternatives design in policy making. The first one is Spatial multicriteria evaluation (Malczewski, 2006; Ferretti, 2013): by overlaying spatial maps for each indicator, it enables the discovery of suitable areas for the location of a new "object" (i.e. areas with high concentration of positive scores across adjacent cells), as well as unsuitable areas (i.e. areas with high concentration of negative scores across adjacent cells). The second tool is Choice-based conjoint analysis (Lancaster, 1966): by decomposing

[1] http://www.hm-treasury.gov.uk/d/green_book_complete.pdf; http://www.hm-treasury.gov.uk/d/magenta_book_combined.pdf

[2] http://www.bis.gov.uk/assets/biscore/better-regulation/docs/i/11-1111-impact-assessment-guidance.pdf

a good or service into attributes with different levels and asking users to choose between different combinations of attributes' levels, it enables the discovery of the most important characteristics on which to focus the attention in the design of the new product or service (e.g. Ferretti, 2016b). The third approach is Value-focused thinking design (Keeney, 1996): by focusing on the values that should be guiding the decision situation, it removes the anchor on narrowly defined alternatives and makes the search for new alternatives a creative and productive exercise.

Among the aforementioned tools, this paper proposes the use of Choice-based conjoint analysis to co-design, together with the local community, sustainable strategies for the regeneration of the abandoned buildings located in a new World Heritage site in Italy. The reasons for the selection of this approach in the present study can be summarized as follows: (i) the need for the regeneration of abandoned buildings emerged as a community issue in the geographical area under analysis, thus prompting for the development of a collaborative design process, (ii) one of the municipalities within the core UNESCO area expressed the willingness to take community input into account for designing feasible solutions to regenerate abandoned heritage, and (iii) the community in this context is made of residents within the geographical area under analysis as well as of tourists (i.e. non-technical experts), thus prompting for the use of user-friendly preference elicitation protocols. Choice experiments comply with the above demands by proposing user friendly elicitation protocols/experiments to help local residents and tourists advocate for their needs and for the development of local services, thus allowing a value-driven planning procedure rather than a data-driven one.

The choice of which tool to use to design alternatives thus strongly depends on the characteristics of the decision-making problem under analysis, as well as on the phase of the process that the tool is conceived to support and on the type and amount of community or experts' engagement in the process. Spatial multicriteria evaluation and value-focused thinking were indeed used in the initial phases of the decision-making process discussed in this paper to identify key areas needing intervention in the region under analysis and to define the system of values and objectives for the requalification of the abandoned heritage, respectively (the interested reader can refer to Ferretti, 2016b for more details about the initial phases of the process). However, we found that choice experiments are more suited to support the design of possible solutions when large community input has to be taken into account and user friendly preference elicitation protocols are required (e.g. Hoyos, 2010).

3. The project: fostering rural regeneration in a new World Heritage site

3.1 The territorial context under analysis

The Piedmont Region, located in the North West of Italy, represents an exceptional example of the long-term winemaking tradition in Italy. Different combinations of climate and ecosystems have produced a suitable environment for the development of numerous grape varieties. This has been the fundamental basis for the establishment of viticulture as a productive and important activity since ancient times. This cultivar-cultural

tradition is particularly evident in the territories of Langhe, Roero and Monferrato, not only for the strong and unquestioned economic and social role of modern wine production but especially for the structure of the stunning landscape of this area, which has been shaped by nature in a unique way for centuries. The current landscape is the result of a strong attachment to the land by countless generations of winemakers and centuries of constant hard work, necessary for the implementation of an agrarian transformation of exceptional size (SiTI, 2013).

Given the aforementioned characteristics, the landscape of Langhe, Roero and Monferrato has very recently been added to the UNESCO World Heritage List (Figure 1, SiTI, 2013). The property forming the Core Area of the UNESCO site consists of six components (named "Langa del Barolo," "Grinzane Cavour Castle," "Hills of Barbaresco," "Nizza Monferrato and Barbera," "Canelli and Asti Spumanti," "Monferrato of the Infernot"). These represent specific natural, man-made, and perceptive characters which, in their essence and reciprocal relations, help represent the numerous aspects of the millenary "wine culture" on which the landscape has been remarkably molded via an ongoing relationship between man and nature. This Core Area is surrounded by a Buffer Area (Figure 2) which aims at providing an additional layer of protection to the World Heritage property.

Figure 1 Vineyards in the Langhe area (source: SiTI, 2013)

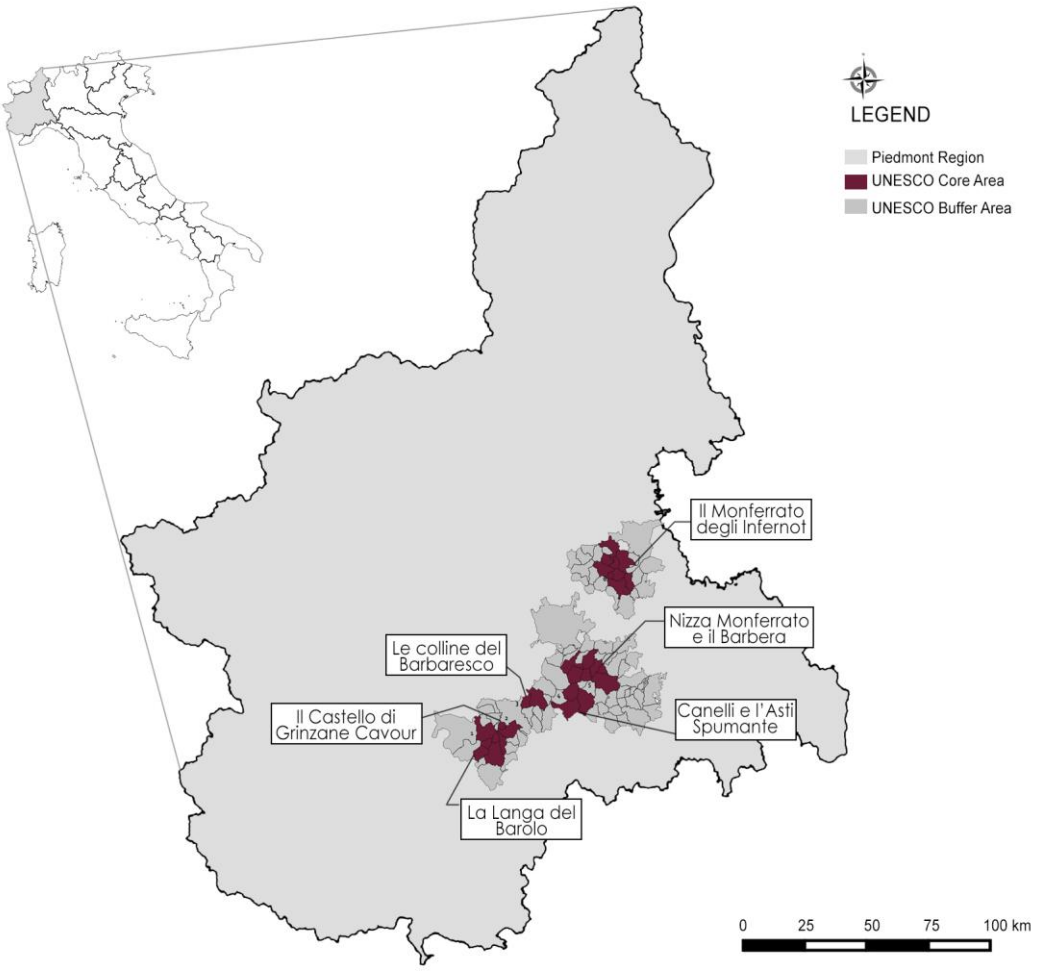


Figure 2 Geographical localization of the Langhe, Roero and Monferrato UNESCO site

Becoming a UNESCO site means that conflicting needs coexist in the same geographical area. One of these is conservation and protection needs, as local authorities are required by law to protect the exceptional value of the site and thus any development/new project within the site becomes extremely constrained from the planning point of view. Another of these is new development needs to improve the quality of life of the local communities from both the environmental and social points of view.

In particular, as the site under analysis is a rural area, although with multiple exceptional values (i.e. environmental, architectural and economic), local marginalized communities are at risk and a strong trend has been highlighted in recent years towards the abandonment of villages for big cities. This area thus represents a complex territorial system and a challenging decision-making environment. There are a number of stakeholders with an interest in solving this design problem: local marginalized communities, tourists from all over the world who come to admire the stunning landscape modeled through centuries and to taste the remarkable food and wines, territorial authorities, who need to allocate resources in a sustainable way across all municipalities included in the core UNESCO area, tourism associations, who promote the exceptional value of the local landscape and cultural traditions and, finally, environmental advocates, who seek to preserve biodiversity in this unique and challenging context.

According to the taxonomy of problem contexts proposed by Jackson (2004), the problem under analysis in this project belongs to the "Systemic-Pluralist" category, due to the presence of complex issues that cannot easily be reduced to those reflecting the needs of a single stakeholder. This type of problem context is indeed the one for which the use of community-based operational research (CBOR) has proved to be more promising compared to other methods (Johnson, 2012a). In addition to the aforementioned characteristics of the problem, a CBOR approach based on multi-methodologies is appropriate to address the importance of space and place in policy design for UNESCO sites, the presence of under-represented populations in the geographical area under analysis and the need for a cross-disciplinary approach (i.e. reflecting the multidimensional profile of the context under analysis, calling for expertise on spatial analysis, landscape architecture, decision science and collaborative processes facilitation). We explore this topic further in the following section.

3.2 The process: from the knowledge phase, to planning and design in a new World Heritage site

As highlighted in the introduction, Community Based Operational Research benefits from both quantitative methods, to provide numerical outputs for stakeholders' and Decision Makers' consideration, and qualitative methods, to define relevant aspects and to reach a common understanding of the decision problem. As a consequence, an approach that seems particularly promising in this context is multi-methodology. Since the publication of Mingers and Brocklesby's (1997) seminal paper, there has been an increasing interest in exploiting the opportunities offered by mixing operational research methodologies, methods and tools to increase our ability to tackle the complexity and multi-dimensional nature of real-world problems situations (e.g. Morse and Niehous, 2009; Creswell and Plano Clark, 2011).

Mixing may simply involve a straightforward comparison of the methods' outputs or an improvement of a method by taking on elements of another method (Bennett, 1985). Another type of mixing is true mixing, in which methods (or some parts of them) are progressively linked to complement each other or to cover a larger proportion of the different tasks in a planning process (Howick and Ackermann, 2011).

Mingers (2001) explained how mixed methods can enable analysts to flexibly address multiple phases of a project, from understanding the problem from the perspective of stakeholders, to the assessment of proposed explanations, and implementation of actions to bring about changes.

As observed by Myllyviita et al. (2014), although there is a wide scholarly discussion on mixing methods, successful examples drawing from field data are still scares, especially in environmental decision and policy making. Moreover, so far the assumed benefits of using mixed methods have not been systematically tested (Henao and Franco, 2016). There is thus an evident need to pursue and to better communicate the benefits of mixing (Myllyviita et al., 2014). The research presented in this paper is an attempt to fill in this gap and further contribute to the increasing literature on multi-methodology applications.

Figure 3 describes the overall process through which the authors supported the UNESCO area under analysis in the definition of new strategies for its development.

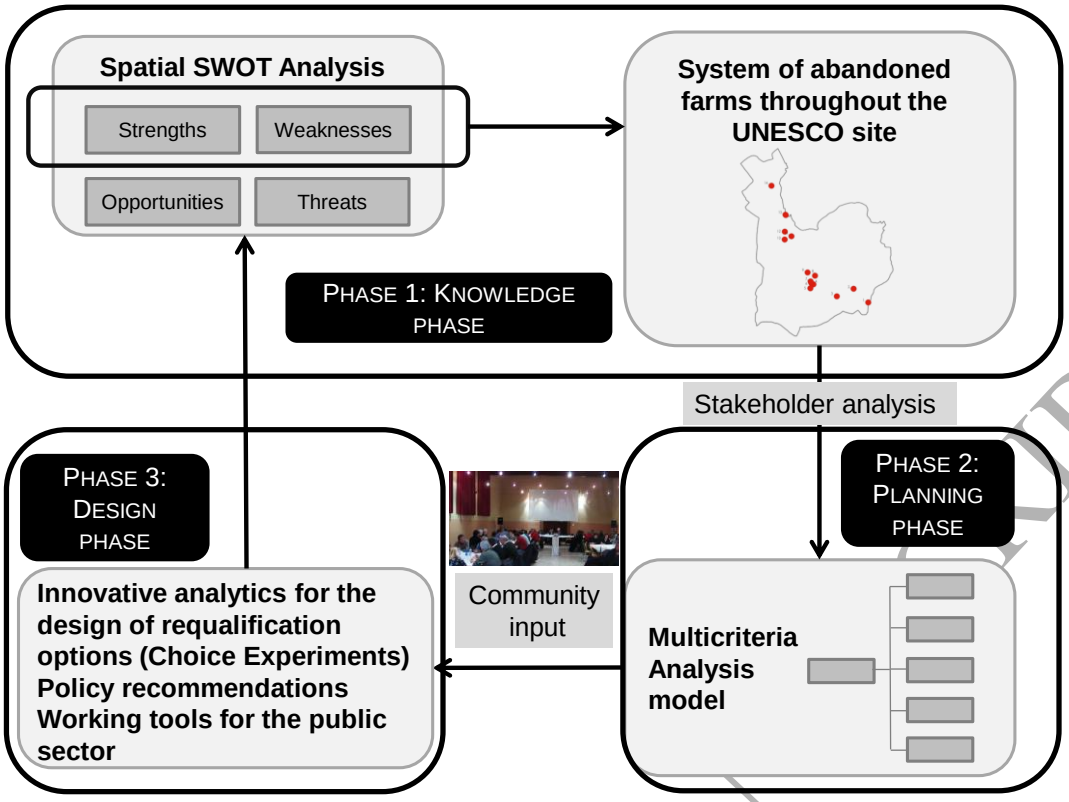


Figure 3 The multi-methodology intervention deployed in this project

The clients of this project are the Tourism organization of Alba, Bra, Langhe and Roero (from phase 1 to phase 3 of the process) and the Technical Office of La Morra Municipality (from phase 2 to phase 3 of the process).

It is worth highlighting that, given the presence of multiple stakeholders and thus the need for a collaborative decision-making process, we employed a facilitated modelling approach. This means that we conducted the whole analysis (i.e. from phase 1 to phase 3) together with decision makers, consultants and experts involved in the decision-making problem: from structuring and defining the problem situation of interest, to supporting the evaluation of priorities and the development of plans for subsequent implementation. Throughout the decision-making process, we worked both as analysts and as facilitators of the decision-making process, thus implementing an action research approach. Action research (Burns, 2007) enables the researcher and the client to build theory, understanding, and best practices together.

Phase 1 (Problem identification – knowledge phase)

Following the Community Based Operational Research analytical steps (Johnson, 2012b), the first phase of the process is the problem identification phase (i.e. knowledge phase).

Situations which are not acceptable to stakeholders may not lead at first glance to the statement of a problem to be solved, or may lead to multiple problems whose statements may be contradictory or so messy to defy representation in ways amenable to mathematical analysis (Johnson, 2012a).

This is indeed what happened in the UNESCO area of Langhe, Roero and Monferrato. At first glance, a statement of a problem to be solved was absent. There was, however, high awareness coming from different stakeholders (i.e. the research institute responsible for the UNESCO candidacy of the area and the Mayors of the different municipalities included in the Core Area as well as in the Buffer Area) concerning the need to map the territorial strengths and weaknesses of the area to properly support its planning and management.

To address the important role of place and neighborhood in determining the spatial extent of issues to be solved and opportunities to be exploited in the UNESCO area under analysis, Phase 1 of this project combined Strengths, Weaknesses, Opportunities and Threats Analysis (SWOT), Geographic Information Systems (GIS) and Multicriteria Analysis (MCDA, e.g. Belton and Stewart, 2002) to develop a spatial SWOT (e.g. Comino and Ferretti, 2016). SWOT analysis is a commonly used tool to study the external and internal factors that affect a decision situation (Wheelen and Hunger, 1995). The objective of a spatial SWOT analysis is to provide comprehensive support early in the life cycle of a project/ process/ decision to strengthen and guide its development. We used SWOT analysis in phase 1 of this project for two reasons. First, the initial knowledge phase aimed to capture and structure both negative and positive aspects of the decision context under analysis to better understand its inherent complexities and characteristics. Second, given that the decision context under analysis is a territorial one, there was a need for a tool able to take into account the spatial distribution of the abovementioned characteristics and Spatial SWOT analysis seems a promising avenue of research in this direction (e.g. Comino and Ferretti, 2016). Indeed, the results of a spatial SWOT analysis are many. It allows us to identify the most vulnerable components of the territory (Weaknesses) that need defense intervention and monitoring measures, the environmental and physical factors that suffer the highest human intervention impact (Threats), as well as the most valuable areas (Strengths and Opportunities), for which monitoring and protection measures should be envisaged.

Briefly, phase 1 consisted of three steps. First, we developed a map of the positive characteristics (e.g. the presence of cultural and architectural heritage linked to the wine making tradition) as well as of the negative ones (e.g. the presence of negative visual interferences with the landscape, such as industrial buildings) for the whole World Heritage Site. Second, we overlaid the maps of each indicator according to the weights elicited for the different characteristics through Multi Criteria Analysis. Third, we generated a final map for each SWOT analysis category (i.e. an overall map for the territorial strengths, one for the territorial weaknesses, one for the territorial opportunities and one for the territorial threats).

Figure 4 shows, as an example, the final map obtained for the territorial Weaknesses which aggregates information about lack of public transportation, presence of abandoned train stations, natural risks distribution (i.e. flooding and landslide areas), presence of negative visual interferences with the landscape (e.g. industrial buildings) and presence of abandoned architectural heritage (i.e. abandoned rural buildings) across the geographical region under analysis. Low values in the map legend identify areas with a high concentration of territorial weaknesses, as it is the case in the surroundings of the main urban areas in the region.

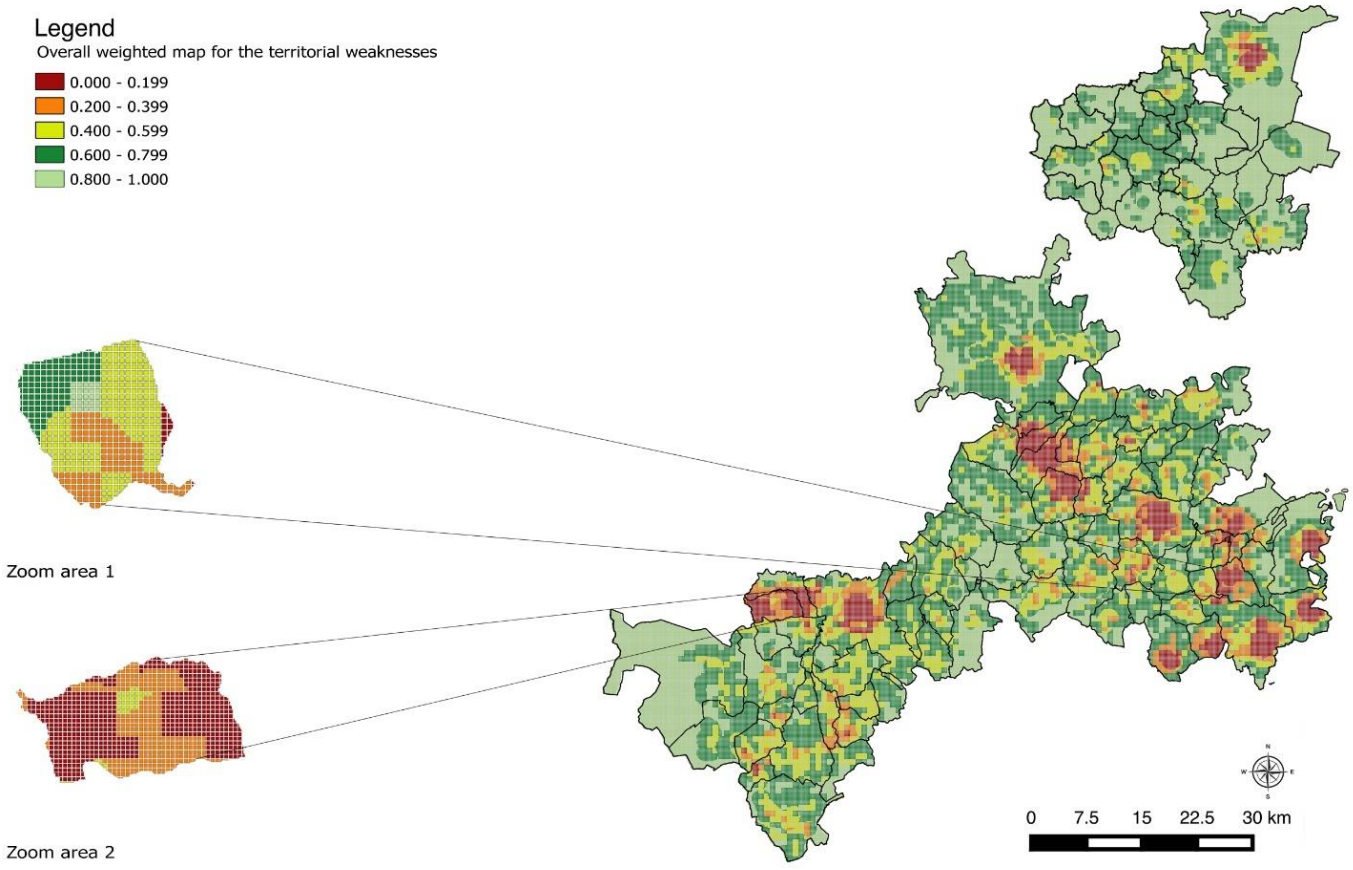


Figure 4 Overall weighted map for the territorial weaknesses in the UNESCO site Langhe, Roero and Monferrato.

The output of Phase 1 was to discover that the network of abandoned historical rural buildings (one of the indicators spatially analyzed in the SWOT analysis), an issue that had already been raised by local communities during the UNESCO candidacy process, represented both a weakness and a future opportunity for the whole World Heritage Site. At the time the issue was raised, there was no database representing the geographical location and density of abandoned buildings within the region. Phase 1 of the analysis allowed to create a database with 292 abandoned rural historical buildings scattered across the World Heritage Site, which includes 101 municipalities. 14 of these buildings concentrate in the Municipality of La Morra, making it the Municipality with the highest concentration of abandoned rural buildings. These buildings represent a true landmark of the rural architectural and historical legacy and are usually located in beautiful surroundings. Their regeneration would thus create significant added value for the area, both from the residents and from the tourists' points of view.

This output, together with stakeholders' analysis and community mapping, became an input to phase 2 of the process (problem formulation and planning phase) where a multi-criteria model was developed to find out which abandoned building was most strategic to regenerate first (i.e. to obtain a priority ranking among the buildings to be regenerated).

Phase 2 (Problem formulation – planning phase)

Thanks to phase 1 of the process, the Municipality of La Morra gained better awareness of the potential value of abandoned rural historical buildings within its territory and developed an interest towards discovering which would be the most strategic abandoned rural farm to be recovered first. Given the limited availability of financial resources to regenerate all 14 buildings, the problem was formulated as a ranking decision-making problem and the technical office of the Municipality of La Morra (an organization consisting of 15 members) became a client of the authors in Phases 2 and 3 of the process.

Figure 5 shows the location of the 14- abandoned rural historical farms in the Municipality of La Morra together with their pictures.

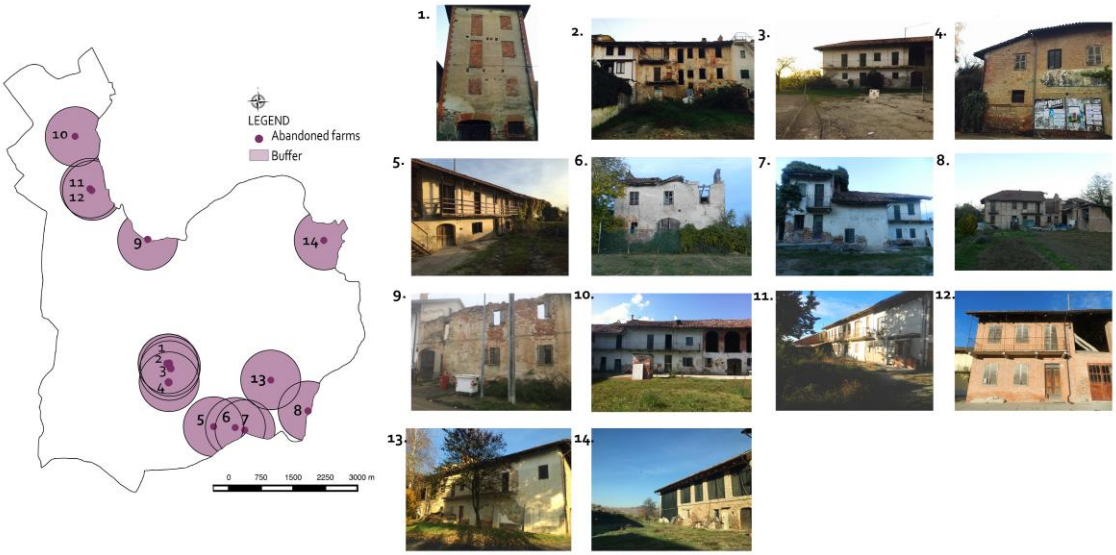


Figure 5 The network of abandoned farms in the Municipality of La Morra

During phase 2 of the developed framework the authors used stakeholders' analysis (e.g. Dente, 2015) and community mapping to identify the multiple interests involved in the process as well as to understand the social context within which the analysis was done (as highlighted by Johnson, 2012a). A specific multicriteria analysis technique (i.e. the Multi Attribute Value Theory approach) was then used to identify the most suitable farm among the 14 identified in the area to be recovered for touristic/ recreational purposes. This result (i.e. the identification of building n.3 in Figure 5 as the most suitable building to be recovered for touristic purposes) became the input to phase 3 of the process (problem solving and design phase), where the preferences and values of the local community were included to design sustainable regeneration options.

Phase 3 (Problem solving - design)

In phase 3 of the developed framework, the authors used Stakeholders' analysis and the Choice Experiments approach (Lancaster, 1966) to integrate community preferences into the design process of alternative options for the requalification of the farm identified as the most suitable to be recovered in phase 2.

In Choice Experiments the utility derived from a good or service can be decomposed into part utilities relating to different attributes of that good or service (Lancaster, 1966). Choice Experiments are thus particularly useful to analyze decisions and to understand the process by which consumers/individuals develop their preferences for products/services/policy alternatives (Sayadi et al., 2005).

In this project, the design step has been informed by the preferences collected from interviews with local actors, residents and tourists, thus allowing to co-design with the local community the best requalification option for the abandoned rural building under analysis.

Section 3.3 will focus on this third phase of the process to show how we co-designed the solution space for rural regeneration in this project. The reasons for the selection of this phase among the three developed in the proposed framework will also be provided in section 3.3.

Following the explanation of the development of the process from phase 1 to phase 3 provided in the previous paragraphs, it becomes clear that, among the different possibilities for designing mixed methods research, we chose the sequential design one (Creswell et al., 2011), as it seems to facilitate a planning process able to follow the subsequent phases of policy formulation since the very beginning of the process. Mixing in this study means that methods have progressively been linked to complement each other or to cover a larger proportion of the different tasks in the planning process. We indeed started from the identification of the problem and objectives to be reached with a qualitative/quantitative investigation and then developed a quantitative analysis to define the best performing alternative option for the regeneration of the area under analysis.

3.3 Focus on the design phase through Choice Experiments

The process outlined in section 3.2 stretches from the initial problem identification phase up to the final design of actions for the territorial context under analysis. The timeline for the project was February 2015 – December 2015. For clarity, this section provides a detailed account for phase 3 of the process, i.e. the design phase. The reasons for selecting this phase among the 3 which constitute the process (section 3.2) can be summarized as follows:

(i) the first and most important reason is linked to the key characteristics of Community OR practice, i.e. the meaningful engagement of communities (Midgley et al., 2016). What constitutes the community in this case are residents in the World Heritage Site, together with tourists and stakeholders (e.g. local authorities, cultural and touristic associations, local entrepreneurs and professionals) who have an interest towards the transformation of the UNESCO landscape or are going to be affected by the transformation. Phase 3 of the process proposed in this project is the one characterized by the highest community engagement, as it enabled people from local communities to have a substantial input into framing both the issues to be discussed and potential actions to address them. The problem of abandoned buildings within the World Heritage site was initially raised by community members, then formalized by the clients (i.e. the Tourism organization of Alba, Bra, Langhe and Roero and the Technical Office of La Morra Municipality) during phases 1 and 2 of the

project (section 3.2) and then collectively discussed and analyzed in phase 3 to co-design the solution space based on community input.

(ii) A multi attribute valuation approach, which enables the estimation of attribute values and, hence, marginal effects, can provide detailed information regarding the trade-offs and values associated with different policy designs (Campbell et al., 2009).

(iii) The nonuse nature of rural landscapes favors the application of a stated-preference methodology for the estimation of existence benefits.

3.3.1 Methodological background

Choice Experiments (CE) are a statistical methodology based on a well-tested theory of choice behavior called Random Utility Theory (RUT, McFadden 1986) which aims to study individual choices using preferences expressed about various profiles, i.e. several versions of a product or service (Lancaster 1966). In choice experiments respondents are asked to choose their preferred alternative among several hypothetical alternatives in a choice task. Experimental design theory is used to construct the alternatives, which are defined in terms of their attributes and the levels these attributes can take. By analyzing the choices made by respondents it is possible to reveal the factors which influence their choice. For an overview of choice experiments see, for example, Alpizar et al. (2001) or Louviere et al. (2003).

The development of a CE model envisages the following steps:

(i) Definition of a set of attributes or features describing the good, service, project or policy, each characterized by a certain number of pre-specified levels.

(ii) Combination of these levels and attributes to build up descriptions of hypothetical bundles, using experimental design techniques.

(iii) Development of a questionnaire intended to elicit preferences from a sample of stakeholders and/or community members over the set of alternatives previously generated by considering the different levels for each attribute. Individuals are thus faced with a series of choices over pairs or three-way combinations of alternatives, which are described in terms of their attributes, or characteristics, and the levels that these can take. One of the attributes is usually the price. From each choice set, respondents must choose their preferred option, considering that the status quo is typically included in the choice set.

(iv) Analysis of the individual responses on each combination. Specific choices demonstrate prioritization among the different combinations of features. It is assumed that the total worthiness of a particular product choice is determined by the different part utilities of each feature level (Sayadi et al. 2005). Responses are then analyzed using statistical models.

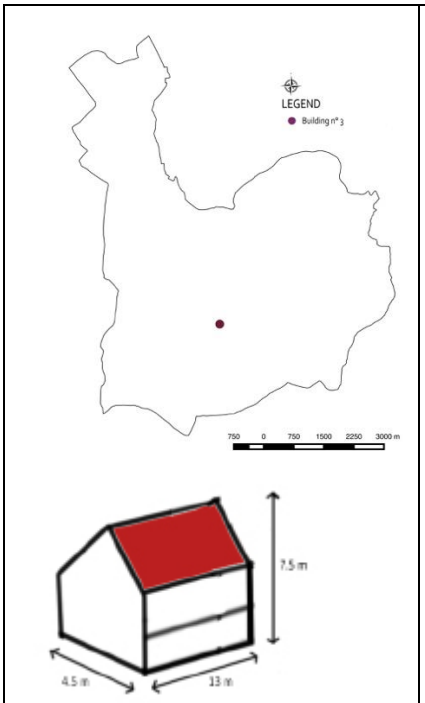
The overall aim of this process is thus to understand individual choices using preferences expressed about various profiles and to obtain an estimation of the willingness to pay of the respondents for the project under analysis. However, CE makes the assumption that the value of the good can be captured by the attributes of the good.

As shown by the recent literature (e.g. Hoyos, 2010), there is a growing interest towards the application of Choice Experiments in the field of environmental and landscape evaluation, which represents an innovative field of research for the economic evaluation of public goods and services (e.g. Nordén et al., 2017). Nevertheless, specific complexities need to be taken into account when applying Choice Experiments to landscape evaluation, as, contrary to the traditional evaluation of economic goods, landscape as well as cultural and natural resources do not have a market. Recent studies in the environmental management domain are thus exploring alternative value elicitation formats to mandatory tax payments, i.e. voluntary, crowdfunding-style, contribution mechanisms (e.g. Roesch-McNally and Rabotyagov, 2016). Crowdfunding platforms have indeed seen explosive growth (e.g. Mollick, 2014), with billions of dollars raised in private contributions. Should voluntary markets for urban and rural regeneration develop, information on market transactions will be used by potential sellers of regeneration projects to offer solutions with attributes that appear most highly valued by crowdfunding participants.

3.3.2 Definition of attributes and levels

As explained in section 3.2, the result of phase 2 of the process (i.e. the one based on the development of a Multi Criteria Analysis model) was a priority ranking of the 14 abandoned buildings to be regenerated in the Municipality under analysis. In particular, building n.3 (Figure 5) turned out to be the most strategic one to be recovered for touristic/recreational purposes.

Each of the 14 abandoned rural buildings has been studied through local surveys under the coordination of experts in the field of historical heritage and restoration, to collect information about performances of the buildings to be used in the multicriteria analysis model (see Figure 3). Figure 6 shows the "ID card" which was developed for building n.3. Figure 7 provides instead the contextualization of building n. 3 within the Municipality of La Morra, highlighting the distribution of key elements in its surroundings (e.g. cultural and natural landmarks) which enhances the potential of the building for touristic regeneration purposes.



Building n. 3

The building presents the typical historical "L shape" structure. It is located very close to the historical urban center and to an area used for urban gardens. Due to the lack of ordinary maintenance work, the façade of the building is characterized by several elements of degradation. Nevertheless, the carrying structure presents an overall good state of conservation.

Figure 6 ID Card for building n. 3

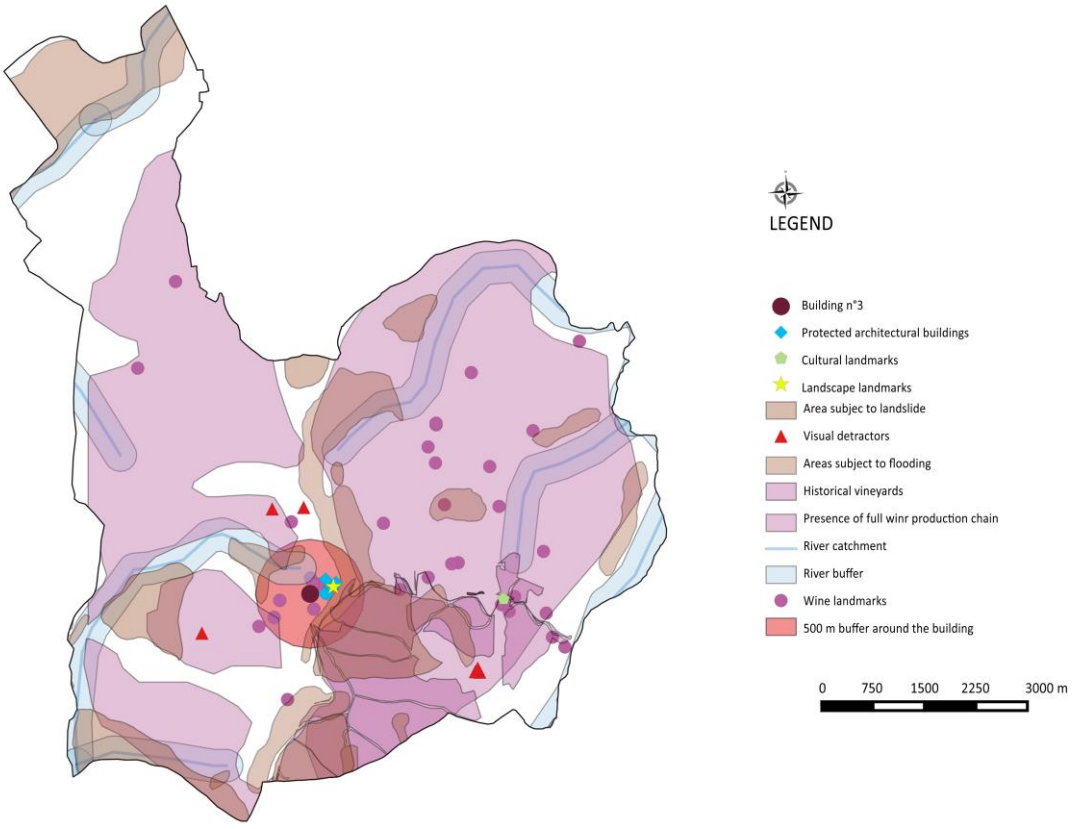


Figure 7 Spatial contextualization of building n. 3 within the Municipality under analysis

As mentioned in Section 3.3.1, the first step in Choice Experiments deals with the selection of the attributes and the definition of their levels of intensity according to the following methodological requirements: attributes should be clear and not redundant; for each attribute the status quo has been included among the levels; each combination of attributes and levels defines a profile. In the case study under investigation, attributes and levels have been identified with the help of a specific focus group with experts in the field of landscape management, UNESCO management plans and historical restoration. As a result, the following 6 attributes have been defined:

(i) Function: this attribute refers to the future use of the abandoned rural building. Five possible levels have been identified for the building under analysis (Figures 6 and 7), i.e. 1) bed and breakfast/ holiday farm, 2) museum/didactic farm with vegetable garden, 3) station for bicycles rental, 4) traditional local products' shop and 5) abandoned (i.e. the status quo level).

(ii) Accessibility: this attribute refers to the preferred access mode to the recovered building. Three possible levels have been identified for the building under analysis, i.e. 1) by car, 2) by bicycle and 3) through a trail.

(iii) Management: this attribute considers the type of management envisaged for the recovered building, i.e. 1) public management or 2) private management.

(iv) System creation: this attribute refers to the possibility of creating a system of recovered farms not only within the Municipality of La Morra but across different municipalities within the World Heritage Site where abandoned rural buildings do exist. This has been considered as a binary attribute, for which the answer is either yes, thus representing the preference of the respondent towards the creation of a network of abandoned farms or no, thus representing the preference of the respondent towards the regeneration of the single building.

(v) Aesthetic design: this attribute refers to the type of regeneration process, i.e. either 1) a traditional solution to maintain the original façade and characteristics of the building, or 2) a hybrid approach making use of innovative solutions to mix historical characters with modern ones.

(vi) Cost: this attribute refers to a hypothetical donation that respondents are willing to make to support the regeneration process of the abandoned building under analysis. The levels for this attribute are 0 Euro, 5 Euro and 10 Euro and have been defined by means of a pre-test of the model together with experts, stakeholders and a subset of residents and tourists. The cost equal to 0 Euro has been included as it refers to the current situation, where no requalification project is implemented.

Table 1 summarises the attributes and their respective levels, where one level refers to the status quo, while the other levels represent possible options for the requalification of the building. With the regeneration alternatives, composed of combinations of the 6 attributes, we aim to capture the relevant variations in regeneration preferences in the case study area and thus provide useful information for the local landscape management and rural regeneration policies.

Table 1 Attributes and levels for the decision context under analysis

Attributes	Levels
Function	Bed and breakfast/ holiday farm Museum/didactic farm with vegetable garden Station for bicycle rental Traditional local products' shop Abandoned (status quo level)
Accessibility	By car (status quo level) By bicycle Through a trail
Management	Private (status quo level) Public
System creation	Yes No (status quo level)
Aesthetic design	Traditional (status quo level) Hybrid
Cost	0 Euro (status quo level) 5 Euro 10 Euro

3.3.3 The questionnaire

The next step in the process consisted in the combination of attributes and levels to generate the profiles (i.e. possible regeneration alternatives).

The Orthoplan function of the SPSS software[3] has been used to define a subset of all the possible alternatives according to the orthogonal design rule. More specifically, the Orthoplan function provides a default set having the minimum number of alternatives which allows to analyze the main effects of the considered attributes. The orthogonality of the design ensures that alternative A is preferred to alternative B because the respondents indeed prefer A to B, without being influenced by the fact that alternative A has a higher probability of being extracted by the set of alternatives compared to alternative B (Johnson et al., 2013).

A subset of 14 alternatives (profiles) has thus been generated, which have been coupled to obtain 7 choice tasks/experiments. In each choice experiment, the status quo alternative has also been included, using the level of the attributes corresponding to the abandoned building current state (Table 1).

To provide an example of a choice task/ experiment, Figure 8 shows an extract of the Choice Experiments questionnaire with visualized regeneration alternatives for the building under consideration. All regeneration alternatives proposed in the 7 choice experiments use a picture of the original abandoned rural building and include visual simulations to visualize the attribute levels under consideration.

[3] www.spss.com

"Choice Experiment n. 1" **Which alternative do you prefer?**		
		
Function: Museum Accessibility: Car Management: Private Creation of a system: Yes Aesthetic design: Hybrid Cost: 0 Euro	Function: Traditional products shop Accessibility: Bicycle Management: Private Creation of a system: No Aesthetic design: Hybrid Cost: 10 Euro	Function: Abandoned Accessibility: Car Management: Private Creation of a system: No Aesthetic design: Traditional Cost: 0 Euro

Figure 8 Graphical representation of the first choice task included in the questionnaire. Each combination of attribute levels represents a specific regeneration alternative (profile), and the last profile to the right refers to the status quo of the abandoned building under analysis.

The questionnaire has been filled in by 100 interviewees representing the stakeholders classified in Table 2 according to the categories proposed by Dente (2005).
When making their choices, respondents were explicitly asked to consider only the attributes presented in the choice task and to treat each choice task independently.

Table 2 Survey of the relevant stakeholders linked to the regeneration of the abandoned historical rural buildings in La Morra Municipality

Stakeholders	**Level**	**Type**	**Resources**
Mayor of La Morra Municipality	Local	Political	Political/economic
Local residents	Local	Special interests	Economic
Tourists	National and International	Special interests	Economic
Cultural associations	National	General interests	Cognitive
Association for the Langhe, Roero and Monferrato Landscape	Local/National	General interests	Economic
Piedmont Region	Regional	Political	Political/Legal
Local entrepreneurs	Local/Provincial	Special interests	Economic

Stakeholders	Level	Type	Resources
Local professionals	Local	General interests	Cognitive

One of the most critical aspects of every CE application refers indeed to the definition of an appropriate segmentation of the reference target population (Hagerty 2008). In our case, the segmentation of the reference target population considered the categories of stakeholders listed in Table 2, to ensure proper consideration of all the relevant interests associated to the particular landscape under analysis and to better support the preparation of future plans and programs for the area.

The final questionnaire consisted of three sections. The first section included motivations for visiting the area and knowledge about the recent World Heritage Site nomination. The second section contained the choice experiments. The third part contained socio-demographic background characteristics of respondents.

3.3.4 Results

100 people, representing the categories listed in Table 2, participated in phase 3 of the process through face to face interviews carried out between November and December 2015 in the municipality of La Morra and its surroundings. Table 3 provides a summary of the characteristics of the sample of respondents.

Table 3 Percentage of respondents within each category of interest

	Categories of interest	Percentage of respondents
	Tourist	41%
	Residents	59%
	Females	51%
	Males	49%
Age	Younger than 25 years old	27%
	Between 25 and 30 years old	9%
	Between 30 and 50 years old	34%
	Older than 50	30%
	Participants who knew that the municipality had recently became a new World Heritage site	73%
	Participants who declared a high interest towards territorial requalification projects	41%
Reasons for the visit to the world heritage site	Excursions	12%
	Work	20%
	Relax	44%
	Food and wine	17%
	Culture	5%

As highlighted in Table 3, the sample of respondents included a balanced amount of both tourists and residents, with most of the respondents being aware of the recent UNESCO nomination of the site.

The answers to the CE questionnaire were analyzed within the random utility model framework (McFadden 1974), which states that the utility obtained by individual i from outcome j is determined by a linear function

of a vector of attributes X, weighted by parameters β, and an unobservable 'random' element ε, such that (Lancaster,1966; McFadden,1974):

$$U_{ij} = \beta X_j + \varepsilon_{ij} \quad (1)$$

This random utility specification accounts for the possibility that not all aspects that determine the choice have been quantified by the researcher.

For the analysis of the responses, we estimated a mixed logit choice model through the statistical software SPSS. Mixed-logit models provide a flexible and computationally practical econometric method, which -as described by McFadden and Train (2000), with adequate data quality- may in principle be used to approximate any discrete choice model derived from random utility maximization. The mixed-logit model overcomes the limitations of standard multinomial logit by allowing for random taste variation, unrestricted substitution patterns, and correlation in unobserved factors (Train, 2003). Moreover, mixed-logit methods do not entail the strong assumptions of independent and identically distributed error terms and its equivalent behavioral association with the independence of irrelevant alternatives property (Campbell et al., 2009). For the above reasons, the mixed-logit model is considered one of the most promising discrete choice models (Hensher and Greene, 2002).

By collecting the preferences of the community and elaborating the data with the SPSS statistical software, we obtained the coefficients presented in Table 3.

Positive coefficients in the models represent a positive preference (utility) associated with a particular level of an attribute, whereas negative coefficients represent a negative preference (disutility) associated with a particular level of an attribute compared with the reference level. All estimated regeneration attribute coefficients are statistically significant ($p<0.05$)[4].

The B coefficients presented in Table 4 provide the level of appreciation for the different combinations of features. These results allowed us to provide specific recommendations to the Mayor of La Morra Municipality for the design of the requalification solution for the abandoned building which best meet the expectations of the local community. In particular, the higher the B coefficient, the higher the value that the local community gives to that attribute level. Indeed, some interesting considerations can be made by observing the results summarized in Table 4. First, the coefficients of the cost levels are both negative. This is consistent with economic theory as, the higher the price of the good or service, the lower its appreciation. Second, the abandoned state, the car accessibility and the traditional design for the recovery also have negative coefficients, coherently with the expectations from the study. Third, the most preferred attribute levels turned out to be "bicycle renting station", "bicycle accessibility", "public management" and "creation of a system of abandoned rural buildings" (coefficients highlighted in grey in Table 4).

Table 4 Choice Experiments' results (the coefficients of the most preferred attribute levels are highlighted in grey)

[4] p-Values < 0.05 indicate whether positive or negative preferences are statistically significantly different from zero.

Attributes	B coefficients
Function	
Abandoned	-3.466
Museum	0.244
Bed & Breakfast	0.036
Traditional goods' shop	0.266
Bicycle renting station	0.486
Accessibility	
Car	-0.050
Bicycle	0.096
Path/trail	0.050
Aesthetic design	
Traditional	-0.017
Hybrid	0.117
Management	
Public	0.223
Private	0.071
System creation	
No	0.045
Yes	0.095
Cost	
0	0.146
5	-0.102
10	-0.248

We then further analyzed the data by estimating separate Mixed Logit Choice models for the most relevant categories of respondents interviewed in this project, i.e. tourists versus residents and respondents who were aware of the recent UNESCO nomination of the geographical region under consideration versus respondents who were not aware of the UNESCO nomination. To facilitate the comparison of the obtained results across the four above mentioned categories, Table 5 provides the ordinal ranking of attribute levels for each considered category.

Table 5 Ranking of attribute levels from the most important one (n.1) to the least important one (n.14). Column "All" provides the ranking based on the results proposed in Table 4 (all respondents considered together), while the remaining columns provide the results segmented for the specific categories of respondents.

Attribute levels	All	Only residents	Only tourists	Respondents who did not know about the UNESCO nomination	Respondents who did know about the UNESCO nomination
Function					
Abandoned	**14**	**14**	**14**	**14**	**14**
Museum	3	9	**3**	7	7

Bed & Breakfast	11	8	7	11	11
Traditional goods' shop	**2**	3	8	6	6
Bicycle renting station	**1**	**1**	**1**	3	4
Accessibility					
Car	13	11	10	10	12
Bicycle	6	4	5	5	**2**
Path/trail	9	5	9	8	5
Aesthetic design					
Traditional	12	13	12	**2**	13
Hybrid	5	**2**	**2**	**1**	3
Management					
Public	4	6	13	12	8
Private	8	12	4	9	9
System creation					
No	10	10	11	13	10
Yes	7	7	6	4	**1**

From the analysis of the results presented in Table 5, it is possible to draw the following interesting considerations:

(i) There is an overwhelming agreement among the categories of respondents on the fact that the current "abandoned state" of the rural building represents the least desirable situation among the alternatives under consideration (n. 14 in the ranking). This confirms the relevance of rural heritage regeneration necessity raised by the local community and suggests that the development of an action plan to recover the buildings should be a priority for the municipality.

(ii) There is an overwhelming agreement also on the fact that the "bicycle renting station" is the most preferable new function among the 4 proposed ones for the abandoned building to be regenerated (the most-preferred attribute in the rankings for tourists and residents, third- and fourth-most preferred for respondents who were not aware of the UNESCO nomination versus those who were aware, respectively).

(iii) Overall, there is agreement among the categories of respondents on the least appreciated features of the regeneration plan, i.e. "accessibility by car" (ranking n. between 12 and 13 for all respondents), "traditional type of aesthetic design" (ranking n. between 12 and 13 for all categories of respondents, except for those who were not aware of the recent UNESCO nomination and who actually considered the traditional type of aesthetical design an important feature), "absence of a network of regenerated farms" (ranking n. between 10 and 13 for all respondents) and "bed and breakfast" function (ranking n. between 7 and 11 for all respondents).

(iv) The "traditional goods' shop" is the second best new function for the abandoned building for all categories of respondents except for tourists, who would prefer to have a "museum" as a new function of the building. This is consistent with the client's expectations based on similar decision contexts and best practices worldwide.

(v) There is agreement among all categories of respondents about the most preferred type of accessibility to the building among the three considered ones, i.e. through the bicycle. This result is consistent with the one obtained for the most preferred new function to be allocated to the abandoned building under consideration,

i.e. the bicycles rental station, and seems thus to suggest that participants completed the choice experiments questionnaires with particular care to reflect the importance they associate to the regeneration of abandoned rural heritage within the UNESCO area.

(vi) There is agreement among all categories of respondents about the most preferred type of aesthetic design to be used for the regeneration of the building, i.e. the hybrid one.

(vii) Finally, there is agreement among all categories of respondents also on the need to foster the creation of a network of regenerated abandoned buildings within the area, rather than focusing on a single one.

(viii) The only attribute on which we registered disagreement is the type of management envisaged for the recovered building. Residents and respondents who were aware that the area just became a UNESCO site would support a public management of the recovered building, whereas tourists and respondents who were not aware of the recent UNESCO nomination would support a private management of the building.

4 Discussion and conclusions

This study showed how a modeling perspective that embraces methodological pluralism (multi-methodology or mixed methods) can productively deal with the complexities of a recently nominated World Heritage site and foster change within communities.

In this section, we would like to shed some light on the benefits observed while developing and applying the proposed approach, as well as on its limitations.

As argued by Johnson (2012a), "solutions" to problems in CBOR may range from increased understanding of the problem under consideration, to agreement on objectives, goals, and metrics associated with solving a problem, to generalized insights on existing processes and strategies, to revised rules-of-thumb and procedures, and to well-defined prescriptions associated with the values of decision variables arising from solutions to specific problem instances. The ultimate goal of CBOR is community change for the public good (Johnson, 2012b). As shown by the results presented in section 3.3, the developed process generated indeed a better understanding of the strengths and weaknesses of a complex territorial system, an overall agreement about the need to regenerate the abandoned historical rural heritage of the area, as well as practical prescriptions based on community preferences for the design of the final project blueprint.

Starting from the results of the CE model (Tables 4 and 5), the estimated coefficients (which provide indications about the appreciation of the different attribute levels) allowed the Municipality of La Morra to recognize the need and urgency to develop an action plan for the regeneration of the system of abandoned rural buildings in the area. Those results are indeed being used as practical guidelines based on community preferences on how to design requalification solutions starting from Building n. 3 (i.e. the one that emerged from phase 2 of the intervention as the most strategic one to be recovered first). In particular, the Municipality of La Morra has been the first Municipality, among the 101 included in the World Heritage site,

to update the Local Strategic Town Plan[5], making it coherent with the UNESCO guidelines and including as well insights from the co-design intervention based on community input described in this paper.

As highlighted by Midgley et al. (2017), the common concern of all Community OR practice is the meaningful engagement of communities. To clarify what role community members played in our study, the next paragraphs address the following questions: 1) What role did community members play in identifying the specific problem to be solved? and 2) What role did community members played in identifying and developing a solution strategy? Answering these questions provides additional insight into the contribution of this work to community-based operations research and community operational research; in the latter domain, the notion of "meaningful engagement of communities" is central (Midgley et al., 2018).

1. Stakeholders, together with the local community, raised the issue of the increasing number of abandoned rural buildings within the World Heritage site during the UNESCO candidacy procedure, thus also contributing to the achievement of a shared definition and to an enhanced understanding of the issue among the municipalities involved.

2. Community members also contributed to the identification and the development of solution strategies for the regeneration of the most strategic abandoned building located within the Municipality of La Morra (Figures 6 and 7), one of the stunning components of the World Heritage site. They indeed provided direct input to the construction of both the decision model, by contributing to the debate about which attributes to consider for the regeneration of the abandoned building, and the final recommendation, by prioritizing the considered attributes and levels and thus co-constructing the solution for the regeneration of the first building.

In conclusion, this intervention generated five important impacts. First, it has had the effect of nudging La Morra Municipality to update the Local Strategic Town Plan. By being the first to implement a new integrated framework and to subsequently adapt the Local Strategic Town Plan, the Municipality is now emerging as a virtuous municipality among those belonging to the Core World Heritage site. Second, it has had a capacity-building effect resulting in improved working practices; incentive mechanisms for other municipalities, and an increased ability of the involved organizations to formulate models, solve problems, and change operations and strategy without the assistance of external analysts. The framework developed in this study indeed leaves as a legacy a working tool for the public sector, thus generating a real impact on practice and a positive impact of analytics on community-based applications[6]. Third, the developed framework is easily transferable to other territorial contexts which may vary significantly from La Mora Municipality. Last, the project has resulted in enhanced understanding of the community issue as well as evidence-based prescriptions for a decision problem associated with this issue, based on an integrated analytical approach.

[5] The purposes of local strategic planning are to protect significant aspects of the local natural and built environment, guide the efficient and effective use and distribution of scarce resources at a local level and guide the delivery of key infrastructures for the benefit of the local communities.

[6] This study has been awarded runner up for the 2016 INFORMS Decision Analysis Practice Award. Evidence in support of impact (ii) is provided by the reference letters wrote within the Award application process by the Organizations involved in the project.

Future developments of this research will follow five strategic directions:

(i) the results obtained from the questionnaires proposed to the community could also be used to determine the Willingness To Pay for the specific reuse project of the abandoned buildings. The focus of this research was on supporting the design of feasible alternatives by allowing community members to engage and provide input to the process and thus not on the determination of the economic value of the resource. However, the quantification of the value of the resource and of the consumer surplus can become more interesting in the subsequent stage of this process when the focus will shift from the preliminary phase of analysis on a single building to the network of abandoned buildings within the World Heritage site. These results could indeed provide interesting insights for monitoring and damage assessment purposes.

(ii) To assist in determining the trade-offs involved in the complex decision making environment under consideration, it would be interesting to integrate Multi Criteria Analysis techniques (e.g. Belton and Stewart, 2002) together with Choice Experiments (e.g. Martin-Ortega and Berbel, 2010).

(iii) Many complex choice models exist (e.g. Louviere et al., 2003) and it would be interesting to test other approaches to define the parameters of the model and compare the results.

(iv) Another interesting avenue of research steaming from this work will consist in the analysis of the impacts of this multi-methodology intervention using an Actor Network Theory methodological lens (e.g. Boerboom and Ferretti, 2014).

(v) Finally, given that eliciting preferences and values through choice experiments has its specific methodological constraints (e.g. preference estimates have been found sensitive to both the predefined levels of the attributes in the experiment and attendance level of the price by respondents, Van Zanten et al., 2016), it would be interesting to test how to debias the above issues for future applications in similar contexts.

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