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An Interdisciplinary Approach for the Valorisation of Active Hydroelectric Heritage: Application of a Conjoint Analysis Methodology to the Sila Scheme in Calabria (Italy)

Giulia Formato *, Cristina Coscia and Manuela Mattone

Dipartimento di Architettura e Design (DAD), Politecnico di Torino, 10125 Turin, Italy; cristina.coscia@polito.it (C.C.); manuela.mattone@polito.it (M.M.)
* Correspondence: giulia.formato@polito.it; Tel.: +39-3387289958

Abstract

Historical hydroelectric systems occupy a still marginal position within heritage valorisation practices, a position made more precarious by their status as active infrastructures. As a result, their intrinsic cultural, historical, and social values are rarely expressed or recognised. The present research proposes an interdisciplinary approach which supports complex valorisation strategies for the difficult task of valorising active hydroelectric heritage. Drawing on Complex Social Value theory, the study employs a Choice Experiment to examine how residents and visitors rank alternative valorisation scenarios linking hydroelectric infrastructures with other local landscape and cultural assets through sustainable tourism itineraries. The analysis estimates the relative importance of four non-monetary attributes—the form of heritage valorisation, itinerary length, integration with other cultural and natural resources, and mobility mode—and the direction of preferences across their levels. Integration emerges as the dominant attribute for both groups; both groups also prefer shorter itineraries, and preferences concerning mobility mode greatly differentiates residents from visitors. The application of this method—which is still not widely adopted in the field of cultural heritage—aims to capture the relative importance of a series of attributes of the itineraries, while also providing insights into the distribution of preferences expressed by respondents in relation to the different valorisation scenarios.

Keywords: choice experiment; conjoint analysis; stated preferences; hydroelectric heritage; hydroelectric landscape; heritage valorisation; landscape valorisation; cultural tourism; Calabria

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1. Introduction

The expression "hydroelectric heritage" refers to the ensemble of structures and technical components devoted to the generation of hydroelectric energy. It includes both architecturally prominent elements, such as power stations and large dams, as well as less visible and minor structures, such as penstocks, surge shafts, turbines, and other machines. From its first implementation at Cragside, Northumberland, in 1862 [1], hydroelectric power quickly spread, becoming the motor of rapid industrialisation in coal-poor European countries [2]. In the early twentieth century, large dams and monumental power stations were celebrated for both their beauty and as symbols of humanity's victory over Nature in the perpetual fight for control over untamable forces. While contemporary observers no longer share this enthusiasm for large-scale industrial infrastructures, nowadays hydroelec-

tric sites continue to elicit ambivalence, a mix of fascination and unease that Nye described as "an essentially religious feeling" [3].

A considerable number of historical hydroelectric systems built between the last decades of the nineteenth century and the first half of the twentieth century are still active today. This factor, in particular, plays a decisive role in their invisibility as cultural heritage assets, since the ongoing productivity of these infrastructures comes with limits to visitors' accessibility. In addition to that, energy companies tend to treat heritage-related initiatives as ancillary rather than as integral components of infrastructure management. Evolution in Corporate Social Responsibility (CSR) [4] approaches, however, is beginning to challenge this lack of recognition for heritage in the energy sector. In recent decades, in fact, several energy companies have increasingly recognised the strategic importance of cultural assets valorisation in improving public perception and strengthening bonds with local communities. Such initiatives, however, remain often episodic and dependent on the energy company's own goodwill.

An additional obstacle to the recognition and valorisation of historical hydroelectric systems as heritage derives from their geographical location, as they are frequently situated in mountainous and marginal areas that, in many European contexts, are characterised by demographic decline, ageing population, and are usually far from the main trajectories of infrastructural and economic development. However, this condition of marginality can also represent an opportunity. The integration of hydroelectric heritage valorisation with other local cultural resources can foster the development of integrated strategies capable of generating positive externalities for local communities [5]. In particular, cultural and sustainable tourism initiatives centred on hydroelectric heritage may contribute to the diversification of the local tourism offer, a key concept of sustainable tourism development [6]. Building from this background, the present research addresses two questions. First, which configurations of valorisation initiatives do residents and visitors prefer, and which of their components carry most weight in shaping those preferences? Second, what do these preferences indicate about the characteristics that valorisation initiatives for active hydroelectric heritage should embrace in order to reflect the values assigned to it by local communities and visitors?

To address these questions, the present study adopts an interdisciplinary approach grounded in Complex Social Value theory [7] and applies a Choice Experiment, a stated preference method belonging to the family of Conjoint Analysis techniques, to investigate residents' and visitors' preferences regarding alternative valorisation scenarios The proposed methodology is applied to the historical hydroelectric scheme of the Sila Plateau in Calabria (Italy), which was chosen as a case study following a thorough recognition of overlooked hydroelectric systems in Southern Italy. While Conjoint Analysis and discrete choice methods have increasingly been applied to adaptive reuse and heritage-related decision-making processes [8–11], applications to active industrial heritage remain extremely limited. Therefore, the present study contributes to extending the application of these methods to an active industrial heritage characterised by relevant landscape and architectural qualities.

The results show potential for hydroelectric heritage valorisation initiatives to be well received by both the local communities and visitors, especially initiatives aimed at integrating hydroelectric heritage enjoyment with other local cultural and natural assets. They further indicate that both groups prefer shorter itineraries, and that the mobility mode constitutes a decisive component of the perceived value of such initiatives for residents, while carrying considerably less weight for visitors.

2. Theoretical Background

2.1. Hydroelectric Heritage: Definition and Background

Beyond the core production elements of energy generation, hydroelectric heritage encompasses ancillary facilities such as workers' housing, service buildings, access roads and transmission infrastructure, as well as the landscapes fundamentally transformed by the creation of artificial reservoirs. The significance of hydroelectric heritage does not, therefore, reside in individual structures considered in isolation. Rather, it lies in the relationships between interconnected components that together form complex territorial systems [12].

The development of large-scale hydroelectric power dates back to the late nineteenth and early twentieth centuries [1], thanks to large-scale adoption of alternating-current transmission, which rendered long-distance power delivery economically viable and substantially expanded the geographical scope of hydroelectric development. Countries endowed with abundant water resources—notably Switzerland, France, and northern Italy —emerged as early leaders in this transformation. Throughout the first half of the twentieth century, major river systems and mountain valleys were progressively equipped with hydroelectric installations, integrating dams, reservoirs, powerhouses and hydraulic conveyance systems into extensive water management territorial networks [13].

Early powerhouses, especially in the Alps, were frequently conceived not merely as functional enclosures for machinery, but as monumental statements intended to assert the legitimacy of industrial progress within the landscape [14]. In the Alpine context, prominent architects were commissioned to design plants that combined engineering excellence with an eloquent architectural language [15]. These powerhouses were intended as durable monuments to the modernising mission of the nascent electricity companies, objects of entrepreneurial pride as much as means of energy production.

Hydroelectric heritage falls squarely within the broader category of industrial heritage, as defined by the Nizhny Tagil Charter of 2003 which explicitly include "places where energy is generated, transmitted and used" as well as "associated machinery" among the remains of industrial culture warranting recognition and protection [16] (p. 2). Yet within this broader category, hydroelectric heritage occupies an anomalous position. Unlike the majority of industrial heritage, that is protected and conserved precisely because it has been decommissioned, a considerable number of historical hydroelectric systems, built between the last decades of the nineteenth century and the first half of the twentieth, remain fully operational today. This same condition of continued productivity that ensures the physical maintenance of these structures simultaneously restricts public access and renders their cultural significance [17] largely invisible.

A further dimension of complexity concerns the relationship between hydroelectric infrastructures and the landscapes they have shaped. Over more than a century of development, dams, reservoirs, and conveyance systems have so thoroughly reconfigured European mountain valleys that they now constitute an integral, if often unrecognised, component of mountainous landscape. Many reservoirs have progressively re-naturalised: artificial lakes have become tourist destinations, and the scars inflicted on the landscape during construction have healed into features that contemporary visitors no longer perceive as artificial. This process of naturalisation, while testimony to the long-term integration of hydroelectric infrastructure into the cultural landscape, also contributes to the invisibility of these systems as heritage.

Two further characteristics distinguish hydroelectric heritage from the wider category of industrial heritage and fundamentally orient the kinds of interventions that can be undertaken on it: its ownership regime and protection status. The two are closely interdependent, since in the Italian legal framework the protection regime applicable to a historic

structure also depends on the nature of its owner. The ownership of a hydroelectric system, moreover, is a complex issue in itself: the water it exploits belongs to the public domain, and its use for energy production is granted to operators through concession of long but limited duration; the infrastructure, however, is built and held by the concession-holding company, which is today generally a joint-stock company, in some cases with a significant public shareholding but operating for profit nonetheless. Only upon expiry of the concession does part of the system return to public ownership. Since the reform introduced by Decree Law 135/2018 [18], the so-called "wet works" (opere bagnate)–dams, intakes, conveyance tunnels, penstocks and discharge channels–pass without compensation to the Regions, whereas power stations, machinery and ancillary buildings (the "dry works", opere asciutte) remain the property of the operator unless the Region elects to acquire them against payment. The historic power stations, which frequently constitute the most architecturally significant components of the system, thus tend to fall within the portion that remains in the operator's ownership.

The other factor is protection status. Under the Code of Cultural Heritage and Landscape [19], immovable property belonging to the State, to other public bodies or to non-profit private legal entities, whose execution dates back more than seventy years and whose author is no longer alive, is subject by law (ope legis) to a provisional protection regime pending a formal verification of its cultural interest, which may either confirm or lift the protection (art. 12). Property held by companies falls, as a rule, outside of this presumption, and acquires protected status only through an explicit declaration of cultural interest issued by the Ministry of Culture (art. 13). Where protection does apply, any work on the protected structure requires prior authorisation by the competent Soprintendenza, the peripheral office through which the Ministry exercises its protection functions and whose jurisdiction may extend over a single city, one or more provinces or an entire region.

Hydroelectric systems are, by contrast, very frequently subject to landscape protection by virtue of their location. Article 142 of the same Code, which incorporates the categories introduced by the so-called Galasso Law of 1985 [20], places under protection by law the land bordering lakes and watercourses, mountain land above 1600 metres in the Alps and 1200 metres in the Apennines, national and regional parks, and forested areas. These categories coincide almost by definition with the typical setting of an Italian hydroelectric system: the Sila scheme reservoirs, for example, lie in the Calabrian Apennines at approximately 1270–1280 metres above sea level and are entirely within the boundaries of the Sila National Park and amid extensive forest cover, so that any intervention altering the state of their surroundings requires a landscape authorisation issued on the binding opinion of the Soprintendenza.

Taken together, these conditions—continued operation, the issue of ownership and a significance that extends to the scale of the landscape—pose specific challenges to the valorisation of active hydroelectric heritage. First, valorisation cannot interfere with energy production. This is in the first place a practical constraint, since production remains the primary function of the system and the first priority of its operator; but it is also a factor of continued conservation, since ongoing use, whether productive or ancillary, is recognised as one of the most effective means of ensuring the maintenance of industrial structures [21], as the case of the Sila scheme discussed in Section 3 illustrates. Second, valorisation cannot be confined to individual buildings or to the technical system considered in isolation. Since the significance of hydroelectric heritage resides in the relationships among its components and between these and the landscape they have shaped, an approach focused on single structures would yield only a partial understanding of its value. Third, the energy companies that hold the infrastructure are necessary interlocutors, alongside the public authorities responsible for its protection: they control access to the sites, determine the

safety conditions under which visits can take place, and own the buildings on which any intervention would have to be carried out. Operational structures cannot change function, and even decommissioned buildings within an active site remain bound by the operator's safety requirements and, where protected, by the authorisation of the Soprintendenza; the scope for material transformation is therefore inherently limited. Valorisation initiatives must accordingly be light-touch, extend to the surrounding territory, and rely on interpretation, experience and communication rather than on physical intervention on the structures. These are precisely the characteristics of the valorisation approaches examined in the following section.

2.2. Cultural and Sustainable Tourism as an Opportunity for Hydroelectric Heritage Valorisation

The recognition of historical hydroelectric systems as cultural heritage presents a wide range of valorisation approaches. These can be broadly distinguished according to whether they address decommissioned or still-operational infrastructures. For decommissioned hydroelectric plants, valorisation has largely followed the established practices of industrial heritage reuse: several early power stations throughout Europe have been recognised for their cultural relevance and converted into museums or cultural facilities aimed at communicating the history of electrification and regional industrial development. Notable examples include the Museo dell'Energia Idroelettrica di Cedegolo (Brescia) [22], housed in a plant decommissioned in 1962 and part of the ERIH Application of Power European Theme Route, and the Kraftmuseet at Tyssedal in Norway, installed in the restored Tysso I power station [23].

In the case of active hydroelectric systems, however, valorisation must instead develop a mixed management model and forms of interpretation compatible with operational and safety constraints. As Rodriguez has observed in his analysis of hydropower landscapes in the Pyrenees, historical hydroelectric installations collectively form coherent territorial systems that have profoundly shaped the morphology and cultural identity of many mountain landscapes [24]. In this perspective, hydroelectric heritage is an intrinsically territorial heritage whose significance can only be fully communicated through approaches that engage with the landscape scale of the system as a whole.

Thus, cultural and sustainable tourism emerges as one of the most promising valorisation approaches for active hydroelectric systems. Cultural tourism—understood, following the ICOMOS International Cultural Tourism Charter definition, as the form of tourism that focuses on the culture, heritage and landscapes of a destination, including the values, traditions and ways of life of local communities [25]—offers a mode of engagement that does not require the cessation of productive activity. A related and more specialised strand of practice has emerged under the label of energy tourism, defined as a particular category of industrial tourism in which the geography of tourism is connected to the traces and living heritage of energy production—including power plants, dams, canals, and other energy-related structures [26]. Several European energy companies have pursued precisely this approach. In France, EDF, in collaboration with the Fondation Facim, developed the Chemins de l'hydroélectricité itineraries across the Savoie region [27]; in Italy, ENEL's long-running Centrali Aperte initiative has attracted close to 100,000 visitors annually since 2002 [28]; while the Compagnia Valdostana delle Acque offers annually the Giri d'Energia routes across twelve itineraries in the Aosta Valley [29].

These initiatives share a common fundamental feature: they are entirely funded and managed by the energy companies that own the infrastructure, and their continuity depends entirely on those companies' willingness to sustain them. When corporate priorities shift, or when the economic support for this kind of initiatives diminishes, such activities can be discontinued with little recourse for the communities they were intended to serve. It is

also worth noting that the territories in which the aforementioned valorisation initiatives have been implemented-the Savoie, the Aosta Valley, Trentino-Alto Adige–are, despite their mountain character, areas endowed with relatively robust tourism infrastructures, established tourism economies and a degree of private initiative that facilitates the uptake and amplification of corporate-led programmes.

There is a considerable difference in the more marginal and peripheral areas where a substantial share of Europe's historical hydroelectric systems is located. In these contexts—mountainous areas characterised by demographic decline, ageing population and limited infrastructure—company-driven initiatives are virtually absent. However, here is where the valorisation of hydroelectric heritage can generate the most meaningful effects for local communities if conceived as an integrated territorial strategy rather than a corporate communication exercise. By incorporating hydroelectric heritage within broader networks of local cultural and landscape resources, tourism itineraries become a vehicle for territorial legibility rather than merely a showcase for the infrastructure owner. To do so, such a valorisation initiative must be grounded in the values that residents and visitors assign to this heritage, and what forms of access and experience they value most. This approach calls for the application of economic valuation methods capable of eliciting the preferences of residents and visitors over alternative forms of valorisation, within a framework attentive to the complex social dimensions of heritage value.

2.3. Economic Valuation of Cultural Heritage

Cultural heritage valuation has long been approached through the framework of Total Economic Value (TEV) theory, originally developed within environmental economics in the late 1980s and early 1990s [30]. The TEV model disaggregates the value of a good into use values—encompassing direct use, indirect use, and option values—and non-use values, which include existence value, bequest value, and the value associated with preserving options for future generations. Therefore, the TEV framework allows cultural and heritage assets to be incorporated into public policy cost evaluations. Methods such as Contingent Valuation (CV), travel cost analysis, and hedonic pricing have been extensively deployed within this framework to approximate individuals' Willingness to Pay (WTP) for the preservation, accessibility or enhancement of heritage sites.

The TEV approach has seen substantial empirical applications in the context of cultural heritage valuation; however, its limits become visible when applied to hydroelectric heritage. Hydroelectric systems are not discrete assets, but they are profoundly embedded in the landscape and the communities, in ways that require to account for their intrinsic social, cultural and historical character. This complexity is shared by other types of cultural heritage, for which an alternative framework has proven more apt. The concept of Complex Social Value (CSV) [31], rooted in theories of sustainability, relational goods and civil economy, represents one of the most articulated responses to the inadequacies of purely economistic valuation approaches to cultural heritage. Rather than reducing the significance of a heritage asset to a single monetary metric, CSV recognises value in cultural heritage objects as. an ensemble of economic, cultural, spiritual, ecological and social cohesion values that are co-produced by communities through processes of interpretation, appropriation and use. In this perspective, value is not a pre-existing property of the heritage object but an emergent quality that arises through the relationship between the asset and the community that engages with. Cerreta further developed this approach by emphasising the need for multi-criteria decision analysis and participatory evaluation processes capable of representing and negotiating the diverse and often conflicting interests associated with complex heritage assets [32].

The TEV and CSV frameworks offer fundamentally different methodological orientations: while the TEV model retains significant advantages in terms of communicability and integration with standard cost–benefit analysis, CSV offers a richer and more inclusive framework that is better suited to capturing the non-use dimensions of heritage significance, though at the cost of reduced standardisation and greater methodological complexity [33,34]. The CSV paradigm has been applied with particular success in the governance of landscape and architectural heritage in marginal and post-industrial contexts [35], where the challenges of valorisation most closely resemble those encountered in the present study. It is therefore proposed here that CSV theory constitutes the most appropriate theoretical framework for the investigation of community perceptions of hydroelectric heritage valorisation.

For the purposes of the present study, preference-based stated preference methods are particularly well suited. Among these, Choice Experiment (CE) methods (that evolved within the broader family of Conjoint Analysis techniques) have emerged as the most appropriate tool for the valuation of cultural heritage assets, as they allow researchers to decompose complex assets into their constituent attributes and to estimate the welfare implications of changes in each attribute without asking respondents to assign monetary values directly [36].

2.4. Conjoint Analysis as a Methodology for the Valuation of Hydroelectric Heritage

The expression Conjoint Analysis (CA), introduced by Green and Srinivasan [37], indicates a family of analytical techniques designed to evaluate multi-attributes and services. Its theoretical foundation lies in Lancaster's characteristics theory of value, which holds that individuals derive utility not from a good or service as an undifferentiated whole, but from the bundle of attributes that constitutes it [38]. The principal variants of CA can be broadly classified into ranking-based, rating-based and paired comparison methods, each presenting distinct advantages and limitations. Among these, the Choice Experiment (CE) approach can be considered an evolution of the paired comparison methods that has gained particular prominence in recent applications to environmental and heritage valuation. In a CE, respondents are presented with repeated choice tasks in which they select their preferred option from sets of alternatives that differ in their attribute composition, with cost included as one of the attributes. This design is consistent with the Random Utility theory, which assumes that individuals select the alternative that maximises their utility from a finite set of options [34]. By embedding the cost attribute within the choice task rather than requesting direct WTP estimates, CE methods reduce cognitive burden and strategic bias, while enabling the implicit derivation of marginal WTP for each attribute from the estimated preference parameters [39].

The adoption of a CA approach is specifically justified in the case of active hydroelectric heritage for three main reasons. First, the operational status of hydroelectric infrastructures precludes those interventions conventionally applied to industrial heritage, such as adaptive reuse, and confines musealisation to the decommissioned buildings within active sites. Valorisation strategies must instead operate through reversible and non-structural actions, such as guided visits or landscape itineraries, which are particularly well represented as alternative attribute combinations within a CA methodology. Second, hydroelectric heritage operates at a systemic and territorial scale that makes it unsuitable for valuation as a single site or monument: CA addresses this complexity by valuing composite scenarios rather than isolated objects. Third, the CA method explicitly accommodates a status quo option in each choice set, representing the continuation of current management practices, which is essential for assessing the welfare changes, and, implicitly, the social benefits, associated with proposed valorisation strategies.

In this study, the valued good is defined as a heritage itinerary integrating active hydroelectric infrastructures within their broader territorial context, allowing public fruition without compromising the primary energy function of the infrastructure. The implementation of the CA follows the methodological sequence established in the literature [40]: definition of the research problem and valuation objectives; identification and operationalisation of attributes and levels; construction of the experimental design; development of the survey instrument; data collection; econometric estimation of preference parameters based on the Random Utility Model; and validation and critical interpretation of results. Attribute selection, a particularly consequential step in this design, was supported by qualitative preliminary investigation to ensure both methodological relevance and contextual resonance for the respondents.

The quantities derived from a CE require careful positioning with respect to the CSV framework adopted in this study. In this case, the CE does not measure the intrinsic value of a heritage asset, nor does it produce an exhaustive account of its Total Economic Value. What it measures is the relative weight that respondents assign to the constituent attributes of a defined intervention, together with the direction and strength of their preferences across the levels of those attributes.

The following sections will describe the application of the CA methodology to the case study of the Sila Plateau hydroelectric scheme in Calabria, Italy, as a pilot case study for the application of this method as a supporting tool for the valorisation of historical hydroelectric systems in marginal and peripheral areas.

3. Case Study: The Sila Scheme in Calabria, Italy

3.1. The Sila Scheme

The selection of the Sila Plateau hydroelectric scheme as the case study for this research followed a systematic survey of historical hydroelectric systems in Southern Italy, conducted with the objective of identifying an active infrastructure that would exemplify, simultaneously, the heritage complexity of active hydroelectric systems, the absence of significant existing valorisation initiatives, and the territorial conditions (geographic marginality, demographic decline, limited private investment) in which integrated heritage tourism strategies carry the greatest potential for positive externalities. Against these criteria, the Sila scheme presented itself as an exceptionally well-suited candidate. The Sila scheme is embedded in one of Italy's most persistently marginalised territories, characterised by a combination of geographic isolation, demographic contraction and limited economic diversification; at the same time, its historical, architectural and territorial significance is considerable.

The origins of the Sila scheme are part of the broader project of industrial and territorial transformation of Southern Italy that shaped Italian economic policies in the early twentieth century [41]. The initial conception of the scheme is attributed to the engineer Angelo Omodeo, working in the context of the broader vision of Francesco Saverio Nitti for the electrification and industrial development of the Mezzogiorno [42]. Construction proceeded in three phases between 1922 and 1932 [43]. The first phase (1922–1927) involved the construction of the Trepidò dam and the Timpagrande power plant, that would later become the second drop of the cascade system. The second phase (1926–1928) saw the construction of the Orichella plant—the first drop of the system—and the excavation of the underground tunnel connecting the two lakes. The third phase (1929–1932) saw the construction of the Nocelle dam and added the Calusia power plant as the third drop of the cascade system.

In physical terms, the Sila scheme constitutes one of the most extensive and coherent examples of integrated water management in Southern Italy. Lake Ampollino (Figure 1a),

situated at approximately 1270 metres above sea level, was created by the Trepidò dam —a gravity structure in granitic stone masonry, 38.6 metres in height. Lake Arvo (Figure 1b), lying at approximately 1280 metres, was created by the earthen Nocelle dam and extends over roughly 8–9 square kilometres, making it one of the largest artificial reservoirs in Southern Italy. The two lakes are connected by a three-kilometre underground tunnel; electricity is generated in the three cascade power stations, with water ultimately returned to the Neto river for downstream irrigation use.

(**a**) (**b**)

Figure 1. Lake Ampollino (**a**) and Lake Arvo (**b**). Source: Authors, 2025.

Following the nationalisation of the Italian energy sector in 1962, the whole infrastructure passed from the Società Meridionale di Elettricità (SME) to ENEL. The subsequent liberalisation of the sector led to the redistribution of assets among different operators, and the plants of the scheme are now operated by A2A, a listed company jointly controlled by the municipalities of Milan and Brescia, which today manages the Sila plants alongside other hydroelectric systems in Lombardia and Friuli-Venezia Giulia [44]. A2A holds the concession for the use of the reservoirs under a convention dating back to 1968 and due to expire in 2029. The components of the scheme are distributed between the provinces of Cosenza and Crotone, each served by a different Soprintendenza. The expiry of the concession constitutes a concrete turning point: the dams, tunnels and penstocks will then pass to the Calabria Region, whereas the fate of the historic powerhouses, no longer in productive use since the upgrading works of 1971–1982, will depend on whether they are still regarded as assets pertaining to the concession—a question that bears directly on any strategy for their valorisation.

Today, the scheme remains fully operational. However, as a consequence of the upgrading works undertaken between 1971 and 1982 [45], production was relocated to newly built powerhouses on the same sites, leaving the original buildings to ancillary uses. The former Timpagrande and Orichella plants serve today as office space and storage facilities; the former Calusia plant, where the original machinery has been preserved in situ, hosts occasional educational visits for local school groups focused on renewable energy production. Despite the loss of their productive function, all three historic buildings are in an excellent state of conservation, maintained by ongoing use and by recognition of their architectural significance on the company's side.

3.2. The Sila Plateau: Tourism Offer

The Sila Plateau is a high-altitude granitic massif located in the central part of Ca labria, extending across the provinces of Cosenza, Catanzaro and Croton, covering approximately 150,000 hectares at elevations generally ranging between 1000 and 1900 metres above sea

level, with its highest point at Monte Botte Donato (1928 m). The plateau is conventionally divided into three sub-areas: the Sila Greca to the north-east, the Sila Grande at the centre, and the Sila Piccola to the south-west. The plateau constitutes a major watershed between the Tyrrhenian and Ionian coasts, but its remoteness and hydrological instability rendered the interior of the plateau largely uninhabitable for millennia, thus explaining the relative scarcity of historical settlements in the area.

As mentioned above, both Lake Arvo and Lake Ampollino fall entirely within the boundaries of the Sila National Park [46], one of the most significant protected areas in Southern Italy. The park encompasses 21 municipalities distributed across the provinces of Cosenza, Catanzaro and Crotone, and manages a small network of visitor centres situated near the main population centres of the plateau: the Cupone Visitor Centre in Spezzano della Sila, the Museum of Water and Electricity in Albi, and the A. Garcea Visitor Centre near Trepidò on Lake Ampollino.

The park boundaries overlaps substantially with the UNESCO Man and the Biosphere (MAB) Reserve Sila, designated in 2014 [47]. The Biosphere Reserve management actively supports sustainable tourism, environmental education and the promotion of local products, and its objectives are aligned with those of the Gruppi di Azione Locale (GAL) Sila and Kroton, the two Local Action Groups operating within the LEADER framework across the Cosenza and Crotone provinces respectively [48]. The Local Development Strategy elaborated by GAL Sila for the period 2023–2027 [49] explicitly prioritises the development of a high-quality slow tourism destination rooted in local resources, including the establishment of the Sila Plateau Tourist District—formally constituted in 2020 and currently encompassing 22 municipalities across the three provinces (Figure 2).

Figure 2. Location and extension of the Sila Plateau Touristic District within Calabria. Source: Authors' elaboration from data provided by Geoportale Calabria using the QGis software version 3.40.8 Bratislava .

The natural assets of the plateau constitute its primary attraction. Also, thanks to its remoteness, the Sila Plateau hosts one of the last surviving old-growth forest complexes in Europe, the Gariglione Forest, which Norman Douglas encountered in 1911 and described as "a real Urwald", unparalleled on the European continent [50] (p. 222). Although today reduced to a fraction of its original extent due to intensive logging in the nineteenth and early twentieth centuries [51], remnants of this ancient Silva Brutia survive in the FAI-protected reserve of I Giganti della Sila, a grove of approximately 58 Laricio pines estimated to be over 350 years old (Figure 3a). The two artificial lakes created by the hydroelectric scheme have themselves become significant landscape assets and focal points of summer recreational activity, their naturalised shorelines now fully integrated into the identity of the plateau.

(**a**) (**b**)

Figure 3. The FAI nature reserve I Giganti della Sila (**a**) and the historical centre of Caccuri (**b**), as seen from the town's castle. Source: Authors, 2025.

The cultural offer of the plateau is more limited, reflecting the historically sparse settlement pattern of the area. The only two settlements formally recognised by the Calabria Region as historical centres of significance are San Giovanni in Fiore and Caccuri (Figure 3b). Nevertheless, several municipalities host small museums and ecomuseums connected to local traditions: the Museo della Civiltà Contadina, the Museo dell'Arte Tessile in Longobucco, the Museo Demologico dell'Economia, del Lavoro e della Storia Sociale Silana in San Giovanni in Fiore, and the Museo dell'Olio d'Oliva in Zagarise. The gastronomic heritage of the area includes several products with protected designations of origin, among them the Caciocavallo Silano DOP, Capocollo di Calabria DOP, and the Patata della Sila IGP.

From a mobility standpoint, the plateau is accessible primarily by road via the SS107 Silana-Crotonese, which constitutes the main east–west axis connecting Cosenza to Crotone across the plateau. Secondary road connections are frequently unreliable due to maintenance deficiencies, reinforcing the perception of the area as remote even for neighbouring municipalities. Rail access is virtually absent: the historical Ferrovia della Sila, a narrow-gauge line originally built to support the hydroelectric construction works, was decommissioned in 2010 and has been partially repurposed for seasonal tourist use, but

does not provide functional connectivity to the national railway network. Air access is available through Lamezia Terme International Airport, reachable from the plateau in approximately 1–1.5 h by car, though the absence of multimodal connections between the airport and inland areas substantially limits its utility for visitors without private transport. In contrast, the plateau has developed a relatively well-structured network of slow mobility infrastructure, including hiking trails, cycling routes and equestrian paths within the National Park boundaries, increasingly integrated into regional networks such as the Ciclovia dei Parchi della Calabria [52] (Figure 4).

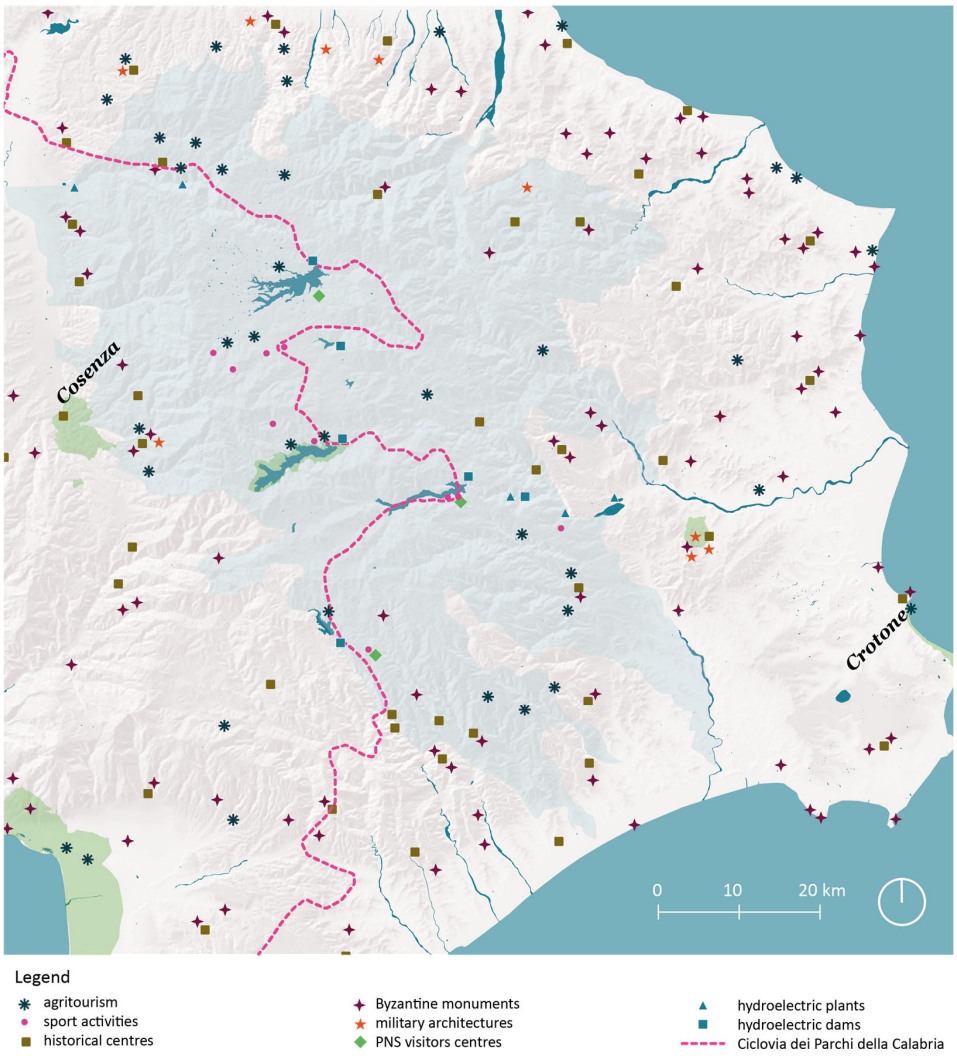

Figure 4. Cultural and landscape resources of the Sila Plateau. Source: Authors' elaboration from data provided by Geoportale Calabria using the QGis software.

3.3. The Sila Plateau: Tourism Demand

Tourism demand in the Sila Plateau must be understood within the broader regional dynamics of Calabria, where tourism flows tend to be heavily concentrated in summer and in coastal location. Inner and mountain areas of Calabria historically experience limited tourism traffic, even in years characterised by overall tourism flow growth. According to ISTAT data for 2024, Calabria's accommodation establishments recorded over 8.1 million overnight stays and approximately 1.75 million arrivals, placing the region third among the Regions of mainland Southern Italy, behind Campania and Puglia [53]. The first half of 2025 showed further growth, with arrivals increasing by more than 10% and foreign arrivals rising by over 45% compared to the same period of the previous year [54]. Notwithstanding

this positive trend, the regional tourism system remains structurally fragile and heavily concentrated in coastal areas. Coastal hill zones account for approximately 63.4% of overnight stays in Calabria, while mountain and inland areas—despite hosting environmental systems of considerable value such as the Sila, Pollino and Aspromonte—account for only 2% of total overnight stays [55]. Within this regional context, the Sila Plateau has shown signs of increasing attractiveness, particularly in the period following the COVID-19 pandemic. The summer season of 2020 recorded an estimated annual growth rate of approximately +37% in tourist presence in the area, consistent with the broader shift in post-pandemic tourism preferences towards nature-based activities, slow travel and alternatives to mass coastal tourism.

The socio-demographic structure of the local population adds a further layer of relevance to these dynamics. The municipalities of the Sila area exhibit severe demographic decline consistent with the broader pattern of marginalisation that characterises inner mountain areas of Southern Italy. According to ISTAT [56], San Giovanni in Fiore, the main settlement of the plateau, currently counts approximately 15,461 inhabitants, down from over 18,000 in the early 2000s [57], with a recent annual natural balance of −62 inhabitants due to deaths significantly outnumbering births. According to data from GAL Sila [58], the Sila Plateau Tourist District had a total population of approximately 106,863 inhabitants in 2020, characterised by a high old-age index, significant youth outmigration and income levels well below the national average.

Building on this preliminary reconnaissance, and consistently with the research objectives, the valorisation scenario submitted to evaluation was defined in terms of visitor itineraries. Such itineraries were conceived as an extension of the existing trail and cycling network, integrating the cultural and landscape resources of the plateau while remaining compatible with the environmental constraints required by the Sila National Park.

4. Materials and Methods

As highlighted in Section 2.3, the CA approach is particularly suitable for the estimating of non-market goods, such as cultural heritage products, for its capacity to disaggregate the good (in this case, the valorisation itinerary) into its different components (the attributes), allowing the assessment of preferences in the intended users including both residents and non-residents. Consistently with standard practice in CE design, the phase following the preliminary analysis and the field reconnaissance was devoted to a pre-test, aimed at validating the selection of attributes and levels and at calibrating the composition of the questionnaire before its final administration.

The selection of non-monetary attributes and levels drew on three complementary sources, in line with established recommendations on the qualitative development of attributes for choice experiments [59]. The first comprises the valorisation practices reviewed in Section 2.2, which provided a repertoire of formats already tested in comparable contexts; the second is the wider literature on cultural and sustainable tourism, which informed the definition of the integration and mobility components of the proposals; the third, and the most consequential for the choice of attributes for this specific context, is a preliminary field investigation conducted in the study area.

The field investigation, carried out in three distinct moments in August 2024, August 2025 and September 2026 included site visits, systematic observation and unstructured interviews. The site visits of August 2024 and September 2026 focused on the power plants and artificial reservoirs of the Sila scheme, that were accessed thanks to the collaboration of A2A Calabria, while the site visit of August 2025 focused on observations regarding the tourism activities offered in the area by private operators and public bodies, including the Sila National Park. The activities of GAL Sila proved particularly informative: they clarified

the strategic orientation of the Sila Plateau Tourist District, which pursues a model of slow and sustainable tourism, consistent with region-wide initiatives such as the Ciclovia dei Parchi della Calabria [47], and whose explicit objectives include the integration of natural and cultural resources within a single tourism offer.

These observations were complemented by unstructured interviews with local experts and stakeholders, including personnel from A2A, GAL Sila, GAL Kroton, National Park guides, and local business owners. Three findings emerged consistently across respondents. First, the local community attributes significant value to the environmental character of the area and expresses a clear preference for forms of tourism compatible with it; National Park guides, in particular, emphasised the importance of sustainable mobility, citing the proliferation of unregulated off-road vehicle rentals in the area as an example of the kind of impact that better-regulated itinerary-based tourism could help mitigate. Second, respondents widely recognised that the potential for sustainable tourism is constrained by the current state of the mobility infrastructure, and that improved connectivity and interpretation of the area's cultural and landscape resources would be a precondition for developing more structured tourist routes. Third, residents and operators involved in local cultural activities expressed the desire for a more open relationship between the energy company responsible for the hydroelectric system and the surrounding communities, including the possibility of organised visits to the plants.

Exchanges with local civic associations and heritage experts added a further dimension. They underlined the historical significance of the hydroelectric infrastructure for the Sila Plateau, noting that it was the creation of the artificial reservoirs in the early twentieth century that made agriculture viable on the plateau and subsequently enabled the development of lake-based tourism. Most respondents, including guides, association members and local residents, shared accounts of family members who had worked at the plants during construction or operation, and expressed a broadly positive attitude towards the infrastructure as a component of local identity. This is consistent with the process of naturalisation described in Section 2.1: the hydroelectric system is perceived not as an industrial intrusion but as a constitutive element of the landscape and of the community's history.

The observations and interviews, read alongside the good practices identified in Section 2.2 and the authors' direct observation of the sites, informed the selection of the four non-monetary attributes. The prevalence of car-based access and the concurrent aspiration towards more environmentally conscious mobility motivated the inclusion of Mobility Mode. The District's strategy of connecting natural and cultural resources through structured routes motivated the Itinerary Length and Integration attributes, the latter being designed to reflect the progressive incorporation of resources—from landscape to cultural sites and activities—that both scientific literature and local stakeholders consistently identifies as the distinguishing character of a territorial, rather than single site-based, tourism offer. The Hydroelectric Heritage Valorisation attribute reflects the interest expressed by local communities in organised access to the plants, and the range of formats already documented in comparable European cases. A fifth monetary attribute, Cost, was included, whose definition is discussed separately below.

These attributes constitute the operational bridge between the theoretical framework of CSV adopted in this study and the application of the CE. When the notion of complex social value was first formalised in the 1980s, the "social" component referred primarily to the collective sphere: to the recognition, by a community as a whole, of the public value of architectural and cultural resources that the market fails to express [7]. In more recent applications of the framework, this collective dimension has been joined by a more granular understanding of the social component, in which the relationship between the individual

and the heritage asset—including its capacity to generate experiences, services and positive externalities at the scale of the person, such as mitigating the negative effects of ageing, reinforcing social cohesion, or stimulating environmental awareness—is treated as a distinct and constitutive element of value [60]. The social dimension therefore now encompasses both the community's collective recognition of the heritage and the individual's experiential relationship with it, with nature and with other members of the community.

As stated above, CE operates on the use-value component of this complex: by presenting respondents with alternative ways of accessing and experiencing the heritage, it elicits the value they attach to different forms of use, while the intrinsic, use-independent value of the heritage remains, by construction, outside its reach. Within this limit, each attribute was designed to engage the dimensions of CSV.

The Hydroelectric Heritage Valorisation attribute primarily addresses the cultural dimension. Its levels determine whether the technical and architectural content of the system is interpreted and communicated, and therefore capture the degree to which respondents recognise a cultural significance in the infrastructure independently of its productive function. The Integration attribute engages the cultural, ecological and social cohesion dimensions. By determining whether hydroelectric heritage is presented in isolation or as one component of a territorial narrative that includes natural and cultural resources, it operationalises the relational character of CSV, according to which the intrinsic value of a heritage asset can be assessed only through careful consideration of the relationship between the heritage and its social and territorial context of reference [61]. The ecological dimension is engaged because the integration of nature-based routes and activities makes the experience of the natural environment a constituent element of the proposed itinerary. The social cohesion dimension is engaged because the route, by connecting dispersed communities, resources and producers within the same territorial offer, performs the function of reinforcing the bonds that Fusco Girard identifies as the living expression of CSV.

The Itinerary Length and Mobility Mode attributes address the dimensions that concern the territorial effects of the initiative and the conditions of access to it. The duration of the itinerary determines the extent to which the initiative engages the accommodation and hospitality network of the district, and thus its capacity to generate local economic effects, but also the time and effort it requires of participants; it captures a trade-off between the economic dimension and social cohesion in its distributive sense. The mobility mode determines both the environmental footprint of the initiative, engaging the ecological dimension, and its accessibility for those without private transport, engaging the distributive component of social cohesion—that is, who is in a position to benefit from the initiative. In the more individual-centred reading of the social dimension that characterises recent elaborations of the CSV framework, the mobility mode is also the attribute that most directly determines the quality of the individual's experiential relationship with the landscape.

In the pre-test version of the questionnaire, each non-monetary attribute was articulated into four levels, numbered from 0 to 3. Level 0 describes the current condition of the study area, in which initiatives for the valorisation of hydroelectric heritage are virtually absent, and therefore functions as the status quo. For the first three attributes, the higher levels represent increasing degrees of intensity. The levels of Mobility Mode are categorical rather than ordinal: they were ordered according to the degree of organisation and service provision that each mode requires of the tourism offer, from independent travel by private car to a dedicated collective transport service.

The selected attributes are Hydroelectric Heritage Valorisation, Itinerary Length, Integration With Other Cultural Heritage Resources, and Mobility. Each attribute is articulated into four different levels (from 0 to 3), corresponding to increasing degrees of intensity of the attribute. The inclusion of a level 0 was intended to represent the absence of the

attribute, thus reflecting the current condition in which initiatives aimed at the valorisation of hydroelectric heritage are virtually absent.

The pre-test questionnaire was administered to a small preliminary sample of six respondents thus distributed: two residents of the Sila Plateau area, both running a productive and hospitality business in the area; a resident of Cosenza, employed in the public administration in the field of cultural heritage and spatial planning; an expert on the topic of hydroelectric heritage, not previously familiar with the Sila territory; and two Italian citizens who visited the area for the first time when the survey was administered. The questionnaire was administered in person, allowing the direct observation of respondents' behaviour and the identification of potential difficulties during completion; this proved especially useful in detecting issues related to question clarity and the cognitive complexity of the CE that were improved in the final questionnaire.

Pre-test feedback revealed that the number of choice tasks in the pre-test was a source of respondent fatigue, with a measurable decline in engagement towards the end of the exercise. In response, the number of levels per attribute was reduced from four to three for the final questionnaire (Table 1), enabling the generation of a more compact set of scenarios through orthogonal design. The highest level was removed from Hydroelectric Heritage Valorisation, Itinerary Length and Integration, while the two intermediate levels of Mobility Mode, on foot and by bicycle or e-bike, were merged into a single level. This adjustment reduced the cognitive burden placed on respondents. Most consequentially for the interpretation of the results, respondents experienced systematic difficulty in assigning a monetary value to the scenarios: greater appreciation for a scenario did not reliably correspond to a higher stated contribution, and several respondents associated higher prices with the scenarios they believed ought to command a higher price rather than with those for which they would themselves pay more.

Table 1. Attributes and related levels, with associated shortened versions for the implementation of the analysis through the software IBM SPSS version 32.0, as defined after the pre-test phase. Source: Authors.

Attributes	Levels	Description
Hydroelectric Heritage Valorisation (HydroVal)	0 = No Hydroelectric Heritage Valorisation (NoVal)	No form of organised access to the hydroelectric system is provided. The infrastructure remains visible in the landscape but is neither interpreted nor made accessible. This level describes the current condition.
	1 = Guided Tours to Power Plants and Active dams (VisitVal)	Scheduled guided tours to the active power plants and dams, conducted under the supervision of the operating company and compatible with industrial safety requirements. Access is periodic and entails no physical modification of the plants.
	2 = Museum Activities in the Dismissed Buildings of the Hydroelectric System (MuseoVal)	Museum and interpretation activities installed in the decommissioned buildings of the hydroelectric system, which no longer serve a productive function and can host public uses without interfering with the operational plants.

Table 1. *Cont.*

Attributes	Levels	Description
Itinerary Length (ItinLength)	0 = No Proposed Itinerary (NoItin)	No structured itinerary including the hydroelectric system is proposed; the resources of the plateau remain accessible only individually.
	1 = One Day Itinerary (OneItin)	A single-day route connecting the hydroelectric installations with the resources in their immediate vicinity, completed without overnight stay.
	2 = Two days Itinerary (TwoItin)	A two-day route extending across a wider portion of the plateau, requiring one overnight stay in the accommodation facilities of the district.
Integration with Other Categories of Heritage and Activitites (Integration)	0 = No Integration (NoInteg)	The itinerary is centred exclusively on the hydroelectric heritage, with no connection to the other resources of the plateau.
	1 = Integration with Nature-based and Sport Activities (SportInteg)	The route incorporates the nature-based and sport resources already present in the area—hiking and cycling trails, the shores of the two reservoirs, the protected forest areas—and activities such as horse riding, kayaking, canoeing and e-bike excursions, so that the visit to the hydroelectric installations forms one stage of a route whose other stages are natural and recreational.
	2 = Integration with Nature-based, Sport Activities and Cultural Sites (CultInteg)	In addition to the nature-based and sport resources, the route incorporates the cultural resources of the district—the historical centres of San Giovanni in Fiore and Caccuri and the local museums and ecomuseums—so that hydroelectric heritage is presented as one component of a composite territorial narrative.
Mobility Mode (Mobility)	0 = Mobility by Own Car (CarMob)	The itinerary is travelled independently by private car, the mode of access currently dominant on the plateau.
	1 = Mobility on foot or by bike (FootBikeMob)	The itinerary is travelled on foot, by bicycle or by e-bike, using the existing network of trails and cycling routes within the National Park.
	2 = Mobility by Electric Public Transport (BusMob)	The itinerary is served by a dedicated electric public transport service connecting its stages. This service does not currently exist and would require establishment.
Cost	Low/Medium/High	Monetary contribution requested for participation, in three ranges (0–10 €, 11–30 €, 31–50 €). Unlike the other attributes, the level was not generated through the orthogonal design but assigned ex ante on the basis of the pre-test.

Particular attention was paid to the definition of the Cost attribute, a key element for the implementation of CA. Unlike the other three attributes, the Cost variable was not generated through orthogonal experimental design. The concern motivating this decision was that a random combination of prices and proposed itineraries could produce implausible scenarios—an inexpensive two-day itinerary integrating multiple resources, or a costly scenario offering no valorisation at all—thereby compromising the credibility of the choice tasks and potentially biasing stated preferences. The monetary levels were therefore established ex ante on the basis of the pre-test: each scenario of the final design was assigned the price range most frequently selected by pre-test respondents for the analogous scenario. Three ranges were retained for the final questionnaire (0–10 €, 11–30 €, 31–50 €), calibrated on the distribution of pre-test responses.

According to widely accepted practices in survey design and administration [62], the final questionnaire was organised into three main sections. The first section investigates respondents' geographical origin, familiarity with the Sila Plateau area, cultural habits, and previous knowledge of hydroelectric heritage. The second section constitutes the core of the survey and includes the choice packets for the CE. The final section is designed to collect socio-demographic information.

The statistical software IBM SPSS was employed for the construction of scenarios for the CE. A fractional factorial design was adopted in order to exclude unrealistic combinations of attributes and levels. The orthogonal design generated nine profiles, from which two were subsequently removed because they combined the absence of any proposed itinerary with the presence of other attributes, a configuration inconsistent with the logic of the valuation exercise; the all-zero profile was retained as the status quo. The resulting seven scenarios are presented in Table 2. They were combined into three choice packets, each containing Scenario 0 (status quo) and two alternative scenarios (Table 3).

Table 2. Attributes and related levels of scenarios selected for the CE. Source: Authors.

Scenario ID	Hydroelectric Heritage Valorisation	Itinerary Length	Integration with Other Resources	Mobility.	Cost
0	NoVal	NoItin	NoInteg	CarMob	0–10 €
1	NoVal	OneItin	CultInteg	FootBikeMob	11–30 €
2	VisitVal	TwoItin	NoInteg	FootBikeMob	11–30 €
3	VisitVal	OneItin	SportInteg	CarMob	31–50 €
4	MuseumVal	OneItin	NoInteg	BusMob	31–50 €
5	MuseumVal	TwoItin	CultInteg	CarMob	31–50 €
6	NoVal	TwoItin	SportInteg	BusMob	31–50 €

Table 3. Composition of the three choice packets presented to respondents. Source: Authors.

Choice Packet	Scenarios
1	{0, 1, 2}
2	{0, 3, 4}
3	{0, 5, 6}

The final survey was administered both in person and online through the main social media and web platforms. A total of 153 responses were collected, including 41 residents of the Sila Plauteau Touristic District municipalities and 112 non-residents.

The final survey was administered between October 2025 and January 2026, both in person and online through the main social media and web platforms, following a

non-probabilistic convenience sampling approach. A total of 153 responses were collected, including 41 residents of the Sila Plateau Tourist District municipalities and 112 non-residents.

5. Results

5.1. Sample Composition and Cultural Habits

Table 4 shows the respondents' answers to the third section of the questionnaire, regarding socio-economic data such as gender, age, household composition, education level, occupation, and income.

Table 4. Composition of the survey sample related to socio-economic characteristics. Source: Authors.

Characteristic	*n*		Total
Gender	Woman	78	51.3%
	Man	64	41.8%
	Other/Prefer not to say	11	7.2%
Age	18–25	16	10.5%
	26–35	74	48.4%
	36–50	39	25.5%
	50–65	12	7.8%
	65+	12	7.8%
Household dimension	1 person	26	17.0%
	2 people	41	26.8%
	3 people	25	16.3%
	4 people	47	30.7%
	5+	14	9.2%
Highest level of education	Middle school	2	1.3%
	High school	31	20.3%
	Bachelor	27	17.6%
	Master's	52	34.0%
	PhD/Other equivalent	41	26.8%
Occupation	Employed	69	45.1%
	Self-employed	32	20.9%
	Student	11	19.0%
	Unemployed	8	5.2%
	Retired	4	7.2%
	Other	29	2.6%
Income	Less than 10,000 €	30	19.6%
	10,000–25,000 €	62	40.5%
	26,000–55,000 €	48	31.4%
	56,000–100,000 €	10	6.5%
	More than 100,000 €	3	2.0%

The sample was characterised by a slight predominance of women (51.3%), while men accounted for 41.8% of respondents and 7.2% selected Other or preferred not to disclose their gender. The largest age group was represented by individuals between 26 and 35 years old (48.8%), followed by respondents aged 36–50 (25.5%), indicating a generally young adult profile for the sample. Households composed of four people were the most represented category (30.7%), followed by two-people households (26.8%). From an educational perspective, the sample displayed a relatively high qualification level: more than 30% of respondents held at least a master's degree, while only a very small share (1.3%)

reported middle school education as their highest qualification. Regarding occupation, employed individuals constituted the largest group (45.1%), followed by self-employed workers (20.9%) and students (19%). Unemployed and retired respondents represented comparatively smaller shares of the sample. Income distribution was concentrated primarily within the low- and middle-income ranges, with the majority of respondents reporting annual incomes between €10,000 and €55,000.

Overall, the average respondent may therefore be described as a relatively young, highly educated employed individual, belonging to a medium-sized household and characterised by a medium income level. This is consistent with the profile of the cultural tourist, identified as the primary target of the proposed valorisation itineraries. Data related to tourism preferences and cultural habits (Table 5) also reinforce this hypothesis. Nature-based tourism was the most preferred tourism typology by 82.4% of respondents (respondents could select more than one option), followed by cultural tourism (71.9%) and tourism involving food and wine experiences (50.3%). Preferences for leisure tourism (39.2%) and adventure tourism (26.8%) are, instead, less prominent.

Table 5. Cultural habits and tourism preferences of the sample. Source: Authors.

Characteristics		*n*	Total
Type of tourism preference	Nature-based	126	82.4%
	Cultural	110	71.9%
	Food and Wine	77	50.3%
	Leisure	60	39.2%
	Adventure	41	26.8%
Frequency of fruition of museums/archeological/cultural sites in the last 12 months	0	13	8.5%
	1–5	85	55.6%
	6–10	25	16.3%
	10+	30	19.6%

The majority of respondents (55.6%) indicated having visited 1–5 museums/cultural sites in the last year, while 19.6% visited more than10, and 16.3% between 6 and 10. Only 8.5% declare that they have visited no cultural sites or museums in the last 12 months. The sample is therefore not representative of the resident population of the district, a composition likely to orient preferences towards cultural and experiential attributes, a composition that should be taken into account in interpreting the preference estimates.

5.2. Econometric Analysis

The analysis of the choice data aims to estimate the relative weight that respondents assign to the attributes of the proposed valorisation scenarios. The theoretical basis for conducting this analysis is the Random Utility Model [38], based on the assumption that each individual *i* associates a level of utility with every alternative *j*, and selects the option that yields the highest utility among the available alternatives. This preference depends on both the good's characteristics expressed through the associated attributes and levels, and on the respondents' socioeconomic status [39].

Formally, the utility U associated with alternative j for individual i can be expressed as:

$$Uij = U\ (xij, \beta) + \varepsilon ij,$$

where U (xij, β) represents the deterministic component of utility, expressed as a function of observed attributes x and parameters β, and εij is a stochastic error term referring to unaccounted for factors. In this formulation, i denotes the individual, j the alternative, and

xij the vector of attributes and characteristics relevant to the choice. Assuming a linear specification of the deterministic component, utility can be calculated as:

$$U = \beta 0 + xij\ \beta 1 + (y_1 - C_{ij})\ \beta\ 2 + \varepsilon ij,$$

where y_i refers to individual income and C_{ij} represents the monetary cost associated with alternative j, under the assumption that individuals tend to choose the alternative k that maxims their utility. The probability Pr that individual i will choose alternative k can therefore be expressed as:

$$Pr(k) = Pr(Uk > Uj)\ \forall j \neq k$$

Substituting the utility function and isolating the error, this function yelds:

$$Pr(k) = Pr\ [(\varepsilon i - \varepsilon k) < (xk - xj)\ \beta_1 - (Ck - Cj)\ \beta_2]\ \forall j \neq k$$

Thus demonstrating how the probability of choice depends on differences in utility across alternatives depending on the difference in attributes and levels, rather than on their similaritites. Assuming that errors are independently and identically distributed, the probability of individual i choosing option k over option j is

$$Pri = expVij/expVij + expVik$$

The analysis was implemented through the Conjoint Plan procedure within the IBM SPSS software: the processes requires two input datasets, one describing the experimental design (including scenarios, attributes and levels) and another one containing the respondents' choices. Answers were grouped into residents and non-residents.

The respondents' choices were coded as preference scores for each of the seven scenarios, 1 for the scenario selected within each choice packet and 0 otherwise, and the part-worth utilities were estimated by ordinary least squares on these scores. All attributes were specified as linear rather than discrete: the levels of each attribute were treated as an ordinal variable whose successive values are equally spaced, and the expected direction of the relationship was declared as increasing for the four non-monetary attributes and decreasing for cost. The syntax adopted was:

CONJOINT PLAN = [design file]
/DATA = [response file]
/SUBJECT = ID
/SCORE = PREF1 TO PREF7
/FACTORS = HydroVal (LINEAR MORE), ItinLength (LINEAR MORE), Integration (LINEAR MORE), Mobility (LINEAR MORE), Cost (LINEAR LESS).

The consequence of this specification is that a single slope parameter is estimated for each attribute, and the part-worth utility of each level is obtained as the product of that parameter and the ordinal value of the level. Table 6 reports, for each attribute, the estimated parameter together with its standard error, t-ratio, *p*-value and 95% confidence interval. The SPSS Conjoint procedure estimates the model on the mean preference scores of the seven profiles; with six parameters and seven observations, only one residual degree of freedom remains, which is insufficient for statistical inference. Since all respondents evaluated the same profiles, the aggregate coefficient for each attribute coincides with the mean of the individual part-worth utilities estimated by the procedure for each respondent. The standard errors were therefore computed from the variation of those individual estimates across respondents—that is, from how much each respondent's part-worth differed from the group mean—and t-ratios, *p*-values and confidence intervals are based on Student's t distribution with $n - 1$ degrees of freedom.

Table 6. Estimated preference parameters by respondent group. Source: Authors.

Attributes	β Coeff.	Std Err.	*p*-Values	95% Confidence Interval
Non residents (n = 112)				
HydroVal	0.068	0.038	0.072	−0.006 to 0.143
ItinLength	−0.080	0.029	0.006	−0.137 to −0.023
Integration	0.164	0.033	<0.001	0.098 to 0.229
Mobility	0.039	0.040	0.331	−0.040 to 0.117
Cost	0.000	0.036	1.000	−0.070 to 0.070
Constant	0.095	0.082	0.249	−0.068 to 0.258
Residents (n = 41)				
HydroVal	0.015	0.073	0.840	−0.134 to 0.163
ItinLength	−0.110	0.043	0.015 *	−0.197 to −0.022
Integration	0.160	0.054	0.005 **	0.051 to 0.269
Mobility	0.131	0.060	0.033 *	0.011 to 0.252
Cost	0.033	0.073	0.658	−0.115 to 0.180
Constant	0.011	0.139	0.938	−0.271 to 0.293

* $p < 0.05$; ** $p < 0.01$.

Integration with other categories of heritage and activities is the attribute with the strongest effect in both groups, with almost identical estimated magnitudes (β = 0.164 for non-residents and β = 0.160 for residents), and its coefficient is statistically significant in both ($p < 0.001$ and $p = 0.005$ respectively). In both groups, preference increases from the absence of integration to the configuration combining nature-based, sport and cultural resources.

Itinerary Length is also significant in both groups, with a negative sign (β = −0.080, $p = 0.006$ for non-residents; β = −0.110, $p = 0.015$ for residents): other things being equal, respondents prefer shorter itineraries. The two groups diverge, instead, on the mobility mode. Among residents, Mobility is significant (β = 0.131, $p = 0.033$), and preference increases as the mobility mode shifts from private car to collective electric transport; among non-residents the coefficient is less than one third of that observed among residents and is not significant (β = 0.039, $p = 0.331$). This pattern is consistent with what may be expected of residents of a marginalised area, for whom transport provision is a component of daily accessibility rather than an element of a discrete leisure episode.

The attribute describing the form of hydroelectric heritage valorisation is positive in both groups, increasing from the absence of valorisation activities to museum installations in the decommissioned buildings of the system, but does not reach conventional significance thresholds in either ($p = 0.072$ for non-residents and $p = 0.840$ for residents). The direction of the estimate is consistent with the hypothesis that accessible hydroelectric infrastructures are perceived as culturally meaningful assets, particularly by non-residents, but these data do not permit that hypothesis to be confirmed. The coefficient of the Cost attribute is not negative in either group: it is null for non-residents (β = 0.000, $p = 1.000$) and positive but not significant for residents (β = 0.033, $p = 0.658$).

This result is contrary to the expectation embedded in the Random Utility framework, according to which utility decreases as price increases, and its origin lies in the experimental design rather than in respondents' preferences. As described in Section 4 , the cost levels were not randomised but assigned ex ante on the basis of the pre-test, so that the cost variable is used as a proxy for the appreciation that pre-test respondents expressed for each scenario. More decisively, the allocation of scenarios to choice packets left the monetary attribute without independent variation: within each packet the two alternatives to the status quo share the same cost level (Table 3), and the status quo is the only scenario assigned to the low level. A respondent who chooses an alternative over the current

situation therefore necessarily chooses a higher cost at the same time, and the cost parameter cannot be reliably separated from the preference for departing from the status quo. Since marginal Willingness to Pay is obtained as the ratio between the coefficient of an attribute and that of the monetary attribute, no monetary measure of value has been derived from the model.

5.3. Relative Importance of Attributes and Ranking of Scenarios

The relative importance of each attribute was computed as the ratio between the range of part-worth utilities it spans and the sum of the range across all attributes, taken in absolute value so that attributes with a negative effect contribute to the total according to the magnitude of their influence on choice. The results are reported in Table 7.

Table 7. Utility range and relative importance of each attribute. Source: Authors.

Attribte	Non-Residents Utility Range	Non-Residents Importance	Residents Utility Range	Residents Importance
HydroVal	0.136	19.5%	0.030	3.3%
ItinLength	−0.161	22.9%	−0.220	24.5%
Integration	0.327	46.6%	0.320	35.6%
Mobility	0.077	11.0%	0.263	29.3%
Cost	0.000	0.0%	0.065	7.3%
Total	0.702	100%	0.897	100%

The utility range of an attribute is the difference between the part-worth utilities of its highest and lowest levels. Relative importance is the ratio between the absolute value of that range and the sum of the absolute ranges across all attributes. The utility associated with each scenario was then obtained by summing the part-worth utilities of its constituent levels and the constant term, using for each group its own estimated parameters.

Utilities are obtained by summing the part-worth utilities of the constituent levels and the constant term, using for each group its own estimated parameters. The monetary attribute is excluded. The two groups do not converge on a single preferred configuration (Table 8). Non-residents rank Scenario 5 highest—a two-day itinerary combining museum installations, the fullest degree of integration with cultural and nature-based resources, and travel by private car—closely followed by Scenario 1, a single-day itinerary integrating nature, sport and cultural resources and undertaken on foot or by bicycle. Residents rank Scenario 1 clearly first and place Scenario 5 only fourth, a divergence attributable to their preference for modes of mobility other than the private car, which penalise Scenario 5.

The two groups do converge, however, on the configurations they reject. Scenario 2 —a two-day itinerary centred exclusively on visits to the active power plants, with no integration with other resources—ranks last for both groups, and is the only scenario that both rank below the status quo. The result is coherent with the importance of the Integration attribute, but should not be generalised to every configuration lacking integration: Scenario 4, a one-day itinerary equally confined to the hydroelectric system but based on museum activities and served by electric public transport, is ranked above the status quo by both groups.

Table 8. Utility associated with each scenario and resulting ranking. Source: Authors.

Scenarios	Non-Residents Utility	Non-Residents Rank	Residents Utility	Residents Rank
0 (status quo)	0.286	6	0.207	6
1	0.571	2	0.549	1
2	0.232	7	0.134	7
3	0.437	3	0.272	5
4	0.420	4	0.390	3
5	0.589	1	0.337	4
6	0.366	5	0.411	2

6. Discussion

The Choice Experiment provides evidence on the relative structure of preferences for alternative configurations of hydroelectric heritage valorisation itineraries. Within this scope, the results converge on one point in particular. Integration with other cultural and nature-based resources is the attribute that most strongly influences preferences, and its coefficient is statistically significant in both groups: other things being equal, presenting hydroelectric infrastructures as one component of a composite territorial offer increases the preference for an initiative in both groups. The only configuration that both groups rank below the status quo is a two-day itinerary centred exclusively on visits to the operational plants; a one-day itinerary equally confined to the hydroelectric system, but based on museum activities and served by electric public transport, is instead preferred to the status quo by both groups, which suggests that the absence of integration can be offset, at least in part, by a shorter format and by collective transport. For a heritage category whose significance is territorial rather than monumental, the dominance of the Integration attribute is a coherent result, and it supports the argument developed in Section 2 that the valorisation of active hydroelectric systems should operate at the scale of the system and its landscape rather than at that of the individual building.

The two groups diverge on the attributes concerning the practical conditions of participation. For residents, the Mobility Mode and Itinerary Length attributes are both significant and together account for more than half of the explained variation in preferences; for non-residents neither attribute reaches conventional significance thresholds. Residents express a marked preference for collective electric transport over private car use, and a marked aversion to the two-day format. Since the linear specification imposes the ordering of the mobility levels, the position of walking and cycling relative to collective transport cannot be established from these data. A plausible reading of the divergence is that residents evaluate the proposals as infrastructure affecting their own daily accessibility, whereas visitors evaluate them as a discrete leisure episode: the same itinerary is therefore a different object for the two groups. The divergence is relevant for design, since it indicates that the mobility component of a valorisation initiative is likely to be a principal determinant of local support. The number of resident respondents is small, however, and this reading requires confirmation on a larger and more balanced sample.

The attribute describing the form of hydroelectric heritage valorisation does not reach statistical significance in either group and accounts for a negligible share of the explained variation among residents. The direction of the estimated effect is positive in both groups and increases from guided visits to museum installations, which is consistent with the hypothesis that accessible hydroelectric infrastructures are perceived as culturally meaningful; the magnitude of the effect is, however, small. The scenario rankings point in the same direction: Scenario 1, ranked first by residents and second by non-residents, includes no

valorisation activity on the hydroelectric structures, and engages the hydroelectric system only as a component of the landscape, through its reservoirs. The result is nonetheless worth reporting, since it suggests that what respondents value is less the specific way in which the hydroelectric system is interpreted than the fact of its being part of a wider territorial offer.

Some limitations must be noted in the interpretation of these results. The most consequential concerns the experimental design: the monetary attribute was not identified independently of the status quo alternative, so that no monetary measure of value can be derived from the model. The second concerns the size and composition of the sample. A total of 153 valid responses was collected, of which only 41 from residents of the Sila Plateau Tourist District. This is a small sample for a CE, and it is particularly small for the subgroup analysis on which the comparison between residents and visitors rests; the estimates for the resident group should accordingly be read as indicative. The sample is moreover not representative of the reference population: respondents are younger, more highly educated and more culturally active than the population of the district, a composition likely to bias preferences towards experiential, cultural and sustainability-oriented attributes. The third limitation concerns the design and the estimation: seven profiles organised into three choice packets constitute a small design, which is not fully orthogonal following the removal of two profiles.

7. Conclusions

This study has addressed the valorisation of active hydroelectric heritage in a marginal territorial context through an interdisciplinary approach combining cultural heritage conservation with stated preference methods. Beginning from the observation that a considerable number of historical hydroelectric systems remain both fully operational and largely invisible as cultural heritage assets, the research has examined which configurations of valorisation residents and visitors prefer, which components of those configurations carry most weight in their preferences, and what these preferences indicate about the characteristics that valorisation initiatives for active hydroelectric heritage should embrace.

The application of the CE methodology to the Sila hydroelectric scheme in Calabria supports three findings concerning the relative structure of preferences. First, integration with other cultural and natural resources is the dominant attribute for both residents and visitors, and is statistically significant in both groups. The only configuration that both groups rank below the current situation is a two-day itinerary confined to visits to the operational plants, whereas a one-day itinerary equally lacking integration, but based on museum activities and served by collective transport, is preferred to it. Second, both groups prefer shorter itineraries, whereas the mobility mode is decisive for residents and comparatively unimportant for visitors, which indicates that the two groups evaluate the same proposal against partly different criteria. Third, the specific form through which the hydroelectric system is interpreted, whether through guided visits to the operational plants or through museum installations in the decommissioned buildings, is not a significant determinant of preference in either group. Taken together, these findings lend support to light-touch, itinerary-based approaches to the valorisation of active hydroelectric heritage, compatible with ongoing productive activity, in which the value of the heritage is conveyed through its integration within a wider territorial offer rather than through the transformation of individual buildings.

The study has limitations that qualify these findings. The most consequential concerns the monetary attribute: because the cost levels were assigned ex ante rather than randomised, and the low level coincided with the status quo in every choice packet, the cost parameter could not be reliably separated from the preference for departing from the

status quo, and no Willingness to Pay (WTP) or other monetary measure of value could be derived from the model. The concern that motivated this choice, the plausibility of the scenarios, is legitimate and recurs in applications to cultural heritage; it is better addressed, however, by excluding specific attribute combinations within a randomised design than by removing the price from randomisation, and this is perhaps the most transferable lesson of the present application. The sample is moreover small, particularly for residents, and not representative of the population of the district, while the focus on a single case, appropriate for an exploratory application, limits the generalisability of the findings.

In June 2026, GAL Sila was awarded approximately ten million euros in public funding by the Italian Ministry of Enterprises and Made in Italy for the project "Sila Outdoor–Un' esperienza autentica tra natura, storia ed enogastronomia" [63], implemented under the national programme for the development of local entrepreneurship established by the Ministerial Directorial Decree of 30 July 2021 [64]. The project comprises nineteen interventions designed to foster an integrated, year-round sustainable tourism offer on the Sila Plateau, combining outdoor sport and activities, experiential tourism, food heritage and the valorisation of local culture and natural resources. The alignment between this project's objectives and the preference structure documented in this study—in particular the relevance of the Integration attribute and the shared preference for itinerary-based, low-impact mobility—suggests that the methodology applied here is capable of capturing orientations that are operationally significant to territorial decision-making, and that a CE applied at the inception of a valorisation initiative could support the joint definition of priorities among the plurality of actors involved. This is particularly relevant in view of the expiry of the current concession for the Sila hydroelectric scheme in 2029, which constitutes a concrete occasion for the energy operator to redefine its relationship with the local communities to an expanded commitment to CSR [4], by including the integration of the historical hydroelectric plants into the sustainable tourism itineraries that GAL Sila is now developing. Evidence of the kind that a CE can provide—a grounded ordering of community's preferences over alternative valorisation configurations—could offer local communities, park authorities and Local Actions Groups a stronger basis for advancing such proposals, and offers energy companies a documented account of the social value that heritage engagement can generate for the territories in which their concessions operate.

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Abbreviations

The following abbreviations are used in this manuscript:

CSR	Corporate Social Responsibility
TEV	Total Economic Value
CV	Contingent Valuation
WTP	Willingness to Pay
CSV	Complex Social Value
CA	Conjoint Analysis
CE	Choice Experiment
SME	Società Meridionale di Elettricità
GAL	Gruppo di Azione Locale

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