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Comparative analysis of AHP and SWARA methods for prioritizing conservation projects supported by heritage funds: A case study from Turkey

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A B S T R A C T

Effective budget allocation and financial management are vital for preserving cultural heritage, particularly in countries with limited resources. This study focuses on Turkey's Contribution to the Conservation of Built Heritage (CCBH) fund, which supports heritage preservation through government funding. Despite the fund's importance, a structured method for prioritizing project applications is lacking. This research proposes a decision-making framework for assessing and ranking conservation funding requests using Multiple-Criteria Decision-Making (MCDM) methods. The study applies and compares the Analytic Hierarchy Process (AHP) and the Step-Wise Weight Assessment Ratio Analysis (SWARA) to assign weights to assessment criteria. The findings demonstrate that SWARA provides a more efficient and practical approach to prioritizing conservation projects. The proposed framework aims to assist decision-makers and conservation practitioners in optimizing the allocation of funds to safeguard cultural heritage effectively.

1. Introduction

The allocation of central funding for the conservation of Turkey's cultural heritage involves various sources such as central government agency budgets, local administration funding, private sector contributions, international aid, as well as public and corporate donations (Ulusan and Ersoy, 2018). Among these, the Contribution to the Conservation of Built Heritage (CCBH) fund stands out as a significant budget established in 2005, with an allocation of 10% of the country's real estate tax revenue. Ulusan and Ersoy (2018) noted that 85% of heritage conservation funding in Turkey stems from the CCBH fund: Managed by provincial special administration bureaus within the governorates, grants disbursed through the fund are then utilized by local government agencies in the direct support of heritage conservation efforts across Turkey. However, despite its significance and importance to the country's conservation efforts, the current regulation lacks a structured methodology for the evaluation and prioritization of projects seeking CCBH funding. This deficiency hinders the efficient and effective use of CCBH funds and therefore its contribution to the country's cultural heritage.

Built heritage is a term that encompasses all man-made structures, buildings, or sites of historical, architectural, cultural, or social significance, and involves a diverse range of elements representing various periods, styles, or cultural traditions. As such, the conservation of built heritage involves multiple dimensions beyond mere physical restoration, including the raising of public awareness, active community engagement, as well as the consideration of economic outcomes. However, decision-makers managing heritage funds may inadvertently or otherwise prioritize only specific aspects, leading to imbalances in the project prioritization process as a whole. In the comprehensive evaluation of conservation project funding requests, overall project management is especially crucial, rather than focusing on isolated aspects pertaining to individual applications.

Decision-making involves selecting the most suitable alternative from a multitude of available options (Nadkarni and Puthuvayi, 2020). In the context of built heritage conservation, it can be a complex task due to the existence of numerous

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potential alternatives, which may not always interact with each other. Moreover, the allocation of limited government funding adds an additional layer of complexity to the whole process. In order to better facilitate the decision-making process, it is essential that suitable evaluation criteria are established that capture the multifaceted nature of built heritage conservation. By defining and quantifying these criteria, decision-makers can create a comprehensive framework that enables a more effective comparative analysis. Methodological decision-making systems provide a structured framework for the assessment and prioritization of conservation funding applications based on these established criteria. By applying weights to the evaluation criteria, decision-makers can then more objectively compare and rank the relevant conservation projects.

Assigning weights to each criterion is a crucial step in this process since it reflects their relative importance in the evaluation of projects. Various MCDM methods are used for weighing various criteria in cultural heritage conservation. However, the methods used often require advanced levels of expertise and can be overly complex. Taking these facts into consideration, the current study proposes a method for the selection of conservation projects requesting financial backing from the CCBH fund, which is expected to contribute to the advancement of Turkey's economic and conservation efforts.

1.1. Research aims

This research aims to develop a structured method for improving the prioritization of conservation projects using multi-criteria analysis. The study has two main objectives: first, to identify the relevant criteria for project evaluation; and second, to assign appropriate weights to these criteria for ranking the projects. The criteria used in this study have been developed over time based on international standards, especially those recommended by the International Council on Monuments and Sites (ICOMOS), as well as national-level factors. To determine the importance of each criterion, multi-criteria decision-making (MCDM) methods are applied. Although many MCDM methods are available, this research focuses on approaches that are easy to understand, practical to use, and time-efficient. These features are important because decision-makers may have different levels of experience and expertise. Therefore, this study compares two methods: the well-known Analytic Hierarchy Process (AHP) and the newer Step-wise Weight Assessment Ratio Analysis (SWARA). The case study is based on the Contribution to the Conservation of Built Heritage (CCBH) fund in Turkey, which was established in 2005 by the Turkish government to support the preservation of the country's cultural heritage. The results show that SWARA is effective in ranking funding applications for conservation projects, especially for decision-makers who prefer methods that are clear, practical, quick, and easy to apply.

2. Methodology

The research was conducted in three stages: 1) Projects were examined that have already benefited from CCBH funding between 2005 and 2020. For this, Muğla province in Turkey was selected since it ranks fifth in the use of CCBH funds due to its rich cultural heritage and cultural tourism as its primary income stream (Ulusan and Ersoy, 2018); 2) Evaluation criteria established for ranking projects considering international conservation principles, national legislation, and problems determined during stage one regarding funding procedures; 3) Criteria weighted using AHP and SWARA multiple decision-making methods with a panel of experts who evaluate projects, manage the fund, and work in the academic field. The results of both methods were then compared.

3. Use of multiple-criteria decision-making methods in cultural heritage conservation

Multiple-criteria decision-making (MCDM) is considered a valuable approach that enables decision-makers to effectively address complex problems by breaking them down into smaller components, and then evaluating each based on multiple criteria (Mardani et al., 2015; Sahoo and Goswami, 2023). By weighing various considerations and making individual judgments about these smaller components, decision-makers are then able to reassemble the components in order to form a clearer overall picture, aiding the decision-making process. Since the 18th century, various MCDM methods have been developed, and their utilization has gained momentum, particularly since the 1990s, in addressing problems in diverse areas such as energy, environment, sustainability, quality management, construction, project management, safety, and risk management (Mardani et al., 2015; Zavadskas et al., 2015; Sahoo and Goswami, 2023).

Cultural heritage conservation presents a multi-criteria nature, demanding simultaneous and harmonious decision-making across various specialties, necessitating the application of MCDM methods for rational solutions (Morkunaite et al., 2019; Prieto et al., 2019; Tupenaite et al., 2010). MCDM methods have been proven relevant in addressing issues related to adaptive reuse, sustainability, and energy savings, particularly those concerning historical buildings (Kim et al., 2010; Liu et al., 2018; Šiožinytė et al., 2014). Additionally, they have been applied to evaluate the impact of commercial functions on historical buildings, to anticipate future changes in urban environments (Chen et al., 2018), and in the planning of historical environments based on user/visitor preference (Işık and Demir, 2017). These methods have been applied in the evaluation of cultural heritage projects where direct comparisons based on heritage value present a challenging task (Dutta and Husain, 2009; Piñero et al., 2017). Research by Vodopivec et al. (2014), which focused on castle structures, and that of Jajac et al. (2017), which considered historical bridges, have clearly demonstrated the effectiveness of MCDM methods in the prioritization of conservation projects within cultural heritage contexts. While many studies have focused on prioritizing cultural heritage values through comparison, research on the evaluation and prioritization of conservation projects has been less prevalent in the published literature. Turskis et al. (2017) proposed a hybrid MCDM method for the protection of cultural heritage, whilst Sanna et al. (2008) explored hierarchy creation among similar projects through expert teams. Research by Nesticò and Somma (2019) has also shed light on project prioritization concerning design alternatives.

Despite the availability of various MCDM methods, no singular method can yet be considered a 'super-method', according to Guitouni and Martel (1998). The comparison and evaluation of MCDM methods concerning their accuracy have yet to be thoroughly discussed; instead, their evaluation relies upon compliance with certain criteria based on the specific nature of the project in question. Among the preferred MCDM methods used in cultural heritage conservation, AHP (Analytical Hierarchy Process) and fuzzy AHP, as well as Delphi and fuzzy Delphi methods stand out (Morkunaite et al., 2019). According to Mardani et al. (2015), AHP is the most commonly used MCDM method and SWARA the most recent; as such, the current study utilized both of these to calculate criteria weights for the evaluation of projects applying for CCBH funding.

The first step in the AHP method is to compare every single criterion in terms of their relative importance (see Section 4.1). Responses given to the questionnaires must then satisfy the consistency condition in order to be used in the calculation. However, in cases where the condition is not satisfied, the answers given should be reviewed until the consistency condition is met, which might be challenging considering the number of comparisons will increase in line with the number of criteria. For the purpose of efficiency, results must be calculated rapidly and revisions applied instantly over and over until the answers are deemed to be consistent, thus a considerable amount of time and expertise is required in these calculations and data analysis (Gyani et al., 2020; Liu et al., 2020; Khan and Ali, 2020). The SWARA method, on the other hand, requires one less comparison than the number of criteria involved (see Section 4.2.). Since the criteria are already arranged by order of importance, this eliminates the risk of inconsistency and repeated revision of the questionnaire, thereby saving a considerable amount of time. Furthermore, calculating the criteria weights using the relative importance percentages provided by experts presents a much simpler process compared to that of the AHP method (Eroğlu and Gencer, 2021).

3.1. AHP method

The Analytical Hierarchy Process (AHP) is a widely used decision-making technique that involves a series of steps to determine the relative importance of criteria within a group. The first step entails creating pairwise comparison charts, where all criteria within a group are compared to each other. The number of required comparisons for each criterion group, denoted as 'n', can be calculated using the formula given in following equation (Taherdoost, 2017).

$$\text{Number of pairwise comparisons} = \frac{n*(n-1)}{2}$$

Upon completion of the pairwise comparison charts, the second step involves expert input, where they are asked to complete a questionnaire chart by assigning numerical values ranging from 1 to 9. These numerical values represent the corresponding importance levels detailed in Table 1 and are recorded in the questionnaire chart shown in Table 2.

Table 1: Scores for the importance of variable (Taherdoost, 2017)

1	Equally important preferred
2	Equally to moderately important preferred
3	Moderately important preferred
4	Moderately to strongly important preferred
5	Strongly important preferred
6	Strongly to very strongly important preferred
7	Very strongly important preferred
8	Very strongly to extremely important preferred
9	Extremely important preferred

Table 2: Sample AHP questionnaire (Taherdoost, 2017)

Factor	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Factor
Privacy	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Reliability
Privacy	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Validation
Privacy	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Verification
Privacy	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Integrity
Privacy	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Confidentiality
Privacy	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Availability

The third step in the AHP method involves the creation of Matrix A, which captures the expert evaluations according to their questionnaire responses. The calculated principal right eigenvector of Matrix A is represented as 'w' (Taherdoost, 2017), as shown in following equation.

$$Matrix\ A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix}$$

The fourth step entails calculations to determine the criteria weights using the normalized values ($w1$, $w2$, $w3$,...wn) (Taherdoost, 2017) as seen below:

$$Aw = \lambda_{max} w, \lambda_{max} \geq n$$
$$\lambda_{max} = \frac{\sum ajwj - n}{w1}$$
$$A = \{a_{ij}\} \; with \; a_{ji} = \frac{1}{a_{ij}}$$

where, A=pairwise comparison, w=normalised weight vector, a_{ij}=numerical comparison between values i and j, and λ_{max}=maximum eigenvalue of Matrix A.

Finally, after completing the calculations, the consistency ratio (CR) is determined in order to verify the consistency of the expert responses to the questionnaire, following the formula CR=CI/RI (Saaty, 2004) according to following equation.

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

The Random Index (RI) value, on the other hand, is a constant that varies based on the number of criteria (n), as indicated in Table 3. If the consistency ratio condition (CR<.10) is not met, the expert is required to revise their answers, and the process is repeated until the consistency ratio condition has been met.

Table 3: Random consistency index (RI) (Saaty, 2004)

n (No. of criteria)	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.52	0.89	1.11	1.25	1.35	1.4	1.45	1.49

3.2. SWARA method

Developed as a 'new' technique by Keršuliene et al. (2010), the SWARA method, steps of which are explained in Table 4, is seen as a practical operation that can be applied as a successful alternative to earlier methods such as AHP or ANP (Urosevic et al., 2017). The area of use for the SWARA method varies from machine tool selection to energy systems sustainability as well as supplier selection etc. (Mardani et al., 2017). Furthermore, SWARA can also operate as an export-oriented method for criteria weight calculation (Zolfani et al., 2015).

Table 4: SWARA steps for criteria weight calculation (Morkunaite et al., 2019)

Step 1	Criteria groups determined
Step 2	Experts rank criteria in order of importance (from most important to least important)
Step 3	The average value of comparative importance calculated as *sj*
Step 4	Benefits of comparative importance calculated (Equation S1) $k_j = s_j + 1$
Step 5	Transitional weights recalculated (Equation S2) $q_j \frac{q_{j-1}}{k_j}$
Step 6	Final weights normalized (Equation S3) $w_j \frac{w_j}{\sum_{i=1}^{n} w_j}$

4. Contribution to conservation of built heritage (CCBH) fund

4.1. Existing procedure of CCBH fund

In Turkey, the CCBH fund supports three primary conservation activities. The first involves the expropriation of privately owned heritage assets; while the second pertains to the preparation of preservation projects concerning individual buildings or settlements; and the third entails the implementation of these projects. The main actors in the utilization of the CCBH fund include local municipalities, the fund's central management office, and regional boards for cultural heritage conservation (Fig. 1). Municipalities identify restoration needs within their territories, then formulate restoration projects, and realize their implementation where funding is provided. The CCBH fund's management is directed by the central government, and considers applications received from municipalities, then selects and prioritizes them, as well as manages the utilization of distributed funds. The regional boards for cultural heritage preservation, also under central government direction, serve as scientific councils, evaluating and guiding projects in accordance with prevailing legislation and scientific approaches. Municipalities may also apply separately for the three steps outlined in Fig. 1. If a historical building requiring restoration is not owned by the municipality, expropriation is a prerequisite (Step 1–Fig. 1). Alternatively, in cases where expropriation is not necessary, the municipality can prepare a restoration project or engage an external architect to undertake the task on their behalf (Step 2–Fig. 1). Municipalities can also directly apply to the fund for the preparation or implementation of a restoration project, bypassing the former step (Step 3–Fig. 1). In both cases, the restoration project undergoes evaluation and approval by a regional conservation board. Projects approved for funding are then implemented under the management of the applying municipality, concluding with a final inspection by the regional conservation board.

The CCBH fund's management office collects municipal applications biannually and then evaluates them in order to determine those eligible to receive funding. Current criteria for project selection and prioritization include: 1) urgent preservation needs; 2) non-completed preservations; 3) consolidation needs due to material, ground, and structural system issues; 4) conservation plans; and, 5) expropriations.

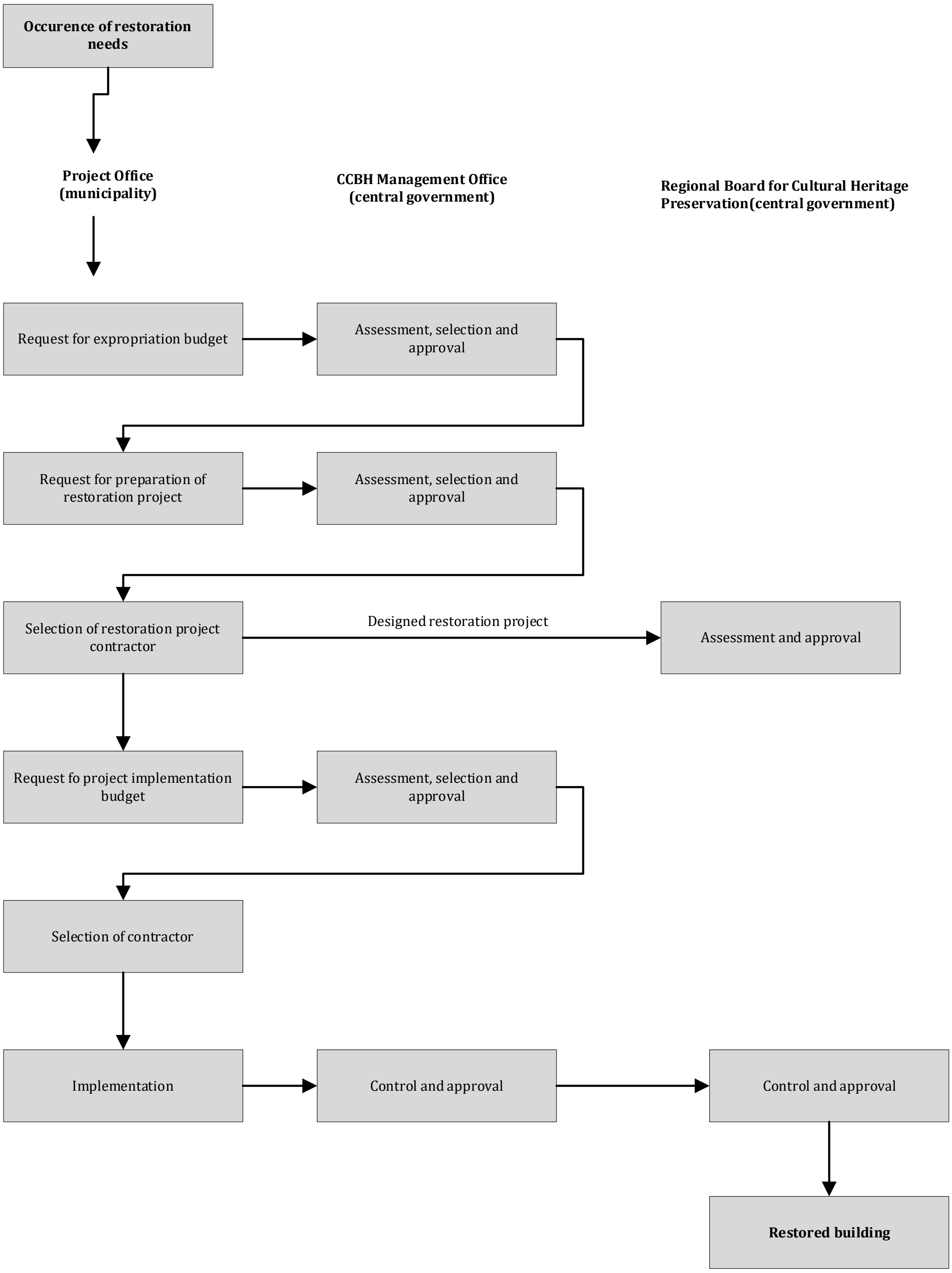

Fig. 1: Existing CCBH procedure

4.2. Analysis of CCBH funding in Muğla province

The CCBH funding activity in Muğla province was analyzed for the period 2005 to 2020, with the aim of identifying deficiencies in the current selection criteria. During this period, 64% of the total allocated funding was for the restoration of individual historical buildings, while 27% went to the preparation of restoration projects, and 15% to expropriation. Notably, some restoration applications for expropriated structures were never implemented, as well as some projects for which restoration project preparation assistance had been provided. This observation highlights a lack of holistic management across the three separate uses of the fund, presenting the potential for inefficient funding allocation and utilization.

A total of 64% of the budget allocated for restoration implementations went to the restoration of historical buildings, including 20 vernacular houses, 18 historical mosques, 12 archaeological assets, nine historical public buildings, seven schools, four mausoleums, six cisterns, five commercial buildings, one bathhouse, one fountain, two mills, two inns, and seven street rehabilitation projects. Presently, only four of the 20 restored vernacular houses are actively used, while 11 lay abandoned, and five are used only on a seasonal basis. Four of these abandoned houses are now in need of renewed restoration, indicating a focus on immediate physical restoration without sufficient consideration of viable reuse options, environmental and infrastructural constraints, and the socioeconomic impact of restoration projects. Notably, restored public buildings and mosques continue to be effectively utilized, while mausoleums, mills, cisterns, historical baths, and archaeological assets, despite significant investment in their restoration, face issues related to their relationship with the environment, accessibility, and visitor management, thereby preventing their use in the public domain.

The current regulation governing the CCBH fund's management emphasizes prioritization based on the urgency of building repairs needed. However, on its own this criterion appears insufficient, necessitating a more comprehensive approach to the entire conservation process; one that encompasses not only physical restoration but also effective management practices. Municipalities, therefore, require a systematic planning system for the entire end-to-end conservation process. In the next subsection, a set of criteria is proposed for both municipalities to consider when preparing their projects and for the fund's management office in evaluating funding application requests for proposed projects.

4.3. Description of proposed criteria for project evaluation

The built heritage conservation process encompasses a series of steps and considerations extensively explained in the principles and approaches outlined in documents primarily published by ICOMOS. The 2013 Burra Charter from ICOMOS states in Article 1.2 that, 'conservation means all the processes of looking after a place so as to retain its cultural significance,' which encompasses the various activities aimed at safeguarding a cultural resource in order that it retains its historic value and extends its physical life. The charter proposed dividing the conservation process into four main steps: understanding the cultural significance; developing a policy; managing the place in accordance with the policy; and finally, monitoring, reviewing, and changing in accordance with the policy. The Xi'an Declaration, which aimed to contribute to the planning processes and management of the world's heritage structures, sites, and areas, highlighted certain key points in the conservation process to first understand, document, and interpret the settings in diverse contexts, then to develop planning tools and practices to conserve and manage settings and to monitor and manage changes that affect the setting. The declaration also emphasized working cooperatively with local, interdisciplinary, and international communities in creating awareness of conservation and conservation management. The built heritage conservation process can be summarized in six phases: initiation; assessment; options; project development; implementation; and, operation. Similarly, in world heritage management plans, the conservation process mainly consists of describing the site, evaluating objectives, and overall site management (Feilden and Jokilehto, 1998). Four stages can therefore be said to summarise the conservation process: 1) Comprehensively understand and evaluate built heritage assets; 2) develop appropriate policies; 3) management of assets in accordance with policy; and 4) monitoring (Fig. 2).

In Turkey, the conservation of the built heritage is handled in four phases: Surveying, preparation of restitution, preparation of restoration projects, and implementation. Surveying and restitution project preparation mainly refers to understanding heritage assets along with their architectural existence, environment, social values, and significance. The preparation of restoration projects corresponds to the second stage, which encompasses conservation policies that safeguard it. The implementation phase delivers the realisation of the restoration project which may also correspond to the management phase. However, the overall monitoring process is lacking. Local conservation boards that approve projects applying for CCBH funding primarily evaluate them according to principles for the analysis, conservation, and structural restoration of architectural heritage. However, whilst the conservation process involves multiple aspects, including sociocultural impact, economic outcomes, and technical and managerial requirements (Wijesuriya et al., 2013), none of these aspects can be considered as being of greater or lesser importance than the others. A technically proficient heritage restoration project may have limited socio-cultural impact, while the inappropriate reuse of a heritage asset could result in structural damage and economic losses. Therefore, the success of conservation efforts is closely tied to a more holistic approach that integrates all the differing aspects of heritage conservation.

The first step in the current study's proposed methodology involves understanding the built heritage subject of a restoration project (Fig. 3). In this process, it is crucial to recognize the built heritage not only as a physical building but also as an asset that encompasses all aspects of its surrounding environment (Wijesuriya et al., 2013). Preservation often arises due to the risk of damage to building heritage, which is an important criterion reflected in the relevant legislation. However, cultural significance, which includes aesthetic, historic, scientific, social, or spiritual value for past, present, or future generations, and public opinion, which refers to the interaction between people and the heritage, are also crucial aspects that influence management policies (Torre, 2013; Havinga et al., 2020). Additionally, the past, present, and future conditions of the environment in which a heritage asset exists are also considered significant factors (Wijesuriya et al., 2013). For example, heritage assets may stand alone within a newly developed part of a city, be part of a historical neighborhood, or be an abandoned structure built at the summit of a difficult-to-access mountain. Each of these different situations will have an impact on the management policies and project success and therefore must be taken into due consideration during the project assessment.

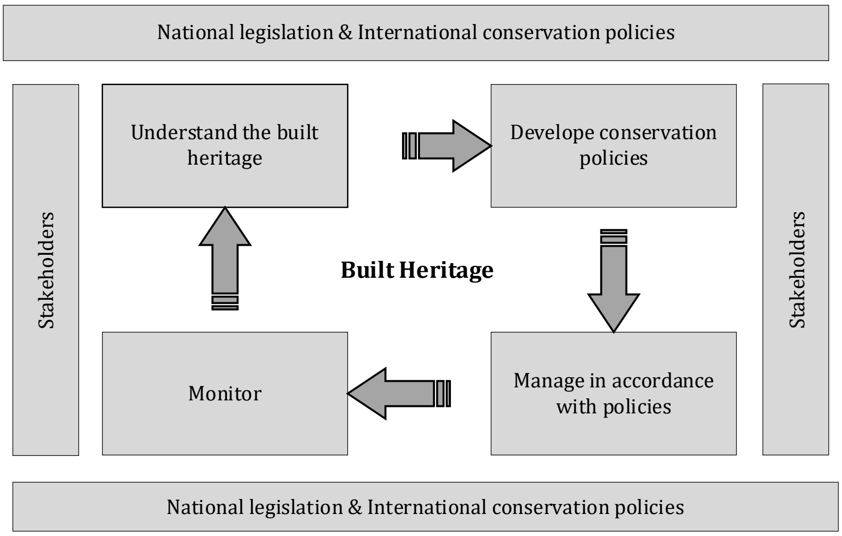

Fig. 2: Steps in built heritage conservation

The second step of heritage conservation involves formulating policies aimed at safeguarding assets based on initial evaluation data. These policies need to align with established principles set out by recognized international scientific councils and national legislation. Cultural heritage can no longer be viewed solely as a driver for sustainable national development since sustainable development in heritage conservation entails the recognition and inclusion of local culture, the accommodation of disadvantaged social groups, as well as the restoration of natural resources (Labadi et al., 2021). Moreover, cultural heritage is accepted as a reflection and expression of people's values, beliefs, knowledge, and traditions (Vecco, 2010; Deacon and Smeets, 2013). Therefore, in order to achieve success in conservation projects, contributing to local culture and raising awareness among the public are also essential objectives (Li et al., 2020). Considering these approaches, it is vital that restoration projects identify appropriate reuses for heritage assets and develop comprehensive business plans that encompass both the restoration activities as well as what happens to assets post-restoration.

The third step involves managing the processes that implement the policies established in the previous step. Here it is important that the ability of the executive municipality is evaluated since they are the primary actors in the whole process and have the greatest influence on the project's success. For instance, an applicant municipality with competent and qualified conservation experts may execute the conservation process far more effectively than another that lacks suitably qualified human resources. Therefore, the adoption of a suitable methodology in both project preparation and implementation is paramount. Firstly, as previously mentioned, expropriation, project design, and implementation phases should be evaluated holistically. Various stakeholders (both direct and indirect participants) in the restoration process should be included in the decision-making process. Similarly, although they may not have a direct connection to the heritage itself, civil society should also be formally involved in the process (Pendlebury et al., 2004; Boniotti, 2023). Assessing the relevance of restoration techniques in relation to financial data is another aspect of effective restoration management. Potential risks, such as managerial, technical, legal, and financial risks, should also be carefully considered and mitigated where possible prior to implementation. Lastly, key quantitative indicators should be evaluated in the comparison of proposed restoration projects in order that only the most appropriate ones are selected.

Finally, the fourth step is the monitoring process, which includes actions aimed at continuous safeguarding and maintenance of restored heritage assets. If repaired buildings subsequently lack appropriate and constant maintenance, and if this upkeep is not carefully monitored, assets can soon experience significant and rapid deterioration, resulting in wasted budget allocation. On the other hand, monitoring heritage assets following implementation by way of annual reporting helps contribute to the overall process, providing valid input to the fund's decision-making processes.

4.4. Weighing the criteria

The criteria obtained through the study were organized according to a two-level hierarchy; main criteria and sub-criteria, in order to simplify the overall process, and especially during pairwise comparison. A total of eight main criteria were identified, with between three to six sub-criteria under each main item (Fig. 3). The sum of the sub-criteria weights for each main criterion equals 1, as in all eight main criteria have the same weight (only the sub-criteria weights may vary). Therefore, in order to obtain the overall weight of a certain sub-criterion, its weight is multiplied by the weight of the main criterion it falls hierarchically under. For calculation purposes in this exercise, Microsoft Excel was used.

UNDERSTAND	**C1**	**Evaluation of Heritage Property**
	h1	Emergence of preservation/risk of damage
	h2	Cultural significance of heritage property
	h3	Public opinion about heritage property
	h4	Cultural value of the neighborhood
	h5	Ease of accessibility
	h6	Location of heritage within the master plan

DEVELOP POLICY	**C2**	**Economic Social Ecologic Feasibility**
	f1	Suitability of heritage property reuse
	f2	Recovery of natural resources
	f3	Innovative conservation approach
	f4	Business plan suitability
	f5	Operational income and costs
	f6	Sociocultural/economic impact of conservation/implementation
	C3	**Contribution to Sustainable Development Goals**
	s1	Contribution to sustainable tourism
	s2	Contribution to local culture
	s3	Promotion of women's participation in the project (disadvantage)
	s4	Promotion of public awareness of cultural heritage

MANAGEMENT IN ACCORDANCE WITH POLICY	**C4**	**Applicant Ability**
	a1	Suitability of organizational structure/resources
	a2	Suitability of financial resources
	a3	Similar project experience
	C5	**Evaluation of Methodology**
	m1	Relevance of project activities' division
	m2	Clarity and feasibility of time schedule
	m3	Inclusion of stakeholders in decision-making
	m4	Inclusion of civil society in decision-making
	m5	Suitability of choice of restoration technologies
	m6	Relevance of the project's financial data
	C6	**Risk Management**
	r1	Control of managerial risks
	r2	Control of technical risks
	r3	Control of financial risks
	r4	Control of legal risks
	C7	**Project Main Quantitative Indicators**
	q1	Project budget
	q2	Project duration
	q3	Visitor increase after project implementation
	q4	Number of protected items
	q5	Number of contractors/subcontractors
	q6	Infrastructure investment

MONITOR	**C8**	**Monitoring Process**
	p1	Continuity of heritage property maintenance
	p2	Holistic project management plan
	p3	Reporting of outcomes and feedback

Fig. 3: List of main and sub-criteria

A panel of experts was formed which represented key stakeholders in the utilization of CCBH funding. The panel included a municipal archaeologist with responsibility for applying for CCBH funding, an independent architect responsible for the preparation of restoration project proposals, a CCBH fund project evaluator, a regional head of cultural heritage conservation, and an academic conservation expert. This diverse group was, therefore, able to provide a comprehensive understanding of the fund's use, and expert knowledge of the subject matter and processes involved. All of the experts on the panel recognized existing issues related to the funding of heritage conservation and were eager to participate in the study. In order to calculate the criteria weights using the AHP method, firstly, the experts were each provided with nine questionnaires (one for the main criteria and eight for the sub-criteria) which included pairwise comparison of all criteria. Then, each expert was tasked with evaluating the importance level of one criterion compared to another based on a scale with values from 1 to 9 (Fig. 4).

	Extremely Important		Strongly Important		Fairly Important			Moderately Important		Equally Important		Moderately Important		Fairly Important		Strongly Important		Extremely Important	
	9	8	7	6	5		4	3	2	1	2	3	4	5	6	7	8	9	
Evaluation of heritage property										1									Applicant ability

Fig. 4: Sample questionnaire used in research for AHP method

Finally, after all the questionnaires had been completed and with CR values (see Section 4.1) within the accepted range, criteria weights of each criterion were calculated according to the data obtained from each expert. The experts were unable to agree upon a common time to meet and discuss reaching an agreement on the criterion, which was a time-consuming process since all had busy work schedules and most did not live or work in the same city. For this reason, instead of organizing multiple assemblies, where it would be hard to focus on the whole subject, singular sessions were arranged with each expert. Therefore, the final criteria weight for each criterion was obtained, firstly, by calculating the geometric mean of the criteria weights obtained from each expert (with each expert's opinion having equal importance, as stated by Saaty and Özdemir (2014), and secondly by normalizing the results.

In order to obtain the criteria weights according to the SWARA method, the experts were first tasked with listing the criteria by order of importance. Next, they compared each criterion with the one immediately below in the list of importance, as in the first criterion on the list was compared with the second, the second compared with the third, and so on. Furthermore, the experts were tasked with calculating percentages based on to what degree the higher-ranked criterion was considered more important than the lower-ranked criterion in each pairwise comparison (e.g., 40% or 200%). Then, using these values, the criteria weights determined by each expert were able to be calculated. Finally, the final criteria weights, as in the normalized values of the geometric means of each criterion weight calculated by each equally prioritized expert, were obtained in the same way as for the AHP method.

However, it may be stated that both the AHP and SWARA methods each have certain limitations. In terms of the AHP method, as the number of criteria increases, the number of comparisons increases significantly, making the whole process much more complex. This added complexity makes it challenging and time-consuming for experts to provide comparative responses. In order to address this, we simplified the process of expert comparisons by establishing main criteria and sub-criteria. In the current study, a decrease was observed in the consistency ratio when the number of compared criteria reached eight, necessitating the expert interviews to be repeated three or four times. This led to fatigue of all parties involved and a certain level of despondency. Furthermore, the efficiency of the AHP method is known to decrease as the number of experts increases, with the recommended number of experts ranging from a minimum of five to a maximum of seven. By contrast, the SWARA method does not encounter any limitations or difficulties associated with an increase in either the number of criteria or how many experts are involved in the process, since it does not significantly increase the number of comparisons that need to be performed. However, the SWARA method requires well-founded criteria, since each has direct influence over the results. In the current study, it was observed that the experts tended to prioritize their own areas of expertise and exhibited different priorities according to the method being applied. For example, the independent architect responsible for the preparation of restoration project proposals emphasized the physical repair of an asset's structure, while the CCBH project evaluator prioritized the management process. However, despite the existence of these varying perceptions and prioritisations of cultural heritage, the findings of the current study revealed that both the AHP and SWARA methods resulted in a similar distribution of average criteria weights.

5. Results and discussion

Weights of the main criteria can be grouped into three categories. The first group consists of the first and second most important criteria, with the most important criterion standing out in both methods. Criterion C1 (Evaluation of the Heritage Property) was shown to have been dominantly the most important criterion in both methods with the highest value, and C3 (Contribution to Sustainable Development Goals) was the second most important main criterion in both the AHP and SWARA methods. The second group includes the third, fourth, and fifth most important criteria in both methods, with C2 (Economic Social Ecologic Feasibility), C4 (Applicant Ability), and C5 (Evaluation of Methodology), each with very close weight values in each method. Although the order of importance differs between the two methods, the criteria weights in this second group are very similar to each other, even when compared to the results from the other method. The third group consists of the least important main criteria, C6 (Risk Management), C7 (Project Main Quantitative Indicators), and C8 (Monitoring Process), occupying the sixth, seventh, and eighth positions (Table 5).

Despite the similarities and differences in the order and values of the weights among both the main criteria and sub-criteria, both within themselves and between the methods, the crucial values to be used for evaluation in the next step are the overall weights of the sub-criteria. The calculation for these is the product of the sub-criteria weight multiplied by the main criteria weight, as shown in Table 6, which illustrates that the differences in overall weights of the sub-criteria range from 0.0002 to 0.0201, with the exception of two sub-criteria. The first exception is the most important sub-criterion for both methods: h2 (Cultural Significance of the Heritage Property), with a weight of 0.1422715 in the AHP method and 0.0537552 in the SWARA method. The second sub-criterion with the second most significant difference in weights between the two methods is h1 (Emergence of Preservation/Risk of Damage), with a weight of 0.1089988 in the AHP method (second most important sub-criterion) and 0.0439732 in the SWARA method (fifth most important).

Table 5: Main criteria weights

	Main Criteria	SWARA weight	AHP weight
Group 1	C1: Evaluation of heritage property	0.1812535	0.3514741
	C3: Contribution to sustainable development goals	0.1521306	0.1400103
Group 2	C2: Economic social ecologic feasibility	0.1331185	0.1166179
	C4: Applicant ability	0.1332845	0.1200799
	C5: Evaluation of methodology	0.1227251	0.1219325
Group 3	C8: Monitoring process	0.0947376	0.0417512
	C6: Risk management	0.0942064	0.0616956
	C7: Project main quantitative indicators	0.0885438	0.0464385

Table 6: Weights of main and sub-criteria

Criteria		SWARA Weight	AHP Weight	Min/max	SWARA Overall weight	AHP Overall weight
C1	Evaluation of heritage property	0.1812535	0.3514741			
h1	Emergence of preservation/risk of damage	0.2426059	0.3101189	Max	0.0439732	0.1089988
h2	Cultural significance of heritage property	0.2965746	0.4047850	Max	0.0537552	0.1422715
h3	Public opinion about heritage property	0.0959539	0.0488227	Max	0.0173920	0.0171599
h4	Cultural value of the neighborhood	0.1572675	0.1141136	Max	0.0285053	0.0401080
h5	Ease of accessibility	0.0843869	0.0477358	Max	0.0152954	0.0167779
h6	Location of heritage within the master plan	0.1232112	0.0744240	Max	0.0223325	0.0261581
C2	Economic social ecologic feasibility	0.1331185	0.1166179			
f1	Suitability of heritage property reuse	0.2296623	0.3523035	Max	0.0305723	0.0410849
f2	Recovery of natural resources	0.1428814	0.0971183	Max	0.0190202	0.0113257
f3	Innovative conservation approach	0.1370528	0.1199034	Max	0.0182443	0.0139829
f4	Business plan suitability	0.1514600	0.1078146	Max	0.0201621	0.0125731
f5	Operational income and costs	0.1299947	0.0744299	Max	0.0173047	0.0086799
f6	Sociocultural/economic impact of conservation/ implementation	0.2089487	0.2484303	Max	0.0278149	0.0289714
C3	Contribution to sustainable development goals	0.1521306	0.1400103			
s1	Contribution to sustainable tourism	0.2331258	0.2087536	Max	0.0354656	0.0292277
s2	Contribution to local culture	0.2368878	0.2423950	Max	0.0360379	0.0339378
s3	Promotion of women's participation in projects (disadvantage)	0.2164132	0.1429082	Max	0.0329231	0.0200086
s4	Promotion of public awareness of cultural heritage	0.3135732	0.4059433	Max	0.0477041	0.0568363
C4	Applicant ability	0.1332845	0.1200799			
a1	Suitability of organizational structure/resources	0.3565709	0.3920275	Max	0.0475254	0.0470746
a2	Suitability of financial resources	0.2565444	0.1689976	Max	0.0341934	0.0202932
a3	Similar project experience	0.3868847	0.4389749	Max	0.0515657	0.0527121
C5	Evaluation of methodology	0.1227251	0.1219325			
m1	Relevance of project activities' division	0.2601834	0.3822922	Max	0.0319310	0.0466138
m2	Clarity and feasibility of time schedule	0.1667387	0.1570036	Max	0.0204630	0.0191438
m3	Inclusion of stakeholders in decision-making	0.1013598	0.0611020	Max	0.0124394	0.0074503
m4	Inclusion of civil society in decision-making	0.0958850	0.0471792	Max	0.0117675	0.0057527
m5	Suitability of choice of restoration technologies	0.2116412	0.2272159	Max	0.0259737	0.0277050
m6	Relevance of the project's financial data	0.1641919	0.1252071	Max	0.0201505	0.0152668
C6	Risk management	0.0942064	0.0616956			
r1	Control of managerial risks	0.2189165	0.1774471	Max	0.0206233	0.0109477
r2	Control of technical risks	0.2888410	0.3387564	Max	0.0272107	0.0208998
r3	Control of financial risks	0.2047820	0.1210816	Max	0.0192918	0.0074702
r4	Control of legal risks	0.2874605	0.3627150	Max	0.0270806	0.0223779
C7	Project main quantitative indicators	0.0885438	0.0464385			
q1	Project budget	0.1942664	0.2877103	Min	0.0172011	0.0133608
q2	Project duration	0.1492391	0.1193466	Min	0.0132142	0.0055423
q3	Visitor increase after project implementation	0.1720532	0.1505528	Max	0.0152342	0.0069914
q4	Number of protected items	0.2089634	0.2775883	Max	0.0185024	0.0128908
q5	Number of contractors/subcontractors	0.1182404	0.0614156	Max	0.0104695	0.0028520
q6	Infrastructure investment	0.1572374	0.1033863	Min	0.0139224	0.0048011
C8	Monitoring process	0.0947376	0.0417512			
p1	Continuity of heritage property maintenance	0.4127726	0.6264155	Max	0.0391051	0.0261536
p2	Holistic project management plan	0.2977680	0.1991797	Max	0.0282098	0.0083160
p3	Reporting of outcomes and feedback	0.2894594	0.1744047	Max	0.0274227	0.0072816

There are differences in the weights assigned to the main criteria between the two methods employed. However, the cumulative weights of the sub-criteria, intended for the subsequent stage of evaluation, exhibit consistency and proximity (Table 6). In other words, the proximity of the weights indicates that the criteria proposed in this study are consistent. It is noteworthy that physical restoration predominates in projects supported by the fund, with scant attention accorded to the social, economic, and cultural facets of conservation. The close alignment of weights underscores the imperative consideration of all conservation aspects, beyond physical restoration, for the successful implementation of this methodology, thereby optimizing the fund's utilization.

Experts were asked to express their preference for the set of criteria weights generated by the two methodologies. Their choice was towards the weights computed using the SWARA method. Notably, the weight attributed to C1 (Evaluation of the Heritage Property) through the AHP approach overshadowed other factors that were considered more significant by the experts (Table 6). This preference of experts coincides with the field findings of the study; since, for example, 11 of the 20 traditional houses that had been restored with the help of the fund were subsequently found to have been abandoned due to a lack of improper reuse and infrastructural needs. If the suggested criteria were taken into account and the weights of the SWARA method used, the restoration of these houses would likely have been more successful since any factors found to be lacking would have been taken into consideration. On the other hand, when considering the time required for pairwise comparisons in applying questionnaires of the methods (since the experts were constrained by time), along with the complexity of revising answers for consistency, it led to a sense of haste and a perception of relinquishing control over the judgments made using the AHP method. Ultimately, the lack of personnel skilled in handling such calculations and analysis further inclined the experts to favor the use of the SWARA method, owing to its practicality and relative ease of implementation. Examining the cumulative weights in light of the proposed conservation stages, the outcomes of the SWARA method ascribed foremost importance to the 'management process', succeeded by 'policy development', 'understanding the heritage asset', and 'monitoring'. Conversely, the AHP results equated the 'management process' with the 'understanding the heritage asset' phase, and then ranked 'policy development' and 'monitoring' subsequently (Table 7). When evaluating projects executed under the fund's current system, certain challenges linked to the management process become evident. Issues concerning the gradual failure to utilize heritage buildings post-restoration, accessibility problems, the lack of holistic oversight of expropriation, and the project design and execution stages crystallize as all problems related to the management process. Hence, prioritization of the 'policy development' and 'management' phases emerges as a more judicious course of action for the effective utilization of the fund. Notably, the outcomes of the SWARA method also appear to resonate with this same emphasis.

As an outcome of the current study, it is recommended that municipalities seeking CCBH funding for proposed restoration projects prepare their application files based on the criteria suggested in this study. In doing so, they will have the opportunity to anticipate the most common factors that appear to have influence on the success of the conservation process. Decision-makers associated with the CCBH fund can employ the SWARA method to reevaluate the proposed criteria at different intervals since the use of this adaptive approach enables them to align with evolving conservation trends over time.

Table 7: Cumulative weights of main criteria (grouped by proposed built heritage steps)

Conservation process	Main criteria	SWARA weight	AHP weight
Understand	C1: Evaluation of heritage property	0.1812535	0.3514741
Develop policy	C2: Economic social ecologic feasibility C3: Contribution to sustainable development goals	0.2852491	0.2566282
Management in accordance with policy	C4: Applicant ability C5: Evaluation of methodology C6: Risk management C7: Project main quantitative indicators	0.4387598	0.3501465
Monitor	C8: Monitoring process	0.0947376	0.0417512

6. Conclusion

Conservation funds play a crucial role in the safeguarding of a nation's built heritage. The effective management of these funds contributes significantly to both the conservation process and its outcomes. As such, the ranking and evaluation of projects applying to these funds requires an objective and cautious approach. In order to achieve this, a structured methodology is considered imperative for decision-makers. The current research investigated the Contribution to the Conservation of Built Heritage (CCBH) fund, a widely utilized governmental resource in Turkey. Initially, the authors devised a set of criteria based on the common steps of the conservation process (comprehending the heritage asset, formulating conservation policy, managing in alignment with policy, and monitoring), while taking into account national legislation and international conservation principles. Subsequently, Multi-Criteria Decision-Making (MCDM) methods were applied in order to evaluate the proposed criteria. The authors then developed a clear, easily applicable, less intricate, and time-efficient decision-making process related to funding applications. Since the experts working on the management of the CCBH fund have a generally high workload, they need to be able to reach decisions quickly using an easily understood and effective method. Consequently, the Analytic

Hierarchy Process (AHP) and Step-wise Weight Assessment Ratio Analysis (SWARA) methods were comparatively employed by the current study, with findings that demonstrated the SWARA method to be efficacious in appraising the criteria for the prioritization of projects applying for conservation funds. The results of the current study contribute to the way both the preparation of conservation projects handled by municipalities and the rational decision-making processes of the CCBH fund's managers.

Compliance with ethical standards

Ethical considerations

Expert participation in this study was voluntary, with informed consent obtained. No personal or sensitive data were collected, and confidentiality was ensured.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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