

# The evaluation of actions aimed at enhancing the cultural heritage: the case study of the Colosseum roofing

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pairwise comparison

## Abstract

Several authors over the past few decades addressed the topic of the evaluation of interventions on real estate assets belonging to the cultural heritage. Unlike other real estate assets, the cultural ones cannot be considered only according to use values but also taking into account non-use and existence values. When the evaluation's aim is the selection of a project or a management model to be applied to real estate assets, the multicriteria analysis techniques are, among all the appraisal techniques provided by the evaluative field, particularly suited to the resolution of complex decision-making issues. In this context, one of the crucial steps is the definition of criteria, namely of relevant aspects, for the appraisal. These criteria must be selected according to the evaluation's objectives and to the recognised cultural and architectural values.

This paper presents the application of the pairwise comparison technique -based on the multicriteria methodology of the Analytic Hierarchy Process (AHP) introduced by Saaty - and aimed at selecting and weighting the criteria to evaluate the interventions on cultural and architectural assets. The case study is the Emperor Flavius' Amphitheatre (Colosseum), one of the most representative cultural heritage; we imagined the construction of a roof on the Colosseum (based on the model of the original roman awning – the so called *velarium*) and a panel of experts was involved. The pairwise comparison technique has been applied to select the relevant criteria for the evaluation of different projects (or solutions); the purpose was to identify the relevant aspects which must be considered when evaluating the possible interventions on real estate belonging to the cultural heritage.

## 1. INTRODUCTION

This work is the result of a study projection outlined in an Architecture dissertation which presents an imaginary situation, namely the construction of a roof for the Emperor Flavius' Amphitheatre in Rome (known as Colosseum). This idea was a sort of cultural issue based on a similar provocation related to the Verona Arena<sup>1</sup>,

and, in the intentions of the author and her supervisors, had to be discussed within the academic field that is

<sup>1</sup> The Verona Arena was subject to a design contest, published in 2016 by the Municipality of Verona and concluded in March 2017. 87 proposals were submitted and the German Engineering Studio Schlauch Bergermann and partners won the contest together with

generally tolerant towards students' projections which are sometimes quite imaginary.

If compared to the Verona Arena, the Colosseum case study is even more surreal if we think that it is a world-renowned monument entrusted to a city and a country that do not really show the iconic value of Colosseum worldwide.

This work deals specifically with two levels that are apparently distant from each other: the scientific evaluation of a possible roof for the Colosseum and the analysis of cultural and political, rather than financial, consequences which may be triggered by this hypothesis. The second level is also considered as the decision-making factor<sup>2</sup>.

This paper does not provide any solutions or suggestions. The main purpose is to outline a scientific and meticulous evaluation system referred to a real estate that has no market and that does not belong to us. We are only temporary "trustees" not completely aware of the extraordinary meaning of this monument.

## 2. THE APPRAISAL OF CULTURAL REAL ESTATE

We can distinguish the evaluative applications related to cultural real estate according to the appraisal's objective.

When the objective is to estimate their economic value, the appraisals are quantitative-monetary; we must select values (direct use, potential use, and existence use values) and methodologies according to the asset's typology, to the estimate's goal and to the available data and information (Mason, 2002; CHCfE, 2015; Fusco Girard e Nijkamp, 1997, 2005; Fusco Girard, 2000, 2001; Sirchia, 2000; Curto, 2003).

When there is no demand and supply (a typical condition for cultural real estate assets), the techniques must be based on the "reconstruction" of the market itself, by adopting direct economic measures (such as questionnaires submitted to actual or potential users) or indirect economic measures (travel costs, hedonic prices, opportunity costs). The challenge of this kind of appraisals is the collection of useful data for the market's reconstruction, since these data are not always representative of the actual values attributed by users.

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the architects of the Gerkan Marg and partners group. The main goal was to identify the best project for the roofing of the Arena, with the aim of enhancing the usability for entertainment activities as well as the conservation of several architectural elements (the cavea, the underlying vaults, arches and walkways) which may be subject to disintegration and wash-out caused by the percolation of rain water. The project also includes a removable roof which allows to host events in the Arena even in case of bad weather.

<sup>2</sup> During the presentation to the Commission, these cultural, more precisely political-cultural, aspects have been highlighted even more than the scientific content of the work, resulting in a heated debate, triggered by the projection of three interviews: the first to the relaxed Prof. Manacorda, the other to the furious Sgarbi to conclude with a moderate speech by prof. Della Torre.

Monetary appraisals may also concern the comparison and selection of hypothetical or alternative intervention or management projects according to the best ratio between benefits and direct and indirect costs (Cost-Benefit Analysis). In this case, there is an additional challenge, since the appraisal is elaborated based on "shadow prices", which must be associated to the projects' inputs and outputs. The conversion of market prices into economic values can lead to abstract hypothesis, which are not completely verifiable and understandable by the community (Lichfield *et al.*, 1990, 1992).

Even the economic models of choice optimization (or objective maximization), such as the multi-objective analysis, developed within the framework of welfare and collective choices theories, cannot provide effective tools to make rational choices within a complex society that is characterised by conflicting cultural attitudes and interests, especially if these also entail different intervention and use options of culturally and ichnographically relevant assets (Rostirolla, 1992; Nijkamp e Rietveld, 1976). The main criticism regarding these models is the challenge of considering the interaction among all the possible criteria and objectives of different subjects.

In contrast, the appraisals are not monetary when the aim is not to estimate economic values but indeed hypothesis or intervention scenarios based on a specific objective. These appraisals also include applications aimed at identifying the intervention option or scenario that allows to reach – in a "more satisfying" way – a desired goal (such as restoration, enhancement etc.). The appraisal issue can be analysed and solved by applying the multicriteria analysis, namely several methodologies which allow the rational resolution of choice issues characterised by a variety of criteria and objectives (Mason, 2002; Fusco Girard e Nijkamp, 1997; Sirchia, 2000).

These techniques are based on the achievement of an "acceptable compromise" (or a satisfactory solution) more than an excellent result but can be useful to guide the decision-making process. Besides, when the decision concerns particularly important assets, the variety of decisional levels with their own goals and sometimes conflicting and preconceived perspectives may make it difficult to set objectives and targets which are comprehensive of all factors involved in the decision-making process. A suitable alternative is the multicriteria analysis which allows to evaluate all the alternatives by objectively applying the same parameter and by analysing the individual objectives of the decision (Nijkamp, 1977, 1979; Nijkamp, e Voogd, 1979).

The multi-criteria evaluation approach is also in line with the guidelines of the Ministry of Cultural Heritage and Activities and Italian Tourism - MIBAC (MIBAC, 2004) concerning the management of cultural assets. The ministry suggests going beyond the peculiarities of specific assets and adopting a more comprehensive

“cultural system”, which may be actual or potential, as part of a wider framework that must be defined and analysed according to several points of view.

Concerning highly iconographic cultural assets, there is the risk of underestimating their non-use values and of defining in advance conservative management or intervention rules. The project concerning a cultural asset must, therefore, guarantee a sufficient level of protection but also integrate the asset into plans and projects aimed at enhancing and developing the local economic, social and cultural system (Della Torre, 2010; Smith, 2006; Musso, 2017; Ventura, 2016; Manacorda, 2016).

The balance between preservation and use must reduce the risk of deterioration of the cultural asset; according to the LAC methodology (*Limits of Acceptable Change*), there are three factors which must be considered: the cultural asset's value; the danger arising from human activities; the vulnerability of the environment where the asset is located:

$$\text{Risk} = f(\text{asset's value, danger, vulnerability})$$

This methodology, applied mainly to environmental assets and resources characterised by significant tourist flows, allows to estimate the maximum number of visitors that the asset can host without being subject to risks (such as wear of the environmental asset itself etc.) (Pedersen, 2002; Rogers *et al.* 2013; Frauman e Banks, 2011; Roman *et al.*, 2007; Ahn e Shafer, 2002; Cole *et al.*, 1997).

### 3. THE MULTICRITERIA ANALYSIS FOR THE EVALUATION OF INTERVENTIONS ON CULTURAL ASSETS

The objective of a multicriteria analysis is not to determine a value expressed in monetary terms (use, non-use, existence, etc.) but to identify the most satisfactory solution (as a project or management solution, etc.) among several options according to a previously set goal (concerning the asset's preservation or enhancement). By applying this methodology, we can also consider several aspects of an issue in the form of criteria.

Compared to traditional economic appraisals, the multicriteria ones are multidimensional and the choice of a certain project or management option does not depend on a single variable (such as the intervention's cost) but indeed on a variety of factors which have been selected and integrated as criteria in the evaluative process. For further information about multicriteria methodologies, please see Rietveld (1980), Nijkamp e Voogd (1981), Nijkamp (1989) and Voogd (1981, 1983). Overall, the key elements involved in this kind of evaluation are the following ones:

- decision-makers (*stakeholders*), i.e. subjects interested in the evaluation;
- criteria, i.e. relevant elements to compare alternative

solutions (or hypothesis) which are the object of evaluation;

- preferences, i.e. the weight (importance) attributed to each selected criterion;
- alternatives, i.e. the evaluated elements (project solutions, management hypothesis etc.).

The analysis of the main case studies presented both by the national and the international specialized literature concerning multicriteria methodologies for the evaluation of plans or the selection of intervention scenarios (or hypothesis) on cultural and historical-architectural assets (Table 1) shows that one of the most frequently applied techniques is the Analytic Hierarchy Process (AHP), introduced by Thomas Saaty in the late 70s, or its evolution i.e. the Analytic Network Process (ANP) (Saaty, 2005, 2016).

The AHP allows to analyse the decision-making issue and to easily develop the matrix calculation, it therefore lends itself to this kind of applications. The criteria used to evaluate several intervention or management alternatives are selected according to the application level (territorial, urban, architectural), to the evaluation's objectives (i.e. the selection of certain enhancement or intended use scenarios etc.) and, not least, to the available data.

The weighing of criteria and the measurement of the alternatives' impact on each criterion is based on the pairwise comparison introduced by Saaty.

This technique is based on a square matrix of order  $n \times n$  ( $n$  is the number of compared elements), also called “pairwise comparison matrix” (Fig. 1); concerning the weighing of criteria, the comparison is achieved by attributing a score based on a 1-9 scale according to the priority of one criterion over the other and in relation to the higher-level criterion<sup>3</sup>.

Once the square matrix of the pairwise comparison is completed, the weight of each criterion is represented by the correspondent normalized component of the principal eigenvector derived by the matrix.

<sup>3</sup> A growing prevalence of an element over another corresponds to a higher score with respect to a higher-level element (with regard to the weighing of criteria, this is the objective of the appraisal); by comparing criterion 1 with criterion 2, if 1 prevails over 2 with respect to the objective, the score given to the pairwise comparison will be a score between 2 and 9; if criterion 2 prevails over criterion 1, the score given to the pairwise comparison will be a fractioned numerical score between 1/2 and 1/9; the score 1 of Saaty's scale is given when a perfect equality between the two compared criteria is acknowledged, that is when they have the same importance in order to reach the set objective. If we refer to criterion 1, his weight is given by the first component of the main eigenvector taken from the matrix of the pairwise comparison, obtained through the formula  $(1 \cdot a_{12} \cdot a_{12} \cdot a_{12} \cdot a_{12} \cdot a_{12})^{1/n}$ ; once the weights of all criteria have been calculated, normalisation is carried out by dividing each of them by the sum of the values. According to this normalization method, the sum of the weights of all criteria corresponds to unit (1).

	Criterion 1	Criterion 2	Criterion 3	Criterion ...	Criterion n
Criterion 1	1	a <sub>12</sub>	a <sub>13</sub>	a <sub>1...</sub>	a <sub>1n</sub>
Criterion 2	a <sub>21</sub>	1	a <sub>23</sub>	a <sub>2...</sub>	a <sub>2n</sub>
Criterion 3	a <sub>31</sub>	a <sub>31</sub>	1	a <sub>3...</sub>	a <sub>3n</sub>
Criterion ...	a <sub>...1</sub>	a <sub>...2</sub>	a <sub>...3</sub>	1	a <sub>...n</sub>
Criterion n	a <sub>n1</sub>	a <sub>n1</sub>	a <sub>n1</sub>	a <sub>n1</sub>	1

Figure 1 - Paired comparison matrix for criteria weighing

#### 4. The case study

This case study has been developed by taking into consideration of one the most important and visited monuments in Italy, the Colosseum in Rome. This monument was chosen to give a reference to the Panel of experts involved<sup>4</sup> to carry out the analysis. Moreover, for the purposes of selection and weighting of the criteria through which the intervention on this type of assets is appraised, a measure was taken as an example. This measure could be meaningful to the asset and it consists in the construction of a roof structure for the Amphitheater, based on the original “velarium” with the aim of protecting it from weather influence and ensure visits as well as cultural events (such as exhibitions, shows etc.) in case of adverse weather conditions<sup>5</sup>.

This issue is very relevant today if we consider the international design competition which has recently ended to select the best proposal regarding the roofing of the Arena in Verona (Fig. 2).



Figure 2 - Perspective view of the design solution selected for covering the Verona Arena (studio Schlaich Bergermann and partners)

<sup>4</sup> The involved Panel is made up of 62 students attending the 3rd year of the 3-year Degree Course in Civil Engineering at the Polytechnic University in Milan and 24 professionals (architects and engineers) who work in the field of planning and works supervision in the field of architectural and cultural assets.

<sup>5</sup> Reference was made to a structure which consists in a new velar with the aim of protecting open spaces of the Colosseum and walls.

#### 4.1 The Colosseum and coverings

The Colosseum in Rome was built from 72 AD on a wide area that had been devastated by the fire in 64 BC where Nero's house was located. The building satisfied the Vespasian's wishes who was a member of the Flavian dynasty (the name Flavian amphitheater derives from it) (Colagrossi, 1913; Tan *et al.*, 2014; Guzzo, 1986; Gabucci e Coarell, 1999; Luciani, 2000; Coarelli, 2001; Rea, 2001; Alfano *et al.*, 2015; Campioli *et al.*, 2008). It was opened in 80 AD. under the rule of Emperor Titus (Vespasian's son) and its construction combines some completely new technical aspects such as the device use to stretch the large “velum” that was a feature of almost all Amphitheatres. Over the centuries the Colosseum was imitated by a great number of architects. The Flavian Amphitheater represented a range of architectural sequences and indications for their use. Even more important was the influence of another feature: the overlapping of sequences was a recurring element in the compositions of the facades of Renaissance palaces.

The external part of the Colosseum has influenced the development of architecture since the 15th century whereas the plant as well as the velar found an adequate application in the contemporary age. Ancient societies had the need to gather big crowds in a covered space, but citizens did not gather in buildings. They rather met in public squares which could not be covered and remained open spaces.

Since the 19th century, during the second industrial revolution and due to the growth of metropolitan cities, there was an increasing need for large covered surfaces to host exhibitions and protect the audience during shows or sport events. The exhibition palaces and stadiums are a very interesting case if we consider the covering of large spaces. However, technological differences due to the preferential use of metal or reinforced concrete structures make the Colosseum's velar a quite uncertain source of inspiration. On the other hand, modern tensile structures are outlined within a context which is quite distant from a cultural approach based on architectural historicism.

Among the large coverings of buildings with a circular plan we can find architectural and engineering masterworks from the 20th century. The construction of such a structure to enhance the Colosseum is inspired by two architectural references: the original velar and the recall of works that are fundamental to the development of modern architecture such as the coverings of the Sports Hall in Rome by Pier Luigi Nervi.

There may be a third source of inspiration from examples of similar structures planned and built in recent times. These three options would be considered in a different way according to individual sensitivities and cultural contexts of each interviewee. A preliminary historical investigation and a multi-criteria analysis should keep into account the monument's history, without neglecting the

**Table 1 - Some case studies related to applications of multicriteria methodologies to cultural heritage**

Author/s	Year	Evaluation level	Goal evaluation	Multicriterio method	Category of criteria/indicators	Criteria
Bithas e Nijkamp (1997)	1997	Territorial	Sustainable development plan for the cultural heritage of Olimpia (Greece)	Impact matrices	Environmental Economic Social	Environmental quality Income and employment Income distribution; Costs of environmental policy
De Toro (1997)	1997	Urban	Recovery and enhancement of the Coroglio area (Naples - Italy)	Analytic Hierarchy Process (AHP)	Economic efficiency Social equity  Environmental protection	Self-financing; Economic wealth; Job; Infrastructure equipment; Real estate demand Landscape enhancement; Green areas; Soil consumption
Ferretti and Bizzarro (1997)	1997	Urban	Choice of use of the insula Historical Center of Naples	Analytic Hierarchy Process (AHP)	Economic  Socio-cultural  Environmental	Cost of intervention; Revenue / cost ratio; Impact on local development Employment; Protection of historical value; Social utility Soil consumption; Pollution
Giordano (1997)	1997	Urban	Recovery Plan Medieval village of Maratea (Potenza Italy)	Community Impact Evaluation (CIE)	Historical-architectural-environmental  Economic  Social	Protection of architectural and environmental values Arrangement of green areas; Protection of the image and traditions of the local area; Improvement of accessibility; Employment increase; Increase of property values; Maximization of investment profitability; Increasing housing supply; Elimination of architectural barriers
van Herwijnen <i>et al.</i> , (1997)	1997	Territorial	Sporades islands development plan (Greece)	MCA + GIS	Socio-economic development Ecological development  Land use Marine environment	GDP; Income growth; Unemployment Environmental emissions; Waste; Congestion; Water disposal Land use; Natural vegetation Marine fauna protection; Sustainable fishing; Quality of marine waters
Massimo D.E. (1997)	1997	Urban	Monumental restoration project Castle of Nicasastro (Lamezia Terme - Italy)	Regime Method	Cultural-historical and architectural  Economic	Increase of tourist flows; Integration with a thematic tourist itinerary; Conservation of historical and artistic integrity Self-financing capacity; Risk
Nijkamp and Artuso (1997)	1997	Urban	Selection of the development plan for the historic center of Bassano del Grappa (Vicenza - Italy)	Regime Method	Functional area redevelopment  Economic development of the area	Residential function; Tertiary function; Cultural functions Real estate valuation; Commercial enhancement; Socio-economic valorization

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Author/s	Year	Evaluation level	Goal evaluation	Multicriterio method	Category of criteria/indicators	Criteria
					Improvement of urbanization level Environmental enhancement	Recreational public services; Public support services Conservation and restoration of properties with historical value; Conservation of aesthetic values of the urban area; Integration with the Historic Center of the city
Fusco Girard and De Toro (2007)	2007	Urban	Masterplan for the Municipality of S. Marco dei Cavoti (Benevento - Italy)	Analytic Hierarchy Process (AHP) + GIS	Geomorphology Natural resources and landscape Urbanized territory	Geology; Morphology Natural resources; Landscape quality Network systems; Soil consumption
Dutta and Husain (2009)	2009	Urban	Evaluation of 69 cultural sites in Calcutta (India)	Multi-Criteria Decision Analysis (MCDM)	Cultural/Historical Architectural Social	Historical value; Social-cultural value Architectural value; Signs of deterioration; Accessibility; Integrity; Usability Local public opinion; Local response
Giove and Rosato (2010)	2010		337 historical residences in Veneto region (Italy)	MCDM Choquet method	Positional Building Economical	Quality of urban contest; location Flexibility of the building spaces Economical development
Wang and Zeng (2010)	2010	Building	Progetto di recupero edificio storico a Taipei (Cina)	Analytic Network Process (ANP) + Delphi	Cultural Economic Architectural Environmental Social Continuity of the aspects	Historical/artistic value; Integrity and/or authenticity; Real estate market demand; Financial resources; Initial investment; Profit; Tax reduction Physical building conditions ; Architectural characters; Site features; Land use Social value; Increasing public awareness Adequate protection and management of the system; Cultural sustainability
Fuentes (2011)	2011	Edilizio	Selection of the most representative building of local traditional architecture in the Province of Soria (Spain)	MCDM	Context Economic-Social-Legal Building values Morphological characteristics General conditions of the building	Location; Accessibility; Landscape value; Services; Surrounding space; Settlement type Social interest; Property; Legal conditions building Architectural value; Historical value; Other values Dimension; Form; Number of floors; Spaces Structural and maintenance building conditions

segue

Author/s	Year	Evaluation level	Goal evaluation	Multicriterio method	Category of criteria/indicators	Criteria
Giove <i>et al.</i> (2011)	2011	Building	Evaluation of the sustainability of the Venice arsenal restoration and re-use project (Italy)	Choquet method	Intrinsic sustainability Sustainability of the context  Economic and financial feasibility	Reversibility; Versatility; invasiveness Landscape quality; Perception of recovery; Traffic impacts; Local economy Expected revenue
Cerreta <i>et al.</i> (2012)	2012	Building	Choice of recovery scenario for the historic railway line Benevento - Rocchetta S. Antonio (Italy)	Analytic Hierarchy Process (AHP) + GIS	Social Economic Environmental	Population; Occupation; Intangible heritage Railway network; Local mobility; Economy and production Hydrosphere; Geosphere; Cultural heritage
Ferretti <i>et al.</i> (2014)	2014	Building	Re-use of a historic building in Caselle (Turin - Italy)	Additive model (Weighed sum)	Environmental / landscape Economic City planning Building/ Architectural	Quality of the context; Accessibility Economic activities Accessibility Building flexibility; Conservation building
Napoli and Schilleci (2014)	2014	Urban	Urban area intervention plan choice in Palermo (Italy)	Costs-Benefit-Opportunities Risk Analysis (BOCR) + ANP	Cultural services Urban Landscape Social	Cultural services; Green spaces Restoration of cultural heritage; Quality of public spaces Social housing; Social participation
Oppio <i>et al.</i> (2015)	2015	Territorial and building	Selection of strategies for the recovery and enhancement of the castles of Valle d'Aosta (Italy)	Analytic Network Process (ANP)	Social  Cultural Territorial Landscape Economic Social-cultural	Number of initiatives, Vitality; Pride of the population; Demographic dynamic; Replacement rate; Low interest in events; Relations between tourism and local residents Events distribution; Scheduling of events Regional characteristics (accessibility, etc.) Pedestrian routes; Presence of areas of naturalistic interest Revenue from tickets, withdrawable income Damaged / undamaged residents, Cultural value

complex relations with the concepts of modernity and the needs of contemporary society.

By analysing the current situation and specifically, facilities built in the past decades, it can be noted that the building of large coverings meets the growing needs of our contemporary society. Besides the construction of new buildings, there are proposals to change already existing

complexes. In the past decades this need justified the proposals to change existing facilities, such as soccer stadiums which were high-quality ones in terms of architecture and design.

A long cultural tradition has pushed us to establish a relationship between the value of a cultural asset with its ancient origin. If a stadium built in the first half of the

twentieth century can be altered or rebuilt without arising any criticism, an “ancient” building creates problems in this respect. However, if this intervention is fully reversible, the possible covering should look like a “case” to protect the building rather than change it; as a result, the way the building looks like may be altered, and not the construction itself.

The covering could create a new image of the Colosseum which would certainly redefine the recognisability of the monument.

In this respect, it is interesting to note that the current “iconic value” of the Colosseum is related to a configuration comprising the “spur” by Giuseppe Valadier in the 19<sup>th</sup> century. The inclined cut which defines the alternating external and internal rings of the building has become a graphic element which characterizes almost all cases in which the building is used as symbol or logo.

The current image of the Colosseum is not dominated by the side where the building is better preserved but, paradoxically, the side which was given a complex and recognizable shape by the renovations in the nineteenth century. It can be therefore maintained that the most famous and commercial representations of this building show the Colosseum by Valadier rather than the building dating back to the age of Vespasian and Titus.

To sum up, the Colosseum has unique features that make it particularly interesting as a case study with reference to the Panel of experts involved.

Specifically, this study can provide an overview of the attitude shown by different categories of professionals towards this issue. The relationship professionals dealing with construction and architectural culture have with history can change deeply over time.

The historicism of the nineteenth century was considered as belonging to the past by a representative of the modern movement. At the same time, the “demolition” practices regarding old town centres is distant from our way of conceiving urban transformations.

This type of analysis can be a new source for cultural history in this field. Although individual sensitivity can change rapidly, the information collected through a multi-criteria analysis can provide, especially if repeated over time, an interesting overview to understand the relationship between society, professionals and the use as well as protection of historical buildings in a specific time.

#### 4.2 The selection of appraisal criteria and their weighting

In order to be correctly applied, the pairwise comparison technique shall be arranged according to a specific goal: in this case, the selection of criteria and their subsequent weighting has been developed by indicating to each Panel expert, a precise question-goal and specifically: “*taking into account a cultural an immovable cultural asset and an intervention hypothesis aiming at functional, cultural and*

*economic enhancement, i.e. the building of a new velar to cover the Colosseum in Rome, what criteria should be considered in order to select the best design and management proposals?*”.

The appraisal is divided into two levels, each of them characterised by a subsequent weighting step:

1. the first step aimed at identifying categories (or groups) of criteria and evaluate the importance (weight) within the identification of the most satisfying design solution;
2. the second step aimed at identifying, within each group, individual criteria in relation to which the interventions on the cultural assets had to be estimated.

Each group of criteria, as well as each criterion, was weighted through the pairwise comparison technique derived from AHP.

Unlike the scale used by Saaty which has scores from 1 to 9, this case study used a variant within the method awarding pairwise comparison, scores from 1 to 9, thus redefining the judgments awarded by Saaty<sup>6</sup>. Specifically, by using the calculation software Excel, the matrices of pairwise comparison were compiled and eigenvectors subsequently standardised were extracted.

First the groups and then individual criteria were identified through the brainstorming<sup>7</sup> technique led by the authors in relation to the definition of possible scenarios regarding cultural and historical-architectonical assets by referring to, as an example, the covering of the Colosseum. Specifically, based on the configuration of potential interventions (preservation, economic enhancement etc.) and by referring to the covering of the Colosseum, the groups (or categories) of significant criteria<sup>8</sup> were identified in the first step.

In relation to the individual criteria, they were identified based on the groups that had been identified in the previous step. The covering of the Colosseum was taken into consideration in this step, as well. Within each category, each member of the Panel identified a series of variable criteria from 4 to 6. Starting from these criteria, in a following step, they were compared with regard to their meaning and aims thus defining 12 final criteria<sup>9</sup>.

<sup>6</sup> In particular: the same level of importance corresponds to score 1; a moderate prevalence corresponds to score 2; a strong prevalence corresponds to score 3; an extreme prevalence corresponds to score 4.

<sup>7</sup> The method used in the advertising field, that is value analysis etc., allows us to look for the solution to a specific problem through intense debates and confrontation of ideas and proposals freely expressed by participants.

<sup>8</sup> Particularly, the Panel members were asked to think about and indicate the aspects that have to be considered when it comes to intervene on a cultural asset (immovable) within a preservation/enhancement scenario.

<sup>9</sup> This “standardization” step was needed because some criteria had been defined in different way by the Panel members but indicated an already selected aspect.

## 5. RESULTS

In the first step for the selection of categories needed to estimate the interventions, the Panel identified the following four groups:

1. *Historical-Architectural*, related to the historical, architectural and cultural values that characterise the asset (or group of assets);
2. *Environmental*, related to environmental values and landscape around the cultural asset, whether natural (e.g.: park) or built (e.g.: old town centre);
3. *Social*, deemed as values and characteristics of the population living near the asset;
4. *Economic*, related to economic values connected to the cultural asset, both direct (economic value of the asset and revenues from visits and/or activities that can be hosted) and indirect, in terms of effects generated by the asset in a specific territory (tourist expenses etc.).

Through the pairwise comparison technique, the Panel members weighted the importance of each group, giving a higher weight to “Historical-architectural” (30,7%) then “Environmental” (24,8%) and “Economic” (24,6%); the group of “Social” criteria is considered as the least important within the evaluation of interventions of cultural assets (19,9%) (Fig. 3).

In relation to individual criteria, those selected with the 4 groups are 12 (Fig. 4).

The most important criteria are the “Limitation of degradation phenomena” (11,8%), the “Limitation of Environmental Pollution” (10,5%) and the “Respect of historical-architectural characters of the asset” (10,1%);

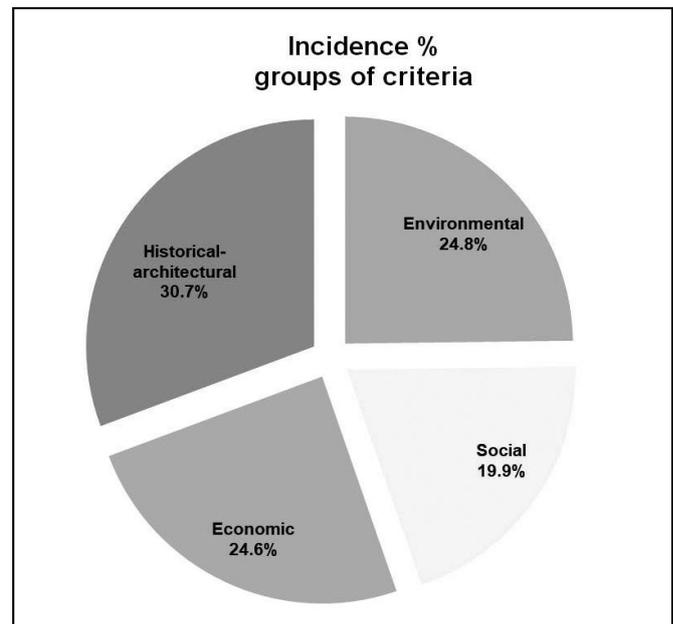


Figure 3 - Groups of criteria and average% weight

the least important criterion is the “Establishment of a public-private partnership” (5,0%) belonging to the group of “Social” criteria.

The results confirm the findings for each group: within the evaluation of interventions on cultural assets, according to the Panel members, attention must be paid to the aspects related to the preservation of the assets and its historical-architectural values.

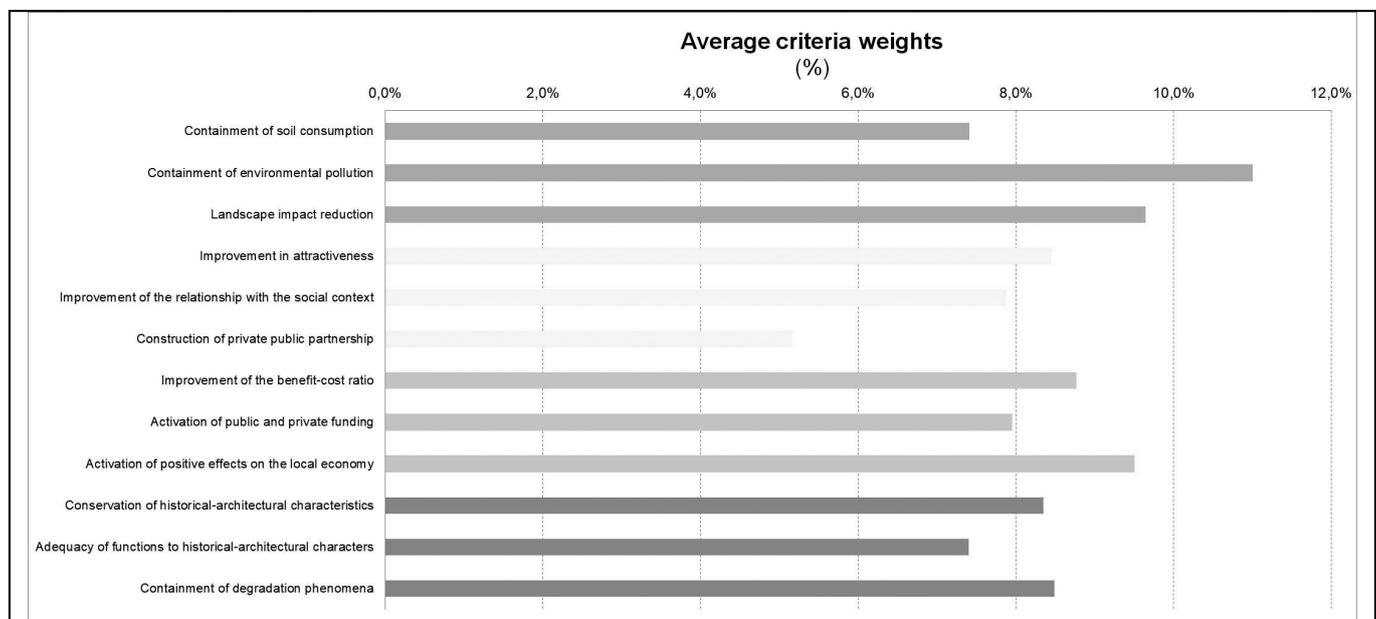


Figure 4 - Criteria and their percentage weight (%) average

## 6. CONCLUSION

The appraisal issue within projects regarding the use and preservation of immovable cultural assets and interventions aimed at their enhancement is very relevant today also in the light of the new management policies implemented by the MIBAC (Ministry of Cultural Heritage and Activities) and local authorities.

The results need to be deeply analysed in terms of consistency and composition of the Panel. However, they highlight the importance of this type of analysis to identify relevant aspects needed to develop the appraisal of interventions.

Unlike other “ordinary” immovable assets, cultural assets are characterised by values that go beyond the mere use value which is directly quantifiable in monetary terms. As a result, we must refer to non-use values, existence values, related to historical and cultural recognisable values.

When we aim at selecting the best design solution for preservation and enhancement, it is fundamental to define the relevant aspects needed to develop the evaluation.

They allow us to define an objective “grid” that enable the development of an analysis and the outline of design/management solutions to support the decision-maker in resolving the problem.

Of course, criteria can be weighted in a different way according to the evaluation objectives, by establishing panels which comprise specific stakeholders to check the variance of results based on the different pursued goals.

According to the Panel of experts for this specific study, the aspects, in the form of criteria that must be considered to evaluate the interventions, are first of all those related

to the preservation of historical-architectural values and environmental values; the economic aspects related to the sustainability of the intervention “only” rank third and this shows that they pay more attention to the issues related to the preservation of the asset’s values.

In relation to the individual criteria, the limitation of degradation phenomena and environmental pollution have the greatest weight; the first one relates to the asset, the second one to the effect of the design solution on the surrounding environment.

The case study of the Colosseum has unique features that make it an interesting case study in relation to the Panel of experts involved.

This study had also provided an overview of the attitude shown by different categories of subjects (professionals) towards this issue. Individual sensitivities can rapidly change over time, but the information collected can provide, especially if repeated over time, an interesting overview to understand the relationship between society, professionals and the use as well as protection of historical buildings in a specific time.

It is important to highlight that the four groups of criteria identified by the Panel are aligned to the research *Cultural Heritage Counts for Europe* (CHCfE, 2015) within which the cultural heritage plays a central role for the implementation of virtuous policies in different economic, social, cultural and environmental areas (Fig. 5).

It is a review of the known outline of sustainability to which the “cultural” criterion was added due to the peculiarity of assets subject to appraisal. In this respect, culture is an effective policy for sustainable development.

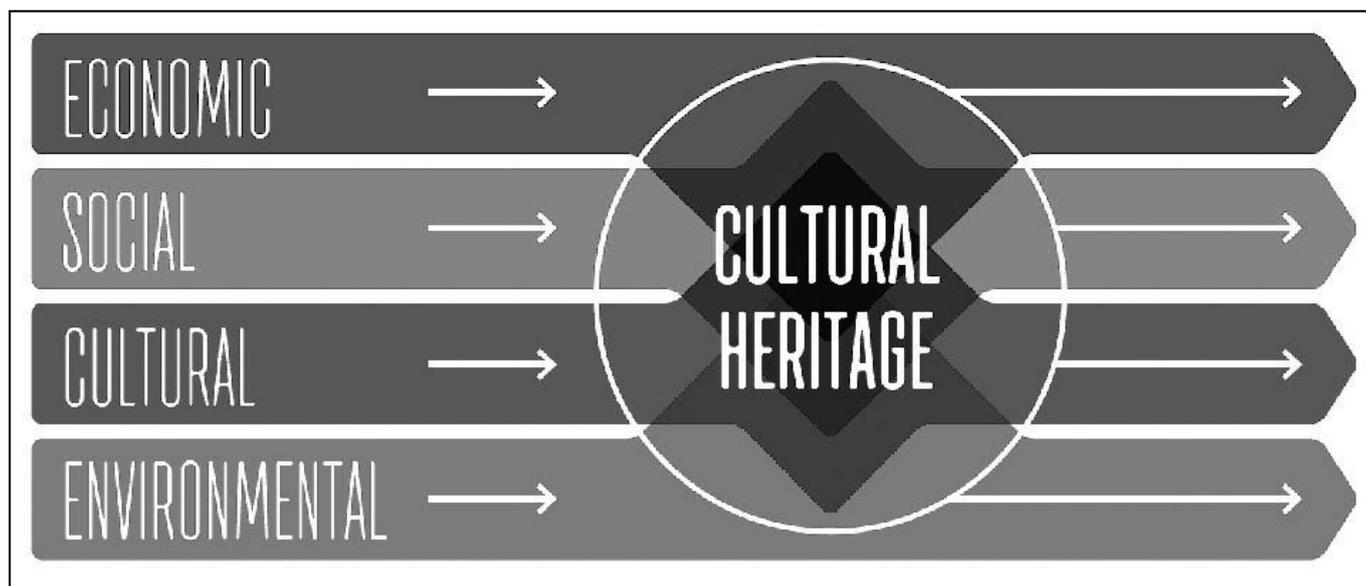


Figure 5 - Valorization actions on cultural heritage and impact areas (CHCE)

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