

MULTI-CRITERIA DECISION-MAKING METHODOLOGY ACCORDING TO HIERARCHICAL ANALYSIS AND ABC METHOD

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The ABC Method: IS a risk management approach to the preservation of cultural heritage

Abstract:

Heritage properties have many values which need to be preserved by countries and bodies responsible for managing and protecting them from risks, which are increasing with increasing values. It may affect those values One of the most important tools approved by UNESCO for monitoring and evaluating risks is the measurement ruler for the ABC method (ICCROM, 2016), which aims to take decisions for heritage management by identifying risks and measuring their severity depending on the extent of their impact on the values of the heritage property. Looking at recent research and studies that dealt with management and decision-making, we find that many evaluations and measurement methods have been used, such as multi-axis measurements (AHP, ANN, ANP), and other evaluation and measurement methods that have been used in many fields, whether economic, social, or political). It has proven its worth in selecting the most appropriate options In view of the importance of the decision to preserve and its impact on the property, the research dealt with the analysis and comparison of the measurement ruler for the ABC method and the hierarchical analysis AHP and their role in making multi-criteria decisions Where the research deals with the ability of the measurement ruler to deal with values, whether material or moral, and to develop a quantitative measurement of the severity of the expected damage and compare it with the quantitative measurement of the AHP hierarchical measurement method and apply it to the selected case study. To find out the most appropriate and accurate way to manage risks The Al-Lutan Hassan Mosque was chosen as a case study, determining the values of the building, determining the risks on it, using the measurement ruler to manage risks, and then using hierarchical analysis for risk management.

Keywords: Risk assessment – Heritage Values – ABC method – AHP (Analytical Hierarchy Analysis)

Hypothesis:

The combination of ABC method and hierarchical analysis makes up a clear method for heritage management and protection, as it gives more specific indicators of values and risks.

Methodology:

The research follows the descriptive-analytical method and comprises three parts

- **The first part:** is the theoretical part of the research, which includes the basic definitions and principles followed
- **The second part:** case study
 - descriptive part
 - hierarchical analysis AHP
 - Analysis using ABC method
- **The third part:** Suggested methodology

- **results and recommendations**

INTRODUCTION:

The value of heritage has always been the main goal of Conservation projects since nothing without value deserves to be preserved.

Valuable building is those linked to the community's conscience, memory, and history. Thus, heritage is a person's awareness of the significance of a building, monument, or heritage site, along with the goals and objectives they aim. Specialists determine the general framework that constitutes "heritage" and ways to preserve it. Throughout history, the concept of heritage has developed and flourished, and the identification of heritage values has become a classification of values for each region and institution. However, all specialists and interested parties in the field of heritage preservation agree that there is no fixed classification of heritage values. Since each building or area is different according to the changes in its surrounding conditions

when considering the preservation of heritage buildings, and defining management priorities starting with restoration, facing risk, proposals for re-use, and dealing with conflicting interests, there are some values that demand the inclusion of local communities and beneficiaries in the conservation of heritage buildings and rehabilitation of their urban region.

Therefore, defining values is a crucial aspect of making decisions about interventions to preserve the heritage site from the threats it faces permanently. These threats negatively influence the elements that possess heritage values and consequently affect the heritage values themselves. In addition, values change as the scope of classification changes and as time passes. The Tangible values of heritage buildings are mainly related to the architectural and construction characteristics of the buildings (direct loss), so it is easy to quantify them quantitatively, concerning the intangible values, such as the community connection to the building, its affiliation with the urban site of the heritage place, the extent The collapse of that value in whole or in part, its impact on social cohesion, sustainable development, and quality of life is hard to quantify, and this is what makes the quantitative assessment of this Intangible loss difficult, and therefore ignoring or neglecting this part will affect the decision-making and, the quality of management, which is influenced by:

- In what way and to what extent values are verified, and how they are classified.
- Risks, their severity, and methods of assessing them.

1. Classifications of Heritage Values:

The heritage specialists have categorized heritage values since ancient times, but the classification criteria took a different course, beginning with the Venice Charter in 1964, where it recognized only two types of values, historical and aesthetic values and stipulated that "the intention in conserving and restoring antiquities is to safeguard them, no less as works of art than as Historical evidence."(ICOMOS, The Venice Charte 1964, - February 2012)However, the 2013 Australian ICOMOS Charter BURRA is particularly interesting due

to its definition of cultural significance as it entails aesthetic, historical, scientific, social, and spiritual aspects.

1.1. The Burra Charter categorizes values that are culturally important as:(ICOMOS, The Burra Charter, 2013)

1.1.1. Aesthetic value: The sensory and cognitive experience of a place, i.e., how we react to both visible and invisible aspects of a place, such as sounds, smells and other factors that influence a person's feelings and behavior. The concept of beauty and formal aesthetic standards may be included in aesthetic qualities while Culture affects aesthetic expression.

1.1.2. Historical value: It aims to encompass all aspects of history, including aesthetics, art, architecture, science, spirituality, and society. The significance of a place can be attributed to its influence on or connection to a historical event, stage, country, or group of people. It may be the witness of an important event. Wherever the significance is greater the evidence of a link or event exists in the largely intact location. Nonetheless, certain events or associations may be so significant that the place will retain its significance regardless of this change or lack of evidence.

1.1.3. Scientific value: In archaeological terms, it refers to the ability of a place to provide information about an aspect of its past through examination or investigations, including the use of archaeological techniques. The scientific value of a place is likely to depend on its rarity, quality, and representativeness, as well as its potential to provide vital information about the place itself, a type or category of place, or to address important research questions.

1.1.4. Social value: Indicates the meaning of a particular place to a cultural group and the social or cultural meanings it holds for them

1.1.5. Spiritual value: Refers to intangible values and meanings embodied in or traced back to a place that gives them significance in the spiritual identity, or traditional knowledge, arts, and practices of a cultural group. It may also be reflected in the intensity of aesthetic and emotional responses or societal associations and is expressed through relevant cultural practices and places.

1.2. In 2008, the English Heritage proposed a "family" of values as follows (Heritage, 2008)

1.2.1. Evidential value: derivative of the possibility of offering a place for evidence of past human activity.

1.2.2. Historical value: derivative of the ways in which people and events of the past have and aspects of life can be connected somewhere to the present they tend to be illustrative or associative.

1.2.3. Aesthetic value: Derived from the ways that people extract senses and intellectual stimulation from somewhere.

1.2.4. Communal value: derived from the meanings of the place to people with whom it relates, or of their collective experience or memory.

1.3. The Arab Charter for the Preservation of Architectural Heritage in Arab States also discussed the development of classifications of these values(Arab League Educational, sep 2014)

1.3.1. Historical and cultural significance: Urban heritage is a precious cultural treasure that shows real evidence of human creativity, national identity, and this can be measured by two indicators:

- Time indicator: described by the construction date
- Symbolic indicator: It is related to several elements such as: its ability to express the architectural heritage of his time, and its uniqueness and authenticity.

1.3.2. Scientific significance: Architectural heritage expresses many principles that must be considered and recognized and is one of the most valuable sources of knowledge.

1.3.3. Social significance: Urban heritage embodies various social benefits and helps in increasing the spirit of belonging and social identity.

1.3.4. Economic (touristic) significance: Consider urban heritage as a valuable source of economy, in addition to other related activities in tourism.

1.3.5. Artistic and aesthetic significance: Considering urban heritage as aesthetic reflects local culture through designs, artifacts, techniques and materials.

1.4. In the Egyptian context, the Practical Guidelines for Egyptian Law No. 119 (2008) and the Urban Coordination Manual issued by the National Organization for Urban Harmony (NOUH) (Presidency of the Republic, 2008) (Harmony, 2010) mentioned a set of common values patterns that characterize groups of buildings and urban fabric as follows:

| | |
|--|--|
| <p>Historical value: Buildings have a historical connection that forms part of the community's identity. Associated with a person or persons of national or international importance. Connected to an important event that clearly affects the history of a country. Buildings have symbolic values. The age of the building.</p> | <p>local traditional value: Part of an integrated urban, rural or desert structure that is important in its historical and architectural harmony Special use of materials that represent a category of places and are compatible with the environment It expresses the collective experiences of design, construction and the traditional profession across generations</p> |
| <p>Architectural value: The buildings are distinguished by a unique and important architectural style. Buildings with unique and creative architectural design aesthetics. It represents an important stage of architectural and aesthetic history. The job of an architect or designer is important Contribution nationally or internationally. Represents a unique scientific value or building technology.</p> | <p>urban configuration: Buildings that exhibit patterns of environmental and historical interest Landscape or landscape patterns in the nation's history. Integration of historical buildings in terms of form and construction.</p> |
| <p>Social value: Association across ages with important social functions. Buildings are a reflection of related religious, customs or social customs</p> | <p>urban value: Part of an integrated historical group of important buildings inside</p> |

Table 1 Heritage Values as listed in the Egyptian context

2. Risk management based on Heritage values:

Heritage management is a complex field as it refers to the conscious process by which decisions are made regarding heritage policy and practices for cultural heritage resources, the way these resources are developed (Torre, 2002)

Heritage and heritage tourism management addresses many issues, including stakeholder groups and the social and cultural values of local communities rooted in the place.

| Burra Charter | National Register of Historic places (NRHP) | English Heritage | Arab Charter to preserve the architectural heritage | National Organization for Urban Harmony (NOUH) | Comprehensive Plan of Alexandria of 2005 |
|------------------|---|------------------|---|--|--|
| Aesthetic value | Associative value | Evidential value | Historic and Cultural importance | Historic value | Architectural style |
| Historic value | Events Persons | Historical value | Cultural importance | Architectural Value | Relation to Historic figure |
| Scientific value | Design or Construction value | Aesthetic value | Scientific importance | Urban Value | National history |
| Social value | Information value | Communal value | Social importance | Social Value | Association with Historic period |
| Spiritual value | | | Economic importance (touristic) | Local traditional value | |
| | | | Artistic and Aesthetic importance | | Tourist attraction |

Figure 1: represent a summary of the listing of values criteria adopted by various organization and scholars as to sum up the key criteria in the literature review (Metwally, 2014)

3. A major shift in heritage management methods:

In the last fifty years, the concept of heritage Management at heritage sites has extended to include social and cultural values as well as tangible and traditional historical values. Specialists mention that heritage Management can be addressed through two approaches; Traditional or value-based management, Recent theoretical discussions in heritage management have focused on values involved in the site.

Value-based management, by definition, is “the coordinated and organized process of a heritage site “This management approach, in particular, is concerned with large-scale value sets and then taking into account how those values function in a particular heritage site. It is an approach that seeks to achieve an appropriate balance between site management and heritage management and interpretation

The core purpose is to protect the significance of the place as defined by designating standards, governmental authorities or other owners, experts of various fields, and other

citizens who have legitimate interests in the place” **Hazards and Risks faced by heritage sites:**

Most of the heritage sites around the world have features and values of high importance and uniqueness, however they are considered fragile and vulnerable, because they are exposed to many Hazards and difficulties, as heritage sites suffer continuously from various risks such as natural disasters, misuse, urban development and pollution, security conflicts, wars and others.

The severity of the impact of these risks on heritage sites varies according to the circumstances, nature and weaknesses of each site, in addition to the type of risks facing it. These risks are divided into:

- Natural or Anthropogenic risks
- Sudden and catastrophic risks, or persistent risks with low impact, but cumulative.

Cultural heritage has features, components, and special significance, whether for society or for the world, because it is a place of value, and in order to preserve it in the best way, it is necessary to identify and classify these values since they are related to the parts and elements of the site, place, and building. Conservation managers must be aware of the reasons for which (Anna Paolini, 2012) heritage sites are being preserved since these reasons will influence their strategies for managing conservation and maintenance, as well as the priorities for intervention in risk mitigation plan.

So accurate identification of values helps in understanding the needs of the heritage site and its nature, thus helping to make the right decisions for assessing risks and the severity of their impact since the study of values is the basis of risk assessment and prioritization of interventions to prevent or mitigate the severity of their impact

3.1. Risk assessment based on heritage values:

There are several disadvantages of quantitative approach of values assessment it requires effective information systems and continuous informed review with updated knowledge. The information must be sufficient to provide an informed judgment. Assigning numerical values or points is subjective though using grades, numbers, and categories; It is never an objective statement as every evaluation is the result of a number of expert and subjective judgments. (Metwally, 2014)

3.2. Risk assessment Methodologies:

There are various approaches available, and none is necessarily better or worse, but some fit certain types of situations better. In the case of a limited set of alternatives, one uses the scale of the ABC assessing method while in the case of set problems and endless alternatives such as MAUT (Multi-Attribute Value/Utility Theory), AHP (analytical hierarchy process), Goal programming (GP) and multi-objective programming (MOP) is used. (López, 2016)

4. Multi Criteria Assessment Methodology:

Value assessment systems usually involve decision-making, which is making choices for alternatives based on the decision maker's values and preferences. Conflicting, multidimensional, and unmeasurable, such as intangible heritage values.

As a decision aid in the field of cultural heritage, MCDA is a tool that takes into account tangible and intangible values and then enters them with the problem-solving alternatives into the hierarchical analysis software.

Multiple Criteria Decision Analysis (MCDA) methods differ from traditional methods in that they take into account a set of objectives and criteria that can be conflicting, multidimensional and difficult to compare.

4.1. Analytical Hierarchy Process (AHP)

Analytical hierarchy process (AHP)

The way AHP works depends on the tree principle:

This principle requires evaluation to analyze the problem of decision-making into a hierarchy targeting the basic elements of the problem (risks), and to evaluate the even-sided comparisons of the elements within a certain level of the hierarchy, Creating a complex set of priorities for elements at the lowest level of the hierarchy. AHP uses a quantitative comparison method that relies on even comparisons for decision criteria, The choice of AHP in this research is due to its ability to hierarchically structure the problem, and therefore, provides users a better focus on specific heritage values and provides an efficient way to handle complex decision making. AHP has a number of stages:

1. Phase 1: Structuring of axes, selection of criteria and preparation of decision hierarchy
2. Phase 2: Prioritizing criteria: Make even comparisons of attributes and alternatives. This is used to determine the relative importance of attributes and to compare how well the choices perform on different attributes.
3. Phase 3: Convert and verify comparisons to weights.
4. Phase 4: Even comparison of options on each criterion: Use weights to obtain degrees for different options and make a decision (Metwally, 2014)

4.2. ABC method:

This method depicts the value of an item as a single parameter equated with its relative importance, or significance. In addition to aesthetic, historical, and spiritual values, all components identified by the organization and other stakeholders are considered and included. A risk management organization must rely on its mandate and the judgement of stakeholders when determining the relative value of items

It does not measure absolute value, there are no exact numbers involved, Risk assessment establishes priorities based on the shared perception that some elements are more important

than others. This is usually as simple as identifying what things are comparable or similar in value

There is no permanent judgment. It serves only to guide this particular risk assessment cycle, Value assessments will change over time, and so should the model.(Jr., 2016)

5. CaseStudy Sultan Hassan Mosque and School:

The Sultan Hassan Mosque is the jewel of Islamic architecture in the east, one of the most harmonious and beautiful mosques in Islamic Cairo, and it represents the peak of Mamluk architecture. It was established by Sultan Al-Nasir Hassan bin Al-Nasir Muhammad bin Qalawun in the period from 757 AH / 1356 AD to 764 AH / 1363 AD during the rule of the Maritime Mamluks of Egypt, which gives it its historical value.(Hertz, 2009)• Al-Maqrizi described it by saying: “No Muslim temple is known in the countries of Islam that simulates this mosque and its dome, which was not built in the homes of Egypt, the Levant, Iraq, Morocco and Yemen like it.” (Mahdi, 2008)

Dr. Souad Maher wrote in her encyclopedia “Egypt’s Mosques and its Righteous Guardians” about its decoration that this mosque is one of the best Arab monuments, in terms of the decorations inside and outside the mosque, especially the entrance door and the facade that is above it and decorated and destinations with its 8 layers of windows, so It is one of the most important mosques that tourists are keen to visit because of its unique architectural value.”(Maher, 1971)



The Sultan Hassan Mosque is considered one of the most important tourist places that tourists of all cultures flock to. The mosque currently contains a small school for children to study the Noble Qur'an, and many cultural seminars and seminars are also held in it. The mosque opens for visitors from nine in the morning until five in the evening, and during the month of Ramadan, the opening hours of the mosque extend until the worshipers perform the Tarawih prayer. Therefore, it represents a social value for the urban surroundings, as well as an economic value, given that it is one of the most important international attractions for lovers of Islamic architecture, although the economic return is weak compared to the value of the archaeological building, and it is due to mismanagement. (Makrizi, 1997)

5.1. The Site

The Sultan Hassan Mosque and Madrasah are located in Salah El-Din Square, below the Cairo Citadel. The mosque occupies an area of approximately 8000 square meters.

During the middle Ages, an open courtyard known as Rumaila was located between the mosque and the citadel. Today, it has become a large traffic square and was named after the mosque. Historically, military parades and official ceremonies were held, which gave the site an additional architectural and symbolic value. (Capitals, 1990)

5.2. Architectural description

The building is about 500 meters long, 68 meters wide and 36 meters high. The south-west and north-east facets of the building (its longer sides) have vertical rows of eight windows each (divided into four floors inside), a unique feature that helps to visually highlight the height of the structure. The upper edge of the exterior interfaces is crowned with a thick frieze of pinnacles 1.5 meters high above the rest of the wall, another unprecedented feature in Mamluk architecture. (Capitals, 1990)

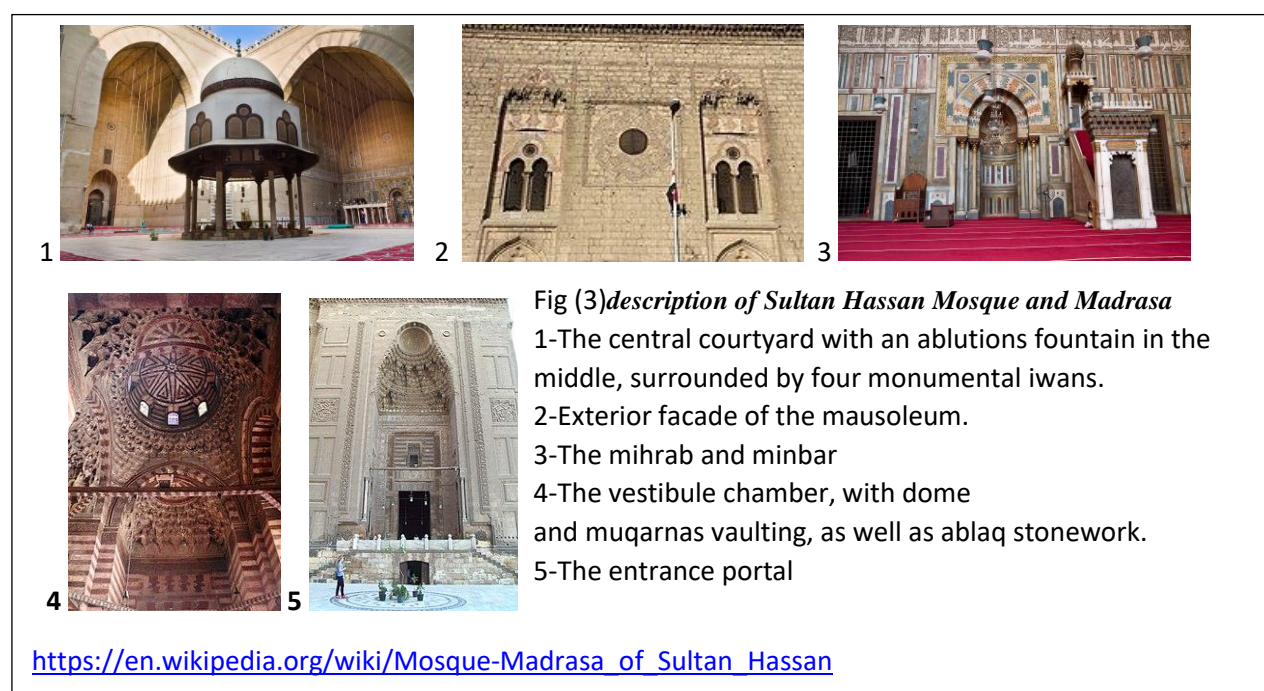
Its horizontal area consists of an exposed middle plate, surrounded by four iwns, the first and largest of which is the "Kiss Yuan." It consists of a rectangular area covered with a pointed basement, which is used to perform the congregation prayer. It can accommodate about 700 worshipers. It also contains four schools for the four sects, which are placed in the corners of the building, and which are entered by the plate, in addition to a burial place, a library, a service group, facilities, and a health unit.

The court consists of a square-like area of 34.6 m x 32 m with a total surface of about 1,100 m². Its average open court is a wooden dome that rests on eight eighth columns. The mausoleum is located in front of the "mosque's kiss" and occupies a square area of 440 m². (Ismail, 2017) The site of the tomb is well known on the center of the building in front of Ewan Al-Qibla, overlooking the main square in front of the castle, is a tomb built to bury Sultan Hassan. The grave is covered by a huge dome

The limestone has generally been used in the construction of the mosque and school, and its uses and methods of construction vary depending on the surfaces." For example, stone holding

s cover the entrance; "We also find wooden boxes covering the pipes and circular ones covering the classrooms."

Marble was used to cover the walls of the Yuan Kiss and the floor of the plate, while plaster was used in the Quranic texts. Here, the use of the natural building materials, both inside and outside reflect truthfulness in the expression of the structure and the construction materials, although the covers of the animals did not appear in the front.



"The Sultan Hassan Mosque and School is considered one of the largest and richest mosques in Cairo, which gives it unique architectural value," (Doris Behrens-Abouseif, 2007)

6. Standardized evaluation criteria

The study aims to assess the risk to the building and identify the management's priorities in handling and making decisions by using two measurement methods

One, the **AHP** hierarchy method, and two, the use of the **ABC** method to identify the pros and cons and determine the best methodology for the study situation, standardize the values that are used and targeted by the analysis, as well as the possible risks, according to the environment of the building

A set of values has been identified and summarized in:

Historical values, social values, economic values, urban values, architectural values, with sub values determined

The risks surrounding the building were also studied and identified:

- Social hazard
- Economic hazard
- Environmental hazard
- Urban hazard
- Architectural dangers
- Legislative risk

7. AHP analysis

Based on the sequence of hierarchical analysis, and according to the value table adopted and monitored in the building, the evaluation is conducted according to the following steps

1. Target Selection (Most effective risk)
2. Evaluation criteria (building heritage values) Table1. Proposed criteria
4. Alternatives Table 2. Identification of the risk
3. Table 3. Pair wise comparison scale.
5. Evaluation hierarchy

7.1. Evaluation criteria

- a. Making pairwise comparisons between the criteria is to determine the weight of each criterion with respect to the goal. Table (4)
- b. Normalization of the results. (Weighted Attributes) Table (5)
- c. Calculate overall priorities. Table (6)
- d. Summary of analytic hierarchy process Fig (12)

| Table 2: proposed criteria | |
|----------------------------|---|
| Essential Values | Sub Values |
| Historical Values | Protecting and enhancing the importance of heritage R11 Life expectancy R12 |
| Social Values | Quality of life (Fulfilling the needs of the region and raising the quality of life) R21 Developing Cultural Awareness R22 |
| Economic values | Economic revenues on the building and the region R31 |
| Urban Values | Respecting the character and identity of the region R41 Ease of Access R42 Urban Fabric R43 |
| Architecture Values | Respecting the building, architectural element and decorations R51 Maintaining structural stability R52 |

| Table 3. Identification of the risk |
|-------------------------------------|
| Identification of the risk |
| • Social Risks |
| • Economic risks |
| • Environmental Risks |
| • Urban Risks |
| • Architectural Risks |
| • Legislative Risks |

| Table 4: Pair-wise comparison scale. | | |
|--------------------------------------|---|--|
| Intensity of importance | Definition | Explanation |
| 1 | Equal importance | Two criteria contribute equally to the goal. |
| 3 | Weak importance of one over another | Experience and judgment slightly support one of the criteria over the other one |
| 5 | Strong or essential importance | Experience and judgement, strongly support one of the criteria over the other one. |
| 7 | Demonstrated importance | A criterion is considered strongly more important and its dominant |
| 9 | Extreme importance | The evidence showing one criterion to be more important than another is the heights possible order |
| 2,4,6,8 | Intermediate values between the two adjacent judgements | When compromise is needed |

From the previous points of evaluation criteria and the potential risks, the following three levels may be drawn for the evaluation process hierarchy as shown

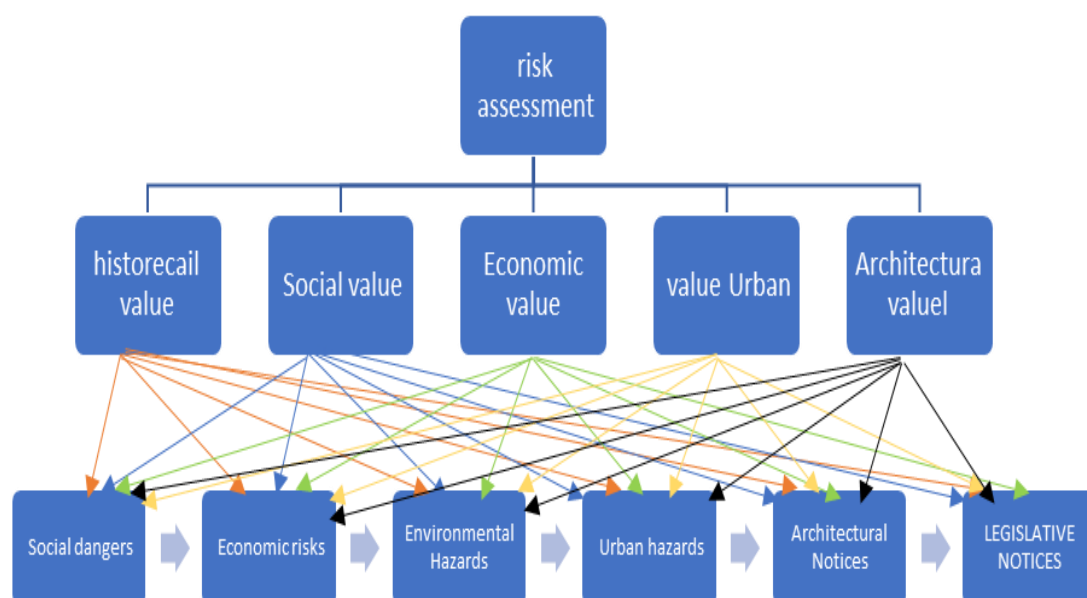


Fig (4) Project Alternatives Explains the main objective of the assessment process: to identify the most value-threatening and risk-sensitive values, as well as the hierarchy underlying the assessment process. This includes five evaluation criteria and six sources of risk

Table 5: Making pairwise comparisons between the criteria is to determine the weight of each criterion with respect to the goal.

| | historical values | social values | Economic values | Urban values | Architectu ral values | wight | Prior ities |
|----------------------|-------------------|---------------|-----------------|--------------|-----------------------|-------|-------------|
| Historical values | 1 | 3 | 3 | 0.5 | 0.333 | 17.74 | 0.177 |
| Social values | 0.333 | 1 | 2 | 0.333 | 0.2 | 9.03 | 0.09 |
| Economic values | 0.333 | 0.5 | 1 | 0.333 | 0.25 | 7.13 | 0.071 |
| Urban values | 2 | 3 | 3 | 1 | 0.5 | 24.59 | 0.246 |
| Architectural values | 3 | 5 | 4 | 2 | 1 | 41.51 | 0.415 |

* Consistency Ratio calculated as 0.037

| Table 6: Normalization of the results. (Weighted Attributes) | | | | | | | | | | |
|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | Value | | | | | | | | | |
| risks | R11 | R12 | R21 | R22 | R31 | R41 | R42 | R43 | R51 | R52 |
| Social risk | 0.004291 | 0.006232 | 0.003914 | 0.006763 | 0.0095 | 0.017923 | 0.006473 | 0.017921 | 0.009793 | 0.031478 |
| Economic risk | 0.005407 | 0.017288 | 0.010626 | 0.003949 | 0.009938 | 0.007058 | 0.006979 | 0.011331 | 0.023836 | 0.062391 |
| Environmental risk | 0.013798 | 0.030807 | 0.008649 | 0.002419 | 0.005074 | 0.005518 | 0.005182 | 0.00891 | 0.014541 | 0.070517 |
| urban risk | 0.007374 | 0.015537 | 0.014401 | 0.005591 | 0.01186 | 0.01386 | 0.011962 | 0.02416 | 0.008606 | 0.067239 |
| Architectural risk | 0.019333 | 0.031808 | 0.015634 | 0.003274 | 0.021143 | 0.009673 | 0.004271 | 0.018286 | 0.022009 | 0.054067 |
| Legislative risk | 0.008914 | 0.016562 | 0.006966 | 0.008099 | 0.013768 | 0.022682 | 0.013737 | 0.040024 | 0.024997 | 0.025655 |

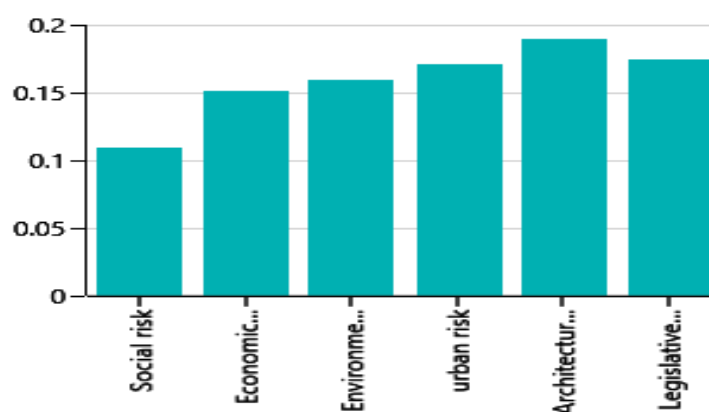


Figure 5: Risk Priorities

| Table 7 Calculating overall priorities | |
|--|------------|
| Option Name | Priorities |
| Social risk | 0.109 |
| Economic risk | 0.152 |
| Environmental risk | 0.16 |
| urban risk | 0.171 |
| Architectural risk | 0.19 |
| Legislative risk | 0.174 |

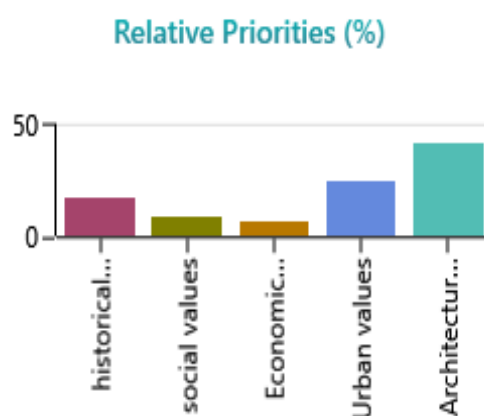


Figure 6: Prioritization of values

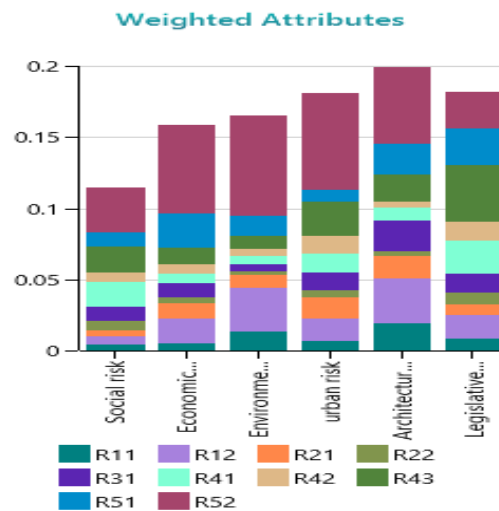


Fig (7) The graph shows the impact of the various risks on the heritage values of the building Source: researcher

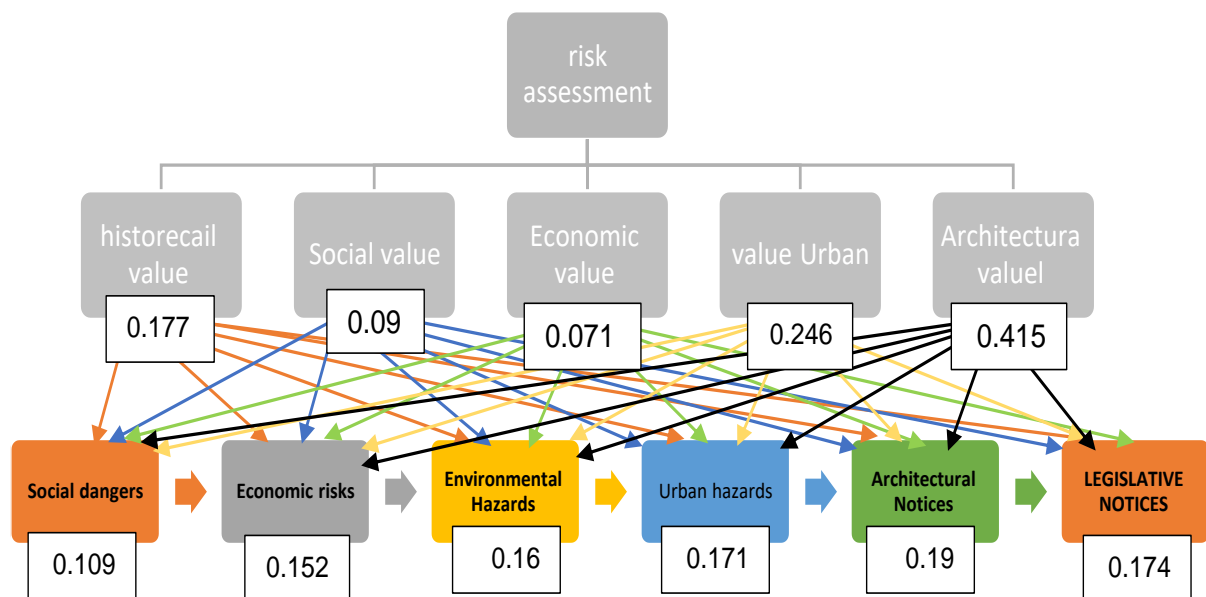


Figure 8: Making pairwise comparisons between the criteria is to determine the weight of each criterion with respect to the goal.

8. AHP method (conclusion):

Explains the main objective of the assessment process: to identify the most value-threatening and risk-sensitive values, as well as the hierarchy underlying the assessment process. This includes five evaluation criteria and six sources of risk.

The Hierarchical method AHP revealed that: (Results)

According to the results of the previous hierarchical analysis and based on the monitoring of the risks to which the building is exposed and their relation to heritage values, whether basic or subsidiary, we note that the most effective risks were architectural ones followed by urban and legislative risks with a small margin, and social risks were the least affected by fig 6. This was reflected in the extent to which values were affected by those risks, especially architectural elements and ornaments, followed by urban and historical values, and the least affected by them were economic values. The analysis gives clear indications to decision makers about the priorities of maintenance and preservation of values, on the one hand, and the priorities of managing risks, on the other hand. The results tend to show the extent to which values of the risks are affected in more detail than the values, and in terms of analysis, as they are based on the values of disaggregation of risk in terms The measurement ruler used by UNESCO, which will be revealed from the following analysis in which the search uses the measurement scale.

9. Second ABC method:

The measuring scale is one of the most important tools used by UNESCO to measure and monitor the risks upon heritage buildings. The measuring ruler uses several stages

The first stage is to monitor the risks accurately and in detail, which is what distinguishes the measurement rule, where the risks are then divided down into major and secondary risks

The second phase is a frequency of occurring risk assessment, based on UNESCO's pre-assigned values, table number (7). This phase is called Scale A

Third stage is the scale specializes in determining the loss in heritage values, and it is based on a pre-determined schedule from UNESCO - Table No. (8). this stage is called scale B

The fourth stage, which is concerned with determining the size of the area that is exposed to danger. Table No (9) this stage is called scale C

| Score | Percentage of the value pie | Range | Word guidelines (These are offered as guides, not definitions.) |
|-------|-----------------------------|------------------|--|
| 5 | 100% | 100% to 80% | All or most of the heritage asset value is affected. |
| 4½ | 30% | 80% to 20% | |
| 4 | 10% | 20% to 6% | A large fraction of the heritage asset value is affected. |
| 3½ | 3% | 6% to 2% | |
| 3 | 1% | 2% to 0.6% | A small fraction of the heritage asset value is affected. |
| 2½ | 0.3% | 0.6% to 0.2% | |
| 2 | 0.1% | 0.2% to 0.06% | A tiny fraction of the heritage asset value is affected. |
| 1½ | 0.03% | 0.06% to 0.02% | |
| 1 | 0.01% | 0.02% to 0.006% | A trace of the heritage asset value is affected. |
| ½ | 0.003% | 0.006% to 0.002% | |

8 scale C (ICCROM, 2016)

| Score | Mean time between events or Time period for cumulative damage assessed in B |
|-------|---|
| 5 | 1 year (1 to 2) |
| 4½ | 3 years (2 to 6) |
| 4 | 10 years (6 to 20) |
| 3½ | 30 years (20 to 60) |
| 3 | 100 years (60 to 200) |
| 2½ | 300 years (200 to 600) |
| 2 | 1000 years (600 to 2000) |
| 1½ | 3k years (2k to 6k) |
| 1 | 10k years (6k to 20k) |
| ½ | 30k years (20k to 60k) |

Table 9 scale A (ICCROM, 2016)

| Score | Fraction of value lost in each affected item | Range | Word guidelines (These are offered as guides, not definitions.) | Number of damaged items equivalent to one total loss |
|-------|---|------------------|---|---|
| 5 | 100% | 100% to 60% | Total or almost total loss of value in each affected item | ~1 |
| 4½ | 30% | 60% to 20% | | ~3 |
| 4 | 10% | 20% to 6% | Large loss of value in each item affected | ~10 |
| 3½ | 3% | 6% to 2% | | ~30 |
| 3 | 1% | 2% to 0.6% | Small loss of value to each item affected | ~100 |
| 2½ | 0.3% | 0.6% to 0.2% | | ~300 |
| 2 | 0.1% | 0.2% to 0.06% | Tiny loss of value to each item affected | ~1000 |
| 1½ | 0.03% | 0.06% to 0.02% | | ~3000 |
| 1 | 0.01% | 0.02% to 0.006% | Trace loss of value to each item affected | ~10,000 |
| ½ | 0.003% | 0.006% to 0.002% | | |

TableTable 10 scale B (ICCROM, 2016)

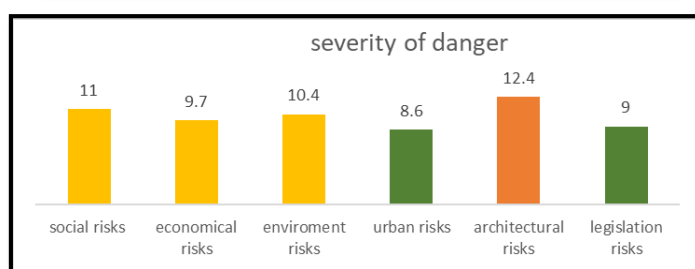
By combining the values specified for A+B+C the severity of the risk displayed for the building area is obtained

Next, in which the search used the measurement scale

| Sultan Hassan Mosque and Madrasa | | Analyze A Frequency or rate | Analyze B Loss of value to each affected item | Analyze C Items affected | Risk Magnitude | Scale |
|----------------------------------|--|-----------------------------|---|--------------------------|----------------|----------------|
| Assessing Criteria | | | | | | |
| Social Risks | Low Indicators of standard of living and quality of life | 5 | 3 | 3 | 11 | High |
| | Low cultural and intellectual level among the people of the region | 5 | 4 | 4 | 13 | Very High |
| | Lack of community participation in conservation decision-making processes | 5 | 2 | 2 | 9 | Medium |
| Total risk average | | | | | 11 | High |
| Economic Risks | Feeble of the financial revenues on mosque visit tickets | 5 | 2 | 2 | 9 | Medium |
| | Insufficient resources to implement decisions | 4 | 3 | 3 | 10 | High |
| | Lack of investments in the region | 4 | 3 | 3 | 10 | High |
| | Rising land prices | 3.5 | 3 | 2 | 8.5 | Medium |
| Total risk average | | | | | 9.7 | High |
| Environmental Risks | Climate change | 4 | 1 | 2 | 7 | Low priority |
| | Ongoing pollution | 5 | 1 | 2 | 8 | Medium |
| | Rain and Humidity | 5 | 2 | 4 | 11 | High |
| | Rising in subsurface water levels | 4 | 3 | 3 | 10 | Medium |
| | Earthquakes | 3.5 | 5 | 5 | 14 | Extremely High |
| | Vandalism and fires caused by human activity | 3 | 5 | 5 | 13 | Very High |
| Total risk average | | | | | 10 | High |
| Urban Risks | Excess Mechanical Motion in the surroundings | 5 | 2 | 3 | 10 | High |
| | Difficulty in accessing the place | 5 | 1 | 1 | 7 | Low priority |
| | The urban direct domain of the site is isolated from its Urban context | 5 | 1 | 1 | 7 | Low priority |
| | Roads network inadequate for traffic densities | 5 | 2 | 2 | 9 | Medium |
| | Construction and accelerating urban development | 4 | 3 | 3 | 10 | High |
| Total risk average | | | | | 8.6 | Medium |
| Architectural Risks | Absence of maintenance of all types | 5 | 4 | 4 | 13 | Very High |
| | The numbers of visitor overload for building materials | 3 | 4 | 2 | 9 | Medium |
| | Deterioration in the Construction elements of the building | 5 | 5 | 4 | 14 | Extremely High |
| | Loss in the Heritage Values of the Architectural elements | 3.5 | 5 | 4 | 13 | Very High |
| | Wrong restoration ,unplanned addition or Modification in the building | 3.5 | 5 | 5 | 14 | Extremely High |
| Total risk average | | | | | 12 | Very High |
| Legislation Risks | The multiplicity of agencies responsible for preserving heritage sites and the lack of coordination between them | 5 | 1 | 1 | 7 | Low priority |
| | Inefficient implementation of conservation legislation | 4 | 4 | 4 | 12 | Very High |
| | Armed Conflict | 3 | 4 | 5 | 12 | Very High |
| | Absence of the role of local agencies in the conservation projects | 3 | 1 | 1 | 5 | Low priority |
| | Rapid acceleration of development projects without taking heritage Sites into consideration | 3 | 3 | 3 | 9 | Medium |
| Total risk average | | | | | 9 | Medium |

Table:11 ABC Scale assessing of Sultan Hassan

| | | |
|-------|--------------------------|--|
| Scale | Extremely High (13.5–15) | |
| | Very High (11.5– 13) | |
| | High (9.5– 11) | |
| | Medium(7.5– 9) | |
| | Low priority (4.5 – 7) | |



10. Results of analysis using the ABC method:

According to the results of the previous measuring scale's assessment, based on the monitoring of the risks to which the building is exposed, the most severe risks are architectural ones with an intensity of 12.4, followed by social hazards with a score of 11, followed by environmental hazards with the lowest intensity being physical ones, sub-notifications are closely monitored, and results are shown in Table No (10) Analysis using the measurement ruler gives clear indicators for decision makers on priorities for managing risk. The results tend to show the severity of the risks in a precise and detailed manner. The analysis was based on dividing the risks into basic and subsidiary risks. As for values, they were addressed in an aggregate manner that was without detail, as opposed to a hierarchical analysis that detailed the values

11. Suggested methodology for merging AHP features ABC scale

The hierarchical analysis provided detailed data and indicators on the building's heritage values and its impact on expected hazards, providing a clear vision of conservation and maintenance plans that helped decision makers to manage heritage well. However, the risks were not given the same priority in the analysis and detail, which was done by the measuring ruler, who analyzed the expected hazards in detail and helped set priorities for risk management, but dealt with the values in a more general way. Heritage management is one of the most difficult and complex decision-making processes. It involves a history and a human heritage of universal value that is subject to loss and destruction. Therefore, any criterion that may affect the decision-making process, whether that criterion is related to values or risks, should not be neglected. The paper therefore uses measurement ruler indices to measure the severity of the risk, as well as hierarchical analysis values to reach a more efficient decision that takes both values and risks in detail, helping to raise the efficiency of management and prioritize risk management and maintenance plans by the next equation

(Risk Impact on Value = Severity of Danger x Priority of Each PRIORITISE OF VALUE)
Table No (11)

Suggested methodology for merging AHP method and the ABC method:

| Sultan Hassan Mosque and Madrasa | | | | Architectural values | | Urban values | | | Economic values | social values | | historical values | |
|----------------------------------|--|------|--|----------------------|-------|--------------|-------|-------|-----------------|---------------|-------|-------------------|-------|
| Assessing Criteria | | | | R52 | R51 | R43 | R42 | R41 | R31 | R22 | R21 | R12 | R11 |
| Social Risks | Low Indicators of standard of living and quality of life | 11 | | | | | | | | | | | |
| | Low cultural and intellectual level among the people of the region | 13 | | | | | | | | | | | |
| | Lack of community participation in conservation decision-making processes | 9 | | | | | | | | | | | |
| Total risk average / High | | | | 0.101 | 0.094 | 0.149 | 0.133 | 0.234 | 0.133 | 0.225 | 11 | 0.109 | 0.073 |
| Economical Risks | Feeble of the financial revenues on mosque visit tickets | 9 | | | | | | | | | | | |
| | Insufficient resources to implement decisions | 10 | | | | | | | | | | | |
| | Lack of investments in the region | 10 | | | | | | | | | | | |
| | Rising land prices | 8.5 | | | | | | | | | | | |
| Total risk average / High | | | | 0.2 | 0.23 | 0.094 | 0.144 | 0.092 | 0.139 | 0.131 | 0.177 | 0.146 | 0.091 |
| Environmental Risks | Climate change | 7 | | | | | | | | | | | |
| | Ongoing pollution | 8 | | | | | | | | | | | |
| | Rain and Humidity | 11 | | | | | | | | | | | |
| | Rising in subsurface water levels | 10 | | | | | | | | | | | |
| | Earthquakes | 13.5 | | | | | | | | | | | |
| | Vandalism and fires caused by human activity | 13 | | | | | | | | | | | |
| Total risk average / High | | | | 0.226 | 0.14 | 0.074 | 0.107 | 0.072 | 0.071 | 0.08 | 0.144 | 0.261 | 0.233 |
| Urban Risks | Excess Mechanical Motion in the surroundings | 10 | | | | | | | | | | | |
| | Difficulty in accessing the place | 7 | | | | | | | | | | | |
| | The urban direct domain of the site is isolated from its Urban context | 7 | | | | | | | | | | | |
| | Road's network inadequate for traffic densities | 9 | | | | | | | | | | | |
| | Construction and accelerating urban development | 10 | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| Total risk average / Medium | | | | 0.216 | 0.083 | 0.2 | 0.246 | 0.181 | 0.166 | 8.6 | 8.6 | 0.131 | 0.125 |
| Architectural Risks | Absence of maintenance of all types | 13 | | | | | | | | | | | |
| | The numbers of visitor overload for building materials | 9 | | | | | | | | | | | |
| | Deterioration in the construction elements of the building | 14 | | | | | | | | | | | |
| | Loss in the Heritage Values of the Architectural elements | 12.5 | | | | | | | | | | | |
| | Wrong restoration, unplanned addition or Modification in the building | 13.5 | | | | | | | | | | | |
| Total risk average / Very High | | | | 0.174 | 0.212 | 0.152 | 0.088 | 0.126 | 0.297 | 0.109 | 12.4 | 0.269 | 0.327 |
| Legislation Risks | The multiplicity of agencies responsible for preserving heritage sites and the lack of coordination between them | 7 | | | | | | | | | | | |
| | Inefficient implementation of conservation legislation | 12 | | | | | | | | | | | |
| | Armed Conflict | 12 | | | | | | | | | | | |
| | Absence of the role of local agencies in the conservation projects | 5 | | | | | | | | | | | |
| | Rapid acceleration of development projects without taking heritage Sites into consideration | 9 | | | | | | | | | | | |
| Total risk average / Medium | | | | 0.082 | 0.241 | 0.332 | 0.283 | 0.296 | 0.193 | 0.269 | 9 | 0.14 | 0.151 |

Table 12: Comparing the two methods of assessing risks

The previous table(11) merged the measurement ruler indices in the determination of the severity of the hazard and the hierarchical analysis indices in determining the extent to which the values of the different hazards are affected quantitatively and qualitatively, giving a clear picture that will help manage the heritage in a more accurate and efficient way

12. results and recommendations

- Heritage management decisions are complex and multi-criteria decisions that must be studied carefully and in detail
- Analysis using AHP is well suited to multi-criteria decisions and is well suited to heritage management decisions
- The use of AHP in the decision-making process does not replace the use of ABC in risk analysis, but it is complementary to it
- The combination of AHP and ABC in heritage management is one of the factors that increase the efficiency of management
- The methodology used in the research helps to reach a clear decision, as it depends on analyzing the risk into primary factors, as well as determining the values ??and the extent to which they are affected by the expected dangers, and then determining the priorities of risk management, as well as the priorities of preserving values.

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