Preventive Conservation in Historic Houses and Palace Museums: Assessment Methodologies and Applications

SilvanaEditoriale

Preventive Conservation in Historic Houses and Palace Museums: Assessment Methodologies and Applications

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and the Research Centre
of the Palace of Versailles (CRCV)

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The EPICO Assessment Method: a Tool for Prioritising Preventive Conservation Actions in Historic Houses

Abstract

After analysing the existing evaluation methods, having tested them in situ and verified their effectiveness of implementation on the collections and decorations of three historic houses open to the public, we have identified and understood their strengths and weaknesses, in order to put in place the four main steps that can now summarise the EPICO evaluation method:

1. Prior zoning: the room has been treated as a basic cell, a common characteristic to all houses. We have defined criteria that enable us to identify homogenous classes of rooms and to select the representative areas of the palace that will be evaluated.

2. The collections and the decorations' condition report: by object and constituent material, the most significant damage are identified and, for each degradation, the evaluator must indicate their *seriousness* and their *range* (from 1 to 4), as well as the *generic cause* that may have generated the degradation that he is observing on the object.

3. Data processing: among the most interesting results of the data processing is that the EPICO method enables to calculate the importance of the cause index (IC), where each cause is related to the seriousness of the generated degradations.

4. The interpretation of the results and recommendations for the implementation of conservation actions: the treatment provides a classification of active causes and risks that help the collections manager prioritise the actions for preventive conservation.

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The process of setting up the preventive conservation plan in a historic house has four phases: assessment, diagnosis, recommendations, action plan.

The EPICO method focuses in particular on the first two stages.

The objectives of the EPICO programme, already described elsewhere [Forleo *et al.*, 2017] respond to the founding principle of conservation assessment: "know to act and re-establish" [Guillemard, 2014].

Is it certain that climate rather than lighting is the most important damage factor inside our house? Experience shows us that the analysis of the climatic curves cannot suffice.

We do not wish to lead to recommendations by the only analysis of the conservation conditions, our ultimate goal is to make the objects "speak."

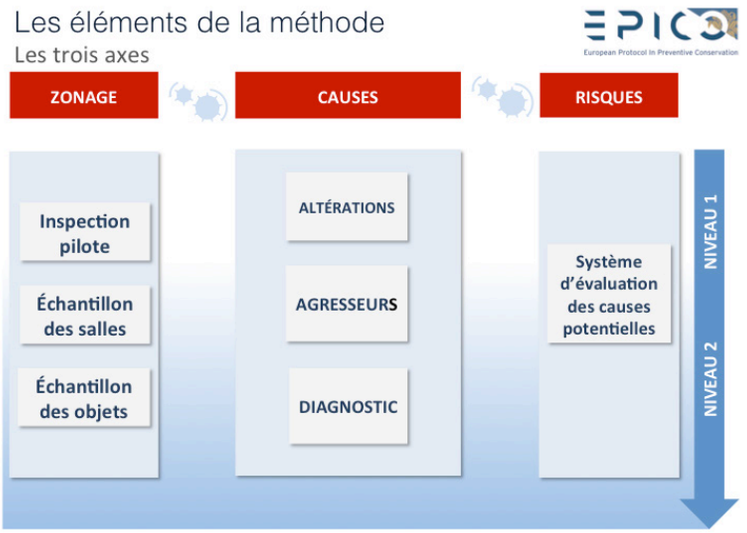


Fig. 1
Synthetic diagram of the active causes assessment method from the EPICO programme [Forleo, Francaviglia].

Only the analysis of hundreds of symptoms (the visible effects of the degradations on the collections) related to the causes at the source, can follow up to a good diagnosis.

The Method's Three Axis

The evaluation method tested within the framework of the EPICO programme consists of 3 axis that correspond to three distinct moments of the assessment (fig.1):

1. The zoning of the house: this step is fundamental if we must evaluate a large house with more than 500 displayed objects in the rooms; following an in situ pilot inspection and a brief collection of information on the configuration of the rooms and the history of the object's conservation, their typology, etc. we can identify the sample of rooms and objects that will be statistically representative of the conservation conditions of our house [Forleo, Francaviglia, 2018].

2. Cause evaluation: following specific steps, we start the evaluation of the active causes by recording the observable degradations on the objects and the analysis of conservation conditions. Following this process, we can then identify the plausible causes of the damage to establish our diagnosis.

3. Risk evaluation: we finish our diagnosis by evaluating potential damage causes, namely the aggressors for which it is not possible to observe the effects at the time of the report because they haven't manifested themselves yet.

We have concentrated more our research on the statistical zoning system and the evaluation of active causes (approach 1 and 2), since the risk assessment methods have already been developed in other contexts [Waller 2003; Brokerhof 2005; Xavier-Rowe 2011; Michalski 2016].

The Two Levels of the Evaluation

For these three approaches of the method, the evaluator can choose between two levels of complexity for its application according to the available time, the expertise of the team of evaluators, the degree of precision expected for the diagnosis. We called these two levels "initial assessment" and "comprehensive assessment."

Implementation Tools

This method, which is intended to be simple and transferable, must be able to be applied independently of the available database management tools. Ideally with paper or Excel® spreadsheets, widely available, or in the best case, with the computerised system of collections management. In the case of the Palace of Versailles, the collections management system (TMS® – The Museum System) is very efficient and flexible, which has allowed us to make it evolve so as to integrate the elements from our evaluation method.

Pilot Inspection

The application of the method requires data collection before starting the evaluation of the collections per se.

A significant part of this prior data collection concerns the rooms: the room is indeed our base unit, as a fundamental cell in the "historic house" system.

During the research, we realised that the criteria concerning natural risks (climate, light, etc.) would not be exhaustive enough to describe the conservation conditions of the «house» system. We have therefore chosen criteria that concern the architectural envelope and the site's operating procedures that statistically contain all the potential causes that may manifest themselves in a house:

– room orientation;

– human impact: coefficient calculated *by room* that takes into account three variables: the number of visitors per year, the floor area and the number of opening days per year according to peak times (low and high season). If we don't have the figures concerning peak times during the different seasons, we can also calculate it more globally [Forleo, Francaviglia, 2018];

– museography (presentation of *apartment* type collections, where all the typologies of the objects are also represented, or *gallery* type, when a typology of an object takes precedence over others);

– activities excluding visits (shootings, receptions).

These criteria help us classify the rooms so as to define the representative sample of the house's conservation conditions or the conditions of a particular zone. A sampling of the objects is also possible on the basis of a pivotal criterion: **the history of the conservation of collections**. Particularly it is about knowing the dates of the last moves and

restorations, which allows the classification of the objects into three categories:

– unrestored, exhibited for 5 years or more;
– recently moved (less than 3 years);
– recently restored (5 to 10 years).

The objective is to relate the observed degradations at the time of the collections conditions report with the exhibition conditions in the room where the objects are displayed.

The preliminary collection of this data implies information research work within the institution, it is fundamental to implement a preventive conservation strategy based on the specificities of the place. It seems important to note that this is significant teamwork because it requires the involvement of several services and professionals within the institution (documentation, collections management, computer database management).

Prior Zoning

For a small house, the Petit Trianon for example, with less than 1,000 objects on display, it is possible to make a complete survey of the collection but we must also take into account larger residencies such as the Palace of Versailles with more than 1,000 rooms open to the public and more or less 17,000 displayed objects.

We have tested several sampling methods (random or clustered) and given the heterogeneity of the collections and the analysed locations, the cluster method proves to be the most efficient. The studies conducted by Bianca Fossà and Marta Giommi [Giommi, 2009], which are the subject of a paper in this publication (see *infra*) were a starting point for our reflection.

The combination of certain criteria (museography, orientation, etc.) lead to as many clusters from which the rooms are sampled.

After the draw, it would be ideal to survey all the objects in each of the sample's rooms. If after this first sampling, the amount of objects is still too important and the team is not able to take care of the collection, it is possible to proceed to a double sampling and to draw the objects to assess on the basis of the three criteria describing the history and the typology of the collections.

Data Record Form for the Condition Report

For the condition report, we use the same form model implemented during method testing and then developed for our assessment system.

The first part of the identification of the object, in the case of the collections of the Palace of Versailles, can be easily extracted from the management of the collections computer database, TMS®. It gives us information on the inventory number, the typology as well as the description of the object and its constituent materials.

TYPE OF DAMAGE: ABRASION / WEAR / SCRATCH / FRAYING

DEFINITION

Abrasion: wear through rubbing due to poor treatment or handling which leaves marks on the surface

Scratch: loss of material, slender cut on the surface due to a mechanical movement

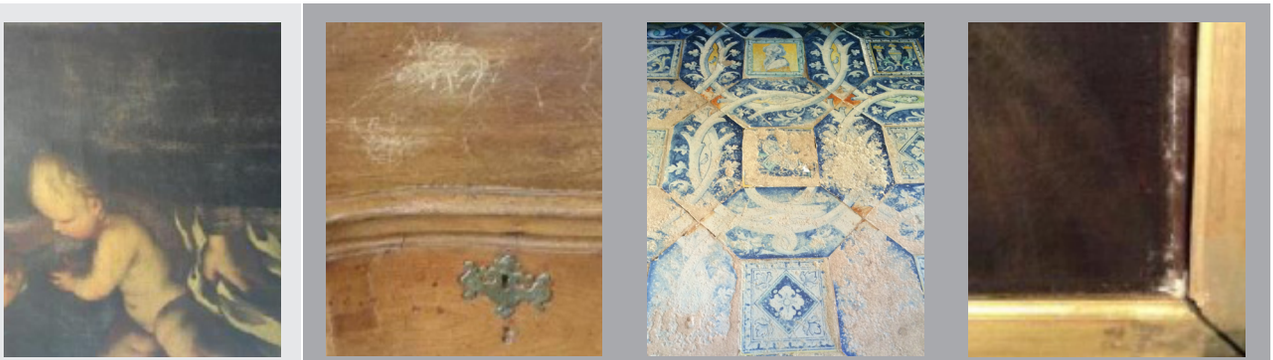
Wear: deterioration of the surface as a result of use or repeated or extended rubbing

Source: Glossaire visuel du Centre de Conservation du Québec

INDEX OF GRAVITY

1. SUPERFICIAL ABRASION / SCRATCH

4. DEEP ABRASION / SCRATCH, NOTICEABLE UPON TOUCHING



INDEX OF EXTENT

1. Localised damage **less than 10%** of the surface	**2.** Damage covers **10% < x < 25%** of the surface	**3.** Damage covers **25% < X < 50%** of the surface	**4.** Damage covers **more than 50%** of the surface

Fig. 2
Visual glossary developed during in situ tests in 2016.

Table 1
Example of a generic cause term, a specific cause and an associated diagnosis.

GENERIC CAUSE	SPECIFIC CAUSE	DIAGNOSIS
• Inadequate maintenance	• Abrasive / wet cloths • Inadequate micro-suction tools • Care product (shining, washing, polishing)	• Unsuitable maintenance protocol (material or frequency) • Lack of training / awareness of the staff
• Dust accumulation – repeated maintenance	• Over-frequency	• Inadequate management of visitor flow (airlock, changing rooms, regulation of the number of visitors, etc.) • Inadequate exposure mode (lack of protection, tulle…)
• Handling / transport accident	• Handling • Transport • Accident • Accidental blows from visitors or museum staff • Friction due to the repeated passage of visitors	• Excessive frequency of movement of works (policy, institutional events) • Non-compliance with handling and transport protocols (inappropriate procedures, packaging) • Lack of training / awareness of the staff • Inadequate management of visitor flow (airlock, changing rooms, regulation of the number of visitors, etc.)
• Use according to function	• Handling of doors and windows	• Absence of a protocol for the use of works (copies or non-heritage objects)

On the other hand, the second part that must be filled in is dedicated to the condition report of the objects, which is the heart of the assessment: where it is possible to choose among a list of 18 generic degradation indicators.

For each degradation, the most probable cause is identified among a list of 14 generic causes.

For the initial assessment, the alterations are listed for each material as well as the plausible causes and the corresponding diagnosis.

The exhaustive assessment provides the evaluation of the alteration on a scale from 1 to 4 through two criteria, severity and extent. This system is fundamental for then calculating the importance of the causes attributed to each damage. For each generic cause, a specific cause can be indicated and therefore a plausible diagnosis, based on the available information.

Visual Glossary of Damage

The list of damage indicators and the terms of generic causes has been the subject of a long research.

It was indeed very important to ensure that the alteration terms used during the test phase are understood in the same way by the entire team of evaluators, unambiguously.

Once the list had been settled on 18 generic damage indicators, we wrote a definition for each of them (when it was not available in literature).

We offered a range of 4 levels of severity and extent illustrated by images.

This document, put in place by the Versailles team was then entrusted to the team of conservators from the Venaria Conservation Centre (CCR) and provided support for the research on specific damage indicators (see *infra*) (fig. 2).

The involvement of CCR teams on terminology standardising work on heritage damage has represented a significant asset in this research.

The visual glossary created as part of the second phase of the EPICO programme is an essential support for the evaluation team.

Glossary of Damage Causes and the Diagnosis

The same as for the damage terms, we have written a glossary of the damage causes that provides:

– a definition for each generic cause;

– a predefined list of specific causes, which represents the detail of each generic cause;

– a predefined list of correspondent diagnosis.

These lists are selectable during the condition report and in situ data collection. They are then subject to specific data processing, detailed as follows.

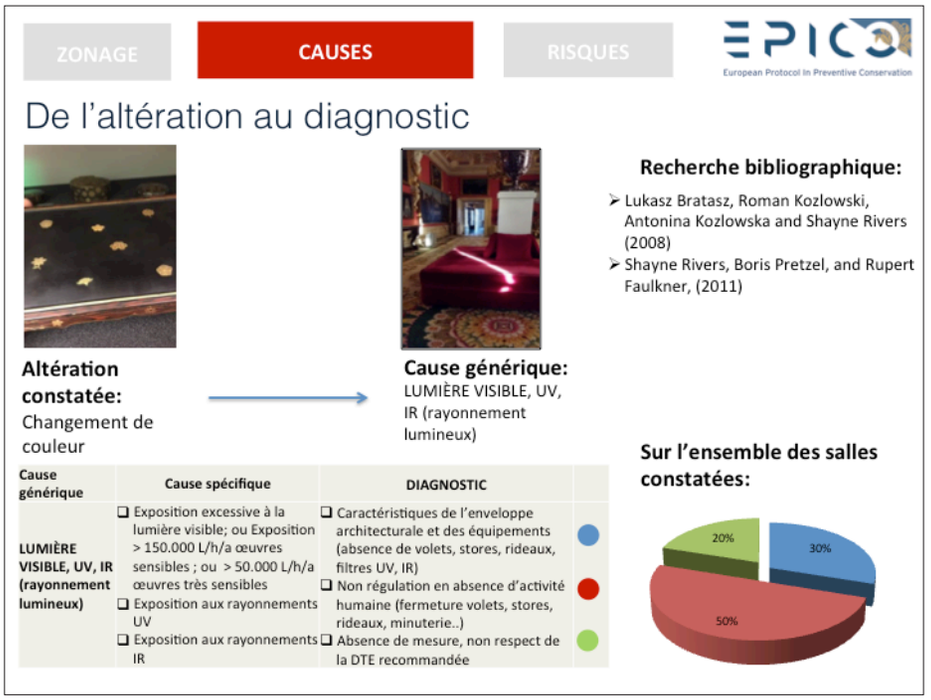


Fig. 3
Example of diagnosis on a given cause (light and UV).

From Damage to Diagnosis

Take lacquerware for example, which is very sensitive to exposure to light. If on an initial level we can simply indicate light as a generic cause, an exhaustive evaluation can also guide us towards the identification of the specific cause and to a diagnosis that allows us to better support our recommendations, therefore, our priorities for action.

In the specific case of light exposure originating from the windows, the knowledge of the practice of opening and closing the shutters as well as the number of days open to the public can help us calculate the total exposure doses (DTE) and understand if these practices need to evolve or not, in order to slow down the discoloration process.

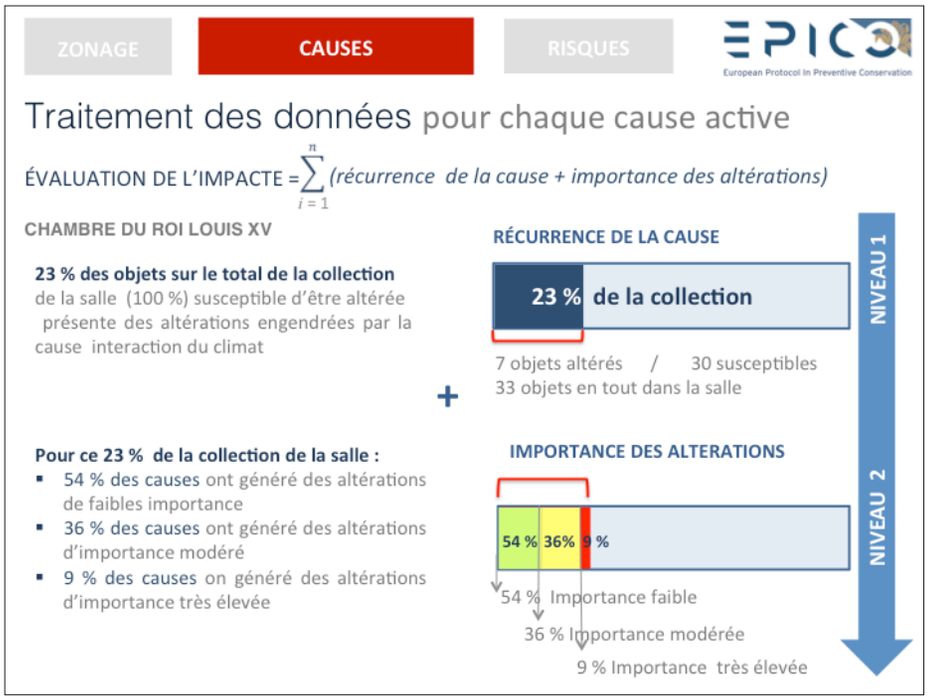
Knowing that the list of degradations, causes and the diagnosis are pre-established and that the same diagnosis can be proposed for several causes, we can obtain simple reports for a room, a zone or a house.

In the proposed example, a simple practice change and appropriate training of the agents in charge of closing the curtains and shutters can quickly stop the detected active cause (fig. 3).

Calculation Method

For each reported active cause, we can evaluate its impact on the collection. The goal is to have a ranking of all the causes from the most important to the least important in order to prioritise our investments on the causes that have a major impact on our house.

Fig. 4
Method for calculating the frequency and impact of the active causes on a room or a given area [Forleo, Francaviglia].



The evaluation of the impact of the cause follows a simple equation = recurrence of the cause + importance of the generated degradations of this same cause.

Recurrence is easily evaluable. The collection and processing of data can be done during the initial evaluation (our first level of expertise and time required for the evaluation). This gives us the number or % of objects in the collection affected by a given cause (fig. 4).

Here is an example: in King Louis XV's bedroom in Versailles, a certain number of objects are likely to be deteriorated by inadequate climatic conditions (for example organic materials and metals). Of this group of objects, 23% actually exhibit degradations by the climate cause. It is essentially a quantitative information.

In the most advanced level of evaluation, we can also have qualitative information. For this same cause (the climate), we can know the importance of the degradations engendered on the collection.
Using the same example as King Louis XV's bedroom, if we consider that 23% of the "sensitive" collection of the room is affected by climate effects:

– 54% of the time the climate cause generated minor degradations;
– 36% of the time the climate cause generated degradations of moderate importance;
– 9% of the time the climate cause generated degradations of very high importance.

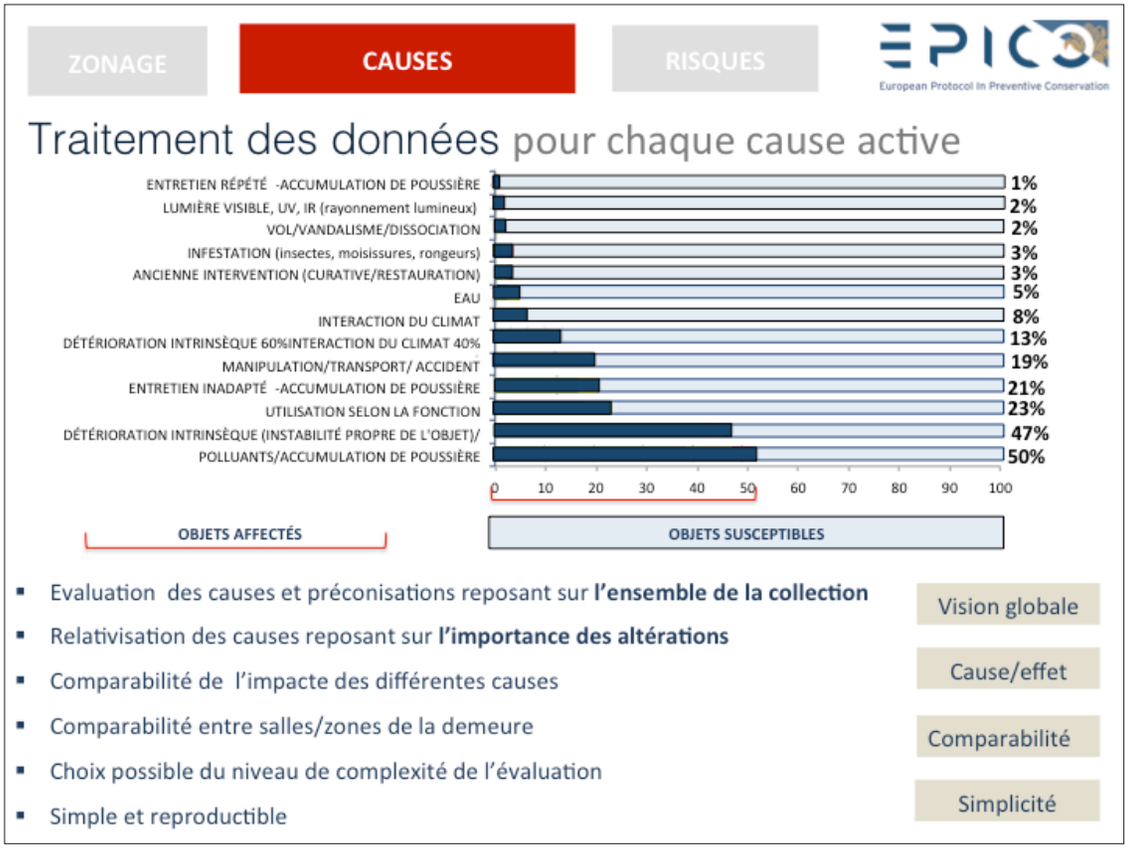


Fig. 5
Results presented in graph form of a group of active causes.

Data Treatment

Calculating the recurrence of a cause for the room's objects or the house gives essential information. It is based on the basic principles of preventive conservation that requires us to look at the entire collection and not at each object individually. The results of our assessment and the recommendations are corroborated by the mass of collected data – the interpretation errors are thus minimised: the importance of each cause is the result of the sum of the number of objects affected by the same cause.

In the most advanced level of the evaluation, calculating the importance of the damage is also useful. This allows us to estimate the cost/benefit of treating one cause over another when writing the recommendations.

For example, the *inadequate maintenance* cause may have been frequently diagnosed but it generates minor degradations. In addition, by training agents during a week it can be easily treated at a very low cost.

On the other hand, *dust accumulation* and the presence of *pollutants,* also observed recurrently, generate very important degradations. These causes are due to a large influx of visitors, therefore, to the policy of opening rooms to the public. Their treatment requires long-term thinking and involving the site's administrators at the highest hierarchical level.

The calculation system of the causes allows us to compare their

impact on the rooms/zones of the house on a same scale and it can be applied by simple means (fig. 5).

Risks

We have developed the method more in direction of zoning and cause evaluation. Risk evaluation methods already exist today and have been widely tested and used in a wide variety of contexts [Karsten, Michalski, 2012].

The simplest method, which can best relate to our cause evaluation, is the calculation method of the RISK SCORE tested by the English Heritage, which takes into account the probability that the risk will manifest itself, the number of objects potentially affected and the consequent loss of value (see infra).

As in the English Heritage method, the list of damage factors is the same for the assessment of causes and risks.

Contrary to the approach proposed by our English colleagues, in our system an aggressor that has already been identified as an active cause will not be analysed as a risk.

The risk evaluation concerns only the aggressors whose effect on the collections is not yet visible at the time of the report.

The risk evaluation only concerns the rooms from the previously identified statistical sample.

Results

Repeating the proposed scheme with two possible levels of applications:

– zoning and the pilot inspection are common to both levels, as they are necessary, particularly in the case of a house whose size and number of displayed objects doesn't allow the team to carry out a complete survey.

– Following the data collection carried out with the forms we presented, the evaluator is able to propose, for the first level of assessment, a classification of damage and generic causes by number of affected objects and a classification of plausible causes.

For the most advanced level, "the exhaustive assessment," a cause classification with IMPACT, represents the result of the combination of the quantitative side given by the recurrence of each cause and the qualitative side of the importance of the engendered degradation. As in the case of level 1, a classification of the diagnosis can be made as well as a classification of specific causes.

The risk evaluation does not differ from level 1 to level 2.

Conclusions

We want to limit our modelling system in the classification of cause and risk diagnosis.

It is preferable to leave the following step of interpretation and

drafting of recommendations to the evaluator's skills and experience that is necessary, according to the specificities of the house in question, to estimate the cost/benefit of the cause treatment or the degradation risk compared to another.

Nevertheless, assessment is still, in our opinion, the fundamental step for the drafting of the recommendations and the preventive conservation plan.

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