Risk management as a strategy for sustainable conservation: studies for the Oswaldo Cruz Foundation's cultural heritage

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Abstract

The Oswaldo Cruz Foundation (Fiocruz) is a Brazilian public institution that holds a diverse range of collections and historical buildings. A medium-term program was established to implement risk management plans for the Foundation's cultural property. This paper presents the research outcomes and strategies adopted to mitigate the identified risks. The work's results have been fundamental for the definition of actions that aim to minimize the need for large-scale interventions in cultural assets, reducing the amount of material and financial resources used and avoiding the removal and replacement of large volumes of preexisting materials, minimizing energy consumption and waste generation.

Keywords

Preventive conservation, Risk management, Sustainability, Historical buildings, Collections

Introduction

The Manguinhos historical site, located in the North Zone of the city of Rio de Janeiro, Brazil, contains a significant part of the scientific and cultural heritage of the Oswaldo Cruz Foundation (Fiocruz), an institution affiliated with the Brazilian Ministry of Health. The Manguinhos site includes nearly 40 collections (archival, bibliographic, museum, and biological), historical buildings, and archeological sites (Figures 1 and 2). A large portion of this heritage was built over the course of more than a century through the work processes at the institution, which was founded in 1900 as the Federal Serotherapy Institute, to produce medicines, antisera, and vaccines, besides conducting public health research and working in health education and health promotion. The historical site includes buildings listed as national heritage by IPHAN (the National Institute of Historical and Artistic Heritage), collections acknowledged at the regional and national levels by the UNESCO Memory of the World Program, and internationally renowned biological collections of considerable value to biodiversity.

Figure 1 – Moorish Pavilion, Stable, and Clock Pavilion - Fiocruz's historical buildings. Source: Fiocruz

Figure 2 – Museum collection item - autopsy suitcase. Source: Casa de Oswaldo Cruz

Fiocruz fulfills its institutional mission through 16 institutes located in 10 states of Brazil (in addition to an office in Mozambique, Africa) which one has the autonomy to manage their work processes, including the development and custody of their collections. The Foundation has dedicated great effort to its various collections ever since it was founded. An important milestone in this process was the creation, in the late 1980s, of institutes whose mission significantly includes the preservation of health's cultural heritage: Casa de Oswaldo Cruz (COC) – responsible for the preservation of historical buildings, archival, bibliographic and museological collections; and the Institute for Scientific and Technological Communication in Health (ICICT) – the custodian institute for bibliographic collections. These initiatives were joined in 2010 by the creation of a collegiate advisory body, the Technical Chamber for Biological Collections, consisting of the curators of the institution's biological collections (under the custody of different technical and scientific units in Fiocruz). In the early 2000s, the institution discovered that the model for the collections' development and custody, based on the units' autonomy - which until then had been historically beneficial to their work in the fields of research and education - was no longer sufficient to deal with the challenges raised by contemporary science and open data, social communication of science, and the growing need for integration of an institution of a national level.

New guidelines were indispensable for integrating the various institutional stakeholders responsible for the development, organization, conservation, and dissemination of the different types of collections, to reaffirm them strategically in an institution whose mission includes research, teaching, technological development, and innovation in health and to meet the growing demand to access these collections through information systems. These new guidelines aim to present these different collections as constituent parts of an integrated complex of the Fiocruz cultural and scientific collections, capable of linking the collections' inherent daily processes to the challenges of intensifying research and teaching in the area, and to relations between the cultural heritage and its preservation and sustainable development, as well as to the risks to which the collections are exposed. For this purpose, the Preservo - Fiocruz Collection Complex was created. Its development and implementation considers four dimensions: 1) conceptual, involving structural guidelines; 2) procedural, involving normative and reference documentation; 3) preservation and physical access; and 4) preservation and digital access.

The conceptual dimension involves the underlying principles and theories guiding preservation activities. Such principles are consistent with values that are important to the Foundation, expressed in its bylaws, enriched with other specific documents in the fields of institutional memory, history, and cultural heritage, in addition to solidarity and commitment to the identification and preservation of cultural collections in the area of sciences and health, especially those exposed to risk. Such values arise from the structuring guidelines, governing the way the collections should be preserved, such as: access to information, preventive

conservation, risk management, integrated conservation, sustainable preservation, preservation of biodiversity, research and development for preservation, and heritage education.

The second dimension has been responsible for the production of important reference documentation and is oriented by a hierarchical structure, ranging from policies, programs, and plans to reference manuals, all under the aegis of an institutional policy for the preservation of collections, entitled the Preservation Policy for Scientific and Cultural Collections of Fiocruz (2018). This policy and the other normative documents have been elaborated with extensive participation in the Foundation, including assessments at different advisory and decision-making levels and public consultations, and will be posted sequentially on the Fiocruz website in Portuguese, Spanish, and English.

The development and institutional approval of these documents have fostered the establishment of various joint activities between the different Fiocruz institutes; collegiate bodies such as the Preservo Management Committee in the scope of Fiocruz and the Permanent Commission on Collections in the scope of COC; and mainly the working groups to draft preventive conservation and risk management plans for the buildings and the collections housed in them.

According to the principles set out in the Fiocruz Preservation Policy and seeking to improve the preventive conservation activities already underway, a medium-term program was established to implement risk management plans for the Foundation's cultural property. An interdisciplinary working group was set up, consisting of specialists in charge of the conservation of different types of collections, besides representatives from the management areas. The team selected the ABC Method, developed by the Canadian Conservation Institute (CCI) and the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM), and a consultant was hired to guide the group.

This paper presents the main results achieved thus far and discusses the relationship between preventive conservation and sustainability, based on the expanded vision adopted by the Foundation that considers cultural, economic, environmental, and social aspects.

Preventive conservation and sustainability

The UNESCO Convention on the Protection and Promotion of the Diversity of Cultural Expressions (2005), defines the protection, promotion, and maintenance of cultural diversity as essential requirements for sustainable development, benefiting present and future generations. Culture's role as a factor for the promotion of sustainable development was acknowledged in documents such as the Hangzhou Declaration, resulting from the congress *Culture: the key to sustainable development* held in 2013. The new attitudes proposed for the issue of sustainable development assign a central public policy role to culture:

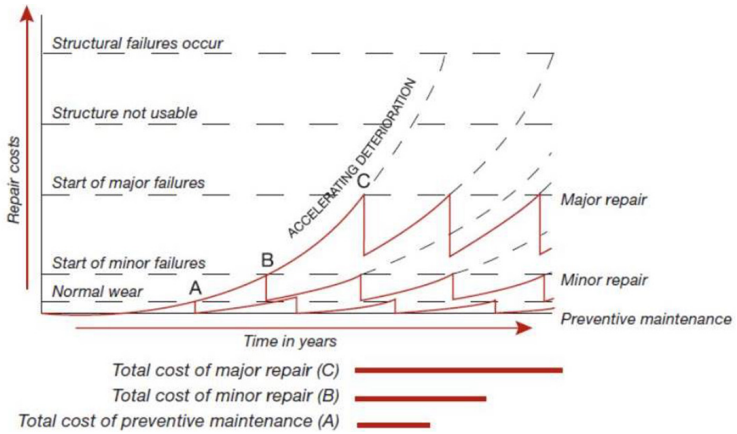
> *«These new approaches should fully acknowledge the role of culture as a system of values and a resource and framework to build truly sustainable development, the need to draw from the experiences of past generations, and the recognition of culture as*

part of the global and local commons as well as a wellspring for creativity and renewal (UNESCO, 2013, p.1).»

The *2030 Agenda for Sustainable Development*, adopted by the United Nations member states in 2015, established an action plan organized on 17 strategic goals. Goal 11, "Make cities and human settlements inclusive, safe, resilient, and sustainable", includes as guidelines: strengthen efforts to protect and safeguard the world's cultural and natural heritage; and develop and implement holistic management of disaster risk at all levels for cities and human settlements, investing in the implementation of integrated policies and plans for the efficient use of resources and mitigation and adaptation to climate changes (UN, 2015, p.24).

As stated by Coelho (2018), preventive conservation is fundamentally important in this context, since it is an approach that allows making contributions to each of the sustainability pillars. From the point of view of culture, preventive conservation enables the retention of authentic materials and the perpetuation of knowledge related to traditional building techniques resulting from continuous processes of conservation and minimal interventions. Whereas preventive conservation requires the involvement of a growing and more constant number of stakeholders (as compared to restoration) to monitor and conduct periodic conservation measures, its contribution to the *social* aspect is also significant.

In economic terms, the investment in periodic low-impact measures reduces the need for large-scale, high-cost invasive interventions. Although preventive conservation requires the constant availability of financial resources for maintenance of periodic activities, the total cost over time is considerably lower than the budget required for restoration works, as shown in Graph 1. In the medium and long term, this means a reduction in the resources employed by private owners and the government for the preservation of cultural assets. As stated by Podany (2009), bearing in mind the current context of economic constraints, preventive conservation is no longer considered an option but acknowledged as a necessity.



Graph 1 – Diagram of comparative costs according to type of intervention in cultural assets: preventive; small-scale restoration; large-scale restoration. Source: NSW Heritage Office, 2004, p.3 – adapted from MATULIONIS, Raymond C. Preventive Maintenance.

The implementation of periodic conservation activities also provides an opportunity to employ the local population and strengthen local economic activities.

From the environmental perspective, the preventive approach avoids the removal and replacement of large volumes of preexisting materials, thereby minimizing energy consumption (which would otherwise be necessary to produce new materials and execute interventions) and reducing the amount of waste generated by the interventions. As described by May Cassar, coordinator of the Institute for Sustainable Heritage of the University College of London, conservation of cultural heritage is strategically important as an activity capable of avoiding the generation of waste and of preserving knowledge:

> *«Our awareness of the fragility of old materials mirrors society's concerns with the fragility of the air, land, and water and with fossil fuels as a finite resource. Championing the continued use of old buildings extends their productive life through new uses; it reduces material waste, conserves embodied energy, and preserves the human skills and creativity that went into producing them (Cassar, 2009, p. 6).»*

Preventive conservation is an important alternative for avoiding environmental impacts from heritage preservation activities, since, as Podany states, "our conservation efforts applied to the material heritage, today, should not contribute to the global problems that affect the capacity of future generations to enjoy the very heritage that we are preserving" (2009, p.6).

According to the principles set out in the Declaration of Vassouras on Heritage and Sustainability[1] (Semana Fluminense do Patrimônio, 2012), cultural programs and policies should be formulated, executed, and assessed with integration, which requires prioritizing organizations in network format and cooperative activities with solidarity. According to this approach and the principles set out in its Policy for the Preservation of Collections, COC developed a medium-term program for the implementation of risk management plans for the cultural property under its responsibility. An interdisciplinary working group was set up for this purpose, consisting of technicians in charge of preservation of the different types of movable collections and built heritage, in addition to representatives from the planning, infrastructure, and administrative areas.

Risk management to Fiocruz's cultural heritage

The purpose of risk management for cultural heritage is to support planning with the objective of reducing the risks to which the assets (buildings and collections) are exposed, while optimizing the available resources for preservation activities. Based on an expanded view

[1] The document is the result of the 2nd Rio de Janeiro State Heritage Meeting, organized by the Rio de Janeiro State Public Archives (APERJ), Casa de Oswaldo Cruz (COC/Fiocruz), Casa de Rui Barbosa Foundation (FCRB), Museum of the Environment/Research Institute of the Rio de Janeiro Botanical Gardens, Rio de Janeiro State Cultural Heritage Institute (INEPAC/Rio de Janeiro State Department of Culture), Institute of Historical and Artistic Heritage (IPHAN), Museum of Astronomy and Related Sciences (MAST), and Brazilian National Museum (MN/UFRJ).

of the problems, risk management contributes to the decisions made by administrators, curators, and other professionals in charge of preserving cultural property.

Considering the diversity and breadth of the Fiocruz collections, Casa de Oswaldo Cruz (COC) team defined an initial sample in which to conduct the pilot cycle of the implementation of risk management based on the application of the ABC Method. The working group members were oriented by expert consultant José Luiz Pedersoli Jr. Three historical buildings were selected (Moorish Pavilion, Stable, and Clock Pavilion)[2], plus the museum collection housed at the Museum of Life. For the archival and bibliographic collections, which will be transferred to the new headquarters of COC in 2021, the study focused specifically on the risks related to the process of transferring the collections to their new location.

The methodology adopted aims to compare the risks identified via a cyclical process consisting of five consecutive stages: establishing the context and risk identification, analysis, assessment, and treatment.

1. Establishing the context

This stage of the work involved a survey and analysis of the data to characterize the contexts to which the collections belong. In relation to the institutional context, the project analyzed information on the Foundation's organizational structure, governance, decision-making processes, budget planning, institutional preservation policies, and legislation applicable to the respective cultural assets.

For each historical building and collection, a Mapping of Internal and External Stakeholders was performed, identifying their levels of interest and influence in the property's preservation. This also included information on the teams dedicated to the preservation activities and existing infrastructure for the conservation work.

The project characterized the Manguinhos site by analyzing information on the climate (including data on future scenarios taking climate changes into account), pollutants, the terrain's geomorphological characteristics, and the presence of pests.

This stage also included value assessment of the respective ensemble (historical buildings and collections), that is, the identification and characterization of their attributes and definition of the intensity with which they are perceived. This process featured various working group meetings and expanded workshops with guest experts.

2. Risk Identification

The comprehensive identification of risks to which the collections are exposed was oriented by the tool called the "10 agents of deterioration" proposed by the methodology: physical

[2] The buildings, designed in eclectic style by Portuguese engineer and architect Luiz Moraes Junior, were built between 1904 and 1918 and listed by the National Institute of Historical and Artistic Heritage in 1981.

forces; criminal; fire; water; pests; pollutants; light/ UV; incorrect temperature; incorrect relative humidity; and dissociation. Various solutions were used to develop the lists of risks, including brainstorming with the teams in charge of the collections, consultation of existing documents in the Foundation (reports, logbooks, etc.) for identification of past problems with the buildings and collections, and research in periodicals to identify past incidents on the site and in the region.

Approximately 45 risks were identified for each of the historical buildings. Forty-eight risks were identified for the museum collection, and 14 risks were identified for the archival and bibliographic collections related to their transfer to the new storage areas.

3. Risk analysis

This stage aimed to understand and report in detail the mechanisms and amount of the expected loss of value in the collections, considering the identified risks. A scale proposed by the ABC Method[3] was used to calculate each risk's magnitude based on the quantification of the probability of occurrence (in the case of events) or the cumulative damage rate (for cumulative processes) and the expected impact on each item's value affected by the risk and on the building or collection as a whole. Each identified risk was modeled on "risk analysis cards" (Figure 3). In all, 113 risk analysis cards were developed for the three buildings (Moorish Pavilion, Stable, and Clock Pavilion) and three collections (archival, bibliographic, and museum).

<table>
<tr><th colspan="2">Risk: rising damp in Stable building</th><th>Agent: Water</th></tr>
<tr><td rowspan="5">  </td><td>A = Frequency of occurrences or period of damage accumulation</td><td>A = 4 - 4 - 4</td></tr>
<tr><td colspan="2">Modeled as a cumulative / ongoing process, cumulative effect will be evaluated in the building over a period of 15 years.</td></tr>
<tr><td>B = Future loss of each affected object</td><td>B = 1 - 2 – 2,5</td></tr>
<tr><td colspan="2">Construction elements affected: part of bricks, stones, mortars on façades. Type of damage: loss of surface layer. Small loss of value.</td></tr>
<tr><td>C = Value of affected objects
Items affected ~ 3% of total construction value</td><td>C= 3,5 - 3,5 - 3,5</td></tr>
<tr><td>Magnitude of Risk</td><td>A + B + C = 8.5 - 9.5 - 10</td><td>Medium priority</td></tr>
</table>

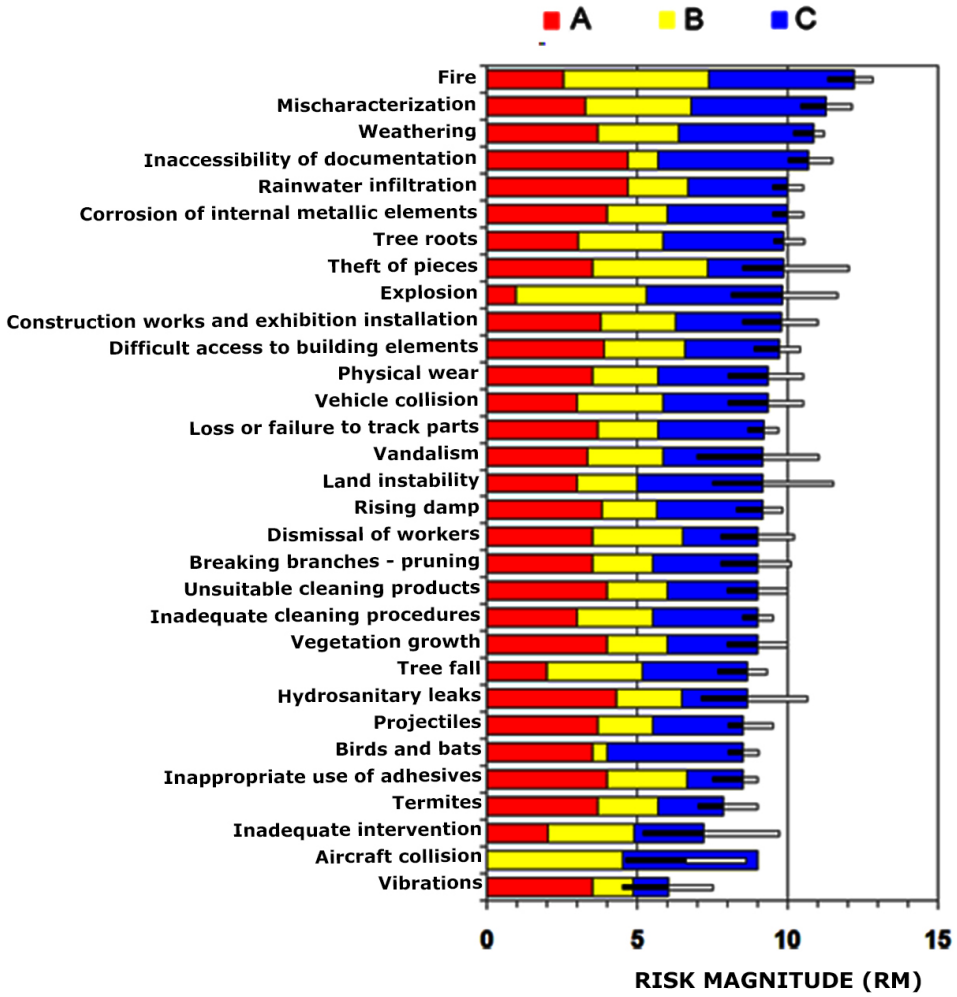
Figure 3 – Example of simplified risk analysis card. Source: Casa de Oswaldo Cruz

[3] According to the ABC Method, each risk's magnitude (RM) is equal to A+B+C, where "A" is the frequency of occurrence of events (in the case of occasional risks) or the period related to a given degree of degradation (in the case of cumulative risks); "B" refers to the loss of value in each affected item; and "C" is the total value of the building/collection affected by the risk.

4. Risk assessment

This consists of identifying the priorities for treatment based on a comparison of the Risk Magnitudes (RM) identified in the previous stage. The methodology defines a RM scale from 0 to 15 and set the type of priority for each risk (catastrophic, extreme, high, medium, and low) according to the score obtained in the Risk Analysis (Graph 2).

During this stage, the Working Group determined as treatment priorities all the risks with RM greater than or equal to 10.5. This score means an expected loss of value to the cultural asset of 0.3% for every 100 years. In the architectural collection, each building presented four risks that were considered unacceptable and thus required urgent treatment. The museum collection also presented four risks in these conditions. All the risks in the archival and bibliographic collections will be treated, since their change of location is scheduled and no risk should be ignored at this moment.



Graph 2 – Risks to the Stable classified in descending order of MR. Source: *Fundação Oswaldo Cruz. Casa de Oswaldo Cruz. Grupo de Trabalho de Gerenciamento de Riscos e Conservação Preventiva*, 2020, p.230.

5. Risk treatment

The last stage in the process aimed to determine the options for measures to treat the risks from a cost-benefit perspective, the feasibility of implementing the treatment, the real reduction in the risks, and the possibility of collateral risks from the treatment or interference from treatments of other risks.

The process revealed that the risk with the greatest magnitude in all the assets analyzed was fire, due mainly to the extremely high impact of fire on the collection's loss of value. This conclusion based the decision to implement more effective fire prevention and extinguishing systems, despite their high cost, since they avoid a risk entailing irreparable loss to the Foundation's heritage.

The study also showed that certain activities outline an advantageous cost-benefit ratio, that is, they provide a relevant safeguard for the property's value in relation to the costs of their application. An example of an excellent cost-benefit ratio is the implementation of a set of routine maintenance and prevention measures to avoid the risk of fire, including preventive equipment maintenance, awareness-raising campaigns against smoking inside and near the buildings, and the establishment of special control rules during construction interventions and events.

Conclusions

The study's outcomes have been used to feed the preventive conservation plans prepared for each building, contributing to the definition of priorities for intervention in the assets and to improve routine conservation measures by the maintenance teams.

The knowledge accumulated during this research and the considerations throughout the process contribute to sustainable preservation of the Foundation's cultural heritage to the extent that they enable retention of the preexisting material and perpetuation of the traditional building techniques based on the definition of appropriate conservation measures. They allow working more objectively while safeguarding the assets' values, establishing adequate processes for contextualized planning. Meanwhile, they contribute to planning new activities in heritage education, including training human resources to work in the assets' conservation. Preservation activities in the Foundation's collections are now discussed holistically, no longer fragmented between the different teams, thus avoiding duplication of efforts and waste of resources.

Risk management for cultural heritage is also aligned with sustainable development in economic terms, since it offers the option for decisions makers to take into account the cost-benefit ratios of alternative risk reduction measures. This enables identifying and prioritizing the implementation of more efficient preservation measures, at lower costs and thus more financially feasible. In addition, by encouraging on-going risk monitoring, risk management also acts directly in prevention, considered the most effective way to protect

cultural heritage. In environmental terms, this approach promotes the reduction of energy consumption and waste generated by unnecessary interventions.

The conclusion of the first cycle of risk management implementation raises various challenges to be tackled by administrators and the teams involved in safeguarding the Foundation's cultural assets. The most direct output is the institution's collective engagement in enabling and implementing the actions indicated by the study. This means a new and different effort that requires capacity for continuous risk monitoring and implementation of the solutions identified. A new cycle of the methodology's application started in 2019 including other collections and buildings. New stakeholders are participating in this process, expanding the prevention philosophy's scope as an effective way to keep the cultural heritage of Fiocruz accessible and in good condition for present and future generations.

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