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National Library of Brazil

Risk management plan safeguard & emergency



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Risk management plan -
safeguard & emergency

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Foreword

Biblioteca Nacional has one of the richest collections of books in Latin America. It is one of the largest libraries in the world with more than nine million items. It is also the department responsible for carrying out government policy for collecting, keeping and preserving Brazilian bibliographic collection, guaranteeing for present and future generations access to Brazilian intellectual production, which makes up the National Memory.



















Biblioteca Nacional has developed '*Risk Management Plan - safeguarding and emergency*' for the management of its heritage in order to safeguard this invaluable collection. This is a far reaching and innovative work that introduces the element of sustainability by using its own and permanent resources which allow actions of careful and controlled use of the heritage. Since losses may occur at any time and in any place, preventive measures allow the Biblioteca Nacional to be prepared beforehand, as well as to act as a counterattack for any such disaster.

Internationally, huge global programs of preservation and conservation such as the *Preservation and Conservation Program of IFLA – International Federation of Library Associations and Institutes* -, highlight the need to "ensure that library and archive materials, published and unpublished, in all formats, will be preserved in accessible form for as long as possible". Among innumerable initiatives adopted by trustee institutions of library collections and documents to prevent or stop the process of degradation of collections, a risk management plan is an essential and effective tool.

The publication of this Risk Management Plan promotes the interchange of information and experiences between professionals responsible for the protection of Brazilian cultural heritage and thus fulfills a duty of the Biblioteca Nacional.

Galeno Amorim
President
National Library Foundation

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I. Introduction

The Brazilian National Library (Biblioteca Nacional - BN) is not only a museum of books but also a knowledge institution and a repository of the country's intellectual production. Considered one of the ten largest National Libraries worldwide by UNESCO, it collects, registers, preserves, and provides access to a rich universe of collections of high historic, literary, scientific and artistic value. The BN acts proactively seeking to promote research and knowledge dissemination based on the use of its monumental and precious collections. It currently serves a monthly average of four thousand on-site users, 1,269,656 consultations to its online catalogues, and 44,476 visits to its digital collections through the BN Digital website.

Given the importance of BN to the memory, identity, and development of the Brazilian society, the preservation of its valuable collections constitutes a primary activity to ensure their accessibility and usability for future generations.

The continual growth of collections, both in volume and in typologies, as well as of the demand for access, represents a significant challenge to the preservation of the BN collections. Furthermore, these collections and the Library's historic building are exposed to likewise increasing environmental and anthropogenic stresses such as climate change, pollution, and criminality.

In this context, a *Safeguard & Emergency* plan becomes necessary to ensure the sustainable preservation and use of BN's collections and building. Recently introduced in the cultural heritage sector, *risk management* is an effective tool to help structure and implement such a plan. Based on a comprehensive assessment of risks (from emergency events to chronic processes), priorities for action and resource allocation can be established to inform preservation and collection management decisions.

Being a reference for the preservation of library collections in Brazil and internationally, the BN strives to continue to set higher standards and provide useful examples of efficiency and innovation in this field. The development and implementation of a *Risk management plan – safeguard & emergency*, and its permanent integration into the broader management system of the institution, is another important step in that direction.

II. Objective and scope

The objective of the present plan is:

“to convey the collections and historic building of the Brazilian National Library to future generations with the least possible loss of value”.

This objective will be achieved by continually assessing and treating risks to the BN collections and main building, from emergency and catastrophic events to continual deterioration processes.

The plan encompasses all cultural property under permanent or temporary custody of the Library, located at its headquarters at Avenida Rio Branco 219, Rio de Janeiro - Brazil. This includes the BN main building and the collections, physical and digital, housed therein. A smaller number of collections located in the annex to the main building, and inside the building of the Palácio Gustavo Capanema (Rua da Imprensa 16, Rio de Janeiro), is also within the scope of the plan. The safeguarding of items on loan or exhibition elsewhere, as well as of digital collections remotely stored and managed by specialized service providers, is assured by the respective policies, procedures, and contracts. Therefore, these items are out of the scope of the plan while outside the Library.

Institutionally, the plan spans all levels and sectors of the BN, aiming to promote collaboration and synergies among them and thus ensure that its objective is reached as efficiently as possible.

The expected duration of the plan is indefinite, i.e., it is meant to be used permanently by the BN as an integrated preservation and management tool.

III. Implementation requirements

The requirements for the successful implementation of the *Risk management plan – safeguard & emergency* include:

- Institutional commitment at all levels, in particular from the Presidency and the upper management of the different sectors of the BN;
- Proactive attitude of all staff to develop a “risk management culture” in the institution;
- Formal establishment of an internal multidisciplinary team that will be responsible for the implementation of risk management in the institution;
- Availability of resources to implement risk treatment measures, according to the degree of urgency and prioritization determined through risk assessment;
- Continual monitoring, documentation, and review of the execution of the plan, which will be systematically updated as needed or at pre-established regular time intervals (for instance, every 6 months);
- Continual communication and consultation with stakeholders, ensuring an inclusive and participatory process, and maximizing the use of available information and knowledge.

IV. Context

The main elements of the BN context within which risk management will be carried out are presented below. These elements determine, guide, or influence decisions concerning the use and preservation of the Library's collections and building:

IV.1. BN: Mission

The mission of the National Library of Brazil is to “collect, register, safeguard and provide access to the Brazilian intellectual production, ensuring the exchange with national and international institutions, and the preservation of the bibliographic and documentary memory of the country”.

IV.2. BN: Collections

The BN collections contain approximately 9 million items including books, rare books, cartography, iconography, manuscripts, music, and periodicals. The collections are protected by the Cultural Heritage Institute of the Rio de Janeiro State (INEPAC) since 2002.

In view of their rarity and historic value, the following collections deserve special attention:

- “Barbosa Machado” collection – donated by the bibliophile. Contains 4,300 pieces in 5,764 volumes, prints and maps.
- “Conde da Barca” or “Araujense” collection – acquired at auction in 1819. Contains 2,365 pieces in 6,329 volumes, mostly from the 17th and 18th centuries. The “Le Grand Théâtre de L’Univers” set of prints assembled in 125 large volumes belongs to this collection.
- “De Angelis” collection – acquired in 1853. Contains 1,717 pieces in 2,747 volumes, and 1,295 manuscripts.
- “Salvador de Mendonça” collection – donated to the BN in 1884. Contains 122 pieces in 215 volumes, seven manuscripts, and numerous prints. The material about the Dutch occupation of Brazil, with pieces printed in the 17th century, is a highlight of the collection.

- “José Antonio Marques” collection – donated in 1889 and 1890. Contains 3,920 pieces in 6,309 volumes, and some manuscripts relating to Colonial Brasil. The collection also includes 323 volumes of Camonian editions, among which “Os Lusíadas” (The Lusíads), from 1572.

- “Dona Thereza Christina Maria” collection – donated in 1891 by Emperor D. Pedro II. Contains 48,236 bound volumes, countless loose brochures and pamphlets, issues from many literary and scientific journals, prints, photographs, musical scores, and more than one thousand printed and manuscript maps. It is the biggest collection ever received by the BN. The photographs and photo albums of this collection have been included in UNESCO’s “Memory of the World Register” in 2003, being the largest set of 19th century photographic documents kept in a public institution.

- “Benedito Otoni” collection – donated in full to the BN in 1911.

- “Casa dos Contos” archives – contains approximately 50,000 documents and many codices from this 18th-century treasury building in Ouro Preto (Minas Gerais). The archives contain materials invaluable to the study of the history of mining, the smuggling of gold and diamonds, the “bandeiras” expeditions, and the Minas Conspiracy in the 18th and 19th centuries.

- “Alexandre Rodrigues Ferreira” collection - richly illustrated documentation containing watercolor drawings by Joaquim José Codina and José Joaquim Freire, produced by the naturalist Alexandre Rodrigues Ferreira about the expedition he undertook between 1783 and 1792 through the captaincies of Grão-Pará, Rio Negro, Mato Grosso and Cuiabá by order of Maria I of Portugal.

- “Abraão de Carvalho” music library – received in 1953 by the Music and Sound Archives Section of the BN. Contains 17,000 pieces, including some rare ones from the 12th and 13th centuries.

- “Lima Barreto” collection – writer’s personal archives (1881-1922), containing about 1,050 documents, correspondence, novels (originals), short stories, essays, plays, notes, and newspaper clippings.

- Large collections of journals and serials - document important historic facts about the social, cultural, economic, and political development of the Brazilian society since the introduction of the press in the country.

- Historical collections of incunabula - compose the large and important rare book collection of the BN.
- “Livros de horas renascentistas (livros para orações)” collection - compose the larger rare manuscript collection of the BN.
- Colonial administration codices – set of administrative documents produced by governors, captains general, and viceroys, including correspondence with the court, from the 17th and 18th centuries.
- “Mapa dos confins do Brasil com as terras da coroa de Espanha na América Meridional” (Map of the borders of Brazil with the lands of the Crown of Spain in South America) (1749) – This map was used by representatives of Portugal and Spain for delimiting the domains of the two Iberian kingdoms in South America through the Treaty of Madrid in 1750.
- Original scores of operas by Carlos Gomes: O Guarani, Fosca, Maria Tudor, Salvador Rosa.
- “Bíblia de Mogúncia (Bíblia Latina)”, printed by Johann Fust and Peter Schoeffer, «in vigília assumpcōis gl'ose virginis Marie», August 14, 1462. The BN has 2 copies.
- “Grammatica da Língua Portuguesa com os Mandamentos da Santa Madre Igreja” (Grammar of the Portuguese Language with the Commandments of the Holy Mother Church) (1539) – this booklet precedes the actual Grammar by João de Barros. It’s probably the first book with woodcut illustrations of didactic nature. This is the single copy of the «Cartinha» in the world.
- “Os Lusíadas” by Luís de Camões, Lisbon - the BN has the so-called “Ee” edition, considered to be the first of the two editions dated 1572.
- “Cultura e opulência do Brasil por suas drogas e minas...” (Culture and opulence of Brazil for its drugs and mines...) by André João Antonil, Lisbon, 1711 – only six copies of this text are known. It was confiscated by the Portuguese government because it publicized Brazil’s natural wealth and the route to newly discovered gold mines.
- Leaflet written by Luís Antônio Rosado da Cunha - considered the first work printed in Brasil (Rio de Janeiro, Segunda Officina de Antonio

Isidoro da Fonseca, Anno de MDCCXLVII). Although the inception of the press in Brazil is officially dated 1808, this document proves that such activity had been previously pursued.

- “Messiah an oratorio in scores as it was originally perfor’d de Handel” – copy of the first edition of the *Messiah* oratorio composed by Haendel, published in London in the mid eighteenth century.

- “Il dissoluto punto o sia Don Giovann” by Mozart – copy of the first edition of this famous opera published in Leipzig, 1801.

- “Correio Brasiliense” – the first Brazilian newspaper, published in London between 1808 and 1822 by Hipólito José da Costa. It defended the establishment of a constitutional monarchy for the Luso-Brazilian Empire, and only started to advocate the country’s independence in July, 1822. It fought oppression, corruption, and ignorance. This newspaper is an important source for historic, political, social, economic, and literary studies.

- Original prints by famous European masters and Brazilian artists, among which: Albrecht Dürer, Stefano della Bella, Jacques Callot, Marco Antonio Raimondi, Manuel Marques Aguiar, Osvaldo Goeldi, Carlos Oswald, Iberê Camargo.

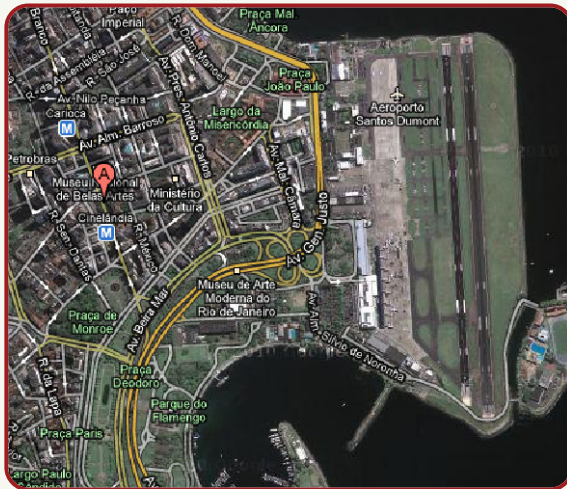
- Prints by the Portuguese engravers of the “Oficina Tipográfica, Calcográfica e Literária do Arco do Cego”, Lisbon. The BN also has many original copper printing plates.

IV.3. BN: Institution

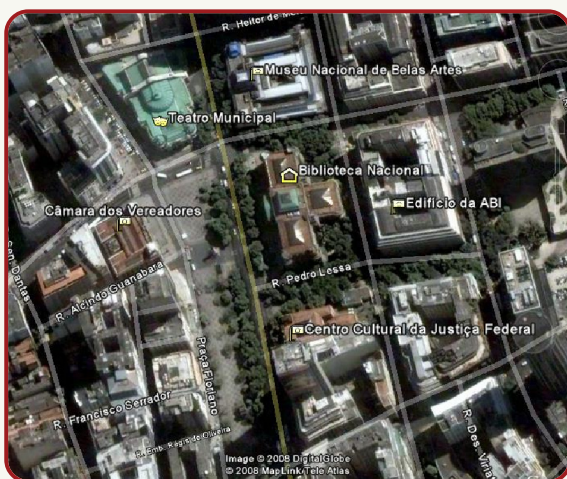
The “*Fundação Biblioteca Nacional*” (National Library Foundation) – BN is a national foundation of unlimited duration established by Law nº 8.029, April 12, 1990. It is attached to the Ministry of Culture, with headquarters and jurisdiction in the city of Rio de Janeiro, Brazil. The BN has the following organizational structure: 1. Collegiate body: Board; 2. Sectional bodies: Federal Attorney; General Coordination for Planning and Administration; 3. Singular specific bodies: Center for Technical Processes; Center for Reference and Diffusion; General Coordination for Research and Publishing; Book and Reading General Coordination; General Coordination of the National System of Public Libraries; 4. Libraries: Biblioteca Demonstrativa de Brasília; Biblioteca Euclides da Cunha.

The current headquarters of the BN had its cornerstone laid on August 15, 1905 and was inaugurated five years later on October 29, 1910. It was designed by General Francisco Marcelino de Sousa Aguiar, and built under the direction and supervision of engineers Napoleão Muniz Freire and Alberto de Faria. Integrated into the architecture of the then newly opened Avenida Central (now Avenida Rio Branco), the building is of eclectic style, with mixed neoclassic elements. It is protected by the National Historic and Artistic Heritage Institute (IPHAN) since 1973. Its facilities fulfilled all technical requirements at the time it was built: glass floors in the storage areas, steel shelving and frames with a storage capacity of 400,000 volumes, large rooms, and pneumatic tubes to transport books from storage areas to the reading rooms. The floor plans of the building in its current configuration are presented in the Annexes.

The BN headquarters is situated in the Rio de Janeiro city center, a highly urbanized, mixed-use (commercial, institutional, residential) area. Its location is relatively close to Santos Dumont airport, and to the entrance of Guanabara Bay. The area has intense vehicle traffic, and a moderate degree of urban violence and criminality. The building has surrounding landscape vegetation, and it is neighbored by other heritage institutions such as the Municipal Theatre and the National Fine Arts Museum (see below).



Location of BN headquarters (indicated by "A") in the central region of Rio de Janeiro. (Source: Google maps).



Surroundings of the BN headquarters in the central region of Rio de Janeiro.
(Source: Google maps).

The BN is open to the public (users, researchers, visitors) from Monday to Friday at the following times:

- 9:00 to 20:00 (General Collections and Serials).
- 10:00 to 16:00 (Special Collections).

The National Library Foundation provides public services at the following addresses:

- *BN headquarters* at Av. Rio Branco, 219/39 - Centro, Rio de Janeiro (for users over 16 years of age).
- *Biblioteca Infantil* (Children's Library) at PROLER. Children's books and related activities. Rua Pereira da Silva, 86 - Laranjeiras, Rio de Janeiro (for users up to 10 years old).
- *Biblioteca Euclides da Cunha*. Collections of general interest, entertainment, and reference works. Rua da Imprensa, 16/4° andar - Centro, Rio de Janeiro (for users over 10 years of age).
- *Biblioteca Demonstrativa de Brasília*. Av. W3 Norte/Esq. 506/7, Brasília-DF (for the general public).

Access to the BN collections is subjected to the following rules and criteria:

- Items dated prior to 1945: restricted access; available for use by authorized researchers only.
- Theses from 1945 to 1994 (located in the annex to the BN headquarters): available 24 hours after request.
- Old or rare books/works: depending on their state of conservation.
- Originals of already microfilmed items: not available for consultation.
- Access to children's books, popular series, handbooks, and textbooks is possible only at the Biblioteca Euclides da Cunha or PROLER.

Access to and use of the collections follows a strict security procedure, which involves user identification and monitoring, control and prevention of objects and materials potentially harmful to the collections and/or their users, and absolutely no removal/lending of collection items (books, manuscripts, journals, iconographic material, musical records, prints, maps, or any other item). For loans and external exhibitions, special authorization is required through specific procedures and paperwork.

Users and visitors inside the BN headquarters are only allowed in the public areas located on the 2nd and 3rd floors. Access to the 1st, 4th, and 5th floors, as well as to the collection storage areas, is strictly restricted to authorized staff members.

IV.4. Actors and stakeholders

The main actors and stakeholders to consider when implementing this plan are identified below. These individuals and organizations will be systematically involved and continually informed and/or consulted throughout the risk management process.

- Main internal actors and stakeholders

01. BN President
02. BN Executive Director
03. BN Preservation Coordinator
04. BN risk management team

05. CPT Direction
06. CRD Direction
07. Conservation - restoration teams and managers
08. Collection storage teams and managers:
 - Manuscripts
 - Cartography
 - Rare books
 - Iconography
 - Periodicals
 - General collections
09. Administrative Maintenance Division (Facility Manager)
10. Fire brigade
11. BN security & surveillance team

• Main external actors and stakeholders:

12. BN user community
13. External service providers
14. IPHAN - the National Historic and Artistic Heritage Institute
15. Fire department
16. Military Police
17. Federal Police
18. CEDAE - State company for water and sewage
19. CEG - State gas company
20. Light - Electric utility
21. Port and airport authorities

IV.5. Context monitoring and review

Since the context in which the *risk management plan - safeguard & emergency* will be implemented is significantly dynamic, the contextual elements described above will be continually monitored and reviewed by the BN risk management team.

V. Risk assessment

V.1. Definition of risk

Risk can be defined as “the chance of something happening that will have an impact on objectives” (source: Australian and New Zealand Risk Management Standard AS/NZS 4360:2004).

Given this definition and the primary objective of the BN to preserve and provide access to its collections and historic building, risks can be identified, analyzed, evaluated, and treated. This process, known as *risk management*, constitutes the conceptual basis upon which this plan is structured.

It’s important to remember that, the risks to the BN collections and building include not only natural disasters and catastrophic events, but also continual deterioration processes and sporadic events of variable intensity that result in loss of value to this cultural heritage.

In order to identify risks in a systematic and comprehensive way, i.e., so that no relevant (type of) risk is overlooked or neglected, the conceptual tool of the “**10 agents of deterioration**” is used. This tool facilitates the identification of risks by considering 10 agents of deterioration through which all possible hazards, internal or external to the institution, interact with exposed and susceptible heritage causing damage and loss of value. These agents are presented below.

V.2. The 10 agents of deterioration

1°. Physical forces

Physical forces can damage cultural heritage materials through shock, vibration, tension, compression, and friction, causing collapse, fracture, perforation, deformation, tears, abrasion, etc. These forces can have different magnitudes, acting either locally or in a large scale depending on their sources. Physical force risks typically result from inadequate storage, transport, and handling, building structural failures, earthquakes and other natural disasters, explosions, vehicle collisions, etc.

Risk typologies: rare and catastrophic event; sporadic event of moderate impact; continual process.

2°. Criminals

Criminal acts of theft or vandalism can be perpetrated by individuals from inside or outside the institution, resulting in total loss, destruction, or disfiguration of heritage items.

Risk typologies: rare event of significant impact; sporadic event of moderate impact.

3°. Fire

Heritage institutions often find themselves at high risk of fire due to deficiencies in prevention, detection, containment, and/or response measures. Factors such as the lack of preventive maintenance of building systems and equipment, the typical nature of heritage collections (often made of combustible materials) and buildings (without compartmentation and often built of wood), the lack of fire detection and automatic suppression systems, and the lack of preparedness of staff to respond in case of fire contribute to increase the risk. Fires can range from small-scale and localized to the complete burning of a building and its contents. The causes of fire can be natural or anthropogenic. The direct consequences of fire to heritage materials can be total or partial combustion, sooting, and/or deformation. Indirect effects can occur, including damage caused by physical forces (due to explosions and/or collapse of structures affected by the fire) and water (used to extinguish the fire).

Risk typologies: rare and catastrophic event; rare/sporadic event of moderate to significant impact.

4°. Water

The interaction of water with heritage materials can cause, depending on their composition, disintegration, deformation, dissolution, stains, mold, weakening, efflorescence, and corrosion. There are numerous sources of water (internal and external to the building; natural and “built”), and different ways it can reach collections and other heritage items (infiltrations, leaks, floods, spills, capillary action, etc.). Water risks can be localized or large-scale. Typical examples include the infiltration of rainwater (through faulty roofs; through defective, incorrectly closed or open windows, etc.), flooding of nearby rivers, leaking or burst waterpipes, overflowing sinks,

toilets, or drains (caused by clogging or inadequate use), negligence during cleaning procedures involving water, etc.

Risk typologies: rare and catastrophic event; sporadic event of moderate impact; continual process

5°. Pests

The term “pest” refers to living organisms capable of disfiguring, damaging, and/or destroying cultural heritage items. Typical examples include insects, rodents, birds, and bats. Pests can interact with heritage materials through their feeding, excretion, reproduction, and sheltering activities, which often cause perforations, loss of parts, structural weakening, soiling, and/or staining. The action of pests may range from isolated, localized damage to large-scale infestations.

Risk typologies: sporadic event of moderate to significant impact; continual process.

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6°. Pollutants

Pollutants include gases, aerosols, liquids, or solids of natural or anthropogenic origin that adversely affect heritage materials through chemical reactions or deposition, causing corrosion, weakening, aesthetic alterations, etc. There are numerous sources of pollutants (internal and external to the building), and different ways they can reach collections and other heritage items (through the air, by contact, by accidental contamination such as spills, etc.). In some cases the pollutant is intrinsic, i.e., it is already present or is formed within the heritage materials themselves. The main (air) pollutants affecting cultural heritage include: particulate matter (dust), sulfur dioxide, nitrogen oxides, ozone, acetic acid, hydrogen sulfide, formaldehyde. Besides air pollution, the use of inappropriate materials in conservation-restoration interventions, as well as accidents involving the spillage/leakage of products used in construction/renovation, maintenance, or cleaning constitute typical pollution hazards that can affect cultural heritage materials.

Risk typologies: sporadic event of moderate to significant impact; continual process.

7°. Light, UV and IR radiation

Light (visible radiation), ultraviolet (UV) and infrared (IR) radiation from the sun and electric sources (lamps) can damage certain types of heritage materials. Light causes fading of colors through photochemical reactions; the rate of fading depends on the sensitivity of the material and the dose received. UV induces different types of chemical reactions in materials, which may result in yellowing, chalking, weakening, and/or disintegration. The degree of damage also depends on the UV dose and the susceptibility of the material. IR causes (localized) heating of materials surfaces, which may result in deformations, drying/dehydration, fracture, etc.

Risk typology: continual process.

8°. Incorrect temperature

Temperatures too high or too low, as well as temperature fluctuations of significant amplitude, can negatively affect certain heritage materials. High temperature causes different types of damage: chemical (by increasing the rate of deterioration reactions), physical (deformations, drying, fracture, softening/melting of susceptible materials), and biological (by favoring mold growth and the metabolism of certain types of pests). Some polymeric materials become brittle and fragile at low temperatures. Temperature fluctuations can cause thermal expansion and contraction of sensitive materials, which may result in deformation, fracture, etc. In the context of libraries, the most relevant risk of incorrect temperature is probably the faster chemical decay of paper-based collections (more specifically, the hydrolysis of cellulose molecules that confer strength and elasticity to the paper). Simply put, the rate of chemical reactions doubles (i.e. the lifetime of paper-based collections is halved) for each increase of 5°C in temperature. Sources of incorrect temperature include (direct) sunlight, local climate, electric light sources (in particular incandescent lamps), machinery, and some types of (portable) equipment.

Risk typologies: sporadic event of low to moderate impact; continual process.

9°. Incorrect relative humidity

Analogous to incorrect temperature, relative humidities too high, too low, or with high-amplitude fluctuations can damage certain heritage materials. High relative humidity favors the development of mold in organic substrates, chemical degradation reactions of hydrolysis and corrosion, condensation on surfaces, dissolution and migration of water-soluble substances, deliquescence of salts, etc. Its effects include weakening, staining, disfiguration, etc. Under excessively low relative humidities, some materials may dehydrate and, as a result, undergo irreversible damage. Hygroscopic materials expand and contract in response to relative humidity fluctuations. Depending on the duration and amplitude of these fluctuations, and on the construction of the object, irreversible damage such as fracture and permanent deformation can occur. The main problems of incorrect relative humidity in the context of libraries in humid climates are probably mold growth and faster chemical decay (hydrolysis) of paper, some film, and magnetic records under high relative humidity conditions. Sources on incorrect relative humidity include the local climate, plumbing system, defective or discontinuously working (central) air conditioning equipment, radiators and other heat sources, etc.

Risk typologies: sporadic event of low to moderate impact; continual process

10°. Dissociation

Dissociation refers to the natural tendency of organized systems to become disorganized over time. It involves the inability to locate/retrieve objects from the collections or other heritage items inside the institution, the loss of data and information about collection/heritage items, or the inability to associate existing information/data with existing collection/heritage items. Common causes of dissociation include the deterioration of labels and tags, the lack of backup copies of inventories and other relevant documentation about the collections in case of disaster, incorrect documentation of objects or collections, misplacement of collection/heritage items (e.g. books and documents) in storage, staff retirement, hardware obsolescence (for machine-readable records), etc.

Risk typologies: rare and catastrophic event; sporadic event of moderate impact, continual process.

V.3. Generic risks to the BN collections and building (by agent of deterioration)

The main generic risks to the BN collections and building are presented below, structured according to the “*10 agents of deterioration*”. For practical reasons concerning their treatment, some of the risks were disaggregated into slightly more specific ones.

1°. Physical forces:

1. Damage and loss of value to the BN collections caused by inappropriate storage, handling, and/or transport.

- **Possible causes:**

Compression, friction, vibration, localized tensions, and/or shock during the storage, handling, or transport of collection items.

- **Expected effects:**

Gradual accumulation of deformations, breaks, tears, creases, abrasions and/or perforations in a significant fraction of the collection. Possible subsequent risk of dissociation if identification labels/tags are damaged.

1°. Forças físicas:

2. Emergency involving (partial) collapse of the BN building affecting the collections.

- **Possible causes:**

Vehicle collision (cars, trucks, buses, airplanes); explosion (gas distribution pipelines, gas cylinders, terrorism, etc.); failure of structural elements of the building due to the action of environmental factors; failure of the building elevator system; falling trees; extreme winds, etc.

- **Expected effects:**

Sudden destruction or severe physical damage (deformation, breakage, rupture, etc.) of all or a significant fraction of the building and collections. Contamination of all or a significant fraction of the collections with particulate matter produced by the collapse of building parts. Possible subsequent risks of theft and dissociation of unaffected items, fire, and (additional) damage due to weathering (rain, direct sunlight, etc.). Possible health effects to staff and users.

2°. Criminals: Theft or vandalism of BN collections and/or building.

• **Possible causes:**

High value on the art market, or significant demand by private collectors, of items belonging to the BN collections; opportunistic theft; political, social, religious manifestations; lack of education.

• **Access to the collections and other heritage items:**

Direct contact between the BN collections and the public occurs exclusively in the reading rooms and during opening hours, from 10:00 to 16:00 for special collections, and from 9:00 to 20:00 for general collections and periodicals. Not all collections can be physically consulted. Items that have already been microfilmed or digitized are accessed only by those means, avoiding the handling of originals by users. Despite continuous monitoring of all areas of the BN, the significant influx and circulation of users in the reading rooms hinders surveillance to some extent. Other heritage items such as furniture, paintings, sculptures, as well as parts of the building, are also vulnerable to theft and vandalism in the public spaces of the BN. Outside opening hours, the possible access of criminals into the building is prevented by the presence of a 24 hour surveillance/security team covering its interior and exterior, inclusive collection storage rooms, which remain locked. BN employees and some service providers are granted access to storage areas, but not to the collections themselves. This is only allowed during opening hours and upon request. Such a level of access increases the risk of internal theft. At closing time everyone must leave all storage areas. If strictly necessary, BN employees can reenter these areas outside working ours accompanied by a member of the security team.

• **Expected effects:**

Irreversible loss of a limited number of (parts of) collection items of variable value (most likely smaller ones of higher value) per event of theft; defacement by writings, markings, underlining, tears, deformation, etc. in a limited number of collection items or parts of the building per event of vandalism.

3°. Fire:

Fire in the BN building affecting the collections.

- **Possible causes:**

Multiple, internal and external - unsafe use and practices (activities using open flames or heat sources, inappropriate storage and use of flammable liquids, smoking in the immediate surroundings of the building, in compliance with the ban on smoking and cooking inside the premises of the building); failure of the building electrical system (obsolete and/or overloaded electrical installations, mechanical room malfunctions, etc.); leaks or defects in the gas distribution installations; failure of small apparatus used inside the building (boilers, coffee pots, dehumidifiers, fans, desk lamps, computers, etc.); arson; lightning; fire in neighboring buildings; fire in vehicles parked around the building; hot air balloons; etc

- **Propagation mechanisms/routes:**

In view of the significant fire load and the building characteristics, without fire resistant compartmentation, a rapid and complete spread of the fire is expected if the response is not fast and efficient.

- **Expected effects:**

Total or partial combustion, sooting, and damage by water and/or physical forces to all or most of the BN collections and building. Possible subsequent risks of theft and/or dissociation of items unaffected by the fire. Possible health effects to staff and users.

4° Water:

Damage and loss of value to the BN collections and/or building due to the action of water.

• **Possible causes:**

Multiple, internal and external – rains/storms; floods; leaks in the water supply system; sewage system failures; rising damp; damage, defect or inappropriate use of the building plumbing system (leaking or burst waterpipes, overflowing sinks, toilets, drains, etc.); malfunction or improper operation of climate control equipment (dehumidifiers, etc.); accidents during cleaning or maintenance procedures involving water.

• **Propagation mechanisms/routes:**

Defects or openings in the roof and ceilings; faulty, incorrectly closed, or open windows; unsealed (non-watertight) external doors located at street level or below; cracks, crevices, holes, and other openings in the building envelope; building foundations; waterpipes located above or next to collections; unsealed ceilings and floors (through which water can infiltrate and spread vertically); stairs and corridors without drainage (through which water can spread horizontally and vertically); unsealed doors in collection storage areas; no or malfunctioning drains (backflow) in collection storage areas; collection storage and/or display shelving and furniture unprotected against possible leaks or infiltrations through the ceiling, and/or without observing a minimum safe distance to the floor; cracks and openings in storage and/or display furniture, showcases, and enclosures (boxes, etc.); transportation of water containers by staff or service providers.

• **Expected effects:**

Wetting of a variable number of items (between a few and a large fraction of the collections) per event, depending on the volume of water involved and the extension of the affected area. Deformation, staining, formation of deposits, weakening, dissolution, losses, and (irreversible or difficult to reverse) adhesion of pages in affected items. Mold growth on affected (especially organic) materials, if the response is not fast and efficient. Possible subsequent risks of theft and/or dissociation of items in the case of large-scale events (e.g. floods). Possible loss of digital records if computers are affected. Possible health effects to staff and users in the case of large-scale emergencies (flash floods, etc.).

5°. Pests:

Damage and loss of value to the BN collections and/or building due to the action of pests.

- **Possible attractors:**

Food scraps; dust/dirt; plants and flowers inside the building; water/humidity sources; light/heat sources; collection materials that serve as nutrients to pests (proteins, polysaccharides, etc.); micro-environments conducive to nesting, reproduction, and/or development of pests; trees and vegetation in the immediate surroundings of the building. Typical pests found in the context of the BN include: book borers (*Anobiidae*), termites, silverfish, cockroaches, ants and rodents.

- **Propagation mechanisms/routes:**

Cracks, holes, openings in the building exterior and interior; doors, windows, and roof; ducts, and pipes; infested objects introduced into the building or storage areas without proper control; cracks and openings in storage and/or display furniture, showcases, and enclosures (boxes, etc.).

- **Expected effects:**

Variable number of items (between a few and a significant fraction of the collections) affected per event or chronically, depending on the pests involved and extent of the infestation. Perforations, loss of parts, structural weakening, soiling, and staining of affected items. Possible loss of digital records if computers are infested (e.g., through hardware damage caused by nesting). Possible subsequent risk of dissociation if identification labels/tags are damaged.

6°. Pollutants:

Damage and loss of value to the BN collections and/or building due to the action of pollutants.

- **Possible sources:**

Multiple, internal and external - vehicle, domestic, and industrial emissions; construction works; (wild) fires; cleaning and maintenance products used in the building; paints; food and beverages; users and employees (clothing fibers, hair, sebaceous secretions, dirty shoes, etc.); some finishing materials; wood, plywood, particle boards; photocopiers and laser printers; some materials and products (wrongly) applied to collection items during their use or conservation-restoration (inks and writing materials, paper clips and metal staples, tapes, adhesives, plastic films, solvents, bleaching agents, rusty or otherwise contaminated equipment and tools, etc.); some constituent materials of the collections, which produce or contain intrinsic pollutants (cellulose acetate, acidic paper, etc.).

- **Propagation mechanisms/routes:**

Cracks, holes, openings in the building exterior and interior; ducts; cracks and openings in storage and/or display furniture, showcases, and enclosures (boxes, etc.); permeable enclosures; direct contact with contaminating materials; direct contact with users and staff; inappropriate conservation-restoration treatments by which substances that can negatively affect collection items in the long run are applied.

- **Expected effects:**

All or most of the collections continuously affected by air pollutants (gases and dust); variable (typically limited) number of collection items affected per contamination event (accidental spills, building renovation works, etc.); variable number of items continuously affected by direct contact with certain storage materials; variable number of items periodically affected by inappropriate use. Progressive acidification and accumulation of dust; formation of deposits, weakening, disintegration, abrasion, aesthetic alterations, corrosion of metals. Possible loss of digital records if computers are affected by pollution (e.g. due to corrosion, excessive accumulation of dust, etc.). Possible subsequent risk of dissociation if identification labels/tags are damaged. Possible health effects to staff and users depending on the type of pollutant and the dose received.

7°. Light, UV and IR radiation:

Damage and loss of value to the BN collections and/or building due to the action of light, UV and IR radiation.

- **Sources:**

Sun and different types of electrical sources (lamps).

- **Propagation mechanisms/routes:**

Windows, skylights, open doors, and other openings in the building envelope; unprotected storage under (constant) illumination; exposure during consultation and exhibition; through showcases and transparent enclosures.

- **Expected effects:**

Progressive color fading, yellowing of certain types of paper, weakening and embrittlement of (organic) materials exposed to light and UV, as a function of the received dose (intensity of radiation x exposure time). Possible deformation, dehydration/drying, and fracture of a limited number of items due to prolonged exposure to IR. Possible subsequent risk of dissociation if identification labels/tags are damaged.

8°. Incorrect temperature

9°. Incorrect relative humidity

Damage and loss of value to the BN collections and building due to the action of incorrect temperature and incorrect relative humidity.

- **Possible sources:**

Multiple, internal and external - local climate, sun, defective climate control system, localized sources of heat (machinery/equipment, incandescent lamps, etc.) and humidity (waterpipes/plumbing leaks, rising dump, infiltrations, etc.).

- **Propagation mechanisms/routes:**

Conduction, convection, radiation (heat); evaporation/diffusion, water vapor absorption and desorption by hygroscopic materials (relative humidity).

• **Main expected effects:**

Progressive weakening and embrittlement of all paper and some other polymeric materials in the collections due to ongoing hydrolytic degradation reactions (whose rate is proportional to the relative humidity and approximately doubles for each 5°C increase in temperature); mold growth on a variable number (between a few and a significant fraction) of books/documents and other organic materials of the collections during periods of relative humidity above 65-70%, depending on the spatial scale and duration of such incursions, as well as on the relative humidity levels reached (at higher relative humidities it takes less time for mold to appear); accelerated corrosion of metals; possible deformation and/or fracture of some materials, depending on the amplitude and duration of relative humidity fluctuations (the higher the amplitude, the greater the risk of mechanical damage to vulnerable materials); dehydration/drying of some materials upon prolonged exposure to low relative humidities or elevated temperatures (direct sunlight, etc.). Possible subsequent risk of dissociation if identification labels/tags are damaged.

10°. Dissociation:

Dissociation of items and/or information affecting the BN collections and/or building.

• **Possible sources:**

Deterioration of identification labels/tags; mistakes when registering information about the BN building or collections; misplacement of items (e.g. books and documents) in storage after their use; failure or obsolescence of the barcode-based object identification and tracking system; obsolescence of hardware required to access machine-readable records; failure or mistakes in the acquisition and/or management of digital images and associated metadata or contextual information; loss of information due to insufficient quality control in reformatting procedures.

• **Expected effects:**

Temporary or permanent loss of physical and/or intellectual access to a variable (typically limited) number of collection items. Deaccessioning or custodial neglect of items due to lack of information about them. Loss of value to collection items and/or building due to lack or insufficient information about them.

V.4. Risk monitoring and review

The risks to the BN collections and building will be continually monitored and reviewed by the risk management team. This will include assessing the levels of residual risks, and identifying eventual new risks. By doing so, it will be possible to verify the efficacy of and improve the proposed risk treatment measures (see below). If necessary, the generic risks described above may be further disaggregated into more specific risks as required.

VI. Risk treatment

VI.1. Definition

“*Risk treatment*” is the process of developing, selecting, and implementing measures to avoid, modify, share (e.g. through insurance) or retain risks. Concerning cultural heritage and its values, the main efforts should be directed to avoid or minimize risks in a cost-effective way.

In order to identify, analyze, prioritize, and communicate risk treatment measures effectively and systematically, taking into account the required degree of integration and redundancy, the conceptual tool of the “**5 stages of control**” is used. Risk treatment measures are organized into 5 possible categories of action: **avoid**, **block**, **detect**, **respond** and **recover**. These actions can be implemented at the different “*layers of enclosures*” around the building and the collections, which include the surroundings, the building itself, storage and exhibition rooms, fittings (furniture, shelving, showcases, etc.), packaging and support. Obviously, preventive actions are preferred over remedial ones. Nevertheless, responsible and effective risk treatment requires anticipating and integrating reactive measures to ensure the reduction of risks. The 5 stages of risk control are presented below..

VI.2. The 5 stages of risk control

1. AVOID

Avoid sources and/or attractors of the agents of deterioration. This includes removing, as much as possible/feasible, sources of ignition (fire), water, pollutants, light, UV and IR radiation, pests, incorrect temperature, and incorrect relative humidity from the building interior and immediate surroundings, in particular from collection areas (storage, reading rooms, exhibition spaces, etc.). It also involves the removal of unnecessary combustible materials and substances that attract pests (food, plants, garbage, etc.); improvements in collections storage, transportation, and access conditions and procedures to avoid unnecessary action of physical forces and dissociation; preventive maintenance of the building to avoid problems in its plumbing, electrical wiring, elevator, and other systems; preventive maintenance and proper operation of climate control (HVAC) systems to avoid incorrect temperature and relative humidity levels; adequate drainage of the ground around the building to avoid penetration of water in its foundations and rising damp problems. Avoid unsafe activities

(e.g. unsupervised use of open flames, smoking) and inappropriate procedures (cleaning, repairing, renovation, etc.) in the building interior and immediate surroundings, particularly in collections areas. Avoid using inadequate products and materials when conserving-restoring collection items. Avoid unnecessary exposure of collection items to conditions or situations conducive to theft or vandalism (e.g. by not allowing users to enter public collection areas carrying purses, bags, etc.; by further restricting staff access to collection storage areas, etc.). Inhibit opportunistic theft by ostensible surveillance. Avoid loss of information by improving quality control of reformatting procedures and processes.

2. BLOCK

Block the agents of deterioration from reaching the collections and the building. This involves the installation and maintenance of effective physical barriers at the different “*layers of enclosures*” around the building and the collections (surroundings, building, rooms, fittings, packaging) to obstruct the action of physical forces, water, fire, criminals, pests, pollutants, light, UV and IR radiation, incorrect temperature, and incorrect humidity on them. Includes appropriate maintenance of the roof, doors, windows, and drains to ensure proper functioning; sealing of cracks, crevices, and holes in the exterior walls of the building (as needed); waterproofing of floors and ceilings; installation of security locks, latches, and bars in external doors and windows; installation of screens or equivalent devices in openings and niches on the outer walls of the building to block the access of birds, insects, rodents; use of properly closed garbage containers with tight fitting lids/caps; installation of suitable blinds, shutters, UV and/or IR filters on windows to block (partially or totally) the entry of light, UV and IR radiation; proper locking and sealing of doors and windows in collection storage areas; fire compartmentation of spaces using fire resistant doors, windows, walls; use of collection cabinets and showcases equipped with effective security locks and capable of blocking the entry of dust, water, and pests; installation of physical barriers (cords, ribbons, etc.) to limit access and movement of users in areas of higher vulnerability; placing protective barriers to block waterpipe bursts/leaks from reaching collection items eventually located under them; appropriate boxing and/or packaging of collection items in storage to block the access of various agents of deterioration. Installation of firewalls and/or other security systems/devices to block possible criminal action against digital collections.

3. DETECT

Detect the presence of the agents of deterioration in the building interior and immediate surroundings, particularly in collection areas (storage, reading rooms, exhibition spaces, etc.). This includes the installation, maintenance and proper operation of smoke and heat detectors, video surveillance systems, motion sensors or equivalent intrusion detection systems, water leak detectors, alarms and connections with central/monitoring stations (Police/Fire/Medical), temperature and relative humidity monitoring equipment. Involves the systematic inspection of the building, facilities, and collections to detect eventual problems or nonconformities; continual monitoring of users and visitors by staff and/or dedicated surveillance team; night patrols; installation of security lighting in and around the building to facilitate the detection of intruders; systematic pest monitoring using trapping monitors or equivalent systems; quantification of light, UV and IR radiation levels; quantification of pollutant levels.

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4. RESPOND

Respond to the agents of deterioration that have been detected in the building interior and immediate surroundings, particularly in collection areas (storage, reading rooms, exhibition spaces, etc.). Includes all emergency/immediate and other actions taken in response to fire, water leaks and infiltrations, flooding, structural collapse, pest attack or infestation, theft and vandalism, exposure of collection items and valuable building elements to unacceptable levels of light, UV or IR radiation, pollutants, incorrect temperature or incorrect relative humidity. Instruct users and staff on the proper handling and use of collection items when such nonconformities are detected. Review and adjust procedures (cleaning, transportation, access, etc.) that are negatively affecting the collections and/or the building. Correct or improve storage conditions that are negatively affecting the collections (e.g. overcrowding of shelves, incorrect placing of collection items on shelves, cabinets, etc.).

5. RECOVER

Recover from damage and losses caused to the collections and/or building by the agents of deterioration. Includes conservation-restoration interventions, attempts to recover dissociated or stolen collection items, reacquisition of lost or corrupted images and/or data, insurance activation, etc.

VI.3. Reducing risks to the BN collections and building

Risk treatment measures for the BN collections and building are presented below, structured according to the “*10 agents of deterioration/generic risks, and the 5 stages of control for each risk*”.

1°. Physical forces:

1. Damage and loss of value to the BN collections caused by inappropriate storage, handling, and/or transport.

1. To AVOID the risk:

- Properly store all collection items (books, documents, etc.) in their respective enclosures and furniture. Avoid the overcrowding of shelves, map/book cabinets, boxes, etc. Correctly position books and documents to avoid compressing them against edges and protrusions, providing adequate support as needed.

- Ensure that bookshelves and racks are securely mounted and anchored to avoid collapse and damage due to the weight of books/documents, or in the event of accidental collision by users or staff.

- Systematically follow appropriate procedures to retrieve and return books and documents from/to their respective storage enclosures, furniture, etc. Avoid pulling books off the shelves by the headcap or the head of their spines. Avoid abrupt movements, application of excessive force, and/or unnecessary friction between books or documents when removing or returning them. Provide adequate support (e.g. PVC board or stiff cardboard) whenever needed, especially when removing or returning large format and/or fragile items.

- Systematically follow appropriate procedures to transport collection items within the BN. Use book carts of adequate materials and dimensions, avoiding shocks, compression, deformation, falls, and excessive vibration during the procedure. Avoid carrying an excessively large number of books/documents at once. Eliminate all or the largest possible number of obstacles from the main (collection) transportation routes inside the BN. Exercise extra caution when transporting collection items to avoid accidents.

- Handle all collection items with due care, supporting them properly, and avoiding sudden movements, the application of excessive force, unnecessary torsion, etc. Pay special attention when handling collection items during microfilming and digitization procedures.

- Systematically instruct BN users on how to correctly handle books and documents, providing the necessary conditions and materials to do so (e.g. well-equipped reading spaces, etc).

- Limit as far as possible the circulation of users and staff in collection storage areas, reducing the chance of accidental collisions and unnecessary physical contact with the collections.

- Instruct staff about the storage, handling, transportation, and use requirements for the BN collections.

2. To BLOCK the risk:

- No applicable measures.

3. To DETECT the risk:

- Systematically monitor collection storage areas do detect improper storage of books and documents. Inform responsible staff of the nonconformities and problems found.

- Systematically inspect books and documents when retrieving and, specially, when returning them to their shelves, cabinets, boxes, etc. after use/consultation. This allows detecting the occurrence of folds, creases, tears, deformations, etc. that may require corrective action or repair.

- Continually monitor users to detect incorrect handling of collection items during reading/consultation.

- Monitor, as much as feasible, the transport and handling of collection items by the BN staff

4. To RESPOND the risk:

- In response to hazards or nonconformities eventually detected, reorganize incorrectly stored parts of the collections to eliminate or minimize damage caused by physical forces (reorganization of overcrowded shelves, cabinets, boxes, etc.; proper positioning and supporting of books and documents; etc.).
- Rectify defects or undesired changes caused by physical forces to collection items (e.g. folded or wrinkled pages) whenever possible; send more seriously damaged items for conservation-restoration treatment, taking into account the degree of urgency/priority and the available capacity at the BN.
- Approach users as quickly as possible whenever the incorrect handling of collection items by them is detected, kindly showing the correct way to do it.
- Notify staff members whenever the incorrect transportation and/or handling of collection items by them is detected, clearly indicating the nonconformities and showing how to correct them.
- In the event of accidental fall of (poorly mounted) shelves/racks or their contents, isolate the area and carefully collect the affected books and/or documents, taking them to a safe place within the building. Inspect affected items and, if necessary, send those more seriously damaged for conservation-restoration treatment. Adequately reinstall the fallen shelves/racks and return the books/documents to their places.

5. To RECOVER from the risk:

- Conserve-restore collection items damaged by physical forces during storage, transportation, or use, taking into account the degree of urgency/priority and the available capacity.

Responsibilities for implementation:

- BN risk management team
- BN administrative maintenance team (facility manager)
- BN architecture and engineering team
- BN fire brigade
- BN security & surveillance team
- BN preservation office
- BN collection storage teams and managers
- BN conservation-restoration teams and managers

1º. Forças físicas:

2. Emergency involving (partial) collapse of the BN building affecting the collections.

1. To AVOID the risk:

- Systematically perform preventive maintenance of structural elements of the BN building (roof framing/structure, floors, foundations).
- Systematically perform preventive maintenance of the elevator system of the BN building.
- Request the responsible authorities and institutions to systematically perform preventive maintenance of the city gas distribution pipelines located under or nearby the BN building.
- Avoid overloading of BN building floors due to excessive concentration of weight (bookshelves, racks, and/or other types of storage furniture containing books and documents) in a given area.
- Eliminate as far as possible the use of (cooking) gas cylinders inside the BN premises. Avoid storing (cooking) gas cylinders inside the building and in its surroundings.
- Avoid using and storing potentially explosive substances (flammable liquids, organic peroxides, etc.) inside the laboratories and other premises of the BN.
- Consider establishing a safety perimeter around the BN building inside which vehicle parking is not allowed.
- Consider establishing a safety perimeter without (large) trees around the BN building.
- Keep safety (backup) copies of digital and microfilmed collections in external repositories, i.e. outside the BN building.

2. To BLOCK the risk:

- Ensure that bookshelves/racks, cabinets, and other collection storage furniture are securely mounted and anchored to prevent them from falling, tipping, or collapsing in case of sudden structural failure in the building.
- Ensure that other heritage items of the BN (paintings, sculptures, etc.), in particular those of higher value, are securely mounted/supported to prevent them from falling, tipping, or collapsing in case of sudden structural failure in the building.
- Consider the installation of protective barriers against vehicle collision around the BN building.
- Consider installing reinforcement systems/mechanisms to better protect the roof and windows of the BN building against extreme winds.

3. To DETECT the risk:

- Systematically inspect structural elements of the BN building (roof framing/structure, floors, foundations) to detect eventual problems or potentially hazardous conditions.
- Systematically inspect the elevator system of the BN building to detect eventual problems.
- Systematically monitor the load distribution on the floors of the BN building to detect eventual nonconformities or potentially dangerous situations.
- Systematically monitor the BN premises to detect any nonconformity concerning the storage of (cooking) gas cylinders or other potentially explosive materials.
- Monitor the building perimeter to detect possible hazardous situations involving vehicles parked nearby (loaded fuel tank trucks, abandoned vehicles, overheated vehicles, vehicle arson, etc.), large trees on the verge of falling, etc.
- Consider installing gas leak detectors and alarm in strategic areas of the BN building.

4. To RESPOND to the risk:

• If the event occurs during opening hours, immediately evacuate the affected area or the entire building depending on its magnitude and level of danger. As far as possible, the evacuation of users and staff must be assisted and verified by a previously designated team (composed of 2 well-trained and properly equipped BN employees for each floor of the building). A specific audible alarm for the evacuation of the building must be installed and properly functioning. Emergency exit doors must be appropriately signed and fully operational, and escape routes permanently unobstructed (e.g. free from bulky objects, furniture, etc.). Emergency signaling and lighting, as well as extra keys to strategic doors, must be available and fully operational in the event of an evacuation of the building. After leaving the building, all BN staff must go to the designated meeting point for a head count to confirm complete evacuation. To this end, a list of staff members present in the building at any given time should be kept and continuously updated. This list must be brought to the evacuation meeting point by the person responsible for keeping it. Periodically (1-2 times a year) simulate the evacuation of the BN building to ensure an efficient response in case of real need.

• Immediately report the incident to the emergency response team of the BN, to the library facility manager, its senior management, and, depending on the gravity of the situation, to the fire department and paramedics. Their respective contact data (names and phone numbers) must be continually updated and readily available in a list to be widely disseminated among the BN staff and placed in strategic locations throughout the building. Consider using a dedicated (mobile) telephone line or radio communication system (e.g. “walkie-talkie”) to facilitate and/or ensure communication between key people of the BN in crisis and emergency situations.

• Isolate the affected area and ensure its continued security throughout the isolation period. Request police assistance to do so as needed.

• Convene a crisis meeting with the BN emergency response team, facility manager, conservation-restoration team, and security staff to define and coordinate rescue and/or recovery actions for the affected collection items and building parts.

• Once access to the affected area is granted by the competent authorities (typically the fire department), rescue affected items and

transport them to a safe place. Depending on the extent of damage and number of items affected, this place might be inside or outside the BN building. Ensure that such temporary storage spaces will be readily available and prepared when needed.

- Inventory all affected items during the rescue operation, documenting them properly in order to avoid subsequent risks of dissociation.

- Follow appropriate procedures when transporting affected items, using containers, supports, and packagings of proper dimensions and made of suitable materials (which should be readily available). Avoid shocks, compression, deformation, falls, and excessive vibration during the process. If there is significant deposition of particulate matter onto affected items, remove as much dirt as possible when preparing them for transportation. This will prevent (further) abrasion of collection items, and irreversible or hard-to-remove contamination of porous materials by fine particles. Anticipate and be prepared for the eventuality of having to transport large amounts of collection items out of the BN, which may require the use of special vehicles, etc.

- Ensure the security of affected items throughout the rescue operation (transportation, temporary storage, etc.). Dedicate special attention to the most valuable collection items.

- Inspect affected items and, if necessary, send those most seriously damaged for conservation-restoration treatment.

- Continually update the BN Press Office on the progress of emergency response operations being carried out by the institution.

- Document the incident and the (emergency) response actions as accurately as possible for subsequent analysis and improvement.

- Correct any problem or nonconformity identified in DETECT: repair structural defects in the BN building and/or malfunctions in its elevator system; eliminate or redistribute incorrect (excessive) floor loadings; eliminate (cooking) gas cylinders from the building premises; investigate suspicious or potentially dangerous situations involving vehicles or large trees nearby the BN building, taking appropriate measures for their removal if necessary; immediately report any gas leak to the fire department and the State gas company, requesting appropriate action.

5. To RECOVER from the risk:

- Conserve-restore damaged collection items, taking into account the degree of urgency/priority and the available capacity. Request assistance to partner institutions if necessary.
- Rebuild/restore the damaged parts of the BN building and ensure that they are ready to receive the collections back.
- Return rescued/recovered collection items to their place and resume normal activities.
- Consider the possibility of insuring (parts of) the BN collections and building against this type of risk.

Responsibilities for implementation:

- BN risk management team
- BN administrative maintenance team (facility manager)
- BN architecture and engineering team
- BN fire brigade
- BN security & surveillance team
- BN collection storage teams and managers
- BN conservation-restoration teams and managers

2°. Criminals:

Theft or vandalism of BN collections and/or building.

1. To AVOID the risk:

- Carry out (ostensible) human surveillance in public areas of the BN during opening hours to inhibit (opportunistic) theft and vandalism.
- Explicitly inform and indicate to users that their presence in the BN is continuously monitored and recorded.
- Systematically demand the identification of users when they enter the BN, which shall be done by presenting an original, official document with photo (ID card, driver's license, professional ID card or passport). Student cards will not be accepted for users over 18 years of age. Systematically register the entrance of users in the library, and issue appropriate badges for all of them. Users must have their ID badges visibly displayed while inside the BN premises.
- Do not allow users to enter the BN carrying bags, purses, backpacks, cases, briefcases or any other object that facilitates concealing and transporting collection items. These objects must remain properly stored in lockers available at the BN reception area at the entrance of the building.
- Explicitly inform users that it is not allowed to enter the BN carrying guns, scissors, scalpels, knives, and other perforating-cutting instruments. Prevent as far as possible the entrance of these items in the library. Ballpoint, felt-tip, and fountain pens, colored pencils, text highlighters, correction fluid, and similar materials are not allowed in public collection areas (reading rooms, etc.) of the BN. These materials must remain properly stored in lockers available at the BN reception area at the entrance of the building.
- Do not allow users to enter the BN carrying originals or copies of books, newspapers, magazines, photographs, maps, prints, drawings or paintings, as well as cameras, portable scanners, and other devices with image capture capability (mobile phones, etc.), explaining the reasons for such measure. These materials must remain properly stored in lockers available at the BN reception area at the entrance of the building.
- Avoid as far as possible user access to collection storage areas. Do not allow users in non-public areas of the BN.

- Limit staff access to collection storage rooms to a strictly necessary minimum. Consider establishing a rule to ensure that staff access to the most valuable collection items will always be supervised.
- Limit the number of collection items and the time they remain in the conservation-restoration workshops or other technical processing areas of the BN (microfilming, digitization, etc.) to a strictly necessary minimum. Avoid that these items remain exposed and/or easily accessible while in these areas. Limit staff access to conservation-restoration workshops and other sensitive areas of the BN where collection items can be found (including digital collections) to a strictly necessary minimum.
- Consider replacing (highly) valuable books and documents on display within the BN by facsimiles (properly informing the public).
- Avoid as much as possible that other valuable cultural heritage artifacts belonging to the BN (sculptures, paintings, etc), in particular those of small size, remain exposed in public areas of the building.
- Continually perform ostensible surveillance around the BN building perimeter, in particular outside working hours, to inhibit eventual attempts of theft and vandalism. Ask the police to strengthen their presence in the area of the BN building.
- Avoid as much as possible the existence of possible hiding places for thieves and vandals in the (immediate) surroundings of the BN building.
- Avoid unnecessary disclosure of sensitive information about the BN collections, in particular concerning items of high demand or value in the art market.
- Keep safety (backup) copies of digital and microfilmed collections in external repositories, i.e. outside the BN building.
- Systematically verify the integrity and capacity of security service providers hired by the BN.
- Properly inform all BN staff about ongoing measures to prevent theft and vandalism.

2. To BLOCK the risk:

- Keep exterior doors and windows in perfect condition, with locks and other security devices operating properly. Consider strengthening or replacing exterior doors and windows as needed and feasible to more efficiently block eventual burglary attempts (e.g. by installing special locks and latches, metal bars, reinforced door frames, etc.).

- Ensure that no door or window giving access to the interior of the BN building remains unlocked or opened longer than strictly necessary. Systematically verify that these doors and windows are properly closed/locked during external patrols.

- Exercise strict control of conventional and magnetic card keys to all entry doors of the BN building. Consider the periodical replacement of their locks every 2-3 years.

- Ensure that any other possible access routes to the BN building interior (e.g. through the roof or other openings such as ducts, skylights, etc.), if any, are properly equipped to block eventual attempts of intrusion or escape into/from the building.

- Keep the doors to collection storage rooms, conservation-restoration workshops, and other sensitive areas of the BN in perfect condition, with locks and other security devices operating properly. Consider strengthening or replacing these doors as needed and feasible to more efficiently block eventual break-in attempts (e.g. by installing special locks and latches, reinforced door frames, etc.).

- Ensure that no door giving access to collection storage rooms, conservation-restoration workshops or other sensitive areas remain unlocked or opened longer than strictly necessary. Systematically verify that these doors are properly closed/locked during and after working hours. Exercise strict control of conventional and magnetic card keys to these doors. Consider the periodical replacement of their locks every 2-3 years.

- Ensure the correct functioning of book/map cabinets, display cases, etc. whose doors, drawers, and lids are fitted with locks. These pieces of furniture should not remain unlocked longer than strictly necessary. Exercise strict control of their keys.

- Consider the need to acquire additional pieces of furniture equipped with locks to increase security in storage and/or display of collection items, particularly those of higher value. Opt for robust units fitted with high quality locks.

- Consider the possibility of storing the most valuable collection items in a dedicated room or space with superior security level and restricted access, including the use of safes.

- Consider the installation of bulletproof glass in vulnerable windows of the BN building to block the entry of stray bullets.

- Install security barriers to better protect other (valuable) cultural heritage of the BN (paintings, sculptures, decorative building elements, etc.) on display in public areas of the library, which are vulnerable to theft and/or vandalism.

- Ensure proper installation, maintenance and continual updating of “firewalls” and/or other security mechanisms to block criminal actions against digital collections of the BN.

3. To DETECT the risk:

- Continually monitor users and visitors in public areas of the BN, particularly when using/accessing collection items, to ensure immediate detection of any attempt of theft or vandalism. Monitoring shall be done both in person (human surveillance) and through the BN video surveillance system.

- Ensure the uninterrupted presence of surveillance/security staff in the public spaces of the BN during opening hours. These officials must be present in sufficient numbers, strategically positioned and/or circulating in order to cover the entire area to be monitored. Each one of them should be responsible for monitoring a specific, not excessively large area. Monitoring of sectors with high concentration of users or at peak times must be done by multiple officials, as needed and depending on staff availability. All staff members monitoring users must be properly trained and equipped to do so.

- Maintain the video surveillance system of the BN permanently functional, and have well-trained and experienced staff to operate it at all times in order to efficiently detect (attempts of) criminal actions. Ensure that the number and location of surveillance cameras are adequate.

- Train the BN reception staff to detect the entrance of users carrying suspicious or prohibited items.

- Continually monitor by means of video surveillance all collection storage rooms and other sensitive areas of the BN where collection items can be found.

- Keep a strict record of all collection items sent to or undergoing conservation-restoration treatment, being technically processed (microfilmed, digitized, etc.), or moved to other areas of the library.

- Keep a strict record of staff members' access to the BN collection rooms.

- Continually monitor by means of video surveillance all access routes and entry points to the BN building interior, as well as its surroundings.

- Ensure that all video surveillance data are continuously recorded and properly stored. Consider the need for remote storage of copies of these records.

- Ensure that the BN security/surveillance team systematically carries out periodic patrols by day and night inside and around the building.

- Install, maintain, and ensure proper use of an effective security lighting system in the BN building perimeter.

- Install and ensure proper functioning, through preventive maintenance and systematic periodic testing, of an effective intruder alarm system in the BN building (including motion detectors, door and window magnetic contacts, glass break detectors, etc.). Ensure that the types, number, and location of sensors are adequate to monitor the entire building. Other access points to the building interior such as roof doors/hatches, skylights, ducts, etc. should also be equipped with burglar sensors. Install and ensure proper functioning of floodlights at strategic locations inside the building, which will switch on automatically when the alarm is triggered. Systematically arm the alarm system at the end of the workday or at other predetermined times.

- Consider installing an automatic signaling system connected with the police and/or a remote 24-hour monitoring station, which will be activated whenever the intruder alarm of the BN is triggered.

- Consider installing an anti-theft system based on security tags using electromagnetic or radio frequency technology, which will trigger an audible alarm when passing through detectors positioned on the route out of the BN building. This might be particularly useful for collection items of higher value and smaller size, which are more vulnerable to theft.

- Consider installing metal detectors in the reception area of the BN to detect eventual attempts to enter the building carrying guns and/or cutting-perforating metallic items such as scalpels, knives, switchblades, etc.

- Ensure that all detection systems of the BN will continue to function normally in the event of a power failure. Consider the installation of a “no-break” system if needed.

- Raise awareness and seek cooperation from all BN staff to assist in the detection of anomalous situations, suspicious (user) behavior, or flagrant theft or vandalism affecting the library’s collections or building.

- Continuously monitor the security of digital collections.

4. To RESPOND to the risk:

- Ensure that security personnel are always present in sufficient numbers and properly equipped to respond to any theft or vandalism attempt against the BN collections or building. Sensitize all security staff about the fragility and high importance/value of this cultural heritage.

- Immediately notify the security personnel as soon as any theft (internal or external) or vandalism attempt is detected inside the BN premises. Immediately inform the occurrence of the event to the respective collection/facility manager(s). Ensure that all members of the BN security team are properly trained to handle such situations when dealing with the perpetrators, avoiding unnecessary damage to (cultural) property and prioritizing people’s safety, especially in cases of (armed) violence by criminals. Notify the police as necessary.

- Provide a dedicated, mobile communication channel (“walkie-talkie” or equivalent) for use by the BN surveillance/security team, reception staff, and other key people of the library so that they can effectively coordinate response actions in case of theft or vandalism attempts.

- Properly investigate any suspicious situation, behavior or evidence of noncompliance involving security procedures and/or devices detected during patrols or informed by staff. Take appropriate corrective measures - approach suspects, investigate unattended items, repair defective equipment, and/or rectify procedures - to restore normality as quick as possible. Notify the police as necessary.

- Consider the need for installing a concealed “panic button” that can easily be reached and used by the BN reception staff to rapidly notify and mobilize security in case of need.

- Sensitize the police about the importance of a prompt and efficient response in case of emergency calling or signaling, especially given the fragility and high value of the BN collections.

- If hiring remote monitoring and security response service providers, contractually require that their response time does not exceed a predetermined maximum.

- Inform the direction of the BN of any attempt of theft or vandalism against the collections and/or building.

Take applicable administrative measures in case of internal theft. da BN para que possam coordenar efetivamente as ações de resposta em caso de tentativa de furto, roubo ou vandalismo.

5. To RECOVER from the risk:

- Rigorously keep detailed and updated records (including photos) of all items belonging to the BN to facilitate recovery in case of theft.

- Sensitize the community of art and antique dealers about the absolute need for provenance certification of commercialized items.

- In case of theft, immediately notify the police, the Federal (port and airport) authorities, the Interpol, and other competent bodies, providing information about the stolen item(s) as needed.

- In case of theft, widely disseminate images and other descriptive information/data about the stolen item(s), requesting the cooperation of all sectors of society for its/their recovery.

- Conserve-restore collection items or building parts damaged by vandalism.

- Inform and update the BN Press Office on the progress of recovery measures adopted by the library in case of theft or vandalism.

- Consider the possibility of insuring (parts of) the BN collections and building against theft and vandalism.

Responsibilities for implementation:

- BN risk management team
- BN administrative maintenance team (facility manager)
- BN architecture and engineering team
- BN fire brigade
- BN security & surveillance team
- BN collection storage teams and managers
- BN conservation-restoration teams and managers

3°. Fire:

Fire in the BN building affecting the collections.

1. To AVOID the risk:

- Strictly comply with the prohibitions on smoking and cooking on the BN premises. Avoid smoking in the vicinity of the BN building.

- Avoid (unsafe) activities using open flames or heat sources on the BN premises (e.g. soldering, use of Bunsen burner, candles, heating plates, boilers, etc.). If strictly necessary, such activities must require special authorization and be continuously supervised.

- Avoid as far as possible stockpiling flammable liquids (ethanol, organic solvents, etc) inside the BN premises. If indispensable, store only the strictly necessary amounts, preferably inside fireproof cabinets equipped with exhaust system that expel flammable vapors to the exterior of the building, or alternatively in a dedicated, well ventilated area. All chemicals used in the BN conservation-restoration workshops must properly labeled, stored in tightly closed (original) flasks/containers, and correctly segregated based on chemical incompatibility.

- Avoid storing cellulose nitrate films on the BN premises. If not feasible, segregate these films from other types of film and from combustible materials, storing them in non-combustible enclosures and furniture, and in a dry, cool, and well-ventilated area away from sources of heat or ignition.

- Avoid storing cooking gas cylinders on the BN premises. If indispensable, store only the strictly necessary quantity in a dedicated, well ventilated area.

- Avoid entry of users carrying matches, lighters, cigarettes, cigars, pipes, and similar items in the BN building.

- Systematically carry out preventive maintenance of the electrical wiring/installations of the BN building. Consider installing (new) circuit breakers and/or fuses, as needed, to reduce the risk of fire.

- Systematically carry out preventive maintenance of the gas distribution installations of the BN building.

- Request responsible authorities and institutions to systematically perform preventive maintenance of the city gas distribution pipelines located under or nearby the BN building.
- Systematically carry out preventive maintenance of mechanical room equipment/installations of the BN building.
- Systematically carry out preventive maintenance of the lightning protection system of the BN building.
- Strictly avoid overloading the electrical installations of the BN building, including electrical outlets with too many plugs.
- Avoid using obsolete, defective, poorly maintained or counterfeit electrical appliances and equipment on the BN premises.
- Avoid damage to electrical outlets, wires and plugs of electrical appliances used in the BN.
- Systematically switch off all electrical appliances at the end of the workday, except those (if any) that must remain continuously switched on.
- Avoid excessive accumulation of dust inside electrical equipment such as fans and air conditioning units, which may cause overheating.
- Eliminate all unnecessary combustible materials from inside and around the BN building.
- Consider establishing a safety perimeter with no vegetation around the BN building.
- Consider establishing a safety perimeter around the BN building inside which vehicle parking is not allowed.
- Keep safety (backup) copies of digital and microfilmed collections in external repositories, i.e. outside the BN building.
- Properly inform all BN staff about ongoing fire prevention measures.

2. To BLOCK the risk:

- Maximize to the extent possible the level of fire compartmentation in the BN building (e.g. by installing and correctly operating fire doors, fire dampers in ductwork, fire resistant and retardant coatings and sealings, fire resistant cabinets/furniture, smoke barriers, etc.) to prevent or slow down the spread of fire.
- Ensure proper functioning and correct use of fire compartmentation/containment mechanisms, structures, and devices already existing in the BN building.
- Consider installing automatic fire sprinklers in the BN building's exterior (roof and external walls) to prevent or slow down the spread of fire from neighboring buildings, vehicles, etc

3. To DETECT the risk:

- Ensure, through preventive maintenance and periodic systematic testing, continuous and proper functioning of all detectors (smoke, heat, flame, etc.) of the fire alarm system of the BN. Pay special attention to the need for regular exchange of batteries in units/models that use them. Ensure that the detectors are properly positioned to maximize the performance of the system.
- Consider installing (if not already present) a fire alarm panel in a strategic area of the BN building to allow staff to quickly locate activated detectors and therefore reduce the response time of the BN fire brigade. If already existing, ensure proper functioning of the fire alarm panel through preventive maintenance and systematic periodic testing. Consider upgrading the BN fire alarm system by installing a (addressable) fire alarm control unit to better integrate and operate all its components.
- Consider the need for installing additional fire detectors to adequately/better cover all areas of the BN building. Dedicate special attention to public areas, collection areas, and places with higher concentration of potential/possible sources of ignition.
- Consider installing a system to automatically notify the fire department when the BN fire alarm is triggered.

- If still not available, install a manually activated fire alarm as backup to the automatic system. Ensure proper functioning of this alternative system through preventive maintenance and systematic periodic training.

- Consider installing gas leak detectors and alarm in strategic areas of the BN building.

- Carry out periodic inspections to detect nonconformities concerning AVOID procedures and measures. Inform all BN staff about the results of these inspections.

- Remain vigilant for fire incidents near the BN building, suspicious behavior/activity inside or around the building (possible arson attempt), hot air balloons flying over the building, etc. Notify the BN fire brigade and, if needed, security staff about any such higher risk situation

4. To RESPOND to the risk:

- In case of activation of the BN fire alarm during opening hours, immediately evacuate the building. The evacuation of users and staff must be assisted and verified by a previously designated team (composed of 2 well-trained and properly equipped BN employees for each floor of the building). Emergency exit doors must be appropriately signed and fully operational, and escape routes permanently unobstructed (e.g. free from bulky objects, furniture, etc.). Emergency signaling and lighting, as well as extra keys to strategic doors, must be available and fully operational in the event of an evacuation of the building. After leaving the building, all BN staff must go to the designated meeting point for a head count to confirm complete evacuation. To this end, a list of staff members present in the building at any given time should be kept and continuously updated. This list must be brought to the evacuation meeting point by the person responsible for keeping it. Periodically (1-2 times a year) simulate the evacuation of the BN building to ensure an efficient response in case of real need. Consider installing (external) emergency/ fire escape stairs in the BN building.

- Members of the BN volunteer fire brigade present in the building must respond immediately to the fire alarm signal, implementing to the extent possible the response procedures previously established and simulated in collaboration with the fire department. All portable fire extinguishers must be fully operational, properly inspected, maintained and/or recharged according to official standards to allow an efficient response by the fire

brigade. These extinguishers must be present in sufficient numbers and in strategic, visible, readily identifiable and accessible locations within the BN building, according to guidance provided by the fire department. The internal fire hydrant system of the BN building must also stay fully operational, with all parts and accessories in place and fully functional, and provided with adequate water supply to deliver the required fire flow. The hydrants must be properly identified and located in strategic points within the building, as required by the fire code.

- Immediately notify the fire department through its emergency number. Call paramedics in case there are victims. Ensure that the BN emergency response team, facility manager, and senior management are informed about the event as fast as possible. Their respective contact data (names and phone numbers) must be continually updated and readily available in a list to be widely disseminated among the BN staff and placed in strategic locations throughout the building. Consider using a dedicated (mobile) telephone line or radio communication system (e.g. “walkie-talkie”) to facilitate and/or ensure communication between key people of the BN in crisis and emergency situations.

- Keep the fire department well informed about the location and how to access the BN collections and other heritage items, particularly the more valuable and/or vulnerable ones, discussing possibilities and strategies to rescue and/or minimize collateral damage to these items during a firefighting operation.

- Consider installing an automatic fire suppression system (fire sprinkler, water mist, or gaseous extinguishing agents). If/When installing such a system, ensure that it is properly designed and sized to meet the BN requirements. Ensure continual maintenance to guarantee an efficient response whenever needed.

- Convene a crisis meeting with the BN emergency response team, facility manager, conservation-restoration team, and security staff to define and coordinate rescue and/or recovery actions to be taken for affected collection items and building parts, as soon as access to the building is granted by the fire department and other competent authorities.

- Once the fire fighting operation is concluded, isolate the affected area and ensure its continued security throughout the isolation period. Request police assistance to do so as needed.

- Once access to the building is granted by the fire department and other competent authorities, rescue affected items and transport them to a safe place. Depending on the extent of damage and number of items affected, this place might be inside or outside the BN building. Ensure that such temporary storage spaces will be readily available and prepared when needed. Anticipate the possible need for immediate freezing of (a large number of) books, documents, and other collection items that will probably become wet during the firefighting operation, in order to avoid subsequent damage by mold growth, etc. For that purpose it is necessary to ensure that freezers or cold rooms will be readily available in case of need.
- Inventory all affected items during the rescue operation, documenting them properly in order to avoid subsequent risks of dissociation.
- Follow appropriate procedures when transporting affected items, using of containers, supports, and packagings of proper dimensions and made of suitable materials (which should be readily available). Avoid contamination (sooting, etc.), shocks, compression, deformation, falls and excessive vibration during the process. Anticipate and be prepared for the eventuality of having to transport large amounts of collection items out of the BN, which may require the use of special vehicles, etc. If/When freezing wet items, use materials and procedures indicated in the RESPOND stage for the risk of damage and loss of value due to the action of water.
- Ensure the security of affected items throughout the rescue operation (transportation, temporary storage, etc.). Dedicate special attention to the most valuable collection items.
- Inspect affected items and, if necessary, send those most seriously damaged for conservation-restoration treatment.
- Proceed as quickly as possible with the drying of collection items affected by water (if not frozen) - refer to the RESPOND stage for the risk of damage and loss of value due to the action of water.
- Continually update the BN Press Office on the progress of emergency response operations being carried out by the institution.
- Document the incident and the (emergency) response actions as accurately as possible for subsequent analysis and improvement.

5. To RECOVER from the risk:

- Conserve-restore collection items damaged by fire, smoke, and/or water, taking into account the degree of urgency/priority and the available capacity. Request assistance to partner institutions if necessary.
- Rebuild/restore damaged parts of the BN building, and ensure that they are ready to receive the collections back.
- Return rescued/recovered collection items to their place and resume normal activities.
- Consider the possibility of insuring (parts of) the BN collections and building against fire.

Responsibilities for implementation:

- BN risk management team
- BN administrative maintenance team (facility manager)
- BN architecture and engineering team
- BN fire brigade
- BN security & surveillance team
- BN collection storage teams and managers
- BN conservation-restoration teams and managers

4° Water:

Damage and loss of value to the BN collections and/or building due to the action of water.

1. To AVOID the risk:

- Systematically carry out preventive maintenance of the plumbing system of the BN building.
- Systematically carry out preventive maintenance of the air conditioning system of the BN, in particular of its waterpipes, to avoid leaks/bursts.
- Request responsible authorities and institutions to systematically perform preventive maintenance of water supply and sewage system installations located under or nearby the BN building.
- Systematically carry out preventive maintenance and cleaning of external drains and gutters, eaves and downspouts, to avoid (excessive) accumulation of rainwater on the roof and/or along the walls and foundations of the BN building. Consider the need for installing additional external drains and/or gutters to avoid overload and possible problems with the drainage of rainwater.
- Avoid improper or negligent use of taps, sinks, toilets, drinking fountains, valves, drains, grease traps, etc. by users and staff on the BN premises.
- Avoid leaving windows, doors, and other (water) entry points into the building open or improperly closed during rainy periods and after working hours.
- Avoid installing architectural, landscaping, or construction elements in the BN building or its surroundings that favor accumulation of water along the building foundations, walls or roof.
- Avoid the presence of vegetation in direct contact or very close to the BN building, which can promote water infiltration into its foundations or walls. On the other hand, maintain a vegetation cover at a safe distance from the building, which provides a permeable area that contributes to reduce the volume of (rain)water to be drained by the sewage system, and therefore the risk of localized flooding.

- Consider the need and feasibility of altering the slope of the terrain and/or digging a trench in the immediate vicinity of the BN building to avoid accumulation of rainwater.

- Avoid storing, displaying or accessing collection items near water sources or potentially dangerous locations in terms of water risks: directly under waterpipes or under the roof, near or under air conditioning or dehumidification equipment; near windows or other openings to the outside of the building; in direct contact with walls, particularly exterior walls without insulation; directly on the floor (observing a minimum safety height of 10 cm); in the basement or other vulnerable areas prone to flooding, etc.

- Avoid procedures involving the use or transportation of water in collection storage and display/use areas (e.g. cleaning floors and/or shelves using significant amounts of water transported in buckets or other open containers). If unavoidable, limit the frequency and volume of water used in these procedures to the strictly necessary minimum.

- Avoid water consumption in collection storage and display/use areas, explaining the reasons for such measure to users and staff.

- Ensure that the collecting tray of dehumidifiers in use is systematically emptied/drained at appropriate intervals to avoid accumulation of water and possible incidents.

- Avoid having carpets in collection storage areas to prevent additional problems of high relative humidity if the floor becomes wet.

- Discuss with the fire department possible ways to avoid using excessive amounts of water in an eventual firefighting operation in the BN (e.g. by using water mist instead of conventional water jets, etc).

- Keep safety (backup) copies of digital and microfilmed collections in external repositories, i.e. outside the BN building.

- Properly inform all BN staff about ongoing measures to prevent water incidents.

2. To BLOCK the risk:

- Systematically carry out preventive maintenance of the roof, windows, doors, and other barriers that close openings in the BN building envelope, considering the need for improving their capacity to block the entry of water into the building (in particular those doors, windows, and other openings that are more exposed/vulnerable to rains and/or external flooding).

- Systematically maintain the exterior walls of the BN building to prevent the entry of water through fissures, cracks, holes, etc.

- Systematically carry out preventive maintenance of all drains and grease traps inside the BN building, considering the need for installing backflow prevention devices. Consider the need for installing additional drains inside the building to improve internal drainage capacity in case of flooding.

- Consider the need for installing a (self closing) flood barrier system at the entrances of the BN building, particularly those located at or below street level.

- Consider the need for waterproofing floors and ceilings to block the downward spreading of water through them, particularly in collection storage and display areas.

- Consider equipping interior doors with effective barriers to prevent the entry of water (e.g. door shoes, weather stripping), particularly in collection storage and display areas.

- Check the water blocking and/or shedding capacity of existing shelves, cabinets, showcases, and other collection storage or display furniture, considering the need for improvement or replacement to better protect the collections in case of water incidents.

- Ensure that the BN collections and other heritage items are properly covered with suitable impermeable (sheet) materials whenever there are (renovation) works in the building involving the risk of water incidents.

3. To DETECT the risk:

- Systematically monitor the weather forecast for the city of Rio de Janeiro.

- Continually monitor the water levels outside the BN building in case of heavy rain.

- Instruct all staff members, in particular those responsible for conducting internal and external patrols, to remain vigilant for the occurrence of water leaks, spills, infiltration, overflow, backflow, or similar problems inside and around the building. Take necessary measures as appropriate (see RESPOND), immediately informing the BN facility manager about the problem(s) detected.

- Instruct all staff members, in particular those responsible for conducting internal and external patrols, to remain vigilant for signs of possible water-related problems affecting the BN building and/or collections. Such signs include: salt efflorescence; plant, fungi, and/or algae growth; water or damp stains; peeling/flaking paint; excessively cold walls or floors; external corrosion of metallic pipes or fittings located near walls, etc. Inform the BN facility manager as soon as any possible problem is detected.

- Carry out periodic inspections to detect nonconformities concerning AVOID procedures and measures. Inform all BN staff about the results of these inspections.

- Consider installing water leak detectors and alarm to warn BN staff about the undesired presence of water (leaks, infiltrations, etc.) in potentially dangerous and/or sensitive areas within the building. If installed, ensure proper functioning of this system through preventive maintenance and systematic periodic testing. The system should remain functional in the event of a power failure.

- Continually monitor the relative humidity levels inside the building to detect anomalous increases, which may be an indication of water leaks or infiltration problems.

4. To RESPOND to the risk

In case of incidents such as spilling or splashing of small volumes of water on collection items:

- Immediately notify the staff member(s) responsible for the affected collection item(s) and the BN conservation-restoration team so that appropriate measures can be taken.

In the event of localized problems of moderate proportions involving the presence of water inside the BN building (leaks, burst water pipes, infiltration, overflow, etc.)

- Proceed immediately with the protection of collections and other heritage items that are being affected by water or about to be. Such protection may involve the removal of these items to safe areas of the building, or covering them with impermeable (sheet) materials (see list of emergency supplies below). Prioritize items of higher value (which should be previously established). Ensure that items are properly transported and identified to prevent damage and dissociation.

- Stop the flow of water as quickly as possible, which may require closing taps or valves (whose location must be well known), closing windows, provisionally sealing roof openings or defective/damaged windows, shutdown of (faulty) equipment, using backflow prevention devices, etc. This procedure often requires the involvement of the facility manager and/or his/her team.

- Contain the spread of water through the building, and remove any accumulated water (see list of emergency supplies below).

- Isolate the affected area.

- Dry the affected area, removing any wet materials such as carpets and upholstery, which absorb/retain water.

- Provide air circulation and dehumidification to restore original relative humidity levels.

- Dry affected items (see below).

In case of imminent threat of flooding of the BN building:

- Immediately notify the BN emergency response team. Consider using a dedicated (mobile) telephone line or radio communication system (e.g. “walkie-talkie”) to facilitate and/or ensure communication between key people of the BN in crisis and emergency situations.

- Remove as many collection items as possible from areas that are more vulnerable to flooding (street level and below), transporting them to safe places in the upper floors of the BN building. Prioritize items of higher value (which should be previously established). Ensure that items are properly transported and identified to prevent damage and dissociation.

- Ensure, as far as possible, that external drains are unblocked.
- Seal, reinforce, and/or block possible entry points for water into the building: doors, windows, etc. (see list of emergency supplies below).
- Activate all backflow prevention devices of the building (whose location must be well known).
- Ensure that drainage/sump pumps and other emergency supplies (see list below) are readily available and fully functional to start removing accumulated water from eventually flooded areas of the building as soon as possible.
- Consider the need for preventively interrupting the building’s electricity and gas supply to avoid electrical shock, gas leak and/or explosion hazards.
- Consider the need for (partial) evacuation of the building.

In case of large-scale flooding of the BN building:

- Immediately notify the BN emergency response team. Consider using a dedicated (mobile) telephone line or radio communication system (e.g. “walkie-talkie”) to facilitate and/or ensure communication between key people of the BN in crisis and emergency situations.
- Consider the need for interrupting the building’s electricity and gas supply (typically recommended) to avoid electrical shock, gas leak and/or explosion hazards.
- Ensure that emergency supplies (see list below) are always available and in perfect condition / fully functional. These supplies must be stored in areas of the BN building of low vulnerability to flooding, located in well known and easily accessible places. Ensure that one or more vehicles can be quickly mobilized to transport emergency supplies that may need to be purchased. An updated list of these materials and their suppliers must be available at all times in pre-defined locations within the BN building.
- Proceed with the protection and rescue operation of collection items only if it is safe to enter the building.
- Use personal protective equipment (see list below) when working inside flooded areas of the building to avoid possible infections, contamination, etc.

- Isolate the BN building and ensure its continued security throughout the rescue operation and isolation period.

- Immediately protect collections items on the verge of being affected by water by covering them with suitable impermeable (sheet) materials (see list of emergency supplies below) or temporarily removing them to safe areas within the building. Prioritize items of higher value (which should be previously established).

- Take all possible measures, when applicable, to prevent water from spreading further into the BN building enlarging the flooded area – install barriers, unblock drains, deploy drainage/sump pumps, etc.

- Start rescuing affected collection items as quickly as possible, not exceeding a critical limit of 48-72 hours after the event. The rescue plan must be reviewed with the staff concerned to clarify their roles and responsibilities. Organize work shifts and provide a resting place, food and drink to people working in the rescue operation.

- Properly inventory and identify all rescued items to avoid subsequent risk of dissociation.

- Wet books and documents must be dried or, depending on their number and the available drying capacity, frozen for later drying (in order to avoid mold growth). These items must be carefully removed from the disaster area and transported to the respective drying or freezing sites, which must be available and properly prepared. Prioritize items of higher value (which should be previously established). Consider the disposal of items that have been damaged to the point of no longer being usable.

- Wet items affected by mud or dirt contained in the water must be washed to remove these materials before undergoing drying or freezing.

- Items that have not become wet should not be exposed to high relative humidities (> 75-80%) for extended periods of time, which also causes mold growth (the higher the relative humidity, the less time required for the emergence of mold). Monitor relative humidity levels around these items and, if necessary, use dehumidifiers and ventilation to reduce them to safe values. If the relative humidity is excessively high and it is not possible to lower it to safe levels, remove the collection items to area(s) with less extreme, more favorable relative humidity conditions.

- Anticipate and be prepared for the need to transport large amounts of collection items out of the BN building, which will require the use of containers, book carts, special vehicles, etc. Take due care when transporting these items to avoid further damage, losses, etc.

- Ensure the security of affected items throughout the rescue operation (transportation, drying, freezing, temporary storage, etc.). Dedicate special attention to the most valuable collection items.

- Drying of wet items should be carried out in a suitable, well-ventilated place at a safe distance from the affected area. Slightly wet items usually can be air dried without problem, except those with water soluble inks or pigments because of ink/pigment dissolution and migration. Books and bound volumes must stand upright with pages fanned out for air drying. Never try to open a wet or damp book abruptly, which will probably cause additional damage. Use blotting paper or pads to help drying book covers, introducing them between the cover and the text block and gently pressing to remove as much water as possible. Single page documents and large format items such as maps and charts must be dried flat, laid on a clean absorbent material that must be regularly changed. Deploy a sufficient number of dehumidifiers at the drying area(s), which should operate continually and be properly drained. Monitor relative humidity levels in the drying area(s). Gently pass cold air over the wet materials, e.g. by using rotating fans positioned at a safe distance from items being dried. Never dry books and documents by exposing them to direct sunlight, which results in damage by ultraviolet radiation and deformation due to excessively rapid drying of the paper. Velum bound volumes, vellum or parchment membranes, and coated papers should not be air dried. If there is no other alternative, carefully separate coated paper sheets of books and magazines while still wet and interleave them with a nylon (or other suitable synthetic material) cloth or mesh before drying. Negatives, glass plates, and prints should be removed from their envelopes, washed in clean cold water if necessary, and air dried with the emulsion side up (the emulsion must not be touched or wiped). Photograph albums should be interleaved with silicone or wax paper. Microfilms (silver halide) should be removed from their boxes/containers, temporarily kept/cleaned in clean cold water if necessary, and reprocessed as needed. Microfiches (silver halide) should be separated, washed in cold water, and dried with the emulsion side up.

- Items selected for freezing must be packed/wrapped in plastic (e.g. polyethylene) bags or films to prevent the formation of one solid block upon freezing, and to facilitate handling. Bound volumes must be packed individually. Volumes that are found lying open should stay in that position and be packed flat for freezing. Bundles of individual documents that have adhered to each other upon wetting must be packed as such without trying to separate them, which would imply excessive loss of time and unnecessary damage. Large format items such as maps and charts should be interleaved with absorbent material (e.g. blotting paper) and plastic sheets (polyethylene). Packed items must be properly identified and placed in rigid plastic containers for transportation, without exceeding a practical handling limit of approximately 15 kg per container. Bound volumes can be placed upright or laying flat inside the containers in a way to ensure their adequate support and prevent further damage. Items packed lying open should be placed horizontally inside the containers. Transport the material and start the freezing procedure as quickly as possible. Opt for blast freezing, if available, to avoid the formation of large ice crystals within frozen materials, which can cause damage. Otherwise, freeze wet collection items in conventional freezers or cold rooms.

- Document the incident and the (emergency) response actions as accurately as possible for subsequent analysis and improvement.

- **The BN emergency supply kit should include the following materials:** drainage/sump pump(s), air circulators and fans, dehumidifiers and thermohygrographs (or thermohygrometers), wet-dry vacuum cleaners, buckets and mops, rigid plastic containers to transport (wet) collection items, flashlights and batteries, large plastic garbage baskets, 5, 10 and 15-meter extension cords, spray bottles, transparent plastic (polyethylene) roll, plastic bags of different sizes, rolls of masking/duct tape and raw cotton ribbons, scissors and box cutters, blotting paper, cotton cloth for various uses, PVC plates of different sizes, nylon cloth/mesh (e.g. *monyl* or *voile*), sponges, pads, pencils, permanent markers, writing paper, wax/silicone paper, self-adhesive waterproof labels, etc.

- **Personal protective equipment:** waterproof aprons and overalls, white coats, hats, rubber boots, safety helmets and goggles, (rubber) gloves, and appropriate particle masks.

5. To RECOVER from the risk:

- Dry, clean, and renovate the flooded areas of the BN building as required, making sure that they are properly prepared to receive the collections back.
- Once dried, it is recommended that distorted books and documents are straightened by pressing them between PVC or wooden pressing plates covered with blotting paper.
- Assess the extent of damage to collection items, conserving-restoring affected items taking into account the degree of urgency/priority and the available capacity. Request assistance to partner institutions if necessary. Depending on the amount of items to be conserved-restored, the process may extend over a long period of time. In this case, items awaiting conservation-restoration treatment should be stored in appropriate boxes/containers (after drying) to prevent further damage.
- Return rescued/recovered collection items to their place and resume normal activities.
- Consider the possibility of insuring (parts of) the BN collections and building against flooding or water damage.

Responsibilities for implementation:

- BN risk management team
- BN administrative maintenance team (facility manager)
- BN architecture and engineering team
- BN fire brigade
- BN security & surveillance team
- BN collection storage teams and managers
- BN conservation-restoration teams and managers

5° Pests:

Damage and loss of value to the BN collections and/or building due to the action of pests.

1. To AVOID the risk:

Avoid creating favorable (micro)habitats for pests inside and around the BN building, particularly in collection display, use, and storage areas. Such measures include:

- Strictly restrict the storage, handling, and/or consumption of food to places that are well-segregated from collection areas. Strictly prohibit and control the consumption of food by users and staff in collection areas, explaining the reasons for such measure. Reduce the amount of food stored inside the BN building to the strictly necessary minimum. If/When storing food inside the building, strictly do so in appropriate, tightly closed containers. Strictly avoid the accumulation of food particles in the eating areas of the building, keeping them always clean.

- Avoid accumulation of dust and dirt inside the BN building, particularly in collection areas and on collection items themselves, by systematically implementing/following appropriate cleaning procedures (see RESPOND for the risk of damage and loss of value due to the action of pollutants).

- Avoid accumulation of garbage, unnecessary organic materials, and clutter/debris in and around the BN building, removing them systematically. Ensure that all (organic) garbage containers are equipped with tight fitting lids, which must remain properly closed.

- Eliminate unnecessary sources of water and moisture within and around the BN building, ensuring proper functioning of existing drains.

- Avoid the presence of plants and flowers inside the BN building.

- Avoid the presence of exterior vegetation in direct contact or very close to the BN building.

- Avoid feeding animals such as pigeons, cats, etc. around the BN building.

- Avoid introducing pests into the BN building together with newly purchased or donated (infested) collection items. A properly isolated quarantine area must be available, where new acquisitions or donations will be systematically received, stored, and inspected before being transferred to other areas of the building.

- Consider conducting preventive pest control treatments (deratization, disinsectization) around the BN building and locally in strategic places of its interior (outside collection areas) to avoid the presence of pests. Obviously, due care must be taken to avoid collateral risks to people and collections when implementing this measure.

- Consider the need and possibilities for changes in the exterior and interior lighting of the BN building in order to avoid the entry of insects, provided that this does not compromise security. Such changes may include the substitution of light sources (e.g., mercury-vapor lamps by sodium-vapor lamps, which are less attractive to insects); use of light sources to attract/keep insects away from entry points into the building; reduce the extent to which interior lighting can be seen from outside the building, etc.

- Properly inform all BN staff about ongoing measures to prevent damage to collections and building caused by pests.

2. To BLOCK the risk:

- Systematically carry out preventive maintenance of the roof, windows, doors, and other barriers that close openings in the BN building envelope.

- Systematically maintain and repair as necessary the foundations, walls, and covering materials of the BN building to block the entry/movement of pests through crevices, cracks, holes, etc. Openings in the order of 1 mm (0.3 mm for termites) are sufficiently large to allow the access of pests into the building.

- Close openings and gaps between floors and walls, as well as between the roof and slabs, to block the entry/movement of pests. Seal openings around pipes and conduits where they enter the building.

- Consider installing physical barriers for pests at the bottom and along gaps between the edges and casing of (strategic) doors and windows of the BN building (e.g. door shoes/sweeps, weather stripping, etc.). Verify

complementarity with similar BLOCK measures for water. Close/seal crevices around vents, plumbing fixtures, equipment, etc. Ensure proper functioning and maintenance of these barriers.

- Install appropriate screens (metal or plastic) and, as needed, other devices such as bird spikes, springs, wires, etc. to block pest access, harboring, and/or breeding in external hollows and niches in the BN building. Ensure proper functioning and maintenance of these barriers.

- Consider the need for installing a chemical barrier against subterranean (ground) termites around and beneath the BN building.

- Consider the need for appropriately screening floor drains at the BN building to block the entry of pests, provided that this does not jeopardize the correct functioning of the drainage system.

- Ensure that collection storage and display furniture are always properly closed. Consider the necessity and feasibility of improving their capacity to block the entry of pests (through crevices, etc.), provided that no collateral risks of incorrect relative humidity are introduced.

- Consider the need for installing physical or chemical barriers to protect computers and digital collection storage devices at the BN against pest infestations.

3. To DETECT the risk:

- Train staff to identify pests that can be harmful to the BN collections and building. Instruct all staff to remain vigilant for signs of the presence and activity of pests affecting the building and/or the collections.

- Implement and systematically maintain a visual monitoring program to detect the presence and activity of pests affecting the BN collections (e.g. with semestral periodicity). Prioritize collection items of higher value, those more sensitive to pest attack, and/or those stored or displayed inside furniture/enclosures that are more easily accessible to pests. Watch for signs such as carcasses, body parts, droppings or excrements (frass), tracks, and specific types of damage to collection items. Maintain a clear line of sight along the walls of collection storage areas, avoiding that shelves and other types of furniture are placed directly against walls. Consider the possibility of covering shelves and drawer bottoms

with sheets of white paper to facilitate detection of signs of pest infestation. Include the monitoring of computers and digital collection storage devices at the BN.

- Systematically conduct periodic inspections to detect the presence of pests in other areas of the building. Pay particular attention to places that can provide more favorable (micro)habitats, e.g., darker, protected, and quite niches, moist areas, kitchen/eating areas, etc.).

- Consider using traps (sticky, bait, cages, etc.) to detect the presence and identify types of pests in the BN building. Use traps systematically, deploying them in strategic locations within the building, e.g., near entrances and exits, food storage and preparation areas, garbage collection areas, mechanical room, ducts and pipes, along the walls in collection storage areas, etc.

- Hire specialized pest monitoring service providers if necessary and depending on available resources.

- Carry out periodic inspections to detect nonconformities concerning AVOID and BLOCK procedures and measures. Inform all BN staff about the results of these inspections.

- Systematically document the results of all inspections and monitoring actions, keeping a detailed record of pest incidents affecting the BN collections and/or building. This record can include a mapping of pest incident locations, photographic documentation, quantitative data (e.g. number of animals involved per incident), description of affected items, etc.

4. To RESPOND to the risk:

- Upon detection of pest infestation affecting the BN collections and/or building, immediately notify the staff member(s) responsible for the affected items and the library conservation-restoration team.

- Immediately isolate infested items from the others to prevent spreading of the infestation. Infested items must be removed to a safe and well segregated place, and properly placed inside well-sealed bags or boxes for containment and to divide the problem into more easily manageable units, as necessary.

- Thoroughly inspect affected area(s) to ensure that all infested items have been isolated, and to try to identify the source/routes of infestation.

- Properly inventory and identify all rescued items to avoid subsequent risk of dissociation.

- Eliminate pests from infested items as needed, which can be done mechanically, by freezing, heating, modified atmospheres (anoxia), or fumigation (not recommended). The choice of disinfestation method will depend on the type of pest, the sensitivity of infected items to the treatment agent, and the available processing capacity/resources. It is recommended to consult experts for help in choosing the most appropriate treatment. If necessary, hire specialized service providers for disinfesting affected items, which must be authorized and continuously supervised by the BN conservation-restoration team. Ensure complete elimination of the infestation before proceeding with conservation-restoration and/or returning affected items to their original places.

- Treat the affected area(s) as necessary to eliminate detected pests (before returning collection items eventually removed for treatment). This may involve the use of pesticides, traps, toxic baits, lowering relative humidity levels, etc., depending on the type of infestation. Regardless of the chosen treatment, avoid direct or indirect contamination of collections and other valuable heritage items or building parts, as well as any health risk to users and staff, and environmental risks. It is recommended to consult experts for help in choosing the most appropriate treatment. If necessary, hire specialized service providers for disinfesting affected area(s), which must be authorized and continuously supervised by the BN staff.

- Ensure the security of affected items and building parts throughout the isolation period and disinfestation procedures. Dedicate special attention to the most valuable collection items.

- Consider the possible need for responding to infestations of computers and digital collection storage devices at the BN, establishing procedures and identifying specialized service providers to do so.

- Document the incident and the (emergency) response actions as accurately as possible for subsequent analysis and improvement.

5. To RECOVER from the risk:

- Once fully disinfested, conserve-restore collection items damaged by pests taking into account the degree of urgency/priority and the available capacity.

- Return recovered collection items to their place and resume normal activities.

- Consider the possibility of insuring (parts of) the BN collections and building against pest damage

Responsibilities for implementation:

- BN risk management team
- BN administrative maintenance team (facility manager)
- BN architecture and engineering team
- BN fire brigade
- BN security & surveillance team
- BN collection storage teams and managers
- BN conservation-restoration teams and managers

6°. Pollutants:

Damage and loss of value to the BN collections and/or building due to the action of pollutants.

1. To AVOID the risk:

- Avoid that doors, windows, and other openings to the exterior of the BN building remain open unnecessarily.

- Undertake systematic preventive maintenance and periodic replacement of filters in the air conditioning system of the BN.

- Ensure through periodic maintenance that all exhaust systems and devices of the BN building are working properly.

- Avoid using building materials, finishes, furniture, packaging or other materials that emit potentially hazardous gases or particles to the BN collections and/or building. Pay special attention when these materials are in direct contact with collection items.

- Avoid exposure of collection items to materials used in or generated by construction/renovation works eventually undertaken in the BN building by temporarily removing them from the area or increasing its ventilation, as necessary and feasible. Prioritize collection items of higher value and/or those more sensitive to that type of pollutants.

- Avoid accumulation of dust inside and around the BN building through effective and systematic cleaning routines. Cleaning procedures must avoid dust resuspension and redistribution, as well as the introduction of collateral risks of physical forces and water. The floors of collection storage and display areas must be cleaned with biodegradable products that are not aggressive/harmful to collection items or people. Metal shelves, map cabinets, and other collection storage furniture must be cleaned with the help of a clean cloth and small amounts of alcohol (ethanol), liquid or gel, due to its rapid evaporation. Proper care should be taken during this procedure to eliminate the risk of fire. Avoid using water to clean collection storage furniture.

- Avoid storing (extensively) degraded cellulose acetate or nitrate films together with well-preserved films and other collection items. Those degraded materials emit harmful gases and, therefore, must be stored separately in a well ventilated area.

- Avoid accumulation of dust on computers and digital collection storage devices at the BN.

- Avoid continual use of photocopiers and laser printers in confined, poorly ventilated spaces inside the BN building that contain collection items.

- Avoid unnecessary handling of collection items by users and staff. Require, as necessary, the use of gloves made of appropriate materials for the consultation/handling of documents and other collection items.

- Strictly prohibit the consumption of beverages and food near collection items.

- Avoid using pens, markers, and similar materials while accessing or handling documents and other collection items.

- Avoid using metal clips and adhesive tapes on documents and other collection items.

- Avoid using inadequate or poor-quality products and materials when conserving-restoring collection items. Opt for reversible treatments.

- Avoid as far as possible any other sources or activities that generate pollutants within and around the BN building.

- Avoid high levels of relative humidity, temperature, and radiation (visible, U.V.) in collection storage and display areas of the BN. This measure contributes to reduce the rate of chemical reactions between constituent materials of the collections and harmful gaseous pollutants.

- Properly inform all BN staff about ongoing measures to prevent damage to the BN collections and building caused by pollutants.

2. To BLOCK the risk:

- Ensure, through systematic preventive maintenance, the correct functioning of the roof, windows, doors, and other barriers that close openings in the BN building envelope, considering the need and possibilities for improving their capacity to block the entry of particulate and gaseous pollutants.

- Consider the need for installing additional filters (for gases and particulate matter) in the air conditioning system of the BN.

- Ensure that collection storage and display furniture and enclosures are always properly closed. Consider the need and feasibility of improving their capacity to block the entry of particulate and gaseous pollutants, provided that no collateral risks of incorrect relative humidity are introduced.

- Consider the need for installing dust barriers (e.g. dust flaps) on open shelves to block the accumulation of dust on books.

- Consider the need to block emissions or migration of potentially harmful substances to the collections (e.g. organic acids and peroxides, metal corrosion products, etc.) from the furniture/enclosures in which they are kept. Shelves and cabinets made of (phosphatized, powder coated) steel are sufficiently inert and do not generate such products. On the other hand, furniture/enclosures made of, e.g., wood, plywood, and iron may constitute sources of those pollutants. Appropriate plastic films or aluminum foil, for instance, can be used as barriers.

- Consider the need for using additional packaging (e.g. neutral/alkaline paper and/or plastic films impermeable to gases) to store collection items, particularly those of higher value, in order to block their exposure to particulate and gaseous pollutants. Consider the use of oxygen scavengers when packing/displaying collection items that are highly valuable and vulnerable to oxidation.

- Consider the need for installing physical barriers to block the deposition of dust on computers and digital collection storage devices at the BN.

- Systematically protect the BN collections in case of construction/renovation works in the building by providing appropriate barriers (e.g. suitable plastic sheeting) to block the deposition of particulate matter, accidental spills and splashes of paints or other liquids, etc.

3. To DETECT the risk:

- Consider monitoring the concentration of air pollutants inside the BN (particulate matter, SO₂, NO_x, ozone, volatile organic compounds, etc.), especially in collection areas.

- Carry out systematic visual monitoring of dust accumulation on the BN collections and building. Instruct all staff to remain alert with respect of this issue. Notify the BN conservation-restoration team about any such problem affecting the collections.

- Instruct all staff to remain vigilant for signs of (gaseous) pollution affecting the BN collections and/or building (e.g. metal corrosion products, “red rot” of leather book covers, vinegar syndrome in cellulose acetate films, efflorescences, fading of colors in the dark, etc.). Notify the BN conservation-restoration team about any problem detected.

- Continuously monitor the handling of collection items by users to detect potentially hazardous situations regarding accidental contamination of books, documents, etc., with inks from pens or markers, food residues, etc.

- Systematically document all products and materials used for conservation-restoration of collection items or special building parts.

4. To RESPOND to the risk:

- Upon detection of signs of pollutants affecting the BN collections or building, identify and, if possible, remove their source(s). If not possible to remove the source(s) of pollution, use appropriate physical barriers to block (further) contact between pollutants and collection items or building parts. Prioritize items of higher value and sensitivity. Consider the possibility of reducing the concentration of pollutants by increasing ventilation in the affected area(s) and/or using suitable adsorbents.

- Consider the need for installing additional filtration (or adsorption) systems or units to reduce unacceptably high levels of air pollutants eventually detected inside the BN building. Air purification can also be locally implemented, e.g. by equipping cabinets, display cases, and other storage/display enclosures with activated charcoal filters, or other types of adsorbents.

- Remove dirt and other foreign materials detected on books and documents (e.g. dust, particulate matter, rusty paper clips and staples, etc.). This “mechanical cleaning” procedure must be carried out by properly trained and equipped staff or outsourced professionals. Required equipment includes appropriate cleaning tools, a (movable) cleaning table, and personal protective gear. Cleaning can be done either inside collection storage areas or in other dedicated areas of the BN building. Always take due care when handling and transporting collection items, especially the most vulnerable

and fragile, to avoid collateral risks of physical forces, dissociation, and theft. The cleaning procedure may involve vacuuming books (using properly adapted semi-industrial vacuum cleaners), brushing book covers and individual pages with a soft brush, removing paper clips, staples, and other foreign materials with the aid of a suitable spatula/staple remover, and/or cleaning of documents using powdered rubber. Send affected collection items for more specialized conservation-restoration treatments as necessary.

- Consider the need and feasibility to deacidify books and documents made of acidic paper to reduce their rate of degradation by hydrolysis, which is accelerated by the acidic contaminants inherently present in the composition of this kind of paper.

- Approach users as quickly as possible whenever the (imminent) risk of contamination of books or documents by them during consultation is detected (e.g. with inks from pens, markers, etc., food, beverages), kindly indicating the correct way to eliminate the risk.

- If problems associated with the use of inappropriate materials or products in past conservation-restoration treatments of collection items are detected, take necessary measures to stop any possibly still ongoing contamination/degradation processes.

5. To RECOVER from the risk:

- Conserve-restore collection items damaged by pollutants, taking into account the degree of urgency/priority and the available capacity.

Responsibilities for implementation:

- BN risk management team
- BN administrative maintenance team (facility manager)
- BN architecture and engineering team
- BN fire brigade
- BN security & surveillance team
- BN collection storage teams and managers
- BN conservation-restoration teams and managers

7°. Light, UV and IR radiation:

Damage and loss of value to the BN collections and/or building due to the action of light, UV and IR radiation.

1. To AVOID the risk:

- Avoid unnecessary exposure of sensitive collection items and building elements (organic materials in general, especially those containing organic dyes) to daylight and light from electrical sources (lamps). Preferably keep collection storage areas in the dark, switching on the lights only when necessary. Consider installing motion sensors and programmable timers to automatically turn lights on and off in these areas. Take into account the differences in incident solar radiation on the different sides of the BN building depending on their respective orientation (see annexes), rearranging collection items as necessary and feasible to protect those of higher value and sensitivity to light, UV and IR.

- Strictly avoid exposure of collection and other heritage items to direct sunlight.

- Avoid excessive doses of light/radiation by using sources whose intensity does not (greatly) exceed the minimum (illuminance) requirements for consultation and display of collection items, and whose emitted UV and IR levels are the lowest possible (consult experts on the selection of light sources for different areas, as needed). For instance, the use of >20W compact fluorescent lamps with color temperatures ranging between 2700K and 4000K, and color rendering index of >75% has been recommended for general lighting in collection storage areas.

- Avoid excessive doses of light/radiation by avoiding placing collection items too close to light sources (the shorter the distance, the higher the intensity and therefore the dose). Pay special attention to collection items of higher value and sensitivity, and to those that are on permanent or long term display.

- Consider using facsimiles to avoid prolonged exposure of originals of higher value and sensitivity to light/radiation.

- Properly inform all BN staff about ongoing measures to prevent damage to the BN collections and building caused by light, UV and IR.

2. To BLOCK the risk:

- Block or reduce excessive daylight (inclusive UV and IR) levels inside the BN building by installing appropriate filters on windows and other openings such as skylights, or by using sun shades, shutters, screens, special paints, etc. Ensure proper maintenance and correct/efficient use of these barriers, replacing them whenever necessary.

- Block UV radiation emitted by electrical sources in collection areas or affecting other UV-sensitive items inside the building by using appropriate UV filters (plastic film sleeves, covers, etc.). Ensure replacement of these filters periodically or whenever necessary to maintain UV-filtering efficiency.

- Block UV radiation from reaching sensitive items on display by installing UV filters on showcases. Ensure replacement of these filters periodically or whenever necessary to maintain UV-filtering efficiency.

- If impossible to segregate collection storage from collection use areas, consider the need and feasibility of covering stored items with suitable barriers to protect them from light/radiation, provided that no collateral risks of pests, theft, fire, incorrect temperature or incorrect relative humidity are introduced.

- Consider the need for adapting or replacing storage furniture pieces to improve their opacity (ability to block light and UV/IR radiation). Keep existing units of suitable opacity properly closed to block light/radiation.

- Consider the need for replacing other enclosures and packaging materials used to store collection items to improve opacity.

3. To DETECT the risk:

- Systematically monitor collection storage and display areas to detect nonconformities concerning AVOID and BLOCK procedures and measures. Notify the BN conservation-restoration team about any problem or potentially dangerous situation detected.

- Remain vigilant for signs of damage to the BN collections or building possibly caused by light or UV/IR radiation (e.g. color fading, embrittlement and weakening of (organic) materials exposed to light/radiation, etc.). Notify the BN conservation-restoration team about the occurrence of any such situation.

- Monitor light and UV levels to which the BN collections and sensitive building parts are exposed by using, respectively, portable light/lux meters and UV meters. In case of suspicion of thermal effects due to IR radiation, use a conventional thermometer to verify the magnitude of the effect.

- Consider the need for using dosimeters to measure the exposure of sensible and valuable collection items on display.

4. To RESPOND to the risk:

- Take the necessary action to correct any detected nonconformity concerning AVOID and BLOCK procedures and measures.

- Upon detection of any (ongoing) decay process caused by light/radiation affecting the BN collections or building, determine its cause and take measures to solve it. These measures may include: removal, substitution, or relocation of light sources; removal or relocation of affected collection items; installation of physical barriers to block or reduce the intensity of incident light/radiation; reduction of exposure time. Send affected items for conservation-restoration treatments as necessary.

- If unexpectedly and unacceptably high levels of light (lux) or UV radiation are measured in collection areas, determine their cause and take necessary measures to solve the problem (see above).

5. To RECOVER from the risk:

- Conserve-restore collection items and building elements damaged by light and/or UV/IR radiation, taking into account the degree of urgency/priority and the available capacity.

Responsibilities for implementation:

- BN risk management team
- BN administrative maintenance team (facility manager)
- BN architecture and engineering team
- BN fire brigade
- BN security & surveillance team
- BN collection storage teams and managers
- BN conservation-restoration teams and managers

8°. Incorrect temperature

9°. Incorrect relative humidity

Damage and loss of value to the BN collections and building due to the action of incorrect temperature and incorrect relative humidity.

1. To AVOID the risk:

- Avoid sources of incorrect relative humidity, particularly in collection storage, use, and display areas of the BN. This includes: preventive maintenance of the air conditioning system; proper maintenance, operation, and drainage of dehumidifiers; preventive maintenance of the building plumbing system to avoid (chronic) leak problems; preventive maintenance of the roof, ceilings, windows, external walls, and other openings in the building envelope to avoid (chronic) infiltration problems; preventive maintenance of the building drainage system to avoid accumulation of water; appropriate execution of cleaning procedures involving water.

- Avoid keeping or displaying collection items under conditions of incorrect temperature and/or incorrect relative humidity, particularly those of higher value and sensitivity. This includes: avoiding direct contact or close proximity to damp exterior walls and cold/damp floors; avoiding excessively humid or warm areas (see DETECT); promoting air circulation to avoid the creation of localized warm or damp conditions/areas inside the building, etc. Consider the need for relocating collection items to protect the more valuable and sensitive ones.

- Strictly avoid exposure of collection and other heritage items to direct sunlight.

- Consider the need and possibilities to avoid excessively high temperatures inside collection areas by managing the opening and closing of windows during working hours, provided that no collateral risks of water, pollution, pests, light/radiation, and theft are introduced.

- Consider avoiding the exposure of sensitive and valuable collection items to conditions of incorrect temperature (and incorrect relative humidity) by producing and providing access copies (digital, microfilm, etc.), and sending the originals for permanent cold storage.

- Avoid sealing collection items with excessively high moisture content inside moisture-impermeable packages/enclosures. Avoid exposure of items eventually packed/stored this way to spatial temperature gradients, thus avoiding temperature differences within the package/enclosure, which may cause condensation.

- Avoid overheating of computers and digital collection storage devices at the BN.

- Properly inform all BN staff about ongoing measures to prevent damage to the BN collections and building caused by incorrect temperature and incorrect relative humidity.

2. To BLOCK the risk:

- Consider the need for waterproofing and/or installing additional barriers against the infiltration of rainwater and groundwater into the BN building.

- Consider the need and possibilities for improving the thermal and hygric inertia of the BN building.

- Systematically carry out preventive maintenance of the BN air conditioning system, ensuring its correct and continuous functioning to “block” incorrect temperatures and incorrect relative humidities inside the building, particularly in collection areas. Ensure proper operation, maintenance and updating of all climate management software and hardware used at the BN.

- Systematically carry out preventive maintenance of all (de)humidifiers in use at the BN, ensuring their correct functioning to “block” incorrect relative humidities inside the building, particularly in collection areas.

- Consider the need and possibilities to improve the sealing capacity of collection storage and display furniture to block the entrance of excessively humid air and dampen (extreme) fluctuations in relative humidity. If this measure is adopted, ensure the absence of spatial temperature gradients inside sealed spaces, as well as the collateral risk of contamination by pollutants eventually produced/accumulated therein (e.g. from off-gassing of furniture materials). Consult with experts about the benefits and collateral risks of this measure in the specific context of the BN.

- Consider the need and possibilities of using desiccants (silica gel, etc.) and/or hygroscopic materials for passive control of relative humidity inside showcases and other storage/display furniture at the BN. Consult with experts about the benefits and collateral risks of this measure in the specific context of the BN.

- Consider the need and possibilities to improve the sealing capacity of collection items' enclosures and packages to block the entrance of excessively humid air and dampen (extreme) fluctuations in relative humidity. If this measure is adopted, ensure the absence of spatial temperature gradients inside sealed enclosures/packages, as well as the collateral risk of contamination by pollutants eventually produced/accumulated inside those spaces (e.g. from off-gassing of packaging materials). Also ensure that the moisture content of eventually sealed collection items is not excessively high. Consult with experts about the benefits and collateral risks of this measure in the specific context of the BN.

- Thermally isolate hot or cold surfaces in the (close) vicinity of collection items or valuable building elements to prevent undesired heating or the creation of locally incorrect relative humidity levels due to temperature effects.

- Block the exposure of collection items and valuable/sensitive building elements to direct sunlight, preventing unwanted (over)heating.

- Consider cold storage of collection items of higher value and sensitivity to block incorrect (excessively high) temperature, for which access copies have already been or will be produced.

3. To DETECT the risk:

- Measure relative humidity and temperature levels inside collection areas at the BN to detect potentially harmful conditions. Monitoring of these two indoor climate parameters can be implemented at different levels: building, room(s), inside storage/display units, and/or inside individual enclosures/packages. Keep in mind that relative humidity and temperature can vary significantly in space and time. Ensure that all sensors and monitoring devices are properly calibrated and positioned to correctly measure temperature and relative humidity in the area(s) of interest. Consider the need for additional sensors or measurements to increase efficiency in detecting potentially harmful conditions to the BN collections and building. Ensure proper operation, maintenance and updating of all climate monitoring software and hardware used at the BN.

- Systematically keep temperature and relative humidity data measured/recorded at the BN for use in future analysis and (conservation) decision making.

- Systematically monitor collection storage and display areas of the BN to detect nonconformities concerning AVOID and BLOCK procedures and measures. Notify the BN conservation-restoration team about any problem or potentially dangerous situation detected.

- Remain vigilant for signs of damage to the BN collections and/or building possibly caused by incorrect temperature and/or incorrect relative humidity (e.g. mold outbreaks, deformation and/or fracture of hygroscopic materials, corrosion of metals, etc.). Notify the BN conservation-restoration team about the occurrence of any such situation.

- Remain vigilant for (chronic) leakage and infiltration problems in the BN building, particularly in collection areas. Notify the BN facility manager and conservation-restoration team about any problem detected.

4. To RESPOND to the risk:

- Upon detection of (potentially) harmful temperature and/or relative humidity conditions affecting the BN collections or building, take necessary measures to eliminate the problem as quickly as possible. These measures may include: identification and removal of heat and/or humidity sources; relocation or (temporary) removal of collection items from affected area(s), taking into account their value and vulnerability; deployment of dehumidifiers to reduce excessively high levels of relative humidity; (temporary) use of vapor barriers at different levels (as needed or appropriate) to protect collection items and/or building parts (see BLOCK). Review existing AVOID and BLOCK strategies.

- Upon detection of mold growth on collection items and/or valuable building elements, immediately isolate all affected items or, in case of a large-scale mold outbreak, the entire affected area to prevent the spread of spores (using appropriate personal protective equipment and taking the necessary care to avoid/minimize health risks to BN staff and users). Isolation of contaminated items should be done by sealing them in suitable boxes or bags, or using plastic films. Isolation of affected areas inside the BN building may include covering entire shelves/racks with suitable plastic (e.g. polyethylene) film, sealing entrances, vents, etc. with thick plastic

(polyethylene) sheeting and tape, etc. Strictly control access to isolated items or areas to minimize health and theft/dissociation risks. Identify the source(s) of incorrect (too high) relative humidity and remove it/them. If impossible to remove the source(s), lower the relative humidity by using a suitable amount of dehumidifiers and/or increasing air circulation. Consider the need for lowering the temperature of affected areas. Consider the need for (temporarily) removing collection items eventually present in the affected area(s) to a safe place within the BN building where relative humidity conditions are more appropriate. Deactivate the mold by air drying or freezing affected items as needed. Take all necessary precautions to avoid the dispersion of mold spores when handling affected items, preferably carrying out mold deactivation procedures in isolated, easy to clean areas capable of venting air directly outdoors. After deactivating the mold, assess the need for conserving-restoring affected items.

- Upon detection of other incorrect temperature or incorrect relative humidity-related processes such as the active corrosion of metals, and (excessive) buckling/waviness of documents on display, take the necessary measures to eliminate the problem (see above). Send affected items for conservation-restoration treatments as necessary.

5. To RECOVER from the risk:

- Conserve-restore collection items and building elements damaged by incorrect temperature and/or incorrect relative humidity, taking into account the degree of urgency/priority and the available capacity.

Responsibilities for implementation:

- BN risk management team
- BN administrative maintenance team (facility manager)
- BN architecture and engineering team
- BN fire brigade
- BN security & surveillance team
- BN collection storage teams and managers
- BN conservation-restoration teams and managers

10°. Dissociation:

Dissociation of items and/or information affecting the BN collections and/or building.

1. To AVOID the risk:

- Develop and systematically adopt procedures to ensure that books and other documents of the BN collections are correctly returned to their storage places after being used, avoiding misplacement or loss of items within the building.
- Develop and systematically adopt a procedure for tracking books and documents within the BN using the bar code identification system already in place. Ensure proper and continuous functioning of this system through preventive maintenance and updating as needed. Consider the need for additional collection management and tracking systems or tools.
- Systematically identify and inventory all BN collection and other heritage items. Ensure the use of robust, efficient, and durable identification and inventorying systems and materials.
- Systematically make safety (backup) copies of inventories, records, or any other documentation containing relevant information about the BN collections and building. Ensure proper security and accessibility of these copies. Consider storing a backup copy of this documentation in a safe place outside the BN building.
- Avoid loss of access to machine-readable records (e.g. audio, video, computer) belonging to the BN collections due to format and/or hardware obsolescence by systematically carrying out preservation reformatting and/or ensuring the availability and proper functioning of the corresponding reading equipment.
- Carry out strict quality control whenever reformatting or copying data/information belonging to or relevant to the BN collections and building to avoid (irreversible) losses.
- Carry out strict quality control whenever acquiring and managing relevant digital images, metadata, and contextual information associated to the BN collections and building.

- Properly inform all BN staff about ongoing measures to prevent dissociation.

- Instruct users as to the proper handling of collection items to avoid damage to or loss of identification labels/tags during use.

2. To BLOCK the risk:

- No applicable measures.

3. To DETECT the risk:

- Conduct periodic inspections using appropriate (statistical) sampling methods to detect dissociated collection items (misplaced or lost within the BN building) and other possible dissociation problems (e.g. damaged or missing identification labels/tags, etc.). Report any problem detected to the staff member(s) responsible for the affected collection.

- Systematically monitor AVOID and BLOCK systems and procedures to detect nonconformities. Report any problem detected to the responsible staff.

- Keep a strict record of all knowingly dissociated items of the BN collections.

- Review, to the extent possible, relevant data and information about the BN collections and building that have been transcribed or migrated, in order to detect possible losses.

4. To RESPOND to the risk:

- Take the necessary measures to eliminate all dissociation problems detected. These measures may include: returning found collections items (previously dissociated) to their correct location; replacing damaged or missing identification labels/tags; improving identification, inventorying, tracking, migration/reformatting, digitization, and backup systems and procedures as needed.

5. Para RECUPERAR o patrimônio:

- Purchase new items for the BN collections to replace dissociated ones.
- Repeat reformatting, migration, digitization, and equivalent procedures as feasible to recover relevant information that has eventually been lost.

Responsibilities for implementation:

- BN risk management team
- BN collection storage teams and managers
- BN conservation-restoration teams and managers

VI.4. Risk treatment monitoring and review

The risk treatment measures and strategies described above will be continually monitored and reviewed by the BN risk management team. This will include assessing and improving the efficiency and sustainability of measures/strategies already in place, as well as developing new ones as needed. Risk treatment measures that may prove ineffective or impractical in terms of costs and benefits should be discarded if they cannot be optimized.

VI.5. Health and environmental risks

The treatment of health risks to the BN staff and users, as well as of environmental risks associated to the BN activities, is implicit and must be strictly observed in all risk treatment measures outlined above. A detailed description of those risks and their treatment, however, is outside the scope of this plan. Nevertheless, some basic guidelines are presented below.

- Constitute, train, and equip a first aid team at the BN. Keep fully stocked and functional first aid kits in strategic locations of the BN building.
- Systematically update and keep readily accessible all relevant information about (hazardous) chemicals used at the BN (e.g. Material Safety Data Sheets, supplier specifications, etc.). Train staff who work directly with these products for their correct use, disposal, and containment/neutralization/removal in case of accidental leaks or spills.
- Properly identify all chemicals used at the BN, correctly storing them according to their degree of hazard and chemical (in)compatibility. Pay attention to their respective shelf life / expiration date, and keep only the minimum necessary amounts of these products inside the BN premises.
- Systematically use appropriate personal protective equipment (PPE) whenever necessary.
- Pay due attention whenever using/operating potentially hazardous tools and equipment (e.g. cutting tools, etc.).
- Avoid working alone, especially in higher risk environments such as laboratories, etc.

VI.6. Criteria for identifying collection items of higher priority for risk treatment, in particular for emergency response

The main criteria for identifying collection items that should be prioritized in risk treatment actions, in particularly when responding to emergencies such as floods, fire, structural collapse, etc., are presented below. Specific procedures concerning the location, labeling, security and access to these items will be established and continuously updated in order to optimize the management of risks to the BN collections.

Main prioritization criteria:

- significance to the BN's objectives
- municipal, regional, or national significance
- inclusion in UNESCO's Memory of the World Programme
- irreplaceability
- scientific value to the collection
- economic value as a collection or as a rare item

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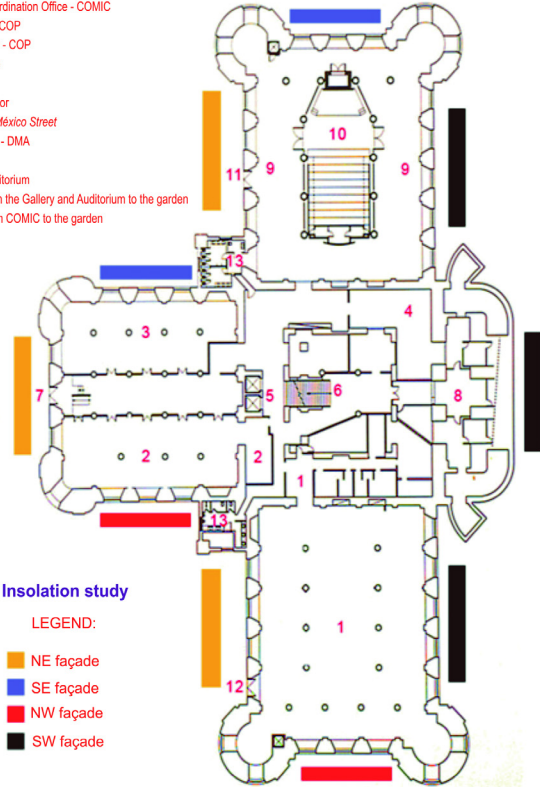
VIII. Annexes

Floor plans of the BN building

Ground Floor - México Street level

LEGEND:

1. Microreproduction Coordination Office - COMIC
2. Conservation Center - COP
3. Restoration Laboratory - COP
4. Data Processing Office
5. Lifts
6. Stairs to the second floor
7. Entrance/Exit door to México Street
8. Administrative Division - DMA
9. Eiseu Visconti Gallery
10. Machado de Assis Auditorium
11. Entrance/Exit door from the Gallery and Auditorium to the garden
12. Entrance/Exit door from COMIC to the garden
13. Toilets



Insolation study

LEGEND:

- NE façade
- SE façade
- NW façade
- SW façade

Façades indicated in red and orange absorb more radiation, which results in temperature increase inside the room. Avoid keeping/exhibiting collection items near the windows (orange and red). Sun Chart source: SOLAR software - Federal University of Santa Catarina.

Façades indicated in blue are exposed to incident solar radiation from 6:00 to 12:00 in the summer. There is virtually no insolation during winter, which results in moderate (direct) illumination near the windows in the morning, and reflected illumination in the afternoon.

Façades indicated in orange are exposed to incident solar radiation from 6:00 to 12:00 in the summer, and from 6:00 to 14:00 in the winter. Direct illumination in the morning and reflected illumination in the afternoon.

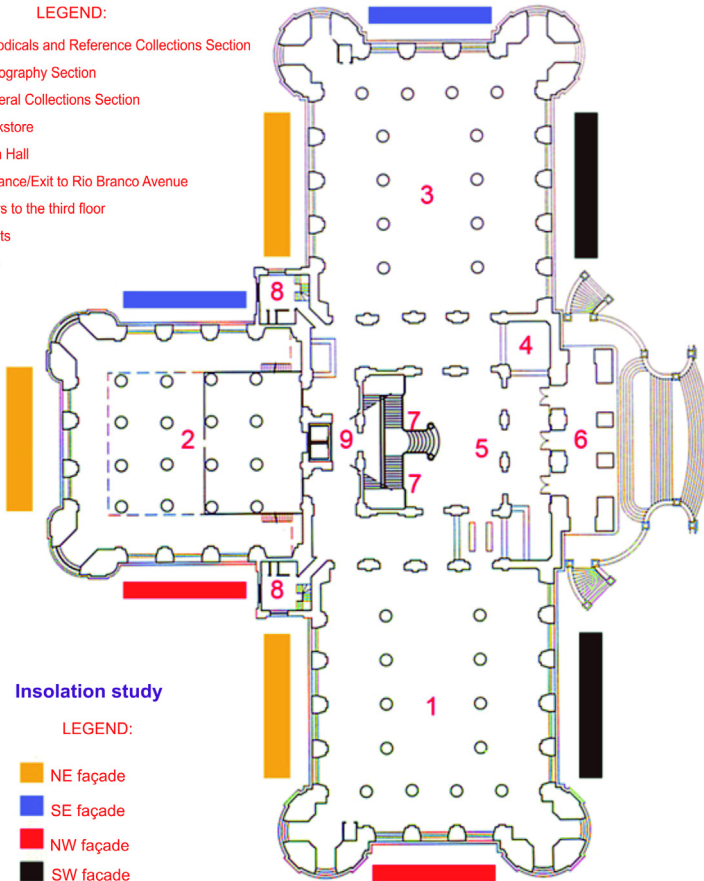
Façades indicated in red are exposed to incident solar radiation from 12:00 to 18:00 in the summer, and from 6:00 to 18:00 in the winter. Good illumination conditions during BN working hours.

Façades indicated in black are exposed to incident solar radiation from 12:00 to 18:00 in the summer, and from 13:00 to 17:00 in the winter. Reflected illumination in the morning and direct illumination in the afternoon.

Second Floor - Rio Branco Avenue level

LEGEND:

1. Periodicals and Reference Collections Section
2. Iconography Section
3. General Collections Section
4. Bookstore
5. Main Hall
6. Entrance/Exit to Rio Branco Avenue
7. Stairs to the third floor
8. Toilets
9. Lifts



Insolation study

LEGEND:

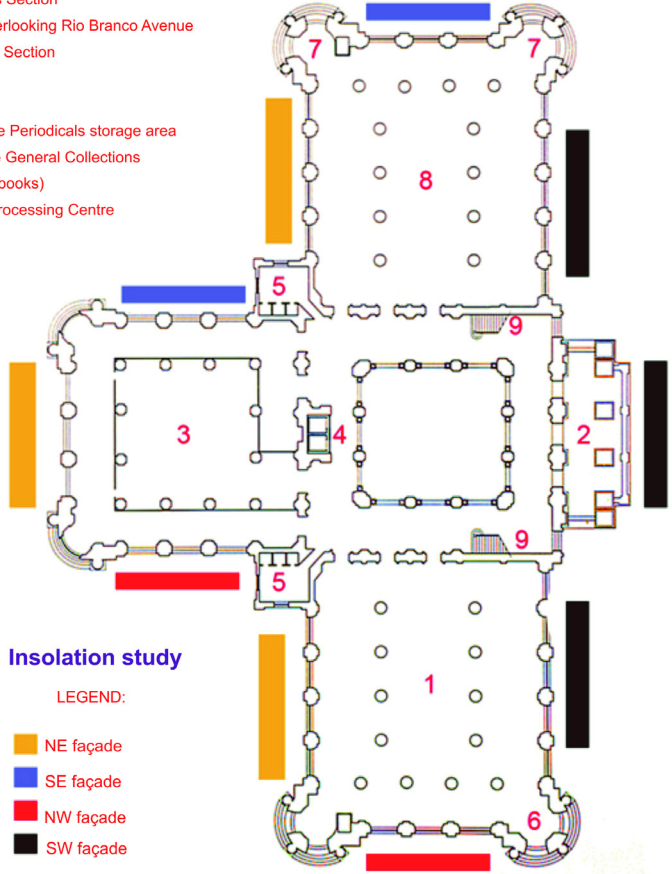
- NE façade
- SE façade
- NW façade
- SW façade



Third Floor

LEGEND:

1. Manuscripts Section
2. Balcony overlooking Rio Branco Avenue
3. Rare Books Section
4. Lifts
5. Toilets
6. Stairs to the Periodicals storage area
7. Stairs to the General Collections storage area (books)
8. Technical Processing Centre
9. Stairs



Insolation study

LEGEND:

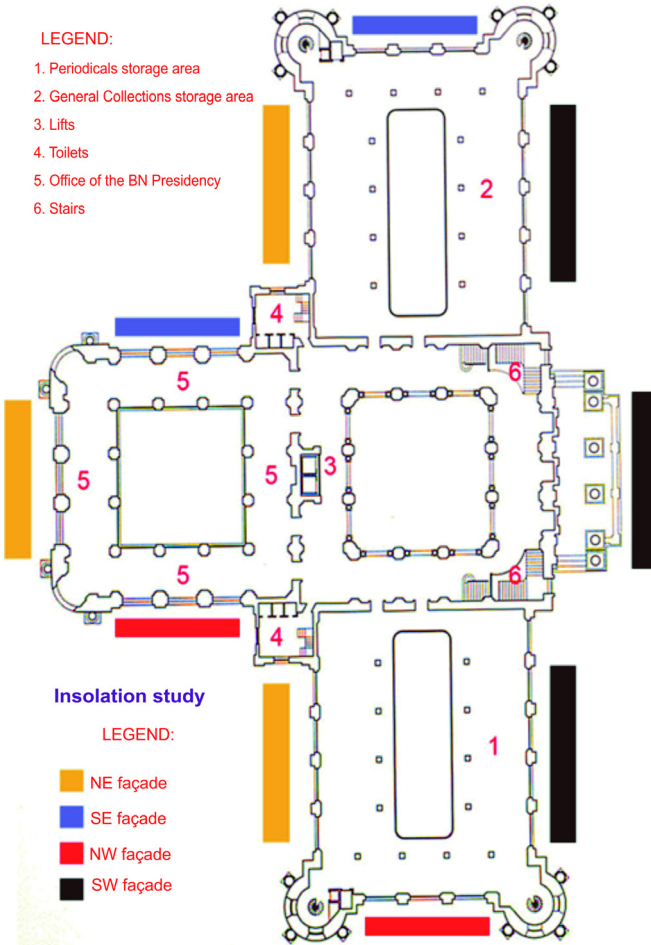
- NE façade
- SE façade
- NW façade
- SW façade



Fourth Floor

LEGEND:

1. Periodicals storage area
2. General Collections storage area
3. Lifts
4. Toilets
5. Office of the BN Presidency
6. Stairs



Insolation study

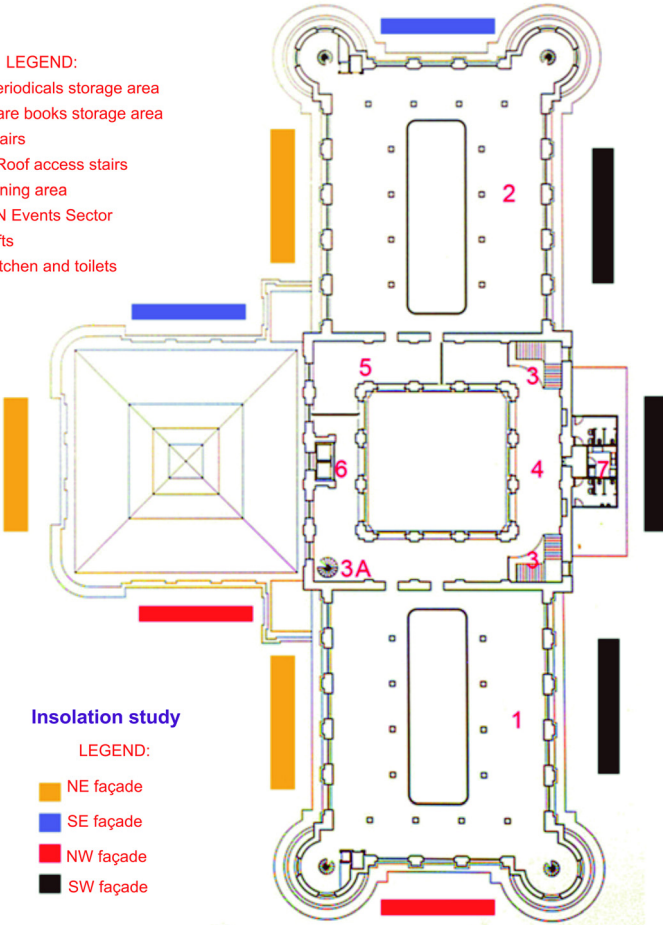
LEGEND:

- NE façade
- SE façade
- NW façade
- SW façade



Fifth Floor

- LEGEND:
- 1. Periodicals storage area
 - 2. Rare books storage area
 - 3. Stairs
 - 3A. Roof access stairs
 - 4. Dining area
 - 5. BN Events Sector
 - 6. Lifts
 - 7. Kitchen and toilets



Insolation study

LEGEND:

- NE façade
- SE façade
- NW façade
- SW façade



This *Risk management plan - safeguard & emergency* has been jointly produced for the Brazilian National Library by:

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