

The heritage at risk survey

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ABSTRACT: The Heritage at Risk Survey (Carta de Risco do Património Arquitectónico) was developed by DGEMN, as a new module of the Inventory of Architectural Heritage (IPA), technically orientated to the conservation condition of historic buildings. A specific methodology has been developed to ensure the survey of buildings with the use of new technology in order to meet the need of technical information for intervention within a useful time frame for decision taking on priorities and resources.

Its recent extension to the Urban Centres Inventory has produced an interesting tool for historic urban analysis as well as a useful planning instrument for local authorities, combining traditional inventory methods with well structured cartography and digital photographic surveys, enabling rapid and rich registers of our historic centres.

1 CONTEXT OF THE CARTA DE RISCO PROJECT

1.1 DGEMN's role and attributions

The Directorate General of National Buildings and Monuments (DGEMN) is a central service of the Portuguese Ministry of Social Equipment. It was created in 1929 with responsibilities for protecting and enhancing the architectural heritage and accommodating public services.

Concerning the architectural heritage, DGEMN's has promoted the conservation of historic buildings, the study and protection of traditional building techniques, research into conservation and consolidation methods, the inventory of the architectural heritage and the dissemination of information to the general public as well as to professionals. In addition DGEMN is responsible for 200 conservation and enhancement interventions a year, all over the country, through its technical body divided by four regional offices in Lisbon, Oporto, Coimbra and Évora.

As a central administration service, it has been DGEMN's concern to make available to everyone information on our architectural heritage. More than 70 years of activity and the legacy inherited from previously responsible institutions gave DGEMN a unique archival of technical and administrative information (architectural drawings, photographs and texts) that urged to be made available to a wider use. For that end an important project has been developed since 1990, promoting the development, study and organisation of the Inventory of the Architectural Heritage (IPA), that since then has grown into an information system encompassing five different databases (textual, drawings, photographic, administrative and technical data) managing 10.000 registers of historic buildings, gardens and urban centres.

1.2 The Inventory of the Architectural Heritage project

The Inventory of the Architectural Heritage (IPA) was developed as a solution to compile technical and administrative information concerning the Portuguese architectural heritage in the

country and its legacy throughout the world. The IPA consists of a computerised system for recording standardised and systematised data of a technical nature, which may be accessed by means of a semantic database. This textual database is complemented by a Documentary Sources database, that is, a digital archive resulting from the integration of graphic and photographic information created by transposition to a digital support of all our documentary holdings, comprising 220.000 technical drawings and 100.000 photographs.

Each of the 10.000 existing records is identified by a code number, corresponding to a register form containing 47 items of information, from its location, legal protection, typology, date of construction, author, chronology, materials, or interventions, complemented with all correspondent graphic and photographic information. The Inventory is open to public consultation with more than 4000 users since 1993 (approximately 470 users/year) and on the Internet at www.monumentos.pt since 1996.

Apart from its interest to the general public, professionals and academics, this new source of information facilitates the study and research prior to any quality intervention on the architectural heritage. It is a rather complex system where the collection, processing and dissemination of heritage information are essential vectors of a policy aiming at safeguarding and enhancing cultural values. Therefore it is essential to mention the IPA project as the starting point concerning the subject of the present paper, the Heritage at Risk Survey, a new module of IPA, technically orientated to the conservation condition of historic buildings.

1.3 *The European context of Buildings at Risk*

The responsibility over historic buildings, within a governmental perspective involves the awareness of the current condition of the national stock allowing a global perspective and planning of interventions, budgets and technical resources. Having the necessary information, that is documentation on the current condition of buildings, is therefore one of the most important premises for decision-makers to determine new management policies for the preventive conservation of the architectural heritage.

In this context, several central institutions in Europe started in the early nineties new strategic plans to achieve a global perspective on their national heritage. The *Istituto Centrale per il Restauro (Ministero per i Beni Culturali e Ambientali)*, in Italy, started a project called the *Carta del Rischio del Patrimonio Culturale* (The Risk Map of the Cultural Heritage) put to implementation in 1990, after a long maturing process since the Pilot Plan for the Umbria region in 1975. It consisted of a complex survey of the country's heritage, through different register forms developed for architecture, archaeology, museums, etc. With the use of a GIS system and statistical methodology, it enabled the production of several thematic maps (a total of 91) on the potential risks to the cultural heritage, from its territorial distribution to static-structural danger (earthquakes, landslides or flooding), erosion of stone materials and atmospheric pollution, just to name a few.

A similar approach was followed by English Heritage, the institution in charge of England's built heritage, promoting the Building's at Risk scheme in 1989 with a sample survey (results published in 1992), following a pilot study in 1986. It was a very pragmatic survey of England's heritage condition, based on a simple but effective survey of the condition and occupancy of buildings known to be at risk through decay and neglect (judged from an external inspection only) enabling fast results made into regional maps of building's at risk providing a broad picture of the historic buildings in England. In some cases, it stimulated further action by local authorities, and if pressure next to the owners proved unsuccessful, buildings could be compulsory purchased and structurally repaired by English Heritage to be exposed to the real estate market. It represents a very interesting approach to historic buildings in a large scale.

It becomes clear, from these experiences, that realistic information is essential to strategic planning, as the necessary resources are scarce to face large responsibilities and need to be targeted effectively. The question of priority arises as a key issue. It was in this context that in 1997, DGEMN started a new IPA module, the Heritage at Risk Survey, aimed at registering the conservation condition of our architectural heritage, through the diagnosis of building pathologies.

1.4 The Heritage at Risk Survey, a new module of the IPA

For the last four years, DGEMN has been developing the Heritage at Risk Survey based on a systematic collection of information to assess the condition and priority of intervention of individual buildings. It is important to mention, at this stage, that much of the information about the country's architectural heritage was already available from crossed research on the IPA database, enabling the output of geo-referenced thematic maps on the general condition of historic buildings in a given territorial area, combined with its listed status and ownership. But the necessary technical information on the building's fabric and detailed conservation condition was particularly important to decide on the priority of intervention considering the necessary funds.

That was the aim of a new survey method, in order to produce updated information of a technical nature in a time effective way. Furthermore, it would provide our own technical staff with a useful and normalised tool to prepare conservation project and cost estimates.

2 DEVELOPMENT OF THE PROJECT

2.1 The development of a data form

The Heritage at Risk Survey began with the development of a specific survey form oriented to the conservation condition of any historic building, that is to say a simple and effective way to evaluate the condition and performance of a building, regardless of its age, architectural style, construction technique, materials or typology. In addition, it was considered that as a new module of the IPA, the survey form would have to consider the basic requisites of any database, regarding standardised data.

It worth saying that, contrary to English Heritage's methodology, it was decided that buildings were to be evaluated in detail, including full access to the interior and structure, opposed to a brief external view assessment. In our view, it is essential to have a full picture of the building's condition in order to define its risk category, and that can only be achieved through a thorough inspection of the building's structure. That meant not only qualified building professionals but also a time consuming effort to guarantee access to various buildings.

At the same time, we have found that having a previous knowledge of the building's characteristics and history helped programming and understanding its fabric and eventual pathologies. For that purpose, the first step towards any building inspection is the research of the IPA database, for architectural plans, older photographs and textual information (some buildings surviving the 1755 earthquake of Lisbon, still show fissures and recent interventions or a fire event are always important information to consider). This information is updated and completed on-site.

2.2 Structure of the data form and assessment of the building

Considering the wide scope of DGEMN's attributions, buildings to survey included such different structures as timber frame, masonry, cast iron or concrete structures, each one carrying different approaches to particular architectural or structural elements and respective pathologies. That meant that the survey form had to be as much versatile as possible to match any building. The result was a matrix-form dividing a building in four parts (Exterior, Interior, Infrastructures and Decorative Arts), each part into groups (i.e. Roof, facades and foundations) and each of these groups divided into its different elements following the same logic (structural, finishing and additional elements).

Once every element was identified, it was easier to survey it, relating to the material it was made of, the visible pathology, its probable cause together with a classification of the degree of damage or danger for the building, following a scale from 1 to 4:

- 1; Good. The element is intact and shows little or no evidence of decay and performs regularly. It requires only preventive maintenance.
- 2; Fair. The element shows failure or decay, with reversible damage. It does not compromise its performance or the general structure of the building. It requires only consolidation and

preventive maintenance.

- 3; Bad. The element shows signs of neglect or serious bad performance, beyond simple consolidation or localised intervention. Its conservation condition compromises its performance and the general condition of the building. It requires extensive repair or partial replacement.

- 4; Ruin. The element is not corresponding to its required performance, due to neglect or decay. It involves loss at a structural, functional or aesthetic level. Its conservation condition puts at risk the building including structural collapse, cultural loss and danger to people in the building. Total replacement of the element.

All data recorded during the survey of a building is thus structured into this form containing the construction details, components, materials, pathologies and respective causes. Every element is assessed individually and given a classification, creating an easy-to-read document of the building's pathologies and main problems. Additionally, guidelines and a word list were developed to guarantee a standardised and systematised recording data of a technical nature, corresponding to a future database. Furthermore, the surveyor is given space for a short personal note on the building's condition and inspection, so that any relevant information is not left out by the rigid structure of the survey form. This information is naturally complemented on-site by drawings and notes on available architectural plans and elevations and a photographic record of pathologies is obtained by rectified metric photography, using a digital camera.

Once a global assessment is obtained, the building is attributed a global risk category and priority level, considering its listing grade, rate of deterioration and urgency of action, providing a means of prioritising both short and long term actions. Risk assessment is based on the general condition of the building:

- In fair to good repair
- Slow decay
- Quick decay
- Immediate risk or rapid deterioration or loss of fabric.

Priority for action is graded as follows:

- No intervention is needed, just regular maintenance
- Long term intervention with preventive maintenance
- Short term intervention with immediate consolidation
- Ruin beyond effective intervention

2.3 The development of a survey methodology on-site

The inspection on-site includes the photographic survey of the structure, through rectified metric photography, using digital cameras with high resolution capacity and a laser distance measuring device. It aims to obtain a record of the building, encompassing the architectural register with its conservation condition, through a photographic register that can be worked in office to maximum effect. The concept behind it is to replace the traditional hand-measured survey - a long and difficult method implying the manual transference of information to the computer in order to obtain architectural drawings - by a simple and effective register that combines both the detailed register of pathologies, with the scaled survey of facades enabling a ready output to AutoCad. As a rough guide, a day's fieldwork with this method is equivalent to a month's work with the traditional methodology.

The system is based on the use of specific software that corrects the vertical distortion of digital photographs creating a rectified image with respect for scale, given the software requirement to introduce scaling parameters registered on-site using laser technology with 97% accuracy (a margin error of 2mm in 100 meters).

All textual and iconography data is then processed in order to quantify existing problems. The software enables alphanumeric data to be complemented with graphic records from rectified digital photography on the type, area and depth of decay. It does so with the automatic association of a pathology table, relating to the scaled register of decayed areas, providing us with a simple and rapid evaluation of the costs of repair involved. It is also possible to produce a vectorial drawing - exportable on DXF files into AutoCAD - of wall elevations showing structural defects and indicating a list of repairs. The result is a user-friendly technical information associating the rectified photographic survey - or computer drawings produced by this system - with an annexed table containing the number and depth of pathologies found. This

information will help to establish a priority action based on realistic information in a very effective time frame.

The software application is presently being developed on demand of DGEMN, in order to include specific features adapted to our national heritage characteristics, such as materials and common pathologies matching our traditional construction techniques.

3 METHODOLOGY

3.1 A sample survey of 150 buildings

For the initial validity of the method, it was decided to survey several buildings existing on the IPA database, considering the cultural importance, ownership or legal responsibility and location. For that purpose during the period of one and a half years, a sample survey of almost 150 buildings was produced, according to the developed register form, and a simple digital photographic record of pathologies. Considering a total of 3.000 registers of historic buildings alone, the number of buildings surveyed corresponds to approximately 5% of all registers, a substantial sample.

There has been no statistical work to the information gathered so far as the project has moved into a new concept of survey, which favours particular buildings of significant cultural value in need urgent repair or funding application reports. Following the demand from various public and private institutions, both in Portugal and abroad, the Heritage at Risk Survey has produced in the last two years a different type of work, including the survey of the Cathedral of Funchal (Madeira), the Church of N^a S^a of Rosário (Cape Verde), Valflores Manor (Santa Iria de Azóia, outside Lisbon) and the Castle walls of Tavira.

3.2 The collaboration with the Urban Centres Survey

Having proved an important and valid tool for the survey of buildings, the methodology developed for the Heritage at Risk Survey was adapted to a new IPA segment, the Urban Centres Inventory, emerging from the need to manage an integrated inventory according to the most recent international conventions promoted by UNESCO, defending heritage values within the urban and territorial context.

Following specific guidelines, the historic research is structured into a register form, and all textual information is indexed to thematic cartography such as location, toponomy, building typologies and use, urban growth and conservation condition, among others. Moreover, it is complemented by historic cartography, photographic documentation and the rectified metric register of areas of cultural significance within the historic centre.

This information is based on streetscape survey with the same technology developed for the register of individual buildings. Furthermore, this method creates an archive of information that can be used later for the production of architectural elevations, and becomes an invaluable tool for historic investigation and urban planning and management at a local authority level.

In straight collaboration with the Urban Centres Inventory, the Heritage at Risk Survey has contributed to the study of six historic centres in Portugal (Ucanha, Montemor-o-Novo, Funchal, Montemor-o-Velho, Monção, Valença and Tavira), the Old City (Santiago, Cape Verde) and the listed conservation area of the historic centre of Sobral, in Brazil.

3.3 The CR&CU team; resources and productivity

It is important to mention the human and technical resources for these projects, which include three architects and an art historian, in a team of four elements only (of which the author of this paper is a member). Although, it is a small team, with the use of such methods a considerable productivity has been possible over the last two years, including on-site and office work. Considering distant places as Brazil or Cape Verde, with all the practical difficulties that such different geographical places and cultural locations naturally carries, the precious help from local authorities providing us with available information, was also an important contribute to our work. Regarding the technical equipment, it involved three digital cameras, one laser measuring

device and the necessary software licenses, representing an average investment of 1750 Euros (350.000 Pte.) by working place. A considerably low cost.

4 CONCLUSIONS

The development of the Heritage at Risk Survey project brought both a new inventory method and a new concept of heritage planning. The survey methodology makes it easier to obtain archival records; faster to produce than hand measured surveys of comparable accuracy, and involving reduced resources. Such systematically organised data represents an invaluable instrument for a realistic strategy planned to make the best use of resources. It introduces new perspectives for intervention and preventive maintenance plans regarding the national architectural heritage. Moreover, data analysis leads to the establishment of intervention priority criteria, the definition of preventive maintenance plans, the study of causes of decay, assessment of potential risks, organisation of specific technical information, as well as to systematic updating of the IPA databases.

It has been DGEMN's commitment to develop a simple tool that proves helpful to the management of our cultural heritage, but at a national scale it overcomes the central administration responsibility and calls for the involvement of local authorities. The diffusion of the Heritage at Risk methodology is now being transmitted to every partner at a local authority level to allow a unique system of work and information, as DGEMN's capacity is limited, and needs to be enlarged to cover the entire national territory. Action has been taken on two presentations at the Regional Coordination Commission offices in Oporto and Coimbra, to a number of technicians from the Local Technical Offices (GTL's). A first experiment on site was developed with the municipality of Monção, in the North of Portugal, for the demonstration of the methodology, which was a success, with more than 18 technicians from several northern municipalities.

At DGEMN, we believe that more than a legal frame, it is through valuable information that heritage is best protected and enhanced. It must be done so with effective inventory tools ensuring critical and updated information on our heritage. It is also our belief that this information should be shared with all public and private institutions or individuals for a better-integrated management of cultural resources.

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