

Conservation, climate change and energy sobriety in historic houses
4 and 5 April 2024, Chantilly and Versailles

CONSERVATION CLIMATE CHANGE AND ENERGY SOBRIETY IN HISTORIC HOUSES

EPICO Programme 2023 - 2025



European Protocol In Preventive Conservation

Danilo Forleo

Preventive Conservation

Musée National des châteaux de Versailles et de Trianon

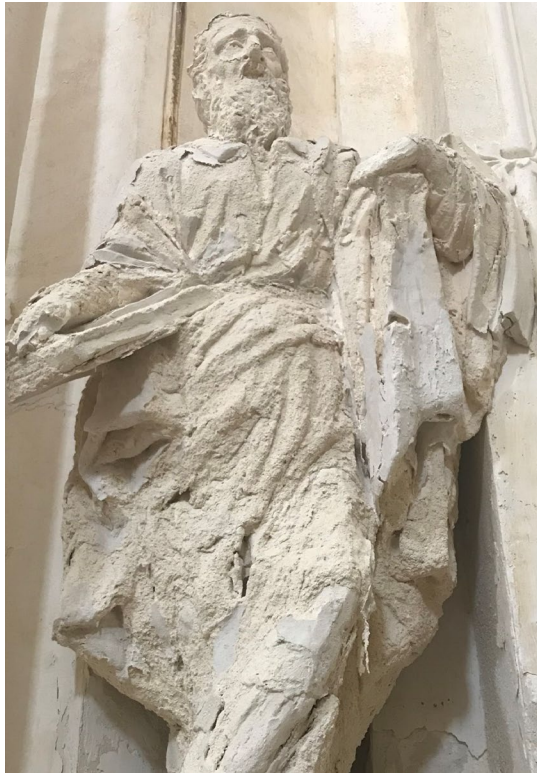
danilo.forleo@chateauversailles.fr



Soutenu
par



CHANGING MENTALITIES: Overcoming the dichotomic approach...

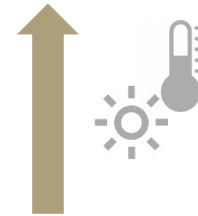


Limestone sculpture, Italy, inherent degradation and climate interaction,
© Danilo Forleo/ Château de Versailles



CLIMATE &
Sustainability

CONSERVATION



Le Premier Ministre

Paris, le 13 avril 2022

N° 6343/SG

à

Mesdames et Messieurs les ministres
Mesdames et Messieurs les ministres délégués
Mesdames et Messieurs les secrétaires d'État
Mesdames et Messieurs les préfets

Objet: Ajustement des conditions de chauffage des bâtiments de l'État, de ses opérateurs et accompagnement des projets en cours permettant des réductions de consommation de gaz.

| | |
|----------------------------|---|
| Référence | 6343/SG |
| Date de signature | 13 avril 2022 |
| Emetteur | Premier ministre |
| Objet | Réduction de la consommation de gaz naturel pour le chauffage des bâtiments de l'État et de ses opérateurs |
| Commande | Consignes de chauffage des bâtiments de l'État et de ses opérateurs, et mise en œuvre rapide des projets en cours afin de réduire la consommation de gaz naturel |
| Action à réaliser | Vous veillerez à l'application des mesures prescrites par la circulaire pour ajuster la température de chauffage des bâtiments de l'État et de ses opérateurs. Vous inciterez les collectivités territoriales et les acteurs économiques à appliquer des mesures similaires. Enfin, vous encouragerez l'achèvement rapide des travaux déjà engagés permettant de réduire les consommations de gaz, ou plus largement d'énergies fossiles d'ici l'hiver prochain |
| Echéance | Effet immédiat |
| Contact utile | Direction générale de l'aménagement, du logement et de la nature (DREAL), Direction de l'immobilier de l'État (DIE). |
| Nombre de pages et annexes | 4 pages – 1 annexe |

Le contexte international actuel a un impact sur les conditions d'approvisionnement du pays en gaz naturel, et doit conduire à une vigilance immédiate de l'ensemble des acteurs sur son utilisation. Le recours à cette énergie représente en effet environ 40 % de la consommation totale en énergie du parc immobilier de l'État et de ses opérateurs, et concerne principalement le chauffage des locaux.

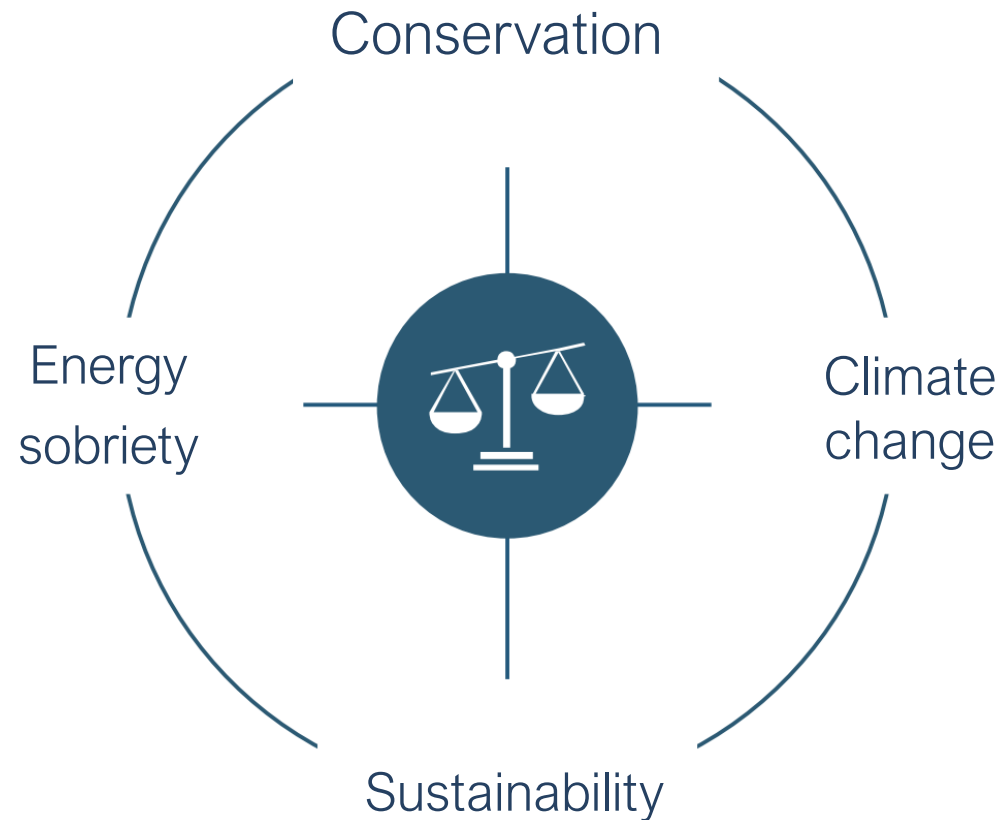
Plus largement, cette vigilance s'inscrit pleinement dans les objectifs de réduction de 60% de la consommation énergétique globale du parc immobilier tertiaire à l'horizon 2050, tels que fixés par l'article 175 de la loi n° 2018-1021 du 23 novembre 2018 portant évolution du logement, de l'aménagement et du numérique (dite « loi ELAN »).

L'État – et plus largement l'ensemble des acteurs économiques – doit prendre toute sa part dans la réduction du recours à cette énergie fossile et contribuer à réduire dès à présent sa consommation pour réduire les possibles tensions d'approvisionnements l'hiver prochain. En effet, tout volume de gaz qui n'est pas consommé en cette fin d'hiver 2021-2022, pourra être utilisé l'hiver prochain.

Circular no. 6343-SG of 13 April 2022
on adjusting heating conditions in State buildings (...) to reduce gas consumption

CHANGING MENTALITIES:

Overcomes the dichotomic approach towards a systemic approach



CULTURAL HERITAGE & CLIMATE CHANGE:

Current state of knowledge



<https://www.ipcc.ch/about/>

+ 2°C

expected temperature increase
compared to pre-industrial times

→ Catastrophic effects on CH

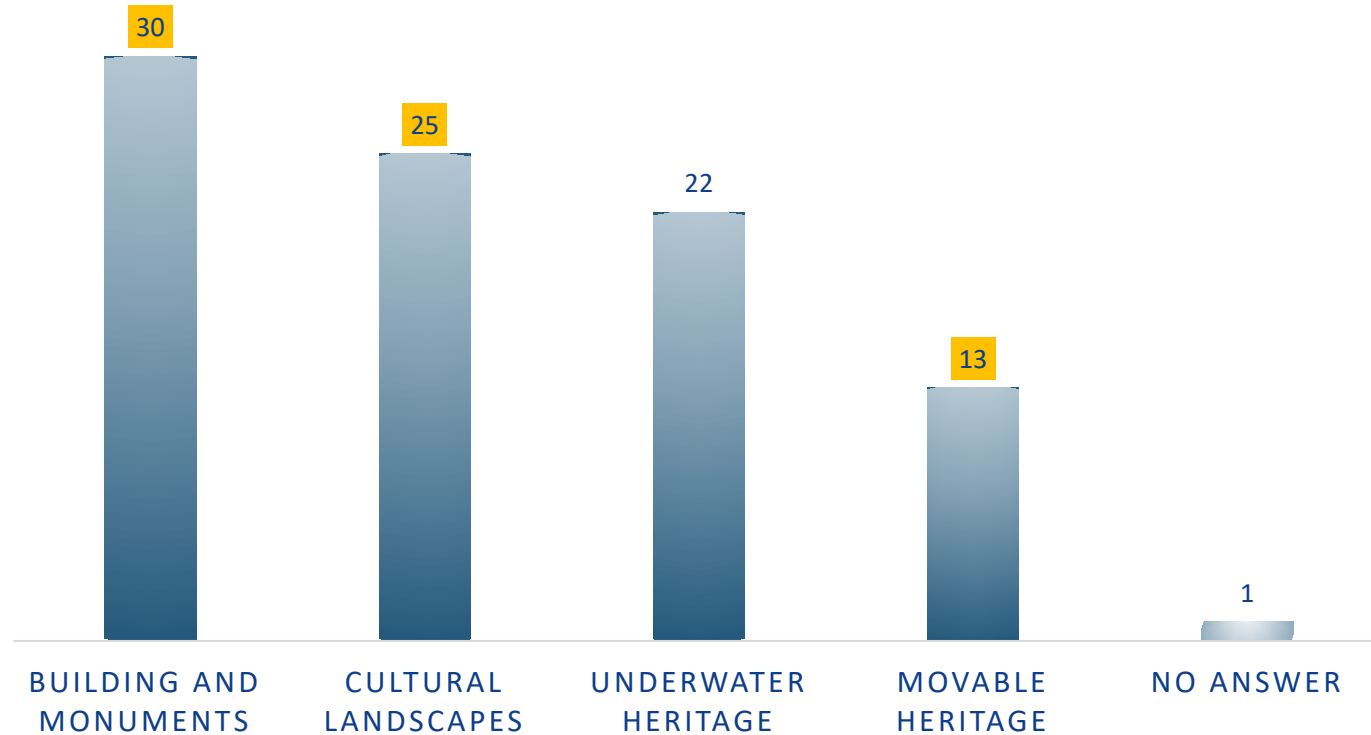
+ 1.5°C

is the target for mitigating the effects

→ Carbon neutrality by 2050

CULTURAL HERITAGE & CLIMATE CHANGE:

The risk by type of heritage: the UE assessment



Examples of historic houses: buildings, gardens, collections
© Domaine National de Chambord
© ToucanWings/ Wikipedia,
© Christian Milet/ Chateau de Versailles

Results of 83 case studies from 26 EU countries

State of play, with the number of responses from the OMC expert group members concerning policies addressing cultural heritage (CH) and climate change (CC) [1]

A SPECIFIC CONSERVATION SYSTEM : HISTORIC HOUSES AND PALACE-MUSEUMS




Vue aérienne du domaine de Versailles le 20 août 2014, © YoucanWings - Creative Commons By Sa 3.0, Wikipedia

A SPECIFIC CONSERVATION SYSTEM : HISTORIC HOUSES AND PALACE-MUSEUMS

With high potential: 75% of EU Historic buildings could improve their energy efficiency



Schloss Schönbrunn
Schönbrunn Palace
Austria
Twitter Instagram Facebook




Schloss Eggenberg
Eggenberg Palace
Austria
Twitter Instagram Facebook



Palais du COUDENBERG
Coudenberg Palace
Belgium
Instagram Facebook



KULTUR STIFTUNG DESSAU WÖRLITZ
KulturStiftung Dessau-Wörlitz
Germany
Instagram Facebook



SCHLOSSERLAND SACHSEN
State Palaces, Castles and Gardens of Saxony
Germany
Instagram Facebook



Kongernes Samling
The Royal Danish Collection
Denmark
Facebook




KULTURMINISTERIET
MINISTERIET
AGENCY FOR CULTURE AND PALACES
Danish Agency for Culture and Palaces
Denmark
Facebook



FREDERIKSBORG
Museum of National History
Frederiksborg Castle
Denmark
Twitter Instagram Facebook



CHÂTEAU DE VERSAILLES
Palaces of Versailles and Trianon
France
Twitter Instagram Facebook



Château de Chambord
Château of Chambord
France
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© Screenshot of the website of The Network of European Royal Residences

THE IMPACT OF CLIMATE ON PALACE MUSEUMS

Initial findings of the assessment results in the European partner of the
EPICO program



European Protocol In Preventive Conservation

Danilo Forleo

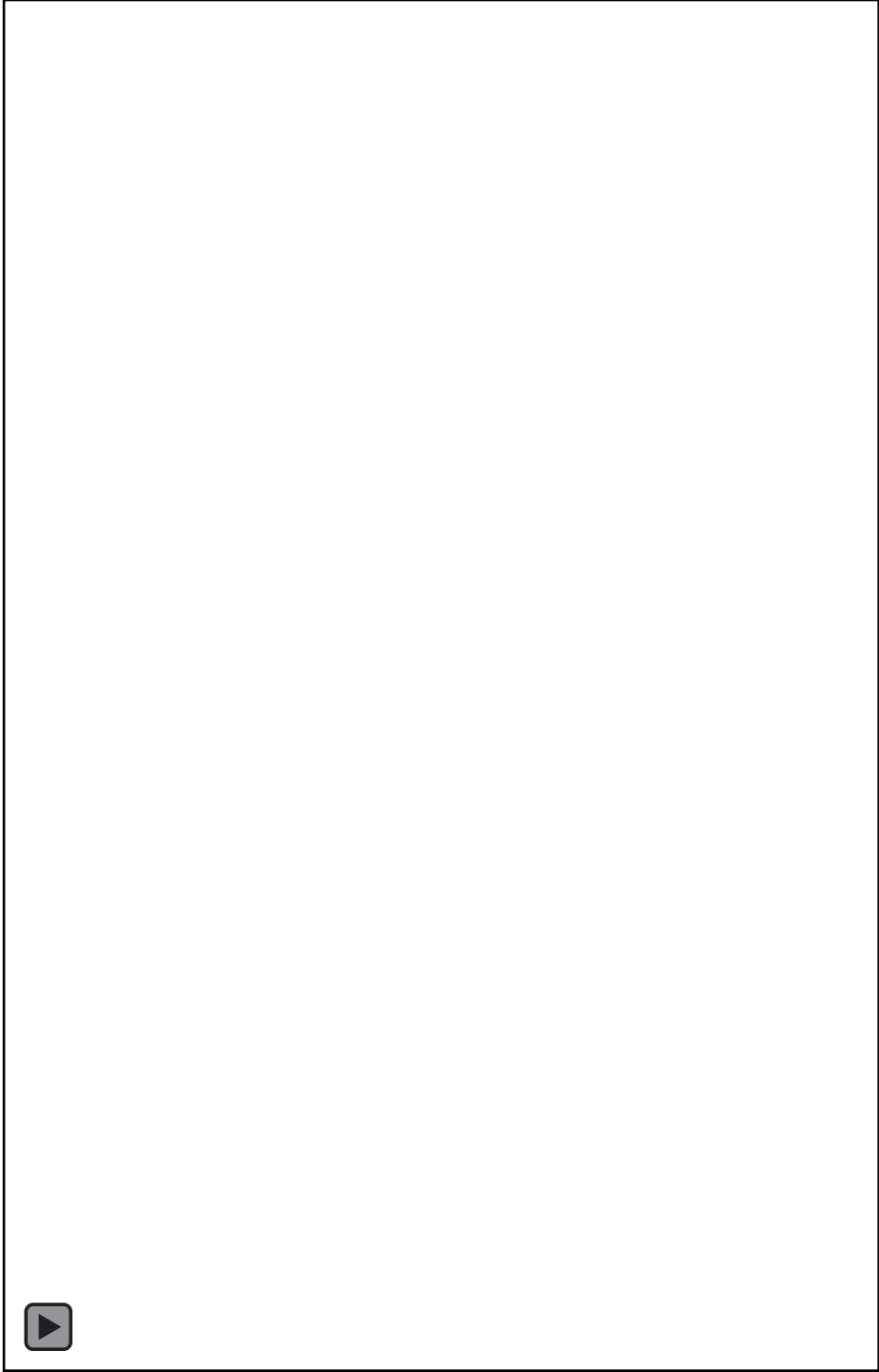
Preventive Conservation

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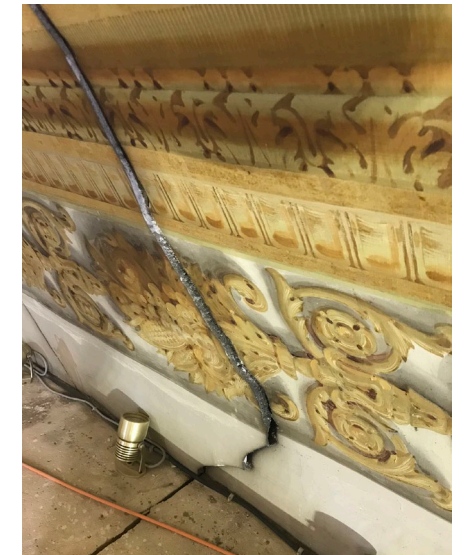
OUTLIINE

1. International et National policies
2. Results of EPICO assessments
3. Goals of the new EPICO programme

REPORTS AND RESOLUTIONS IN INTERNATIONAL POLICIES

Consequences of rising temperatures

- Increased pressure on air handling systems
(risk of using of air conditioning instead of investing in insulation)
- Capillary rise and crystallization of salts
- Increased pest and biological contaminants
- Cracking of organic porous materials
- Cracking of decor due to clay soil movement
- ..



Examples of climate-related risks and damages, © Danilo Forleo/ Château de Versailles

REPORTS AND RESOLUTIONS IN INTERNATIONAL POLICIES

A convergence of intents

→ Assess

→ Raise awareness

→ Rediscover traditional methods

→ Focus on passive methods

→ Transdisciplinary approach

→ ...

International agreements and cooperations



European working groups



National agreements and cooperations



International non-governmental organizations





EPICO METHOD

European Protocole in Preventive COnservation for Historic Houses

13 APPLICATIONS

5 EU COUNTRIES

150 TRAINED PROFESSIONALS

6.588 DIAGNOSTICS

1.207 OBJECTS EXAMINED

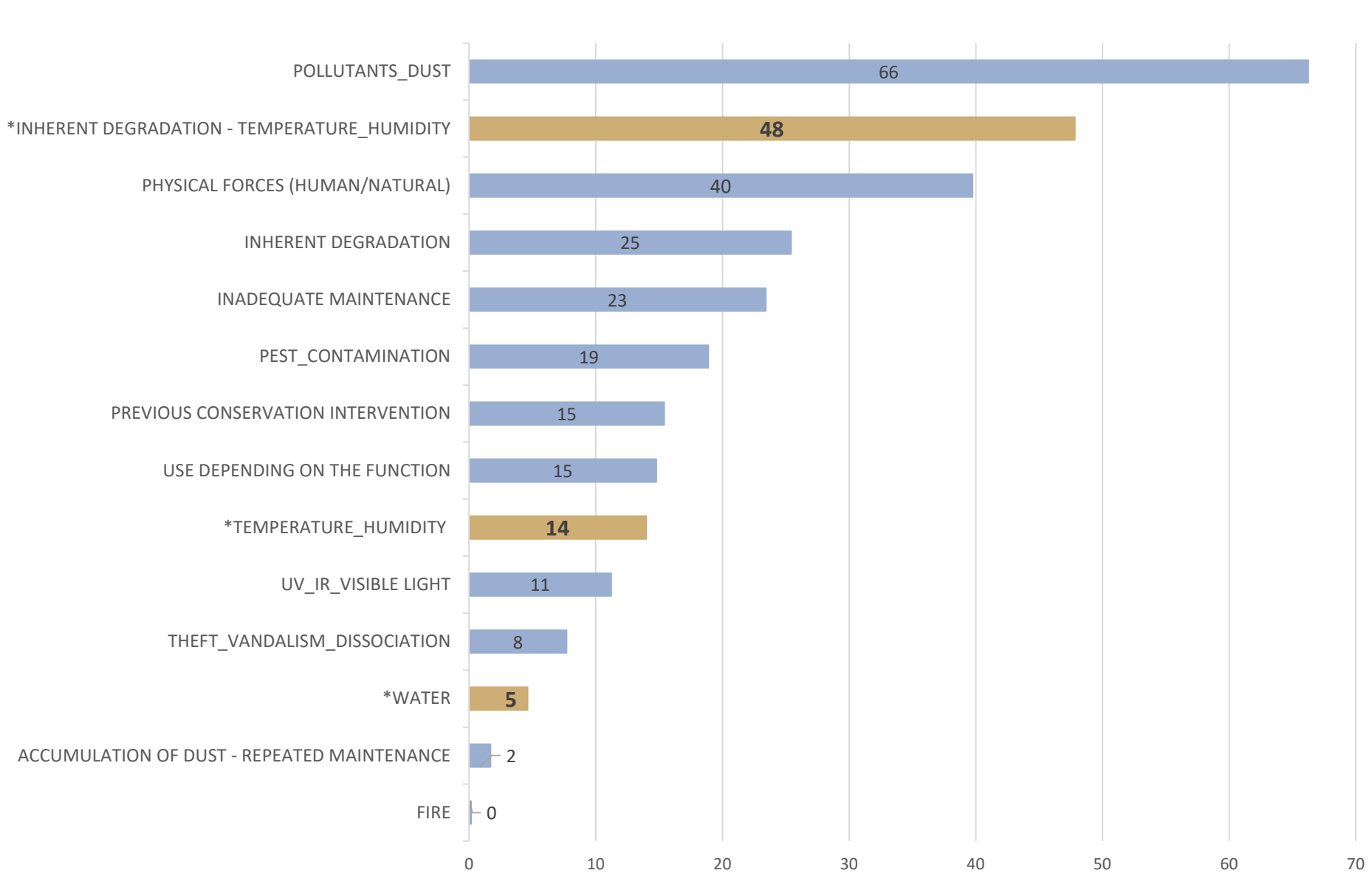


- ▶ specific to historic houses
- ▶ systemic approach
- ▶ cause /effect relationship
- ▶ provide comprehensive vision
- ▶ be replicable/ transferable



RANKING OF DAMAGE CAUSES

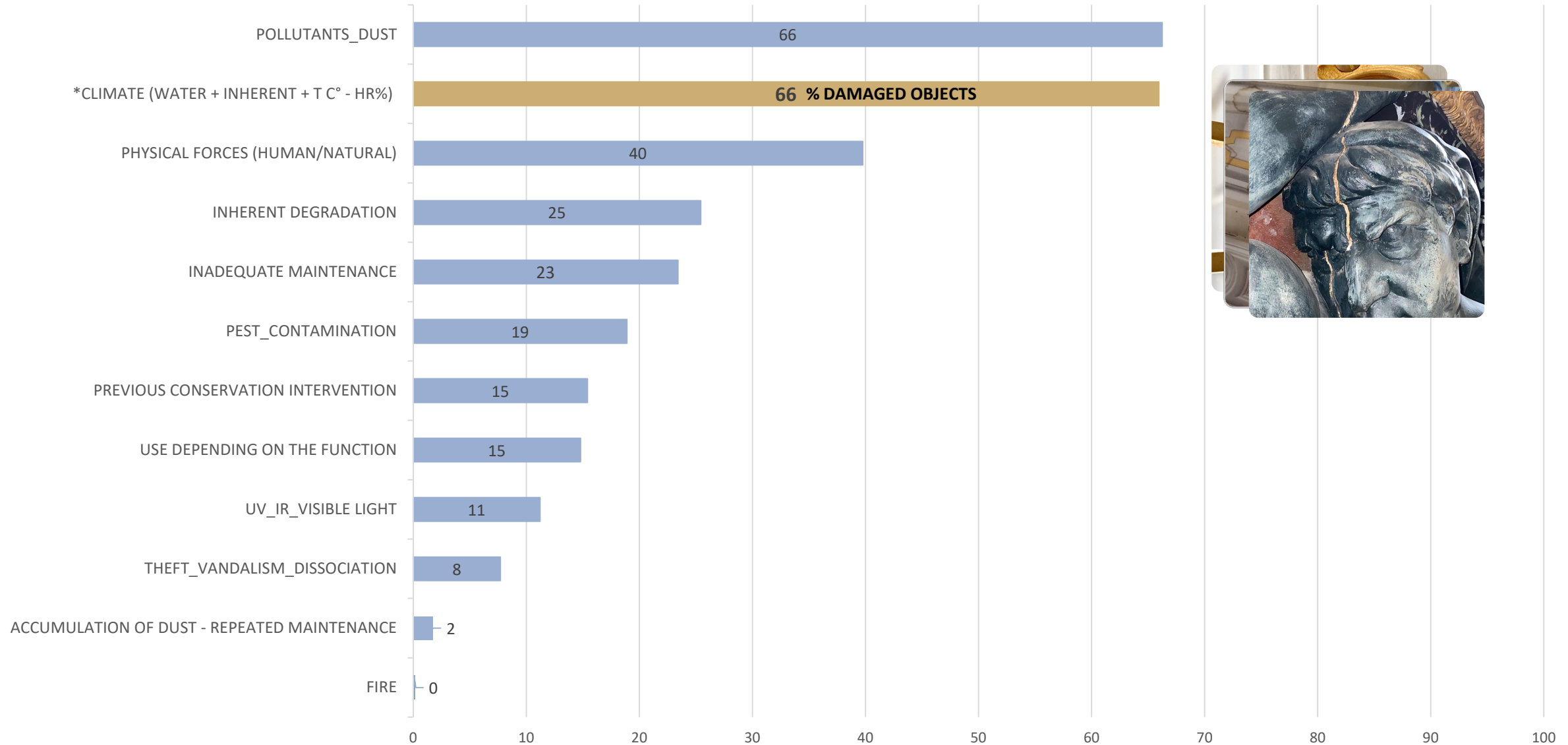
IMPACT OF CLIMATE ON PALACE-MUSEUMS



80 90 100

RANKING OF DAMAGE CAUSES

IMPACT OF CLIMATE ON PALACE-MUSEUMS

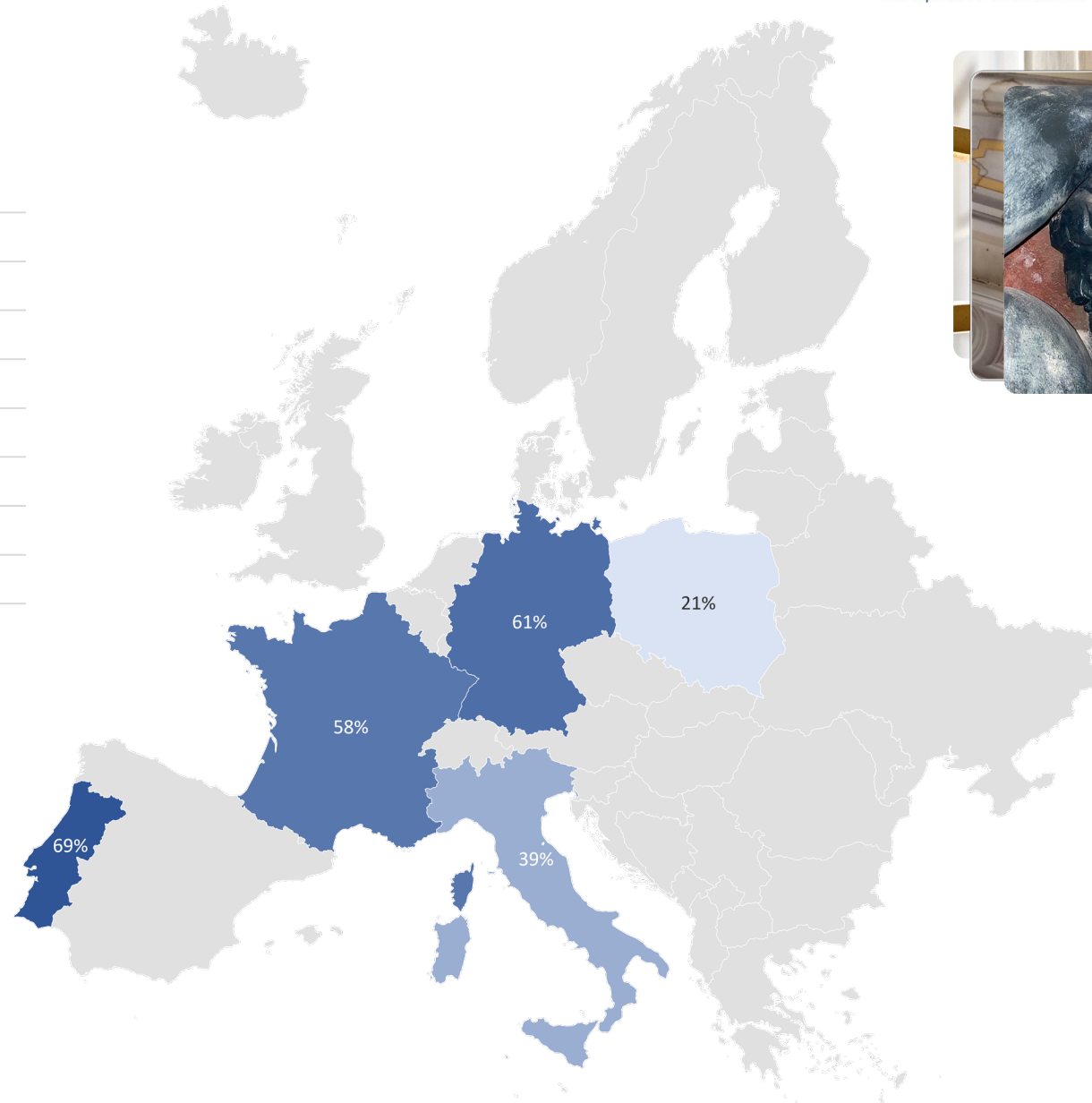
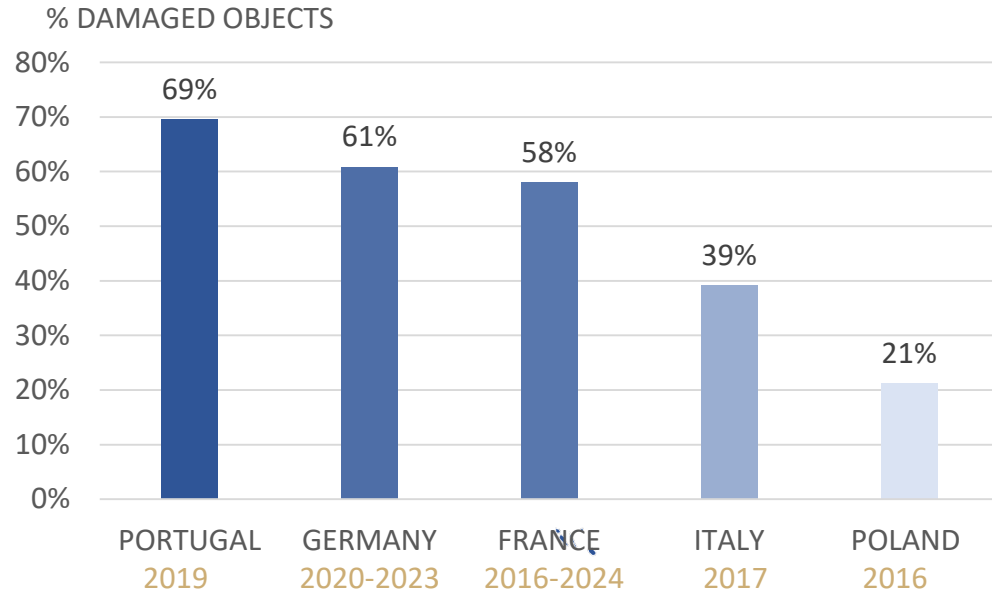


IMPACT OF CLIMATE ON PALACE-MUSEUMS

COUNTRY VIEW



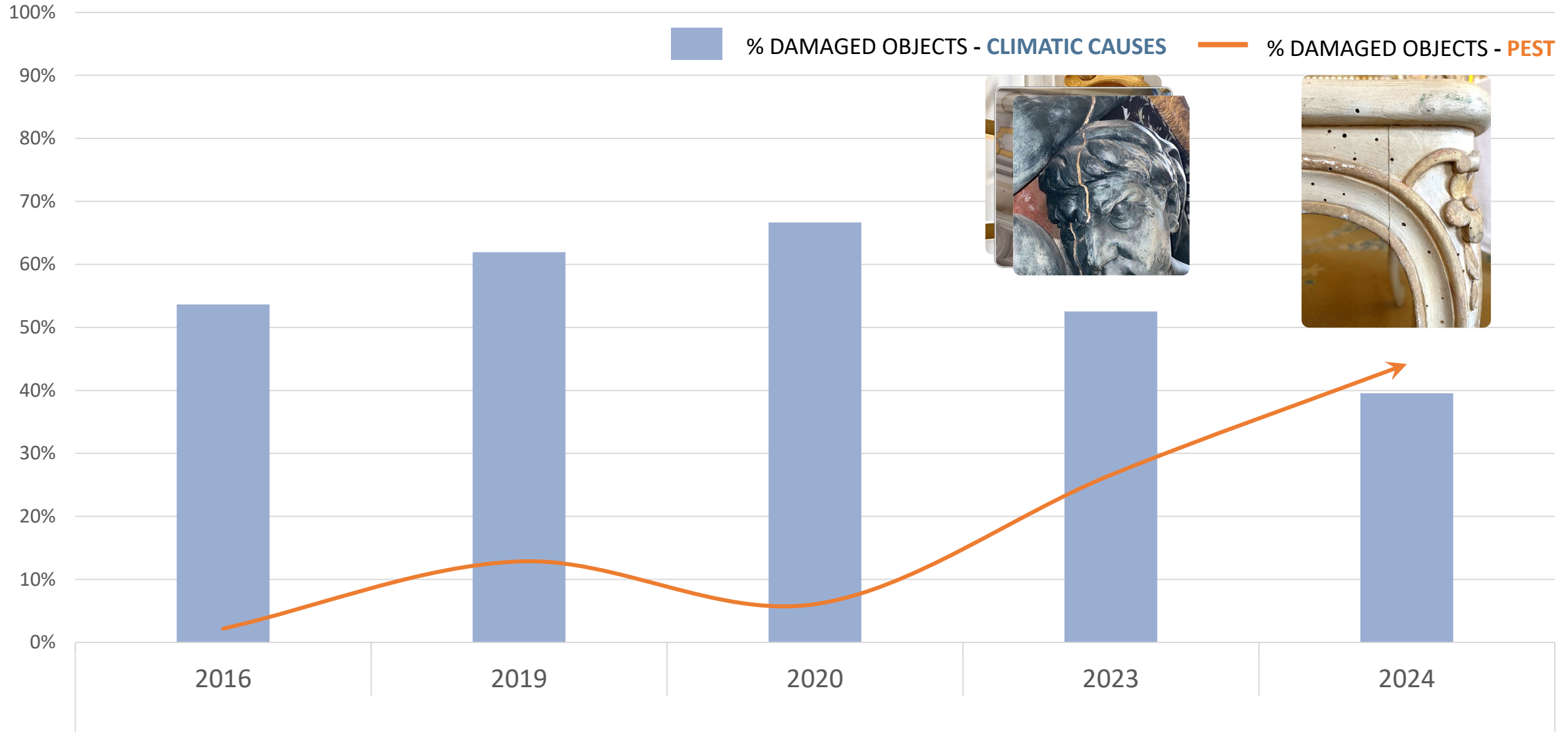
European Protocol In Preventive Conservation



IMPACT OF CLIMATE ON PALACE-MUSEUMS

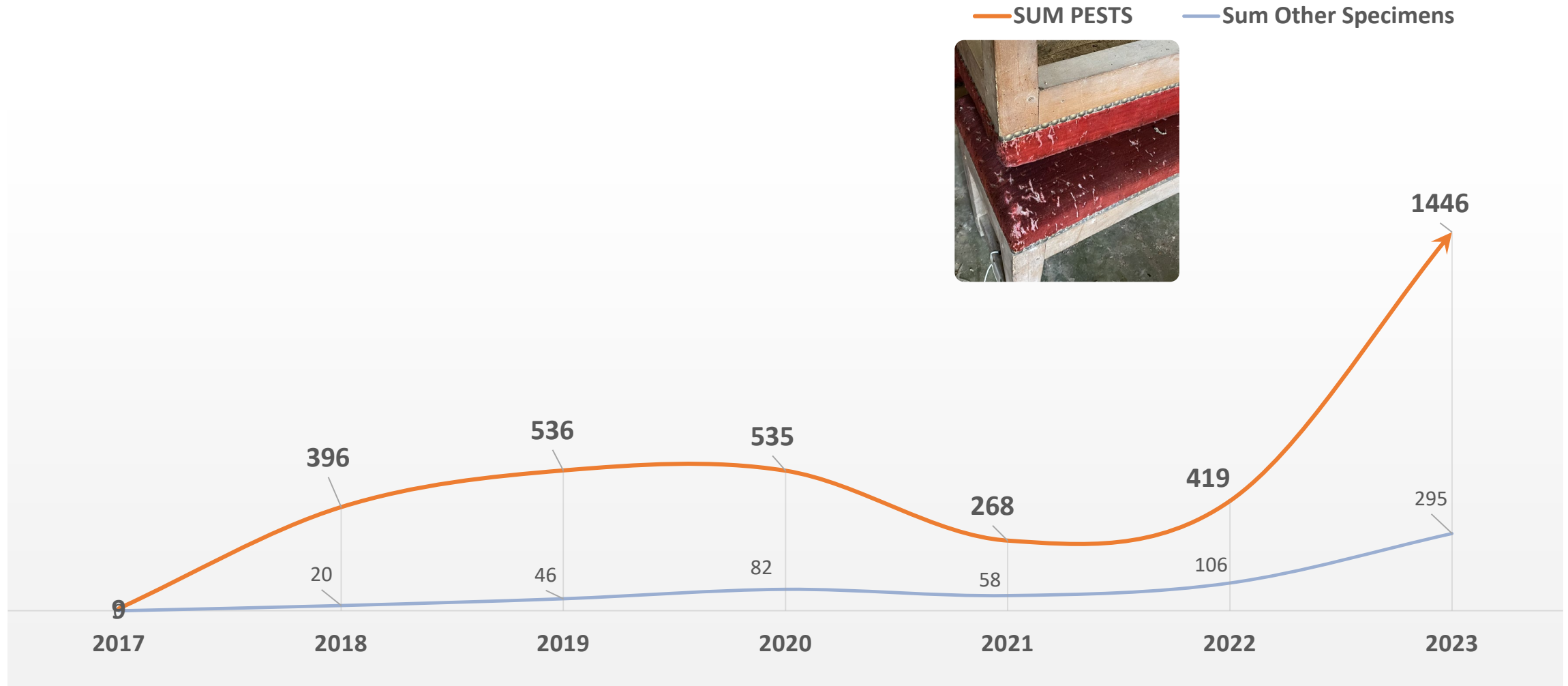
TIME VIEW : EVOLUTION OF PESTS/ OTHER CLIMATIC FACTORS

Île de France/ Picardie



INCIDENCE DU CLIMAT DANS LES CHÂTEAUX-MUSÉES

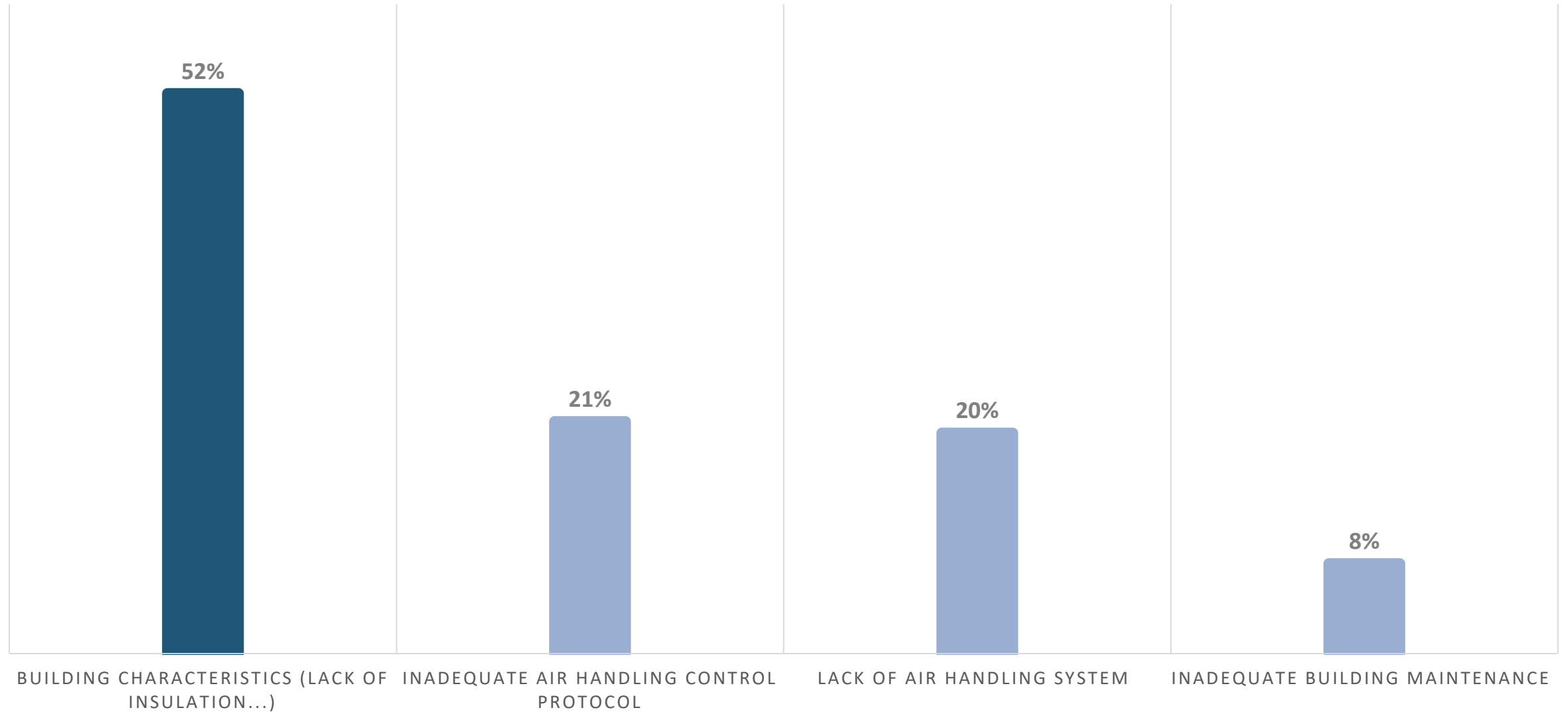
ÉVOLUTION DES RELEVÉS DES INFESTATIONS, VERSAILLES



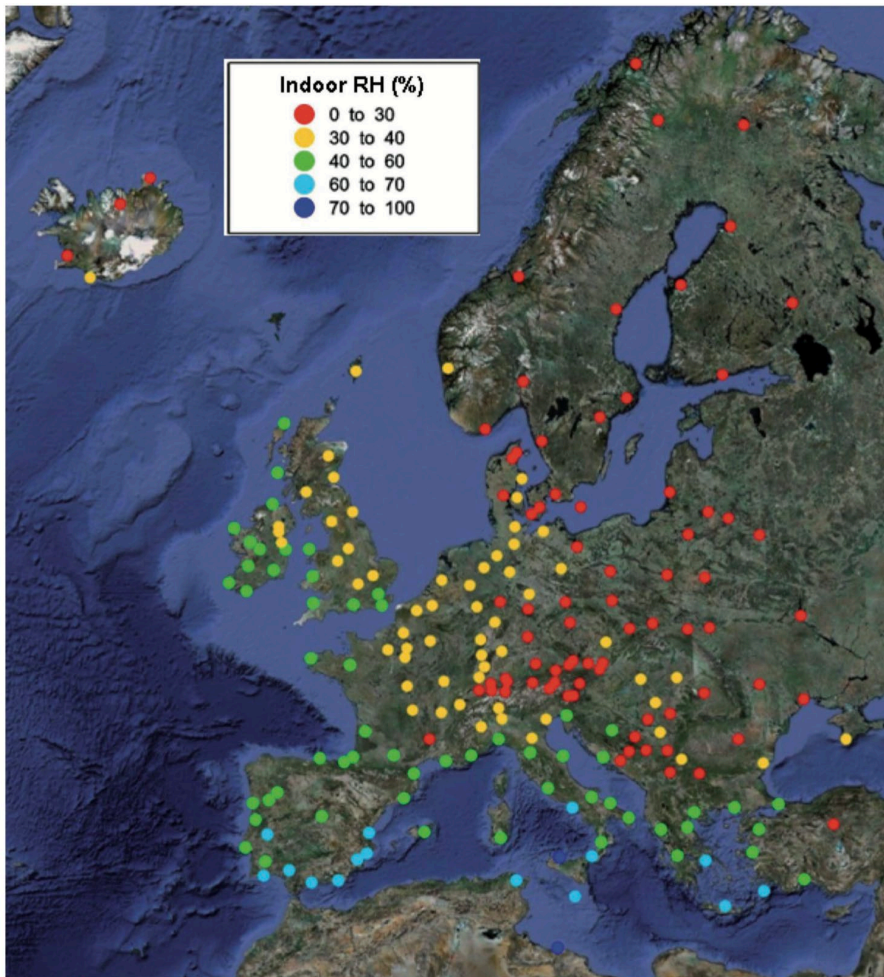
IMPACT OF CLIMATE ON PALACE-MUSEUMS

DIAGNOSTICS: LACK OF INSULATION

BY ACTIVE CAUSES : CLIMATE



Low heating target



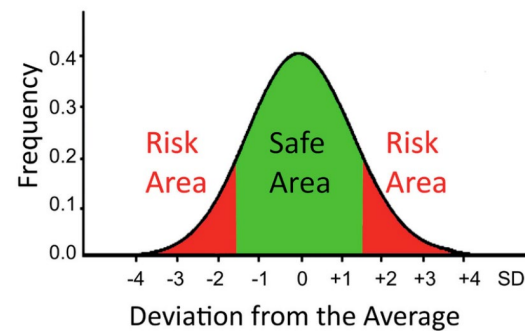
Source : From *Historical Climate to Comfortable Climate in Historic Buildings. How Shall Energy Efficiency Cope with this Revolution?* Camuffo, Bertolin, 2011

Avoids drops in relative humidity / degradation of organic objects

→ Saves on energy costs

→ Reduced ecological footprint

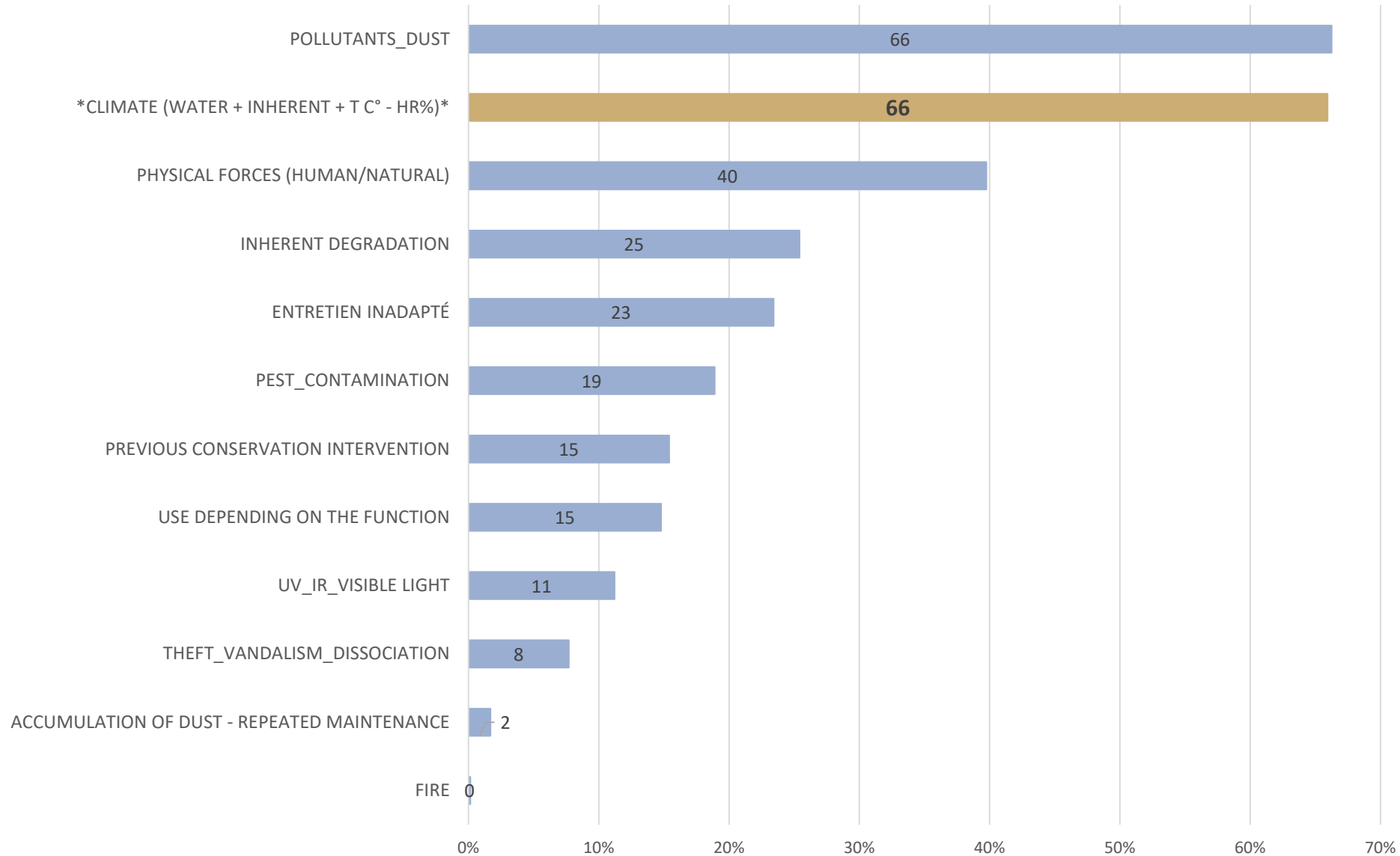
Map of Europe, showing the indoor RHin level in buildings heated at 18 °C in January, when outside the RHout level is 100%, e.g. v.fog or persistent rain. If RHout=50%, then RHin is half the mapped values. In the coldest regions (On the North-Eastern side), the indoor RH drops too much with risk of permanent yield or even fracture of wooden artefacts



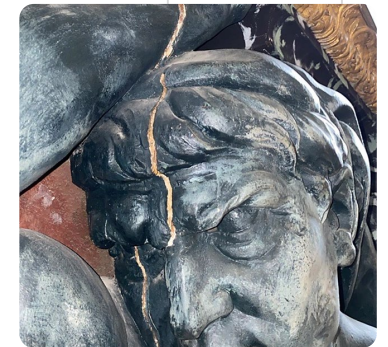
The green zones, safe for conserving collections, and the red zones, at risk, depend on the deviation of the relative humidity from the average historical climate.(EN 15757)

IMPACT OF CLIMATE ON PALACE-MUSEUMS

INVESTMENT IN INSULATION - REGULATION PROTOCOLS

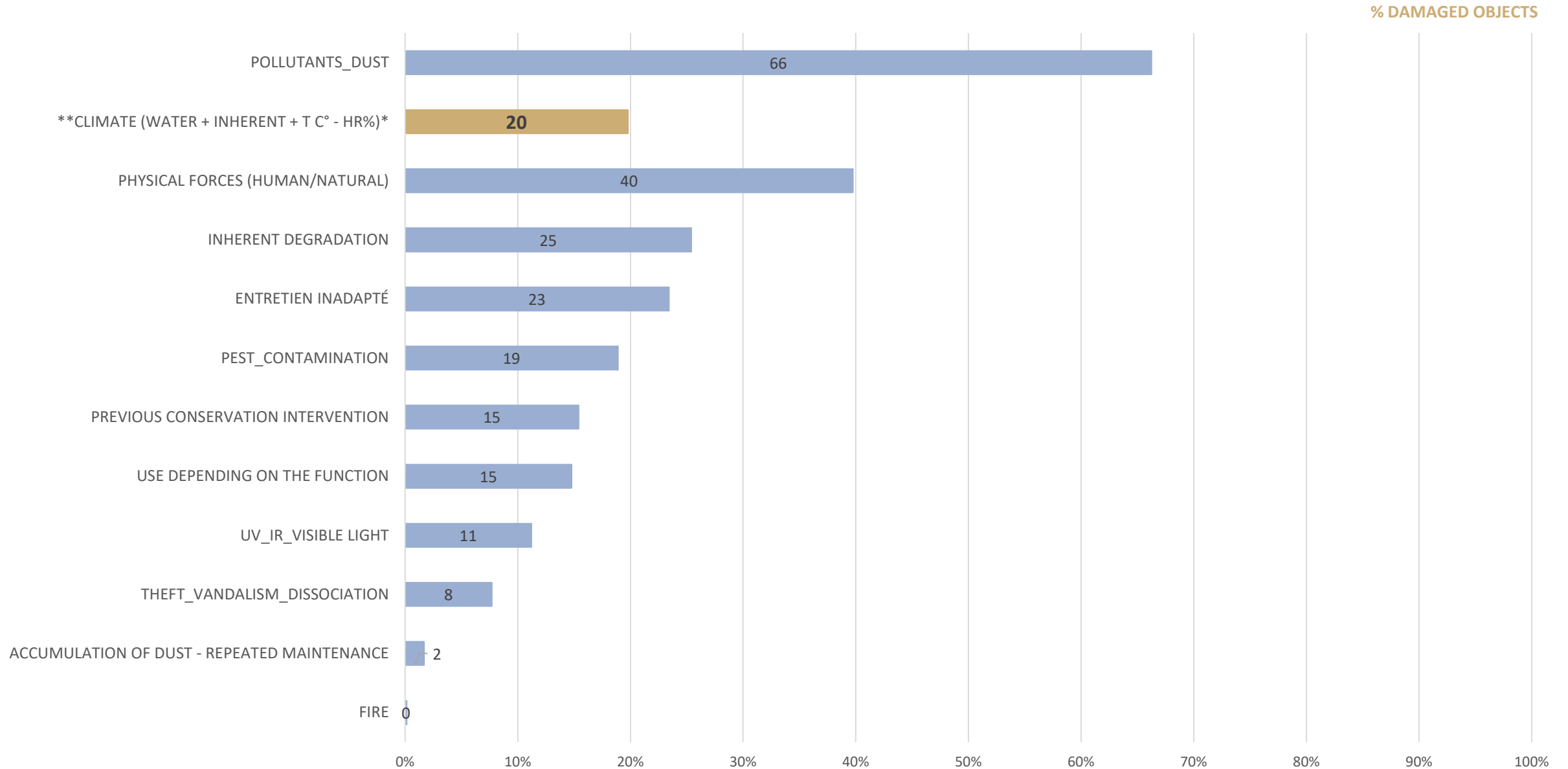


% DAMAGED OBJECTS



IMPACT OF CLIMATE ON PALACE-MUSEUMS

INVESTMENT IN INSULATION - REGULATION PROTOCOLS



A CHART OF TRADITIONAL & MODERN CONSERVATION METHODS

FOR EUROPEAN HISTORIC HOUSES

A reduction in energy consumption is possible through passive interventions

- 10-40% possible reduction of energy loss by insulated windows*
- 50-60% possible reduction in energy loss with interior curtains and shutters*

*Source: *Energy Efficiency in Historic Timber Buildings*, Grytil, 2011

Low heating target

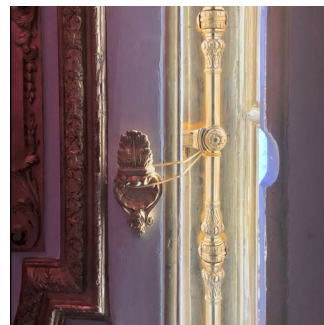
- can avoid the use of air handling units preserving the architecture
- saving energy, protecting the collections from climatic shocks



Knole House, National Trust, UK, © Danilo Forleo



Traditional condensation drainage system
© <https://fr.rec.bricolage.narkive.com>



Use of shutters for heat and light protection,
© Danilo Forleo/ Château de Versailles



*© Danilo Forleo/ Château de Versailles



*Combination of traditional and modern fabrics for light protection
© Danilo Forleo/ Château de Versailles

A NEW INTEGRATIVE AND MULTIDIMENSIONAL PLATFORM FOR EPICO METHODE



Multiscale analysis and AI
Climate Graphing Software



HypErPICO

Hyper-spectral imaging coupled with 3D capture
Identification of deterioration indicators through surface analysis



THE IMPACT OF CLIMATE ON PALACE MUSEUMS

Thank you to Vitruvian Consulting for their valuable assistance in statistics !



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