1.1 Strengthening Cultural Heritage Resilience for Climate Change - from Research to Policy: The Work of the EU OMC Group Johanna Leissner

Strengthening cultural heritage resilience for climate change – from research to policy

- The work of the EU OMC Group

Johanna Leissner, Fraunhofer Gesellschaft, EU Office Brussels

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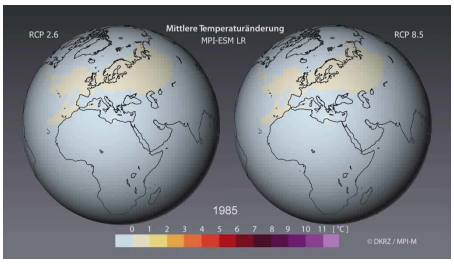
1

2021 Nobel Prize for Climate Research

Klaus Hasselmann was awarded the 2021 Nobel Prize in Physics jointly with Syukuro Manabe and Giorgio Parisi for groundbreaking contributions to the "**physical modeling of earth's climate, quantifying variability and reliably predicting global warming**" and "understanding of complex systems".



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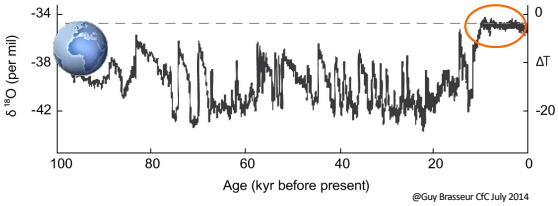
The past evolution of the Earth has been very dynamic with different climate modes, ice periods and interglacial periods. Humanity has had 10,000 years of grace – a stable climate!



3

Historic signposts – from first findings to policies

19th century
- 1824 Jean Baptist Fourier discovered green house effect
- 1896 Svante Arrhenius suggested that at the current rate of coal burning, the atmosphere could begin to start warming **in a few centuries**

20th century
- 1988 establishment of Intergovernmental Panel on Climate Change (IPCC)

21st century
- **2003 EU Commission DG Research`s first call on climate change impacts on cultural heritage**
- 2006 Stern Review on the Economics of Climate Change
- 2015 Paris Climate Agreement signed by 197 countries
- 2018 Greta Thunberg and Fridays for Future
- **2021 OMC Group Strengthening cultural heritage resilience for climate change**

4

EU OMC group (2021- 2022)

Strengthening Cultural Heritage Resilience for Climate Change

Chair: Johanna Leissner (Delegate of Germany)

So far four meetings in 2021

Participating countries that sent delegates

Austria, Belgium, Croatia, Cyprus, Czechia, Estonia, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, Spain, Switzerland

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The mandate

- Examine the current & emerging threats & impacts of climate change on cultural heritage
- Identify & exchange good practices & innovative measures for protection of cultural heritage (including both tangible & intangible)
- Examine contribution cultural heritage can make to mitigating & combatting climate change in line with Green Deal's goals
- **Awareness-raising, capacity-building & produce recommendations** to contribute to discussions & planning of climate change measures at European & national level

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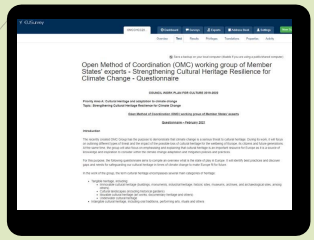
1. Preparation of questionnaire – work in progress



- State of play in the MS
- Identification of direct and indirect threats from climate change
- Collection of Good practice examples

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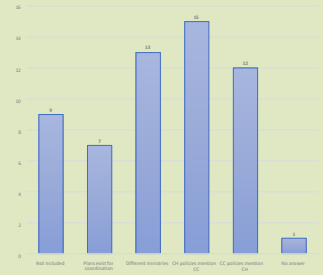
2. Questionnaire: situation cultural heritage / climate change in policies

1) Cultural heritage not included in policies
2) Some plans exist for coordination of climate change and cultural heritage
3) Different ministries responsible
4) CH policies mention CC
5) CC policies mention CH
6) No answer



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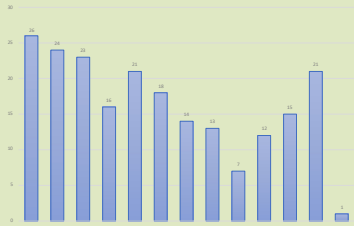
3. Questionnaire: threats to cultural heritage from climate change

1) Severe precipitation
2) Long heat waves
3) Droughts
4) Sea level rise
5) Indirect threats
6) Coastal erosion
7) Strong winds
8) Gradual climate change
9) Too low/high humidity
10) Increase of pests
11) Dieback of vegetation
12) Migration of foreign species



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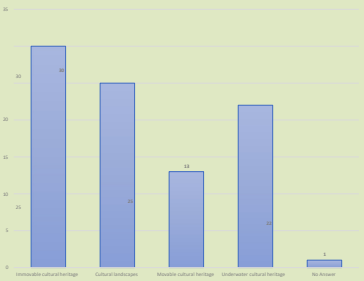
4. Questionnaire: Risk potential by type of heritage

1. Buildings and monuments
2. Cultural landscapes
3. Underwater heritage
4. Movable heritage
5. No answer



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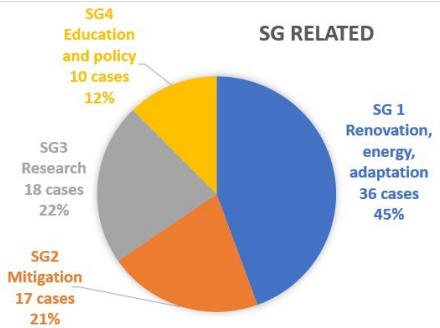
Mandate: Collection of Good Practice examples
60 case studies – received by November 2021



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SOME EXAMPLES – Adaptation and mitigation

- CLIMATE NEUTRAL CASTLE DYCK AND HISTORIC PARKS – DE.

DEVELOPMENT AND TESTING OF INNOVATIVE AND TRANSFERABLE SOLUTIONS FOR PARKS AND GREEN SPACES AFFECTED BY CLIMATE CHANGE AND FOR THE CLIMATE-NEUTRAL OPERATION OF LISTED BUILDING COMPLEXES

Schloss Dyck surrounded by an English Landscape Park, created 200 years ago and covers around 50 hectares
Hit by heat and drought and decrease of groundwater level – 200 trees had to be felled

Measures:
the testing of climate-resilient tree species,
innovative maintenance of trees and soil improvement,
new irrigation systems and the promotion of biodiversity
Castle building complex will be climate-neutral by 2025 by:
the use of Chinese reed as a renewable raw material in a glass heating plant, photovoltaic systems and the electrical operation of machinery and equipment

Goal:
around 80 % of the heating capacity is to be operated using self-produced renewable raw materials and
around 20 % of the electricity is to be self-produced by 2025

Castle Dyck @Jens Spanjer

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SOME EXAMPLES - Adaptation and Mitigation

- AIR WELL SYSTEM – AT.

EVALUATION OF AN AIR COOLING SYSTEM FROM 19TH CENTURY.

To evaluate the effectiveness of the 'old' air well system. To evaluate minimal-invasive options to optimize the reduction of heat in the auditorium and CO_2 saving

- SAFEGUARD AND ENHANCEMENT PLAN – FR.

City of Bordeaux: URBAN PLANNING REGULATIONS - CHANGES IN THE CITY TO COMBAT CC, WHILE MAINTAINING THE REQUIREMENTS OF THE URBAN HERITAGE

Practical measures:
thermal insulation of buildings and revegetation of court yards to fight urban heat, maintaining biodiversity, wellbeing and health improved, incorporating the needs of the residents. Further example Strasbourg, whose completion is scheduled for 2022. The objective is to no longer pit architectural heritage against sustainable development and to combine its preservation with climatic issues.

https://www.youtube.com/watch?v=CNKSwTThvWg (in French only)

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SOME EXAMPLES - Adaptation and mitigation

- Green is not only a colour – sustainable buildings already exist - NO.
- Systematic assessment and meta-analysis of life cycle analyses performed in connection with the rehabilitation and upgrading of existing buildings
- Villa Dammen in Moss is a detached house worthy of protection from 1935. Measures to make the house more environmentally friendly and energy efficient, led to a 67 percent reduction in the total greenhouse gas emissions over 60 years.

@Trond Isaksen, National Heritage Board

EXPLORE WHETHER AND HOW CLIMATE GOALS CORRESPOND TO GOALS FOR THE PROTECTION OF CH BUILDINGS AND WHAT ROLE BUILDINGS AND PROTECTION CAN HAVE AS CC MITIGATION MEASURE.

14 assessed buildings are of varying age, size, architecture and construction method. All have different conservation values based on age, representativeness, architectural design and cultural heritage context.
A comparison of investment costs for the various scenarios shows that the cost of upgrading is lower than of constructing a new building for 20 of the 24 building cases, and significantly lower for 15 of 24 cases. Looking at emissions reductions per invested amount, the results indicate that upgrading is more cost-effective than new construction, if the aim is to reduce greenhouse gas emissions.

A residential building originally from the 18th century. @Innlandet fylkeskommune

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SOME EXAMPLES - Training and Policy

- THE ART OF DRY STONE WALLING – HR.

RESEARCH PROJECT, TRAINING, FOCUSED ON YOUTH. DRY STONE STRUCTURES PLAY A VITAL ROLE IN PREVENTING LANDSLIDES, FLOODS AND AVALANCHES, AND IN COMBATING EROSION AND DESERTIFICATION OF THE LAND, ENHANCING BIODIVERSITY AND CREATING ADEQUATE MICROCLIMATIC CONDITIONS FOR AGRICULTURE

- ADAPTING REINDEER HUSBANDRY TO A CHANGING CLIMATE – SE.

POLICY DEVELOPMENT. IN THE CASE, TRADITIONAL SAMI KNOWLEDGE HAS BEEN USED PARALLEL TO SCIENTIFIC KNOWLEDGE IN THE DEVELOPMENT OF THE CLIMATE AND VULNERABILITY ANALYSES

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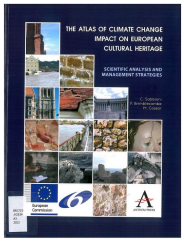
1st Research Project

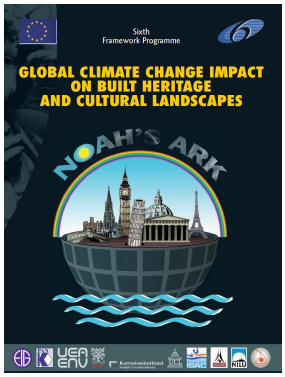
2004 – 2007

10 partners – 7 EU countries

Global climate model 250 x 250 km

Impact on Outdoor heritage





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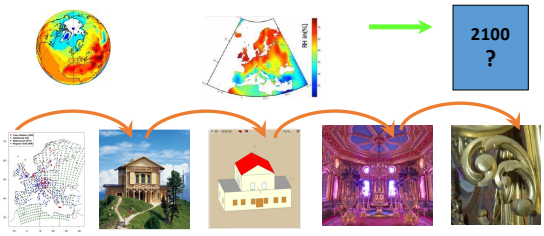
2nd Research Project

Climate for Culture

2009 – 2014 / 29 partners from 16 EU countries

High resolution regional climate model 10 x10 km

Impacts on indoor heritage and energy demand



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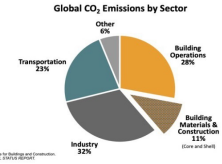
- **Focus on future indoor climate –because much of our cultural heritage is displayed and stored inside buildings and people too spend more time inside buildings**
- **Indoor climate is important for preservation of cultural heritage and for wellbeing of people**
- **Indoor climate control is very costly and requires a large amount of energy!!!**
- **Buildings are responsible for one quarter of total energy consumption and greenhouse gas emissions according to Eurostat.**



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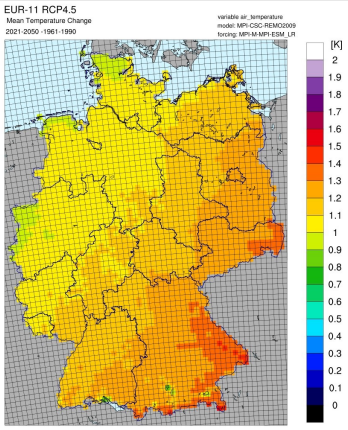

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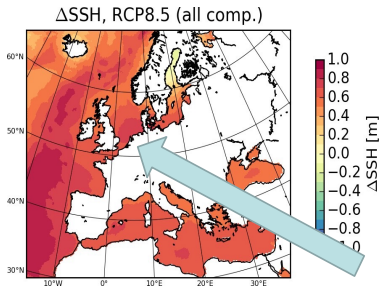
Climate simulation : Sea Level Rise



Changes in sea level rise, [m] 2081-2100 relative to 1985-2005 for emission scenario RCP8.5

North Sea – high increase !

2018@Uwe Mikolajewicz, Max-Planck Institute for Meteorology, Hamburg

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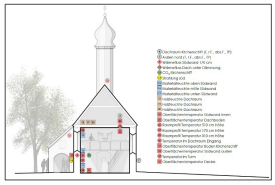
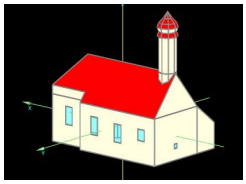
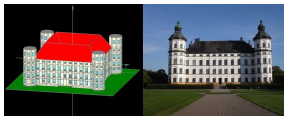
Modelling of buildings – from components to whole buildings







St. Margareta, Roggersdorf (Bavaria)

Skokloster Castle, Sweden

European Commission

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What are the results from whole building simulations?

- **Interior conditions**
  - Temperature
  - Relative Humidity
  - Fluctuations of T / rH
- **Surface and component layer conditions**
  - Temperature
  - Relative Humidity
  - Water Content
- **Energy Demand**
  - Heating/Cooling
  - Humidification/Dehumidification
- **Building Controls**
  - Ventilation
  - Heating

European Commission

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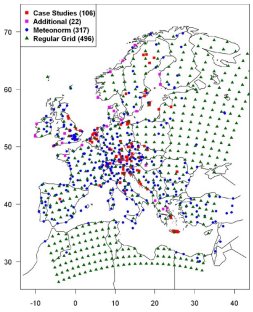
Climate parameters from regional climate model – in hourly resolution for whole building simulation tool



Value	Unit
Temperature	°C
Relative Humidity	%
Normal Rain	mm
Wind Speed	m/s
Wind Direction	degree
Global Radiation	W/m2
Diffuse Radiation	W/m2
Global Counterradiation	W/m2
Cloud Coverage	%
Ground temperature	°C
Ground reflectance	-

Plausibility and applicability of the complete datasets have been verified with past weather records

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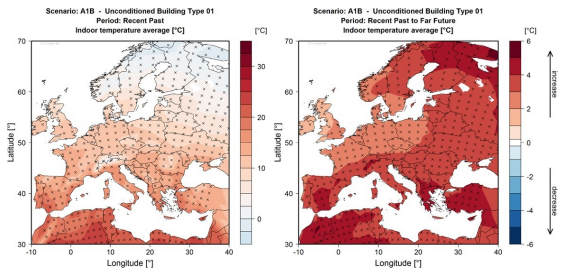
Mean Indoor Temperatures

Recent Past (1960 – 1990)

Difference to Far Future



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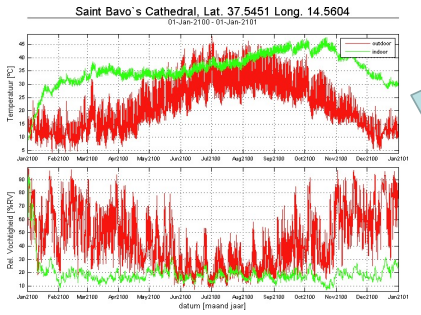
Indoor climate in St. Bavo, Ghent, Belgium in 2100

Moderate emission scenario RCP 4.5



40 - 45 °C in summer inside building

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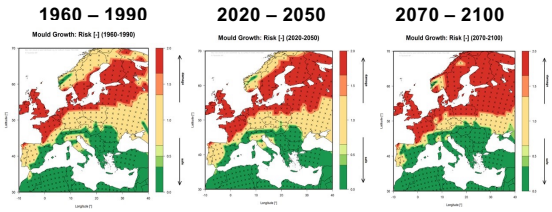
Mould Growth – an increasing danger

Damage — Safe



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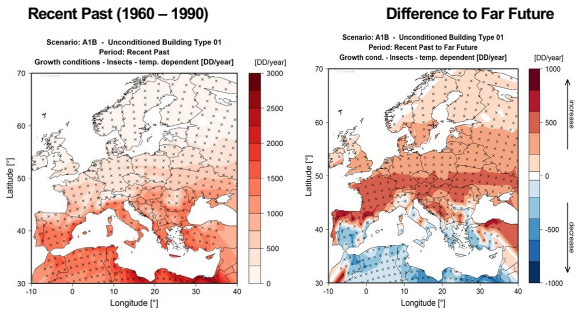
Insects – more and more a problem



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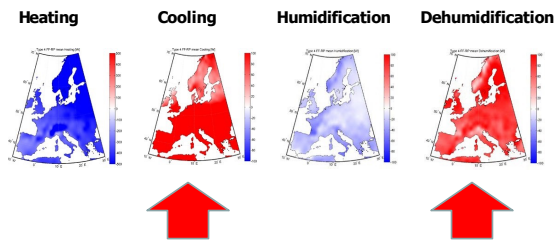
Contribution to Green Deal – Renovation wave

Future energy demand for heritage buildings

Changes from Recent Past (1960-1990) to Far Future (2070-2100)



Expensive and not yet climate neutral

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Preliminary summary from EU OMC expert group: Strengthening Cultural Heritage resilience for Climate Change

- Extreme climate events and gradual climate change are affecting all kinds of cultural heritage (tangible and intangible) all over the world
- There are still many **gaps in understanding and knowledge about climate change impacts**
- **Relevant and reliable data are missing** – difficulty to collect the information
- Lack of awareness about urgency to adapt exists on all levels
- Create a **forum for mutual exchange – need for common entry point or observatory**
- Invest into **skills and training** opportunities
- **Intensify cooperation** / exchange between heritage experts, climate services, decision makers
- **Important mainstream policies on EU and MS level** - cultural **heritage not integrated**
- Example: many national adaptation plans do not consider cultural heritage
- Start planning **now** and develop **adaptation/mitigation and resilience** plans for **climate change**

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