Source: Crevasse du glacier de Grindwald (Suisse), Rijksmuseum, Netherlands

Europeana's Climate Action Community insights:

What do the digital preservation processes of EU Cultural Heritage Organisations unveil on their sustainability?

Evangelia Paschalidou, PhD(c.), International Hellenic University,
Chair of the Environmental Sustainability Practice Task Force, Europeana

DIGHT-Net - New Trends in Digital Culture Studies,
Digital and Ecological Sustainability of Cultural Heritage workshop
25th Apr. 2025

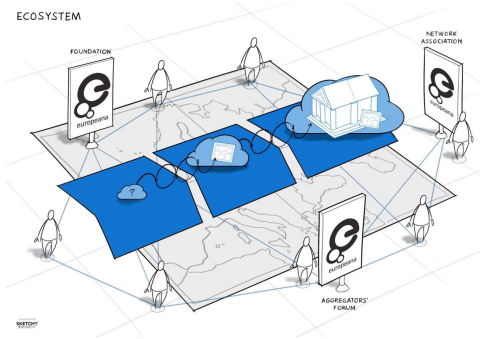
DIGHT-Net

Agenda

1. Europeana CAC, Sustainability Practice TF and Survey
2. Introducing the issue
3. Reality check - TF survey insights
    - Understanding Digital Sustainability
    - Digital Carbon Footprint
4. Digital preservation practices
5. Circular hardware
6. Critical observations & conclusions

Source: Museovirasto (2019)

1. Europeana CAC and Sustainability Practice TF



Ecosystem, Europeana Foundation and Sketchy Business, 2020, The Netherlands, public domain

Europeana Initiative

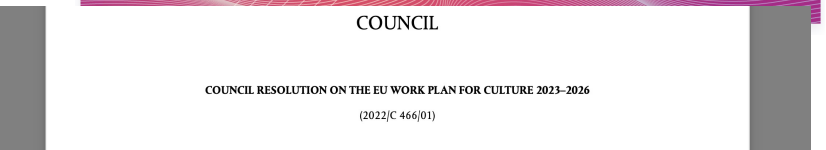
Europeana Network Association

Climate Action Community Steering Group

Environmental Sustainability Practice Task Force

- Survey and collect data on full-cycle of digital preservation practice by CHIs to use as benchmark
- Systematically understand environmental sustainability as part of the digital transformation of the sector
- Elaborate on environmentally sustainable and regenerative working practices
- Analyse and compile survey input into a report accompanied by Policy Recommendations
- Kick-off a community of practitioners to support the implementation of the report findings and Recommendations

Europe's Digital Decade: digital targets for 2030

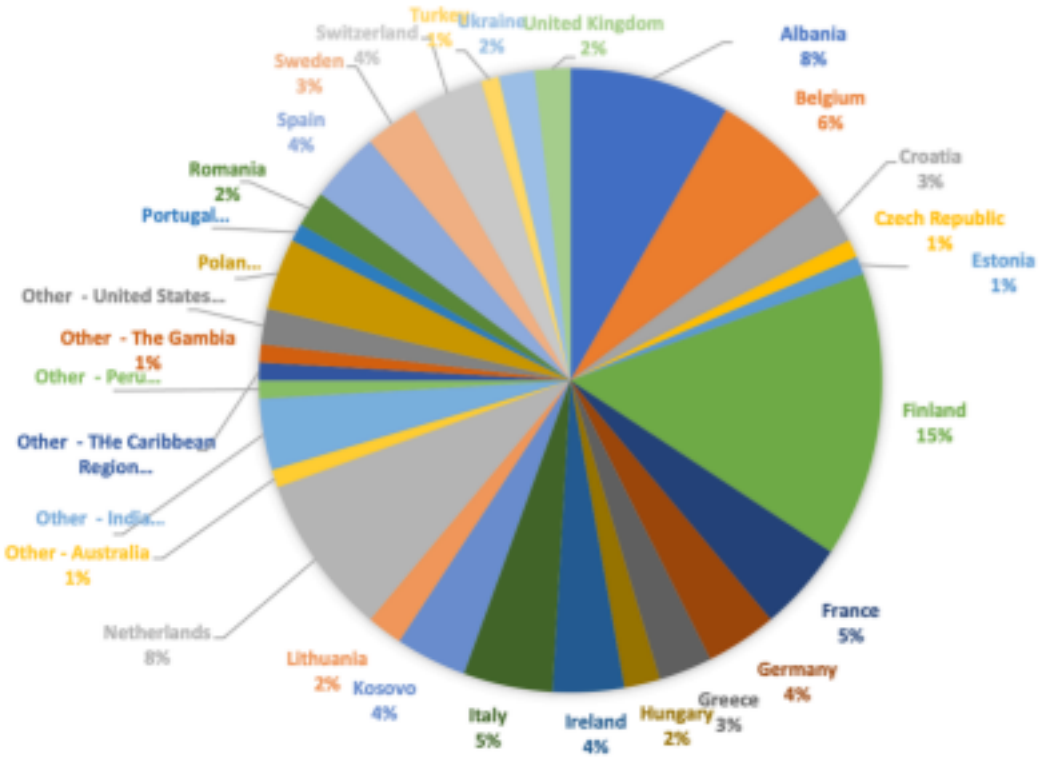

COUNCIL

COUNCIL RESOLUTION ON THE EU WORK PLAN FOR CULTURE 2023–2026

(2022/C 466/01)

Europeana Climate Action Manifesto, Suzan Hazan, 2021

1. Sustainability Practice Survey and Report



Survey Identity:

- 108 respondents
- 24 EU countries
- 6 other countries globally
- July to October 2023 questionnaire dissemination
- 32 questions
- July 2024 Interim Report release
- In-depth case-study Institutions interviews
- *June 2025 Final Report*

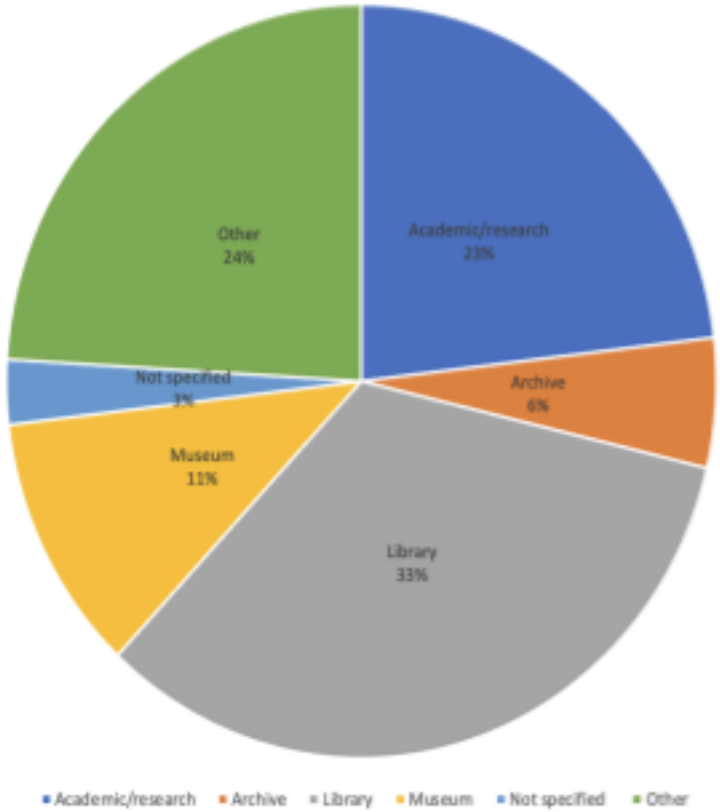
Source: Interim Analysis of the Environmental Sustainability Practice Survey, 2024

1. Sustainability Practice Survey and Report

Respondents distribution by Institution

- 51.4 % Institutions, 48.6 % individuals

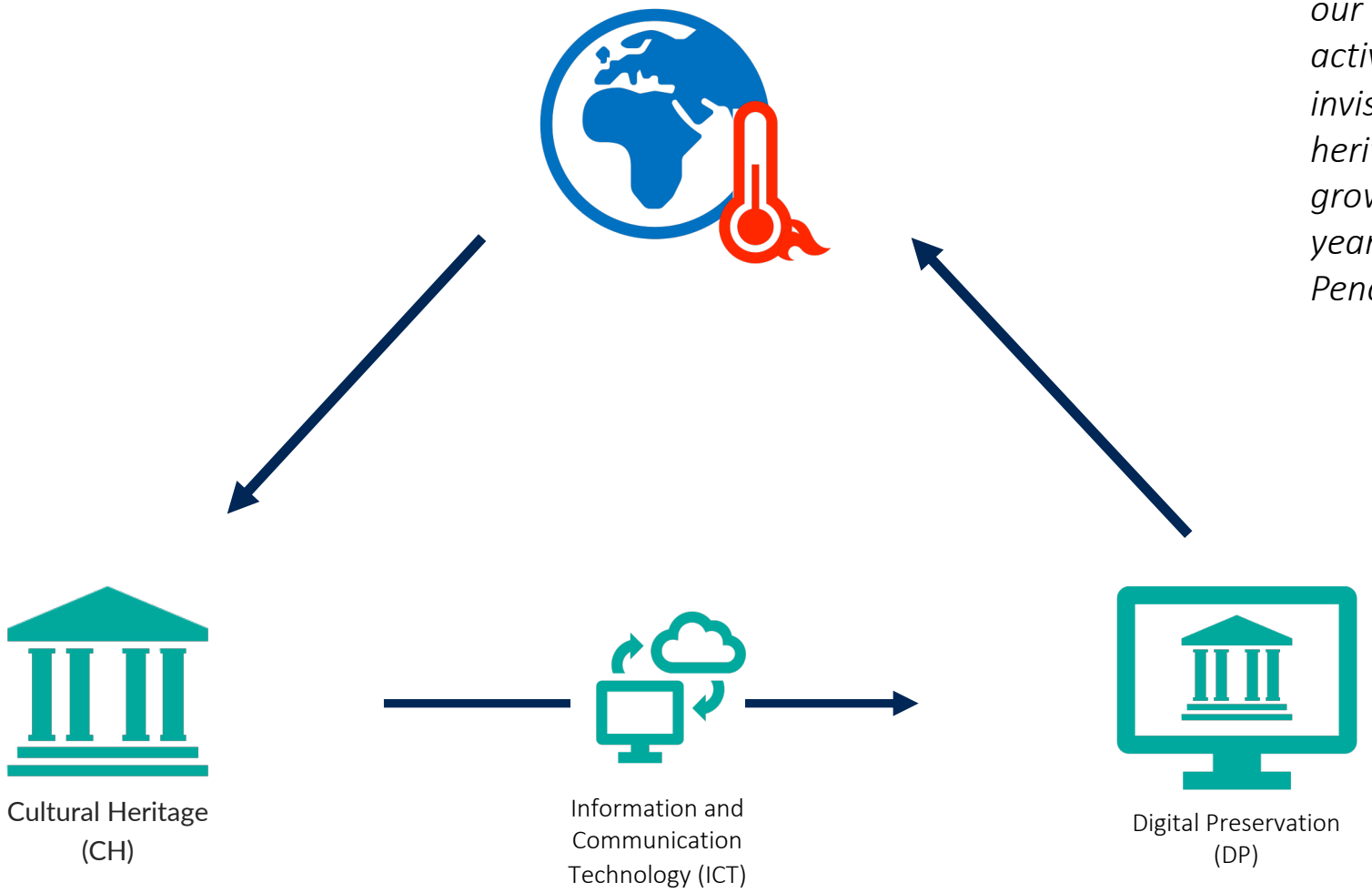
- 33% libraries
- 23.15% academic/ research institutions
- 11.11% museums
- 24.07% creative industries sector



Source: Interim Analysis of the Environmental Sustainability Practice Survey, 2024

2. Introducing the issue – A paradox

"The environmental cost of our digital preservation activities remains largely invisible to most cultural heritage professionals, yet it grows more substantial each year"
Pendergrass et al., 2019



2. Cultural Heritage at risk

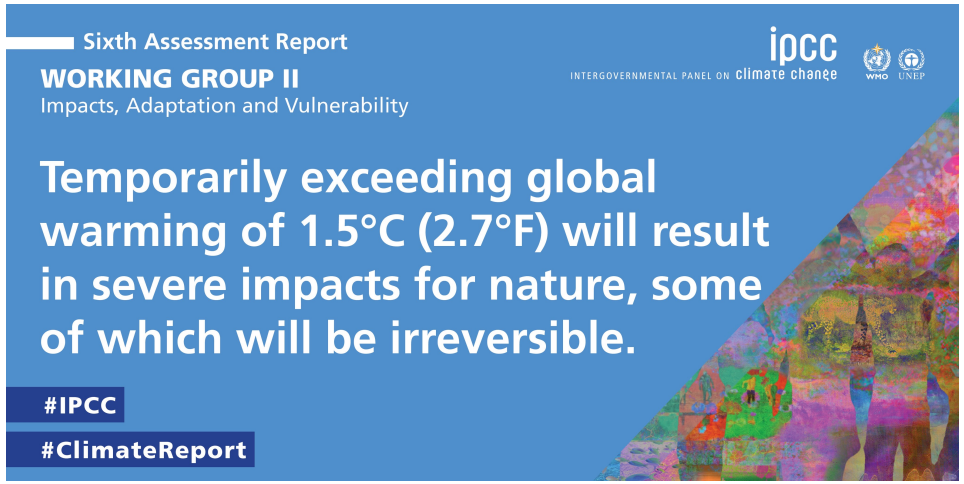
UNESCO sites to be affected by sea-level rise

Source: Mateo Colombo, Getty images.

Climate refugees; artifacts and intangible CH

Source: Lawfare.

2. Climate Change facts

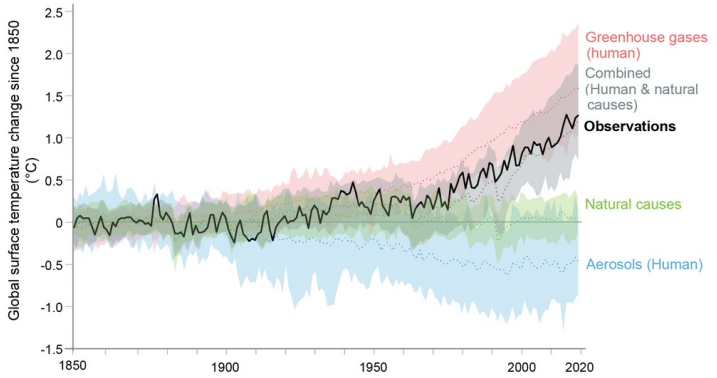


IPCC report, April 2022

"In any overshoot there's an increasing risk of hitting tipping points and triggering feedback, in the climate system, like permafrost thawing,"

Linda Schneider

- 40% of the world's population are "highly vulnerable" to climate
- 1.45C warming in 2024, heading to 1.5C - unavoidable



- 15-30cm of global average sea level rise by 2050
  - 50cm for a 2C warming
  - 70cm for a 3-4C warming
- Extreme weather events to hit harsher and more often

2. ICT environmental impacts

What do we mean by ICT use in DP?

- Infrastructure network for safe storage, sharing and providing access – extended to the end-user
- Software and hardware (e.g. data centers, cables, satellites, laptops, servers)

LIFE-CYCLE ENV. IMPACTS

Production

- Energy intensive mining and refining
- Scarce minerals and metals (cobalt, silver, lithium, indium, tantalum, etc)
- Chemicals use in extraction processes

Use-phase

- Energy demand of the broader network and the end-users
- Maintenance

End of Life

- Landfill, incineration emissions

Only 22.3% *formally* recycled in 2024

WHO, 2024

2. Data and embedded costs

As Thomas Hecker observes already almost 20 years ago in his research on academic libraries:
"We are not in a (sustainable) transition from physical formats to digital formats."

Energy consumption	Scarce mineral use
• EU data centers estimated to consume roughly 3% of the continent's total energy generation (IEA, 2024) • Up to 54% of all data stored by organisations are "dark data" • AI tools - still unsure whether will increase energy efficiencies	• Human rights violation in mineral-rich regions under conflict, e.g. DRC that supplies around 70% of the world's cobalt • Approximately 65% of e-waste is shipped to countries of Global South lacking proper recycling infrastructure leading to health, environmental and social degradation

3. Reality check - TF survey insights

Understanding digital sustainability

- 78% of organizations acknowledge the importance of environmental sustainability, but only 42% have formalized this commitment through official policies or in their strategies

- Among the respondents who act on such a strategy, the majority (28.57%) are linking their sustainability activities to the *'The United Nations' Sustainable Development Goals (SDGs)*

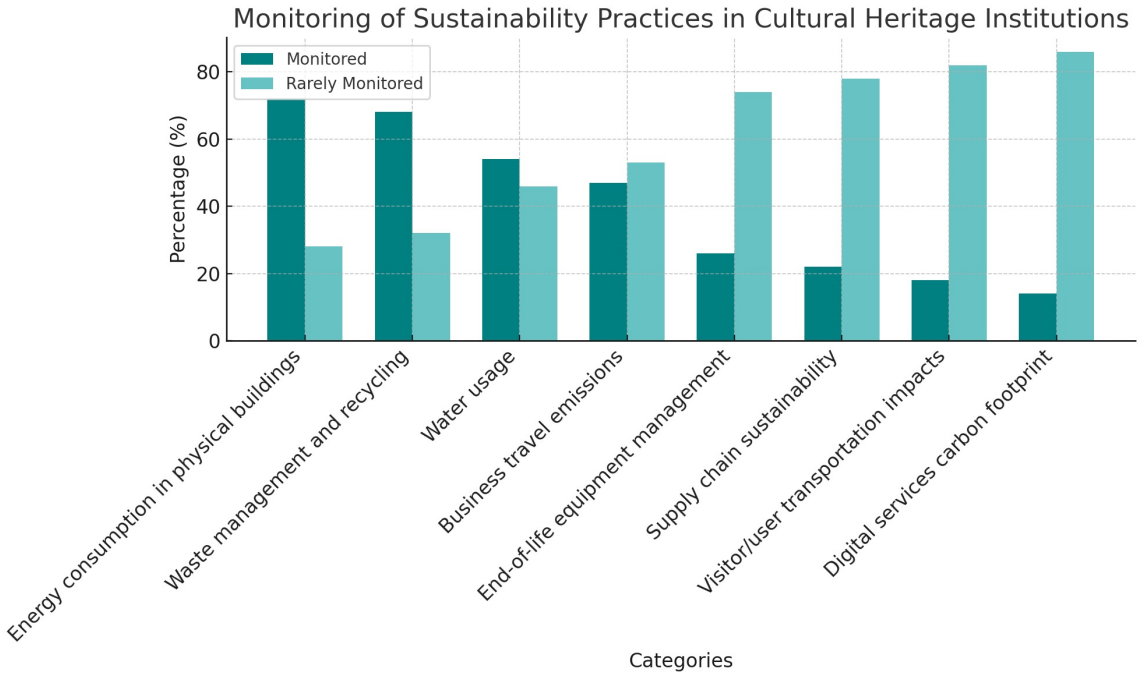
- Approach variation by institution type and size:
    - Larger institutions (100+ employees) are twice as likely to have formal environmental policies
    - Museums and libraries lead in policy adoption (51% and 47% respectively)
    - Archives and smaller cultural organizations left behind, with only 31% reporting formal commitments

3. Reality check - TF survey insights

Digital carbon footprint

Only 14% of institutions track the carbon footprint of their digital services that accounts for:

1. ICT infrastructure energy consumption
2. End-user device usage
3. Embodied carbon ~ 70-80% of total, comes during manufacturing
4. Data traffic – transmission of data



Source: Own elaboration

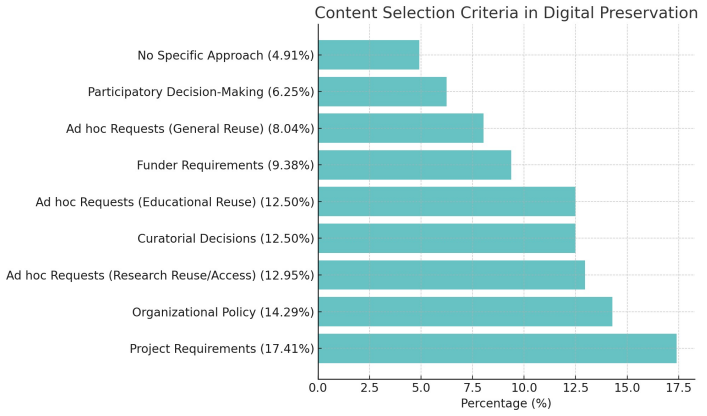
4. Digital preservation practices

To save or not to save? or What is defined as acceptable loss?

- Saving everything syndrome

- Dark data
  - Tiered storage strategy
  - Data life-cycle policies
  - Regular audits
  - Sustainability metrics in preservation decision-making

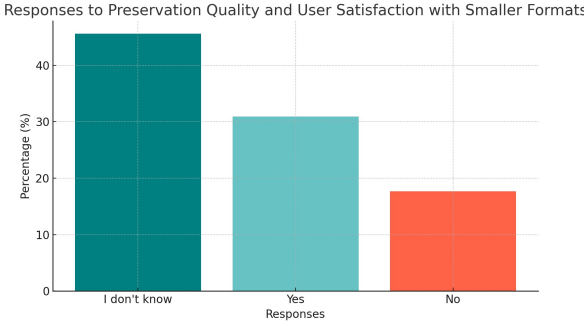
- What is to be digitised? - Content selection criteria



- Format choices – Mainly JPG, PDF, TIFF

e.g. JPG → JPEG XL → 20-60% reduced file size

- Smaller format equivalence for same preservation quality



- Digitisation standards implementation

Source: Own elaboration

4. Digital preservation practices

To save or not to save? or What is defined as acceptable loss?

- **57.14%** of surveyed CHIs lack policies governing the lifecycle of digital assets

When and how to retire digital assets

- Majority has not implemented tiered preservation
  - Unified redundancy practice

86.2%

Up to 3 copies

  - Digital media life cycle environmental impact

5

of respondents Institutions

Tiered Approach to Preservation

Source: Own elaboration

5. Circular hardware

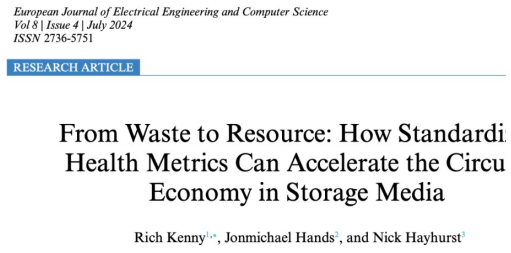
CHIs hardware management:

- Sustainable procurement **3.37%**
- Repair **7.87%**
- Recycle **16.85%**

  65% of e-waste shipped to Global South

  *Basel Convention 1989

Source: Waste Framework Directive, EC, 2023
https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en


European Journal of Electrical Engineering and Computer Science
Vol 8 | Issue 4 | July 2024
ISSN 2736-5751

RESEARCH ARTICLE

From Waste to Resource: How Standardi
Health Metrics Can Accelerate the Circu
Economy in Storage Media

Rich Kenny[1,*], Jonmichael Hands[2], and Nick Hayhurst[3]


CrossMark

Official Journal
of the European Union

2024/1799 10.7.2024

DIRECTIVE (EU) 2024/1799 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 13 June 2024

on common rules promoting the repair of goods and amending Regulation (EU) 2017/2394 and Directives (EU) 2019/771 and (EU) 2020/1828

Shift towards repairability

1. Extending device lifespans by 2-3 years on average
2. Reducing total cost of hardware ownership by up to 30%
3. Reducing embodied carbon emissions
4. Building resilience against supply chain and social solidarity
5. Repairing as community engagement strategy

6. Critical observations & conclusions

Change can be introduced on all levels:

Personal

- Advocate climate-conscious practices within your Organisation
  - E.g. Review your digital image collections
- Organise a Green Team or Working Group
- Knowledge/ experience sharing, Staff training

Organizational

- Establish comprehensive data governance policies
- Exlore Green IT and Computing Communities, Open Source
- Integrate local community as essential stakeholders
- Measure, document, communicate progress transparently

Policy

- Monitor key EU Policies and Regulations e.g.
  - Digital Decade Strategy
  - Strategic Framework for EU's Cultural Policy (2023-2026)
  - Digital Product Passport:
  - Climate-Neutral Data Centers

Thank you for your attention!