

DELIVERABLE REPORT

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1. Executive Summary

This document “*Report of Technology Transfer Activities. Clustering and Standardization Strategy*” describes the progress and results of Task 8.5. Technology Transfer, Clustering with other R&D projects & Standardization within the NEMOSINE project.

The activities have been conducted in line with other tasks in WP8 related to the dissemination & exploitation strategy and plans outlined in other deliverables (D8.2, D8.3 and D8.4).

This document consists of 3 main sections covering the three main pillars of Task 8.5:

- **Technology Transfer and Training Activities.** Suitable methodologies and contents for technology transfer and training are considered and proposed.
- **Clustering with initiatives related to NEMOSINE.** Relevant R/D projects, associations, clusters, non-profit and public organisations have been identified, classified and selected as stakeholders for clustering and liaising activities.
- **Standardisation and policy framework.** Current standards relevant to NEMOSINE have been identified and listed.

In each section, a strategy towards future actions and activities related to each pillar has been drafted.

2. Introduction

The main scope of NEMOSINE is to develop an innovative package for the storage of European cultural heritage (CH) with the purpose of energy saving and extension of its conservation time. NEMOSINE aims to improve the traditional storage solutions, such as freeze storage (below 5°C), by developing an innovative smart package with the main goal of energy saving and extent conservation time of cultural objects based on cellulose derivatives. Beyond the state of the art NEMOSINE plans to develop the following modular and integrated products: i) High O₂ barrier and Active packaging using non-odour additives, ii) Active acid adsorbers based on functionalized Metal Organic Framework (MOFs) integrated in low density and porous structures, iii) Gas detection sensors based on nanotechnology to monitoring AA, water, O₂ & NO, iv) Multi-scale modelling to correlate degradation & sensors signals for maintenance prediction and integrate all these technologies in v) Packaging with modular design to fulfil the technical & economical requirements of the different CH made by cellulose derivatives and vi) Curative packages containing controlled release of natural antifungal additives. The main targets of NEMOSINE project are *cellulose derivatives, from photographic, movies and audio substrates.*

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Figure 1. Scheme of the main innovations proposed in NEMOSINE project.

In order to achieve its final goal, NEMOSINE needs to ensure a wide exploitation of the results with realistic objectives and plans by the active involvement of all consortium partners and led by PNO. Actions designed to ensure successful exploitation of the projects' technical innovations within 5 years after the end of the project include:

- Proper technology transfer and training activities.
- Clustering with other relevant R&D initiatives related to NEMOSINE activities, associations and organizations in order to create a stakeholder ecosystem that multiplies dissemination and exploitation activities.
- Continuous watch of related standardisation and policy-related issues that may affect the implementation of NEMOSINE main results and solutions into the cultural heritage preservation and other related markets.

3. Technology Transfer Activities

NEMOSINE plans a technology transfer and training program to be carried out at the last stages of the project, between M30 and M48, which can include a balance of training in scientific and technological aspects directly related to the activities carried out within the scope of the project. Technology transfer and training program will target the wide range of production companies in the interest areas of the project e.g. new materials developed, sensors, modelling, etc and will include the following types of activities:

Network-wide training. Access to a full range of different methodologies, tools and protocols being developed and applied by the NEMOSINE partners in the scope of the project activities, in an individual manner or collaboratively between two or more partners.

This will be mainly done by the organization of two NEMOSINE workshops, that will be organized in M36 and M48, in parallel with the consortium meetings or a relevant external event and/or in collaboration with other R&D initiatives identified in Section 5 of this

deliverable.

The initial contents for the first workshop in M36 will be related to the progress achieved so far on the active acid adsorbers based on functionalized Metal Organic Framework (MOFs) integrated in low density and porous structures, and the gas detection sensors based on nanotechnology to monitoring AA, water, O₂ & NO. However, these initial contents can be modified if the workshop is organized jointly with another initiative to complement any potential additional contents.

Secondments. Exchange of researchers from one NEMOSINE partner organization to another is fostered in NEMOSINE for the execution of particular tasks related to the project activities. Also, technology transfer will be facilitated through the arrangement of ‘short stay’ training courses designed for scientists/technicians to take place at partner companies’ facilities to foster a quick transfer of the knowledge and technologies developed.

Currently, joint PhD projects are coordinated by Ana Ramos (NOVA) and Bertrand Lavédrine (CNRS):

- Conservation and Valorisation of Ângelo de Sousa Photographic and Filmic Collection (PhD researcher: Joana Silva)
- Black and white: a study on the ageing and conservation of acetate and nitrate photographic negatives in Portuguese collections (PhD Researcher: Élia Roldão)
- The Books of Hours from the 15th century in the Portuguese collections: matter, form and meaning (PhD researcher: Rita Araújo)

4. Clustering with other initiatives

Clustering with other initiatives (such as R&D projects, associations, clusters, public bodies, etc.) directly or partly related to the main NEMOSINE activities has as a main objective to explore opportunities to share and exchange knowledge, and to approach potential common stakeholders by the organization of joint activities and events. The scope of liaising can be dissemination, exploitation of the project results, technology transfer, development of joint research actions and production of scientific publications.

Clustering with other initiatives is carried out in different phases:

1. Identification of R&D projects, associations, clusters and other organisations related to NEMOSINE.
2. Establishment of contacts with relevant consortia and researchers.
3. Liaising and joint activities.

4.1 Identification of R&D projects related to NEMOSINE.

An initial search of funded projects worldwide under the generic scope of ‘cultural heritage conservation’ returned on 1390 hits. Further refinements were applied to the search focusing on the relevance and similarities for NEMOSINE, focusing on those projects that were working on preservation packaging and preservation technologies. Moreover, other projects identified by the NEMOSINE partners have also been considered.

Table 1. List of funded projects related to NEMOSINE.

Project acronym and title	Funding program	Status and timeframe
NANO-CATHEDRAL - Nanomaterials for conservation of European architectural heritage developed by research on characteristic lithotypes	EU Horizon 2020	Closed. End date: 31/05/2018
ECHOES - European Colonial Heritage	EU Horizon	Active.

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Project acronym and title	Funding program	Status and timeframe
Modalities in Entangled Cities	2020	End date: 31/07/2021
NANO-RESTART - NANOMaterials for the REStoration of works of ART		Closed. End date: 30/11/2018
InnovaConcrete - Innovative materials and techniques for the conservation of 20th century concrete-based cultural heritage	EU Horizon 2020	Active. End date: 31/12/2020.
HeritageCARE - Monitoring Preventive Conservation of Historical and Cultural Heritage	INTERREG Sudoe	Closed. End date: 31/08/2019.
APACHE - Active & intelligent PACKaging materials and display cases as a tool for preventive conservation of Cultural Heritage.	EU Horizon 2020	Active. End date: 30/06/2022.
HeriCare - 2D Materials/Polyoxometalate Hybrids for Heritage Conservation	EU Horizon 2020, MSCA	Active. End date: 15/10/2021.
NANOMORT - Development of a novel and ecologic mortar based on nanoparticles of lime and organic additives for the repair of Built Heritage and new construction	EU Horizon 2020, MSCA	Active. End date: 31/08/2022.

4.2 Clustering with associations, clusters and public organisations

In addition to clustering to other active R&D project consortia, wider dissemination and technology transfer would be achieved through using the partner memberships of trade associations, cluster, non-profit and public organizations related to the aims of the project. Several associations which are partially related to NEMOSINE topic and that count with the active membership or presence of NEMOSINE consortium partners have been identified:

- Organic and Printed Electronics Association (OE-A): www.oe-a.org/home
- Association française de l'électronique imprimée (AFELIM): www.afelim.fr/
- Research Association Mechatronic Integrated Devices (3D MID e.V.): www.3d-mid.de/
- 4M Network of Excellence: www.4m-association.org/
- Center of the Picture Industry (CEPIC) Photo Agency Association.
- Fédération Internationale des Archives de Télévision / The International Federation of Television Archives (FIAT/IFTA): <http://fiatifta.org/>
- IASA International Association of audiovisual Archives: www.iasa-web.org
- AMIA, Association of Moving Image Archivists: www.amianet.org/
- FIAF International Federation of Film Archives: www.fiafnet.org/
- Audio Engineering Society (AES): www.aes.org
- German Association of Cinémathèques (Kinematheksverbund)
- Association des Cinémathèques Européennes (ACE)
- Fédération Internationale des Archives du Film (FIAF)
- AIC (American Institute of Conservation)
- Tauvisual (Italian based professional imaging association)
- ECCO, European Confederation of Conservator-Restorers' Organisations
- ICOM-CC International Council for Museums Committee of Conservation

5. Contribution to standards

5.1 Identification of standards relevant to NEMOSINE

The packaging developed within NEMOSINE, as well as other related results need to fulfil the current standards. There are specific working groups in the European Committee for Standardization (CEN) about enclosure and environmental quality preservation for CH, especially about mitigation of environmental impact by the use of protective enclosures (CEN TC346, WG12). Also, there is a working group at the International Council of Museums – Committee of Conservation (ICOM-CC) on Photographic Materials and another on Preservative Conservation that include periodically activities towards preparation and advising on standardisation activities.

A first identification of relevant standards that need to be considered for the NEMOSINE developed solutions has been performed and it is presented in this section by standardization bodies and/or technical committee:

European Committee for Standardization – Technical Committee on Conservation of Cultural Heritage (CEN/TC 346)

This technical committee is mainly dealing with the characterization of materials, the processes, practice, methodologies and documentation of conservation of tangible cultural heritage to support its preservation, protection and maintenance and to enhance its significance. It includes characterization of deterioration processes and environmental conditions for cultural heritage and the products and technologies used for the planning and implementation of their conservation, restoration, repair and maintenance.

25 standards published by this committee that are relevant to NEMOSINE have been identified:

European Committee for Standardization – Technical Committee on Digital preservation of cinematographic works (CEN/TC 457)

The scope of this committee includes the definition and standardisation of digital long-term archive formats for cinematographic works, and methods for ensuring data integrity and quality.

An initial work programme prEN (WI=00457001) - A framework for digital preservation of cinematographic works - The CEN Preservation Package¹ was originally published on 2019-07-02, but so far there are still no active standards published within this specific technical committee.

International Council of Museums – Committee of Conservation (ICOM-CC)

ICOM-CC is a non-governmental organisation maintaining formal relations with UNESCO and having a consultative status with the United Nations' Economic and Social Council. ICOM-CC participates in the activities of 117 National Committees and 31 International Committees. ICOM's activities are focused on the following themes:

- professional cooperation and exchange;
- dissemination of knowledge and raising public awareness of museums;
- training of personnel;
- advancement of professional standards;

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https://standards.cen.eu/dyn/www/f?p=204:110:0:::FSP_PROJECT,FSP_LANG_ID:70021,25&cs=190434EF605A0AD3002A520DB88F972C2. Retrieved on September 2020.

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- elaboration and promotion of professional ethics;
- preservation of heritage and combating the illicit traffic in cultural property.

Photographic Materials is the ICOM-CC Working Group concerned with the conservation of photographic images, including cinematographic material.

The Preventive Conservation Working Group deals with all measures and actions aimed at avoiding and minimizing future deterioration or loss.

5.2 Identification of policy frameworks relevant to NEMOSINE

NEMOSINE scope, covering several types within the audiovisual works (audio, films, images, etc.), is in line with several Commission Recommendations and Communications launched in the last decade and even previously, with the aim of having a common vision for CH. Different policy frameworks at EU level have been identified directly related to protection and conservation of cultural heritage and are described in more detail as follows:

- European Convention for the Protection of the Audiovisual Heritage (Strasbourg, 2001)
- Recommendation 2001 (2012) of the Parliamentary Assembly of the Council of Europe on the Protection of and access to the audiovisual cultural heritage².
- Recommendation 2005/865/CE of the European Parliament and of the Council of 16 November 2005 on film heritage and the competitiveness of related industrial activities³.
- Standardisation mandate M/365 to the CEN on the harmonisation of cataloguing and indexing practices of cinematographic works and on the interoperability of film databases⁴.
- Council Resolution of 24 November 2003 on the deposit of cinematographic works in the European Union⁵.
- Communication COM(2001)534 final of 26 September 2001 from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions on certain legal aspects relating to cinematographic and other audiovisual works⁶.

² <http://assembly.coe.int/nw/xml/XRef/Xref-XML2HTML-en.asp?fileid=18725&lang=en>. Retrieved on September 2020.

³ <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:323:0057:0061:EN:PDF>. Retrieved on September 2020.

⁴ https://ec.europa.eu/archives/information_society/avpolicy/docs/reg/cinema/m365en.pdf. Retrieved on September 2020.

⁵ [https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32003G1205\(03\)](https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32003G1205(03)). Retrieved on September 2020.

⁶ <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52001DC0534>. Retrieved on September 2020.