

2020 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons

22 August 2022

Original: English

New York, 1–26 August 2022

Atoms for heritage: peaceful use of nuclear techniques for heritage science

**Working paper submitted by Australia, Brazil, Egypt, France,
Germany and the Netherlands**

Introduction

1. Along with nuclear disarmament and non-proliferation, the peaceful use of nuclear energy and technologies is central to the implementation of the Treaty on the Non-Proliferation of Nuclear Weapons. Indeed, its third pillar provides a unique opportunity for the States parties to cooperate. The present working paper, in line with this pillar, seeks to highlight a creative, cross-regional manner and inclusive means of cooperation.

2. While nuclear applications in health, climate, agriculture and nutrition are widely known, less well reported is the use of nuclear techniques for the study, characterization, assessment and preservation of natural and cultural heritage. These techniques serve to strengthen target 11.4 of the Sustainable Development Goals, Strengthen efforts to protect and safeguard the world's cultural and natural heritage.

3. Because of their non-destructive and non-invasive character, coupled with a wide applicability, nuclear techniques have become indispensable tools for heritage science. A few examples of these techniques are radiocarbon dating, X-ray or gamma radiography examination or ionizing radiation to control pests. Nuclear techniques can be used to interpret, study, preserve and conserve materials of historical, artistic and natural importance. They furthermore help us to understand the processes and techniques of production of artefacts and works of art that are otherwise hidden under the surface. Once (re)discovered, such understanding has immediate and important practical applications in aiding verification of the identity and authenticity of works of art. Not only does this help to establish provenance, but it is also a crucial step in combating fraud and illicit trade by separating fraudulent artefacts from real ones.

4. Heritage management is embedded within the World Heritage Convention (1972), adopted at the seventeenth session of the General Conference of the United Nations Educational, Scientific and Cultural Organization (UNESCO). The Convention recognizes the duty of ensuring the identification, protection, conservation, presentation and transmission to future generations of cultural and natural heritage.



5. The International Atomic Energy Agency (IAEA) supports research in the area of art and cultural heritage preservation, bringing together institutes from across the world in order to support the application of nuclear techniques in this field. Examples are e-learning publications, such as on the use of X-ray fluorescence spectrometry techniques for the characterization of cultural heritage, in 2021.

6. IAEA, through its technical cooperation programme and coordinated research projects, has been supporting national experts by providing them with harmonized and efficient methods with which to conserve cultural heritage items for the foreseeable future. The successful implementation of the IAEA regional technical cooperation projects in Latin America¹ and the national project in Egypt,² with the aim of applying nuclear techniques for the consolidation and preservation of archived material and cultural heritage artefacts, was a perfect display of the valuable role IAEA can play in this regard.

7. In order to promote and raise awareness of this rich subject, Brazil, Egypt, France and the Netherlands have established a long-standing cooperation, seizing the opportunity of the 2018 IAEA Ministerial Conference on Nuclear Science and Technology to launch the Atoms for Heritage initiative. A further step forward was taken at the 2019 session of the Preparatory Committee for the 2020 Review Conference, through the first joint statement on nuclear techniques for cultural heritage, co-sponsored by Australia, Germany, Portugal and the United Kingdom. Finally, in 2021, IAEA designated its first two collaborating centres in the area of heritage science: France's Paris-Saclay University and the National Centre for Radiation Research and Technology at the Egyptian Atomic Energy Authority. Both centres will play a key role in the development of initiatives worldwide in the application of nuclear techniques in the field of heritage research and conservation, as may institutes that join the list of collaborating centres in the future.

8. In order to support our efforts to share knowledge about the application of nuclear techniques in the field on the occasion of the tenth Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, in 2022, our countries submit the present working paper to illustrate how the nuclear techniques applied to cultural heritage research and treatment can contribute to intercultural dialogue and peace, as well as to propose various actions to continue the development of this contribution.

The way forward

9. Strengthen the international nuclear non-proliferation and disarmament regime, under the Non-Proliferation Treaty, by further expanding the development of, and access to, nuclear energy and technology for peaceful purposes, in particular access to nuclear techniques for heritage science.

10. Extend access to and the application of nuclear techniques for heritage science by widening the circle of beneficiaries, such as major cultural, educational and scientific institutions, government agencies, customs and tourism agencies, and commercial operators, such as auction houses and antique dealers. Raising awareness regarding the existence of these techniques among a wider group of heritage professionals is essential, especially in the fight against illicit trade.

11. Build on existing international cooperation and strengthen network interconnections to foster the further development of the field and more inclusive

¹ A project on strengthening capabilities for the utilization of nuclear and radiation technology to characterize, conserve and preserve the cultural heritage.

² A project on applying nuclear techniques for the consolidation and preservation of archived materials and cultural heritage artefacts.

access to benefits. To this end, the creation of the European Research Infrastructure for Heritage Science, which has been fully operational since 2022, is promoting cross-border access to facilities and resources within scientific networks from a dozen European countries, with considerable focus on equal and inclusive access. This platform serves to focus research efforts and to promote collaboration and knowledge-sharing so as to avoid duplication and increase effectiveness, lowering the costs of analyses, and the development of technological tools and relevant infrastructure.

12. Extend impact through international cooperation by developing shared projects and establishing common knowledge bases, creating and consolidating networks of scientists (epistemic communities), as well as collaborative platforms, while integrating economic and tourism priorities. Some of the international organizations that could be involved are UNESCO and the International Alliance for the Protection of Heritage in Conflict Areas, for instance.

13. Share knowledge with the public through participation in major events in the field of nuclear application, and increase communication about this initiative. This is the purpose of the present working paper, as well as the side event that will be organized on cultural heritage in parallel with the sixty-sixth IAEA General Conference, in September 2022.

14. Train the next generation of scientists by organizing early-career “scientist in residence” programmes and international training activities involving local scientific communities and creating practical training schools. Important in relation to such training are collaborations with existing networks or organizations, such as the Netherlands Institute for Conservation+Art+Science+, which brings researchers together from the disciplines of conservation, art history, physical science and computer science into cohesive research programmes, the Brazilian Institute for Energy and Nuclear Research, the Network of French Schools Abroad and the French Institute for Eastern Archaeology, which has a laboratory dedicated to archaeometry and deals with conservation, restoration, materials study and radiocarbon dating.

15. Develop innovative methods and procedures for non-destructive analysis, dating and characterization of samples. This is the first issue that the French collaborating centre will attempt to tackle. This partly implies working towards safer analysis to preserve the integrity of the objects and historical information stored in the materials.
