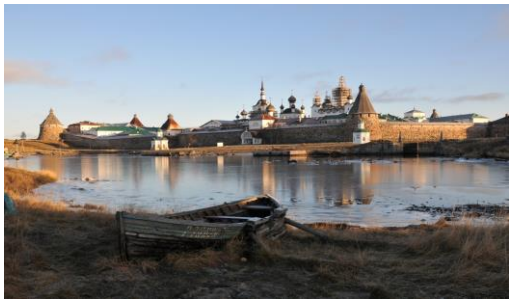
Sustainable Development
Working Group

SDWG Project Proposal Template
Effective as of 21 March 2018

SDWG PROJECT PROPOSAL

Project Title: Preserving ARCtic ARChitectural Heritage (PrARCHeritage)



Picture: The World Heritage Site "Cultural and Historic Ensemble of the Solovetsky Islands ", Arkhangelsk Region, Russia

Lead Country/Project leader(s):

Russia (Project Lead): Maria Frolova, Northern Arctic Federal University named after M.V. Lomonosov (NArFU), PhD, Associate Prof, Head of the Department of Cultural Heritage Objects of the Northern and Arctic Territories

Email: m.aizenstadt@narfu.ru

Co-leads:

Norway: Bjørn R Sørensen, Professor, Head of Dpt. of Building, Energy and Material Technology, UiT-The Arctic University of Norway

Finland: Oulu School of Architecture, Anu Soikkeli, Associate Professor (Arctic Architecture and Environmental Adaption) – *to be determined*

Sweden: RISE, Research Institute of Sweden – *to be determined*

others - *to be determined*

Partner/Supporting Countries and PPs:

Russia:

State Inspection for Heritage Protection in Arkhangelsk Region

Kizhi State Open-Air Museum of History, Architecture and Ethnography

Administration of the Kargopol Municipal District of the Arkhangelsk Region

International Arctic Social Sciences Association

Russian Association of Indigenous Peoples of the North (RAIPON)

Kenozero National Park

Russian Arctic National Park

Norway:

Norsk institutt for kulturminneforskning (Norwegian Institute for Cultural Heritage Research) – *to be determined*

Riksantikvaren (Department for Cultural Heritage) – *to be determined*

Oslo School of Architecture and Design (AHO) - *to be determined*

Iceland: Minjastofnun Íslands (Cultural Heritage Agency of Iceland) - *to be determined*

Participating Observers:

Support is given by:

The Ministry for the Development of the Russian Far East and Arctic, the Russian Federation

The Ministry of Foreign Affairs of the Russian Federation

The Ministry of Natural Resources and Environment of the Russian Federation

The Ministry of Culture of the Russian Federation

The Ministry of Science and Higher Education of the Russian Federation

	Support of the project initiative is negotiated and kindly asked from: Mr. Steinar Lindberg, Norway Ministry of Foreign Affairs, AC SDWG Delegate Ms. Anna Yletyinen Counsellor, Arctic and Antarctic Affairs at Ministry for Foreign Affairs of Finland, AC SDWG Delegate Ms. Sarah Cox, Director of the Circumpolar Affairs Directorate, Department of Intergovernmental and Northern Affairs Canada, and Canadian Head of Delegation to the Sustainable Development Working Group (SDWG) at the Arctic Council Others: TBD
Summary of Required Project Inputs: The cultural and historical sites are being endangered by the current climatic processes, as well as negative anthropogenic impact. The risks of losing the architectural heritage sites are increasing due to lack of properly enforced protection systems and as a result of the global climate change that enhances the negative impact of anthropogenic and cultural factors on unique objects and spurs their degradation and ultimate loss and significance. The processes of urbanization are taking over the traditional cultural space: the architectural ensembles of cities, noble and landowners' estates, temples and monasteries are being rebuilt; wooden and stone buildings of the 18th - 19th centuries undergo complete or partial reconstruction. Thus, during the last decades for various reasons (environmental, anthropogenic impact, technological progress, etc.) a large number of unique historical buildings in the Arctic and sub-Arctic Region has been destroyed or irretrievably lost. The architectural heritage face of the Arctic will never be as it could be unless innovational approaches to preservation and restoration of AH are applied. States need expertise to be implemented on unique objects, whereas the northern universities, business community are interested in attracting more competences to fill in gaps and expand collaboration with both national and international partners. Thus, the question of finding innovative and at the same time culturally sustainable and economically	**Relationship to other AC Working Groups:** This Project contributes to the Arctic Council Sustainable Development Working Group Mandate. It pursues opportunities to protect and enhance the Arctic environment and culture of Indigenous Peoples and Arctic communities. It contributes to achieving the goals of the following SDWG thematic areas: Heritage and Culture of Arctic communities (deepening global understanding of the region's peoples, including Indigenous Peoples, cultures, traditional ways of constructing and preserving AHs, sacred sites), Educational opportunities (through information on the historical and social development of the Arctic region[3], the study of traditional technologies for the construction and preservation of cultural sites using historically established local building materials and architectural features, AH map with augmented reality function, digital database of AH), Infrastructure, Science with inclusion of Indigenous knowledge and research for sustainable development (facilitating good use of the Arctic region's research institutions and extensive intellectual resources to benefit sustainable development, including through academic exchanges and joint Arctic research). For the Social, Economic, and Cultural Expert Group the project will contribute to work to advance social and cultural research in the development of sustainable and integrated approaches emerging in

[3] The Arctic region is a polar region located at the northernmost part of Earth. The Arctic region consists of the Arctic Ocean, adjacent seas, and parts of Alaska (United States), Canada, Finland, Greenland (Denmark), Iceland, Norway, Russia, and Sweden.

feasible solutions to preserve and recreate the authentic appearance of current and lost monuments and artefacts for future generations is becoming more and more urgent.

In the context of current global economic decline, it seems unlikely that all architectural monuments will be given due attention and physical renovation. Another concern is that even well managed architectural heritage sites of the Arctic are not available to a wide range of people (e.g. tourists) because of remoteness, poor accessibility, harsh climate, etc. However, Arctic architectural heritage treasury is worth seeing and discovering. This project aims to unite relevant validated organizations from the countries of the Arctic Council: Iceland, Finland, Norway, USA, Canada, Denmark, Sweden and Russia in order to set the experts network, define Arctic architectural heritage sites that should be protected and initiate new approaches to preservation and popularization[1] of Artic AH with means of virtual and augmented reality technologies (VIAR) - reconstructing the authentic appearance of AH of the circumpolar Arctic territories using modern digital technologies. Applying VIAR approach allows making AH accessible and inclusive worldwide, while reconstruction itself will be environmentally friendly as it doesn't imply physical measures. Participation of all Arctic countries meets the objectives of this project, since this will allow to develop a more complete digital database of Arctic AH that need special measures to preserve, restore and popularize.

The other focal area aims to go beyond the production knowledge towards academia, state (public authorities), professionals & business community collaboration, enhance knowledge and develop expertise in areas of shared interest between Arctic countries in the field of architectural and technological solutions for preservation and sustainable management of the Arctic unique cultural objects, combining old traditional & innovative approaches. This project involves collection and analysis of data on Arctic Architectural Heritage by countries, the circumpolar region. Here we mean digital technologies that allow 1) to obtain a big massive of data on the object, which can be then used by historians, archeologists, etc., 2) to create a 3D model and VIAR. The architectural heritage sites will keep untouched by tourists while the latter will enjoy virtual tour and historic details 3) to save the AH visual information even if the site itself will be changed/lost (physical deterioration, climate change, etc.).

Additionally, the Project is based on the fundamental principles of sustainable development and recommendations set out in the documents of the UN Conference on Environment and Development (Rio de Janeiro, 1992), decisions of the world summit on sustainable development (Johannesburg, 2002).

The implementation of the Project is based on international legal acts: the Convention on the Protection of the World Cultural and Natural Heritage (adopted on November 16, 1972 at the 17th session of the UNESCO General Conference); International Convention for the Safeguarding of the Intangible Cultural Heritage (adopted on 17 October 2003 at the 32nd session of the General Conference of UNESCO); International Charter for the Conservation and Restoration of Monuments and Sites (Venice Charter) (Venice, 1964).

The goal of the Project fully shares the key goals of the Outcome Document "Transforming Our World: The 2030 Agenda for Sustainable Development" and the UNESCO Strategy for 2014-2021 and is guided by the following:

1) Goals and objectives in the field of sustainable development, defined by the Outcome document "Transforming our world: the 2030 Agenda for Sustainable Development":

Goal 11. Ensure openness, safety, resilience and environmental sustainability of cities and towns.

"… 11.4 Enhance efforts to protect and preserve the world's cultural and natural heritage….".

[1] Here and below popularization means 1) development of such a product (interactive online map of Arctic architectural heritage sites with its description, level of preservation, existing problems, 3D visualization) that could be accessible to a wider audience not limited by specialists in this field (free access for all through user-friendly Internet version); 2) organization of cultural/entertainment events (lectures, seminars, festivals, exhibitions, historical quests, thematic fairs, performances, workshops, etc.) on preliminarily chosen pilot AH

mapping, choosing pilot (for each country) sites and provide their digital reconstruction, evaluate technical condition of each Arctic Architectural site, information about their previous physical reconstruction/restoration with analysis of the advantages and disadvantages of used approaches and methods described by project experts. Northern Arctic Federal University (Russian Federation, Arkhangelsk) / NArFU has been promoting the idea of reconstructing the authentic appearance of Architectural Heritage (AH)[2] of the circumpolar Arctic since 2017, when NArFU collaborated with foreign researchers within a number of research projects on UNESCO "Historical and Cultural Ensemble of the Solovetsky Islands" (UNESCO World Heritage Object in Arkhangelsk Region, Russia). July 2020 saw the signing of a bilateral agreement for the establishment the **UNESCO Chair "Technologies for Preservation of the Historical and Cultural Heritage of the Arctic Region Countries**" in Northern Arctic Federal University, Arkhangelsk. The UNESCO Chair of this particular profile and expertise is the only one in the Russian Arctic missioned to be the liaison unit on the interregional and international level for solving the **tasks of preservation of the Arctic heritage, offering technological solutions, promotion and translation of architectural heritage (AH) on natural landscape of the Arctic thru a unique combination** of historical, geographical, cultural, climatic and economic approaches. It is expected that in the Project the UNESCO Chair will **act as a networking fundament and a vital link** between academia, professional bodies, civil society, local communities and stakeholders to unite the knowledge and efforts and make the results efficient, sustained and benefiting northern communities. To support the newly created NArFU UNESCO Chair activities, a series of new	2) Strategic objectives (hereinafter SO) of UNESCO: SO 7: Protection, promotion and transmission of heritage. **The Project contributes to the following UN Sustainable Development Goals: Goal 4 Quality Education** (as the developed AH mapping and digital database will provide access to visual implementation and information about Arctic cultural heritage to everyone thus promoting learning opportunities for all), **Goal 9 Industry, Innovation and Infrastructure** (by developing fully new type of quality authentic sustainable and resilient infrastructure of AH implemented with means of IT technologies (augmented reality) and, probably by promoting new ideas of entrepreneurship in local Artic communities that would rise from such new digitalized objects (sphere of digital souvenirs, new IT apps related to discovering AH, various games developed on the basis of discovering AH, its history and secrets, etc.)), **Goal 11 Sustainable Cities and Communities** (through making Arctic cities and human settlements enriched with digitally renovated inclusive and sustainable cultural heritage objects), partly **Goal 13 Climate Action** (with respect to AH being destroyed due to harsh Arctic climate conditions but renovated/recreated to its original state with means of modern IT technologies), and **Goal 17 Partnerships for the Goals.** Also, the Project activities are subjects of the "Strategy for the Development of the Arctic Zone of the Russian Federation until 2035" and ensure the holistic approach towards the Arctic human dimension in the Arctic, improving common Arctic heritage preservation, advancing ICT solutions in the Arctic and developing people-to-people relations.

[2] Here and below architectural heritage (AH) include: **monuments of history and culture, which are real estate sites that have arisen as a result of historical events and are valuable in terms of history, architecture, art, science and technology, and social culture**

projects were initiated by NArFU and its partners in 2020, including *"ARCTIC HERITAGE: Developing architectural solutions and conservation techniques for unique cultural objects" funded by the Nordic Council of Ministers and "Capacity Building in Sustainability for Architectural Heritage" supported within the Erasmus+ Capacity Building Programme.* Furthermore, in 2021 on the basis of NArFU the Arkhangelsk Region is launching the "*Digital Arctic" Project* aimed at digital transformation of the processes of the Russian Arctic including blockchain technologies, AI and VR technologies, 3D modelling for an industrial sector, etc. These endeavors serve as the pillar of the proposed Project.	

Summary of project objectives and main outcomes:

Project objectives:

- To bring interested people and organizations, including Indigenous peoples, together to set experts' network and initiate new approaches to preservation and popularization of Artic architectural heritage;
- To develop an international Digital platform (on the base of NArFU as a Project Leader) for effective interaction between partners, experience exchange and dissemination of best practice in the field of studying, preserving and popularization of architectural heritage in the Arctic;
- To collect data and create a database & digital map of Arctic AH (including those objects having historical and cultural value for the Northern Indigenous peoples),
- To define a set of problems and understudied topics related to Arctic architectural heritage studying, preservation, and popularization and propose respective solutions (in pilot cases), including attraction of experience and knowledge of Indigenous peoples);
- To reconstruct the authentic appearance of pilot AH[4] (which will be jointly defined by Project team experts) using virtual and augmented reality (3D modeling technology) and existing environment with the possibility of subsequent virtual visit (wide audience coverage, higher inclusivity and accessibility). The list of pilot AH will be specifically identified and negotiated by Project partners and AH owner ,
- To enhance self-education[5] (through access to digital Arctic AHs with their description, photo, history, etc.), transfer knowledge across borders, particularly focusing on young generation

[4] For mapping of Arctic Architectural Heritage sites without 3D modeling no permission of authorized organizations is required. As for the 3D modeling of AH sites and downloading them on the web platform for free access by anyone, only those AH sites for which necessary official permission is obtained will be virtualized.

[5] For example, NArFU's Master Degree Module "Studying and Preserving cultural heritage objects" includes the discipline on the basics of CHO protection, and mapping proposed within this project initiative may illustrate the lecture material and make it interactive and interesting

and university students (also thru University of the Arctic thematic network), and develop expertise in areas of shared interest between Arctic countries in the field of architectural and technological solutions for preservation and sustainable management of the Arctic AH.

*As project progresses, basic and unique information about this or that Arctic AH can be added for end users, also with the assistance of local population. It may include history of creation, story-telling, interesting historical facts, construction/engineering aspects, etc.

Project expected results:

- Digital database of all Arctic Architectural Heritage sites (photo, description) and 3D modelled pilot AH (2-3 per country) (jointly chosen by project experts) with the possibility of subsequent virtual "excursion" visits (pilot cases in partner Arctic Council countries). The digital database will be developed on the base of NArFU jointly by all project partners and all partners will have access to the developed database, while the ownership and intellectual property rights of each Project result shall be vested to the partner who has created the respective result. Where several partners have jointly carried out work generating the result and where their respective share of the work cannot be ascertained, they shall have joint ownership of such result. All Project results ownership details will be negotiated among partners and fixed in the Partnership Agreement. All other database usage issues (data protection, access, sovereignty, downloadability, etc.) will be negotiated among partners and fixed in a separate document.
- Knowledge transfer across borders through developed expertise in areas of shared interest between Arctic Council countries in the field of architectural and technological solutions for preservation and sustainable management of the AH based on a "Living Laboratory" Approach[6].
- Raised public awareness about the AH challenges and prospects.
- Developed Guide for 3D Reconstruction of Cultural Heritage & Recommendations for sustainable management and preservation of architectural cultural heritage for the authorities/decision makers, research institutions, Indigenous peoples and others interested in studying, preserving and popularization of Arctic cultural heritage.
- More attracted tourists to the Arctic area to enjoy the Arctic heritage in the format of virtual tours (no physical presence and hence no damage to susceptible Arctic environment and architectural heritage sites, this is especially true for sacred places, for example).
- Launched new UArctic thematic network on Sustainability of the Arctic Cultural Heritage (this activity is planned for 2022-2023)
- Sustained indigenous and innovative knowledge by its integration into the university curricular for future architects, cultural and regional studies specialists, etc.
- Document local traditional technologies of construction in the Arctic for inspiring modern and sustainable technologies of construction in the Arctic.

NArFU UNESCO Chair "Technologies for Preservation of the Historical and Cultural Heritage of the Arctic Region Countries" (partner of UNESCO Chairs Network) will act as a resource center for knowledge

[6] Living Laboratory is an open-access innovation ecosystem that serves as a platform to involve all relevant stakeholders (academic institutions, cultural heritage related organizations, businesses, municipalities, etc.) in the field of Arctic Architectural Heritage. Its basic function is to be an intermediary between residents, research centers, innovation-driven businesses, authorities and the region for more effective integration of innovations into real life of the communities and their environments. One highly productive format of activity within Living Laboratories is hackathons, i.e. venues for researchers to present their developments within selected sectors of technology. Each case on Living Laboratories' agendas can be related to a specific challenge.

transfer across borders and its integration into curricula. Systemic integration of new methodologies into the university programmes (thru lecture courses, students schools, publications) will support the long term resilience and enhance the role of universities as competence architectural centers acting in accordance with regional needs and lead to improved education of a new generation of architects.

Project objective(s)

July 2020 saw the signing of a bilateral agreement for the establishment of the UNESCO Chair "Technologies for Preservation of the Historical and Cultural Heritage of the Arctic Region Countries" in Northern Arctic Federal University, Arkhangelsk. The UNESCO Chair of this particular profile and expertise is the only one in the Russian Arctic missioned to be the liaison unit on the interregional and international level for solving the tasks of preservation of the Arctic heritage, offering technological solutions, promotion and translation of architectural heritage (AH) on natural landscape of the Arctic thru a unique combination of historical, geographical, cultural, climatic and economic approaches. We assume that in the Project the UNESCO Chair will act as a networking fundament and a vital link between academia, professional bodies, civil society, local communities and stakeholders to unite the knowledge and efforts and make the results efficient, sustained and benefiting for northern communities.

Project Rationale:

Issues such as multi-faceted monitoring of the Arctic's architectural heritage and long-term protection, restoration and conservation of tangible (monuments, structures, natural landscapes) in connection with evolution of intangible (language, traditions, customs, rituals, folklore) heritage have come into the foreground.

An area with many-thousand-year-long history, the Arctic Region boasts diverse natural and architectural heritage. According to UNESCO, 17 UNESCO cultural heritage objects are located here, including those in the Russian Arctic, namely: "Cultural and Historic Ensemble of the Solovetsky Islands", "Natural System of Wrangel Island Reserve" as well as 2 sites included into the World Heritage Tentative List - "Petroglyphs of Lake Onega and the White Sea" and "Heritage of Chukotka Arctic Marine Hunters", and several hundreds of regional and local architectural heritage sites located in circumpolar areas and anticipating due attention.

The overall Project goal is to strengthen academia, public authorities, professionals & business community collaboration, enhance knowledge, provide international in-depth understanding and develop expertise in the areas of shared interest between Arctic countries in the field of preservation and popularization of the Arctic architectural heritage with means of VIAR and to contribute by technical findings applicable to the whole Arctic area.

Project objectives:

- To bring interested people and organizations, including Indigenous peoples, together to set experts' network and initiate new approaches to preservation and popularization of Artic AH;
- To define a set of problems and understudied topics related to Arctic architectural heritage studying, preservation, and popularization and propose respective solutions (in pilot cases), including attraction of experience and knowledge of indigenous people);
- To collect data and create a database & digital map of Arctic AH (including those objects having historical and cultural value for the Northern Indigenous peoples),
- To develop an international Digital platform (on the base of NArFU as a Project Leader) for effective interaction between partners, experience exchange and dissemination of best practice in the field of studying, preserving and popularization of architectural heritage in the Arctic;

- To reconstruct the authentic appearance of pilot AH[7] (which will be jointly defined by project team experts) using virtual and augmented reality (3D modeling technology) using existing environment with the possibility of subsequent virtual visit (wide audience coverage, higher inclusivity and accessibility). The list of pilot AH will be specifically identified and negotiated by project partners and AH owner;
- To enhance self-education[8] (through access to digital Arctic AH with their description, photo, history, etc.) transfer knowledge across borders, particularly focusing on young generation and university students (also thru University of the Arctic thematic network), and develop expertise in areas of shared interest between Arctic countries in the field of architectural and technological solutions for preservation and sustainable management of the Arctic AH.

*As project progresses, basic and unique information about this or that Arctic AH can be added for end users, also with the assistance of local population. It may include history of creation, story-telling, interesting historical facts, construction/engineering aspects, etc.

Activities and Outputs

Project expected results:

- Digital database of all Arctic Architectural Heritage sites (photo, description) and 3D modelled pilot AH (2-3 per country) (jointly chosen by Project experts) with the possibility of subsequent virtual "excursion" visits (pilot cases in partner Arctic Council Countries). The digital database will be developed on the base of NARFU jointly by all Project partners and all partners will have access to the developed database, while the ownership and intellectual property rights of each project result shall be vested to the partner who has created the respective result. Where several partners have jointly carried out work generating the result and where their respective share of the work cannot be ascertained, they shall have joint ownership of such result. All Project results ownership details will be negotiated among partners and fixed in the partnership agreement. All other database usage issues (data protection, access, sovereignty, downloadability, etc.) will be negotiated among partners and fixed in a separate document.
- Knowledge transfer across borders through developed expertise in areas of shared interest between Arctic Council countries in the field of architectural and technological solutions for preservation and sustainable management of the AH based on a "Living Laboratory" Approach[9].
- Raised public awareness about the AH challenges and prospects.
- Developed Guide for 3D Reconstruction of Cultural Heritage & Recommendations for sustainable management and preservation of architectural cultural heritage for the authorities/decision makers, research institutions, Indigenous Peoples and others interested in studying, preserving and popularization of Arctic cultural heritage.
- More attracted tourists to the Arctic area to enjoy the Arctic heritage in the format of virtual tours (no physical presence and hence no damage to susceptible Arctic environment and architectural heritage sites, this is especially true for sacred places for example.

[7] For mapping of Arctic Architectural Heritage sites without 3D modeling no permission of authorized organizations is required. As for the 3D modeling of AH sites and downloading them on the web platform for free access by anyone, only those AH sites for which necessary official permission is obtained will be virtualized.

[8] For example, NArFU's Master Degree Module "Studying and Preserving cultural heritage objects" includes the discipline on the basics of CHO protection, and mapping proposed within this project initiative may illustrate the lecture material and make it interactive and interesting.

[9] Living Laboratory is an open-access innovation ecosystem that serves as a platform to involve all relevant stakeholders (academic institutions, cultural heritage related organizations, businesses, municipalities, etc.) in the field of Arctic Architectural Heritage. Its basic function is to be an intermediary between residents, research centers, innovation-driven businesses, authorities and the region for more effective integration of innovations into real life of the communities and their environments. One highly productive format of activity within Living Laboratories is hackathons, i.e. venues for researchers to present their developments within selected sectors of technology. Each case on Living Laboratories' agendas can be related to a specific challenge.

- Launched new UArctic thematic network on Sustainability of the Arctic Cultural Heritage (this activity is planned for 2022-2023)
- Sustained Indigenous and Innovative knowledge by its integration into the university curricular for future architects, cultural and regional studies specialists, etc.
- Document local traditional technologies of construction in the Arctic for inspiring modern and sustainable technologies of construction in the Arctic.

NArFU UNESCO Chair "Technologies for Preservation of the Historical and Cultural Heritage of the Arctic Region Countries" (partner of UNESCO Chairs Network) will act as a resource center for knowledge transfer across borders and its introduction to curricula. Systemic integration of new methodologies into the university programmes (thru lecture courses, students schools, publications) will support the long term resilience and enhance the role of universities as competence architectural centers acting in accordance with regional needs and lead to improved education of a new generation of architects.

Method

Experts Network

Creation of successful cooperation between Russian and International experts for more efficient education and scientific activities in the field of research and preservation of architectural heritage in historic cultural and natural landscapes thru developing of the University of the Arctic Thematic Network "Sustainability of the Arctic Cultural Heritage". The NArFU UNESCO Chair being a resource of accumulating best practices to be promoted in Russia assigns it the role of an intellectual space and a venue for the exchange of scientific, cultural and educational information towards a more in-depth exploration of the issues and trends faced by the cultural heritage of the Arctic areas.

Practical workshops and master classes in places of compact residence of Indigenous peoples

Conducting events on the topic "Architectural solutions, materials and conservation techniques for unique architectural sites". The Practical workshops will aim at involving the regional community in the problem of preserving their architectural heritage, as well as a better and deeper understanding by the project experts of the historical and social significance of the selected AH (estimated number of participants 15-30).
Master classes will aim at demonstrating and integrating existing best practices for virtual reconstruction of AH (estimated number of participants is 10-15).
The number of Practical workshops and master classes will depend on the number of pilot AH defined as project priority cases.

Digital database and interactive map of the Arctic AH

The successful implementation of "Living Laboratory" approach will allow carrying out cultural, historical, archaeological, ethnographic, anthropological and other research, also with attraction of Indigenous peoples. The project experts from each country will collect information on existing architectural heritage sites. The collected data will serve as the basis for creating an interactive map of Arctic architectural heritage sites, which will provide up-to-date information on the objects, their condition, and recommendations on the need or sufficiency of restoration work.

Oriented work with the historical and architectural heritage is the use of augmented reality (AR) technology - one of the fastest growing technologies of the 21st century. Augmented reality is often confused with virtual reality (VR - virtual reality), but this technology is not formed only from digital objects in 3D space. In augmented reality, objects are part of the existing environment, and the display of a mobile device shows the user the real physical world with added virtual objects.

In the context of the reconstruction of AH, the use of augmented reality technology is more preferable, since it allows one to recreate the appearance of a lost monument in conjunction with the actually existing architectural component of the urban space.

It is worth noting that the use of digital technologies not only makes it easier to obtain information and preserve the memory of endangered objects for the population of the Arctic region, but creates enthusiasm of the modern generation for studying history and culture, and therefore contributes to the understanding and preservation of their social and historical identity. With the help of the created

interactive elements for the popularization of architectural monuments, the population can learn about the past of their country and city even on mobile devices connected to the Internet.

The project has the potential to make Arctic architectural heritage sites accessible for the whole world community despite age, country, physical challenges (inability to physically visit the place) or other limitations as digital technologies are now available worldwide.

Guide for 3D Reconstruction of Architectural Heritage: Data collection & risk assessment

When treating architectural Heritage as a sum of remaining items from the old past, 3D modeling technologies offer a chance to not only digitize existing historic artifacts but to virtually reconstruct those objects that no longer exist and are known exclusively from descriptions.

Until the year 2000 3D visualization of cultural heritage artifacts was used merely as digital replacement for physical models. It is only since new millennium that it was used in a wider context. Nowadays 3D models are mainly used to visualize historic items to the public as well as for research purposes and for education.

The Guide for 3D reconstruction will be a provisional guide which presents an early version of the 3D Reconstruction assessment tool. It focusses on initiating the overall process, collecting information relevant to the specific historic places and assessing it for loss-related risks. This tool will be trialed during the project period at several case study sites across the Arctic. Based on feedback of these trials, the guide will be revised and eventually become a web-based tool.

The Guide will present a systematic approach or a procedure, to facilitate the best understanding of the site and loss- related risks in each individual case. It is a normative working procedure for, in the next step, selecting measures to 3D Reconstruction, based on an investigation, analysis and documentation of the cultural heritage sites including its heritage significance and the actual state of the object.

This method provides a systematic procedure to facilitate the best decision in each individual case. The procedure shall be used to identify the need for preserving AH and to develop appropriate measures. This guide will be available to a wide range of stakeholders after an expert assessment of the professional community and representatives of the Indigenous peoples of the North.

Activity Plan (2021-2023)

-The experts' network set will bring relevant people and organizations to ensure effective communication and identified list of network experts, stakeholders and beneficiaries.

Deliverables

- identified list of network experts and beneficiaries;

-Experts "Think Tank" Hub's activities basing on Arctic Living Laboratory" Approach Deliverables:

-Identified Arctic UNESCO AH sites and regional AH for exploring, mapping and presentation

-Practical workshops and master classes on the topic "Architectural solutions, materials and conservation techniques for unique cultural objects"

-Study Guide and Thematic report on best practices and technologies to preserve architectural heritage done on behalf of participants (from the standpoint of both researchers, conservation architects (theory), craftsmen (practice) and local community and indigenous people representatives (knowledge)

-Digital database of the Arctic AH based on 3D modeling technology with the possibility of their subsequent virtual "excursion" visits.

-Conference "ARCTIC HERITAGE: Special Tools and Solutions for preservation of unique cultural architectural objects. Place: Arkhangelsk.

Deliverables:

The Project technical findings and recommendations for using combined old & innovative approaches will be presented for key target groups (state, business community, academia) as innovative solutions transfer and benefits for the general public.

Financial and economic provision of Project actions on is planned using resources of the Project "ARCTIC HERITAGE: Developing architectural solutions and conservation techniques for unique cultural objects funded by the Nordic Council of Ministers. Maria Frolova, Head of the UNESCO Chair "Technologies for Preservation of the Historical and Cultural Heritage of the Arctic Region Countries" is responsible for this Project implementation.

Timetable and Project Completion

Project Timeline

	2021												2022												2023		
Activity	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
The set experts' network																											
• List of network experts and beneficiaries																											
Experts "Think Tank" Hub's activities (in form of Arctic Living Laboratory)																											
• Identified Arctic UNESCO AH sites and regional AH sites																											
• Practical workshops																											
• Study Guide & Thematic reports on best practices and technologies																											
• Recommendations on concrete AH sites for restoration and conservation																											
• Digital database of pilot Arctic AH sites based on 3D modeling technology																											
Conference "Special Tools and Solutions for preservation of unique cultural objects"																											

Costs

The total budget for this Project will be determined following consultations with respective SDWG Delegates. It is expected that if supported, each State will provide sufficient funding to their research leads to carry out the proposed activities. Financing of the regions outside Russia and in-kind contribution will be requested from AC member countries and observers.

On this project stage, the resource of current NArFU's international projects and activities in the field will be used (including but not limited to projects: "SAH: Capacity Building in Sustainability for Architectural Heritage" (financed by Erasmus + Capacity Building Programme), "ARCTIC HERITAGE: Developing architectural solutions and conservation techniques for unique cultural objects" (financed by the Nordic Council of Ministers current activities of the UNESCO Chair "Technologies for Preservation of the Historical and Cultural Heritage of the Arctic Region Countries".

Budget line	Amount, EUR	Comments
Personnel	40509.1	7 NArFU experts (5 faculty members, 2 MSc students) for 30% monthly employment / 28 months (Sept. 2021-Dec. 2023), incl. social charges
Travel	13889.7	Based on 1 trip/ year/2 experts (2 years)
Expeditions and field works	11574.8	2 expeditions to pilot sites for field works
Equipment costs (3D modelling lab)	38196.7	Co-funding from ongoing international projects, self-financing
Creation of a multilingual online platform	6944.85	.com platform for downloading maps, photos, descriptions of AH
Conference, seminars, meetings costs	6944.85	1 seminar on a pilot AH costs approx. 2314.95 EUR 1 conference costs approx. 4629.90 EUR
Other costs (visualization, dissemination, translation)	4629.90	
Total:	**115745.05**	

Integration of Indigenous Knowledge and Local Knowledge

The project aims at collecting information on the historical and social development of the local Arctic territories, at the study of traditional technologies for the construction and preservation of cultural sites using historically established local building materials and architectural features. Special attention will be paid to AH of Indigenous peoples of the Arctic.

The implementation of the Project results will contribute to a better understanding of traditional local history and awareness of national identity, which is an essential condition for the economic well-being and successful development of any state.

Communications

This project aims to unite relevant organizations from the countries of the Arctic Council: Iceland, Finland, Norway, USA, Canada, Denmark, Sweden and Russia in order to set the experts network, define Arctic architectural heritage sites that should be protected and initiate new approaches to preservation and popularization[10] of Artic AH with means of virtual and augmented reality technologies (VIAR) - reconstructing the authentic appearance of AHs of the circumpolar Arctic territories using modern digital technologies. Applying VIAR approach allows making AH accessible and inclusive worldwide, while reconstruction itself will be environmentally friendly as it doesn't imply physical measures. Participation of all Arctic countries meets the objectives of this project, since this will allow to develop a more complete digital database of Arctic AH that need special measures to preserve, restore and popularize. The project is focused on different target groups: not only the population of the Arctic territories will benefit from the implementation of this project, but also specialized organizations carrying out museum, expeditionary and educational activities in the field of preserving cultural heritage sites as well as the whole world community who will receive access to the Arctic Heritage without physical visiting it.

The other focal area aims to go beyond the production knowledge towards academia, state (public authorities), professionals & business community collaboration, enhance knowledge and develop expertise in areas of shared interest between Arctic countries in the field of architectural and technological solutions for preservation and sustainable management of the Arctic unique cultural objects, combining old traditional & innovative approaches. This project involves collection and analysis of data on Arctic Architectural Heritage by countries, mapping, choosing pilot (for each country) sites and provide their digital reconstruction, evaluate technical condition of each Arctic Architectural site, information about their previous physical reconstruction/restoration with analysis of the advantages and disadvantages of used approaches and methods described by project experts).

The International Project Team will be appointed. Project team members will come from all the participating countries and all partner organizations. Project Manager in NArFU as Lead Partner will be appointed and perform overall project management. Project team will have countries thematic leaders, which task is to provide findings, coordinating educational programmes and acting as scientific supervisor for academia and other activities. Partner organizations will appoint the Project Coordinators tasked to support the management and administration of the project on regional levels. The Project work face-to face meetings will be arranged on hosting organization rotation principle and may be combined with on-line format. Partners will implement jointly a communication and dissemination plan that ensures adequate promotion of the project and its results towards potential beneficiaries, project experts and the general public.

[10] Here and below popularization means 1) development of such a product (interactive online map of Arctic architectural heritage sites with its description, level of preservation, existing problems, 3D visualization) that could be accessible to a wider audience not limited by specialists in this field (free access for all through user-friendly Internet version); 2) organization of cultural/entertainment events (lectures, seminars, festivals, exhibitions, historical quests, thematic fairs, performances, workshops, etc.) on preliminarily chosen pilot AH

Appendix 1

List of NArFU projects that enabled to build synergy and use joint resources for promoting Digital Arctic Heritage project activities.

-"ARCTIC HERITAGE: Developing architectural solutions and conservation techniques for unique cultural objects", supported by Nordic Council of Ministers https://narfu.ru/en/projects/projects/detail/?id=346694

-"Capacity Building in Sustainability for Architectural Heritage", supported by ERASMUS + Capacity Building in the Field of Higher Education https://narfu.ru/en/projects/projects/detail/?id=346965

-The UNESCO Chair in NARFU named after M.V. Lomonosov, Arkhangelsk, Russia) https://narfu.ru/media/video/?ELEMENT_ID=347126&sphrase_id=296545 (ENG) https://www.youtube.com/watch?v=-w6pJ-CkMq0&feature=emb_logo (RU)

References

[1] Guzman, P., Fatori´c, S. and Ishizawa, M., (2020). Monitoring Climate Change in World Heritage Properties: Evaluating Landscape-Based Approach in the State of Conservation System. Climate [online]. 8(39); pp. 1-19. [Viewed 23 April 2020]. Available from: doi: 10.3390/cli8030039

[2] Dawson, T., Hambly, J., Kelley, A., Lees, W. and Miller, S., (2020). Coastal heritage, global climate change, public engagement, and citizen science. Proceedings of the National Academy of Sciences of the United States of America [online]. 117(15), pp. 8280-8286. [Viewed 23 April 2020]. Available from: doi: 10.1073/pnas.1912246117

[3] Climate Change Impacts on the Cultural and Historic Ensemble of the Solovetsky Islands M. Frolova1, A. Shinkaruk1, Y. Sokolova, Department of Cultural Heritage Objects of the Northern and Arctic Territories, Northern (Arctic) Federal University named after M.V. Lomonosov (NArFU), Arkhangelsk, Russia.

[4] Sesana, E., Gagnon, A. S., Bonazza, A. and Hughes, J. J., (2020). An integrated approach for assessing the vulnerability of World Heritage Sites to climate change impacts. Journal of Cultural Heritage [online]. 41, pp. 211-224. [Viewed 23 April 2020]. Available from: doi: 10.1016/j.culher.2019.06.013

[5] Bosher, L., Kim, D., Okubo, T., Chmutina, K. and Jigyasu, R., (2019). Dealing with multiple hazards and threats on cultural heritage sites: an assessment of 80 case studies. Disaster Prevention and Management: An International Journal [online]. 29(1), pp. 109-128. [Viewed 23 April 2020]. Available from: doi: 10.1108/DPM-08-2018-0245

[6] Marsadolov, L. S., Paranina, A. N., Grigoryev, A. A. and Sukhorukov, V. D., (2019). Problems of preservation of prehistoric cultural heritage objects in the Arctic. IOP Conference Series: Earth and Environmental Science [online]. 302(1), pp. 012149. [Viewed 23 April 2020]. Available from: doi: 10.1088/1755-1315/302/1/012149

[7] Sobolev, A. N., (2010-2018). Summary reports on the implementation of the Environmental Monitoring Program of the Solovetsky Archipelago in 2009-2017. Solovki: Federal State Cultural Institution "Solovetsky State Historical and Architectural Museum-Reserve".

[8] Gontar E., Danilov V., Frolova M., Ayzenshtadt A. Developing of eco-friendly «Green» materials for creating a harmonious color environment // International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM. 2018. Vol. 18(6.3). P. 113-120.

[9] Gontar, E., Danilov, V., Frolova, M. Color characteristics of wood-mineral compositions for the formation of an urban color environment // International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM. 2019. Vol. 19(6.2). P. 43-49.

[10] E. M. Tomilina, E. V. Gontar and M. A. Frolova. The use of augmented reality technology in the reconstruction of a lost cultural heritage site.// IOP Conf. Series: Materials Science and Engineering. 2020. Vol. 945 (012065) https://doi.org/10.1088/1757-899X/945/1/012065

[11] V. Danilov, A. Ayzenshtadt and M. Frolova, Practical Application of the Similarity Law of Structures in the Reconstruction of the Surface Layer of Bricks.// Materials Science Forum. 2021. Vol. 1017, pp. 21-30 https://doi.org/10.4028/www.scientific.net/MSF.1017.21