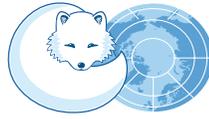




Sustainable Development  
Working Group



ARCTIC COUNCIL

## **SDWG PROJECT PROPOSAL TEMPLATE**

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**Project Title:**

**Zero Arctic**

**Concepts for carbon neutral Arctic construction based on tradition**

**Lead Country/Project leader(s):**

Lead:

- Finland / Ministry of the Environment / Matti Kuittinen

Potential co-lead (negotiations in process):

- Canada / Indigenous and Northern Affairs / Sarah Cox

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**Total Cost of Project:**

- 200 000 EUR (Finland)
- Additional sponsors are welcomed

**Relationship to other AC Working Groups:**

*(name of Working Group/contact name)*

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### **Objective of Project**

The focus of the Zero Arctic project is to develop regional concepts for Arctic building construction that would be carbon neutral over their full life cycle. The aim is to utilise both scientific life cycle assessment and energy simulation methods as well as to learn from and apply traditional knowledge of sustainable construction.

Key tasks of the Zero Arctic project include:

- Establish a network of relevant stakeholders in Arctic countries
- Benchmark the life cycle energy performance and greenhouse gas emissions of Arctic construction
- Analyse the traditional Arctic solutions to sustainable and energy-efficient construction
- Recognise locally-adoptable, cost-optimal and user-centered service and design innovations for reaching carbon neutrality
- Develop concepts for regional carbon neutral villages and buildings
- Arrange stakeholder and expert workshops for key tasks of the project
- Disseminate the findings through local seminars, reports and media
- Enable the capacity for continuous development of Arctic carbon neutral construction

Reaching carbon neutrality requires balanced optimisation of energy efficiency of buildings and their systems, generation of renewable energy, consideration of

embodied impacts of building materials and anticipatory service life planning. The aim is to study how various applications of traditional knowledge in Arctic construction have supported the environmental sustainability of buildings and how these principles can be applied in the development of modern construction technologies. Furthermore, the potential for compensating anthropogenic greenhouse gas emissions through natural and man-made carbon sinks in the context of Arctic construction needs to be explored.

The proposed project contributes to SDWG's area thematic area "infrastructure" by providing information needed for investments in sustainable Arctic construction. The project promotes traditional knowledge, thus contributing also to priority "heritage and culture of Arctic communities". The project has linkages to SDWG priorities "sustainable energy", "sustainable business involvement and development" and "science and research for sustainable development".

## Background

Intended date of project commencement: 01 August 2018

Completion date: 31 May 2020

**Table 1.** Milestones of the project.

<i>Milestone</i>	<i>Description</i>	<i>Due</i>
M1: Network	<ul style="list-style-type: none"> <li>• Network established</li> <li>• Kick-off event held</li> </ul>	Q3/18
M2: Methodology	<ul style="list-style-type: none"> <li>• Methodology for life cycle assessment in the Arctic context ready</li> <li>• Methodology for documentation and analysis of traditional construction techniques</li> </ul>	Q1/19
M3: Benchmarks	<ul style="list-style-type: none"> <li>• Benchmarks from Arctic life cycle assessments</li> <li>• Cross-comparison of results and dominance analysis</li> <li>• Traditional construction solutions documented</li> <li>• Analysis of their applicability to current needs and technologies done</li> </ul>	Q3/19
M4: Concept for stakeholder hearing	<ul style="list-style-type: none"> <li>• Zero Arctic concept developed for stakeholder hearing</li> <li>• Stakeholder events held</li> <li>• Feedback documented</li> </ul>	Q4/19
M5: Concept ready	<ul style="list-style-type: none"> <li>• Zero Arctic concept finalised</li> <li>• Ready for dissemination</li> <li>• Regional concepts developed</li> </ul>	Q1/20

M6: Dissemination	<ul style="list-style-type: none"> <li>• Project has achieved maturity for dissemination</li> <li>• Communication materials and summary reports completed</li> </ul>	Q2/20
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Key stakeholders:

Internal stakeholders include the Arctic States, research institutes and representatives from Permanent Participant organisations. The key external stakeholder groups include building permit and city planning authorities, contracting authorities, designers and planners, construction companies, funders, researchers and the academic / educational sector.

The project stakeholders include tentatively:

- Finland:
  - o Ministry of the Environment
  - o Finnish Environment Institute SYKE
  - o Technical Research Center VTT
  - o Sámi Museum Siida
- Canada:
  - o Government of Canada, Indigenous and Northern Affairs
- USA:
  - o Institute of the North
  - o Northern Forum

Additional stakeholders have been invited from other circumpolar countries. Negotiations are in progress.

**Table 2.** Cost estimate and budget for the Finnish tasks of the project.

Salaries	60 000 EUR
Travel	10 000 EUR
Sub-contracting (work packages 3 □ 5)	90 000 EUR
Services (seminars and events)	30 000 EUR
Other costs (publications)	10 000 EUR
Total	<b>200 000 EUR</b>

The budget given in Table 2 is for the Finnish tasks of the project. Should there be more funding from participating regions, the scope of work can be extended. Finland is prepared to coordinate the work.

## **Rationale**

Construction and the built environment consume half of all global raw materials, use up to 40 % of all primary energy, 30 % of all fresh water and cause over 30 % of greenhouse gas emissions. Furthermore, as people spend on the average 90 % of their time indoors, a variety of moisture, material or maintenance related problems increase health risks and have indirect social and economic impacts. Especially during dark periods of the year, the quality of indoor environment has great impact on human well-being. Several of the UN's Sustainable Development Goals (SDGs) are related to the built environment. Yet, based on literature review and expert interviews, it is evident that the topic of construction has not been studied as much as many other topics relating to Arctic sustainability. The advancement of sustainable construction requires an Arctic approach.

In order to find out which of the themes of sustainable construction have circumpolar interest, the Finnish Ministry of the Environment conducted a survey among the members of the Arctic Council SDWG during summer 2017. As a result, it was concluded that energy efficiency and the use of renewable energy were seen as the most relevant topics. This preliminary project plan has been developed based on the survey.

Life cycle assessment of buildings is gaining foothold in voluntary green building certification schemes (such as LEED, BREEAM, DGNB, HQE or CASBEE). Recently, several countries have also started normative development to include life cycle assessment into their building regulations. The Netherlands, Belgium, France, Finland, Sweden and Germany are among these countries. Outside of national or regional regulations, there is a need for the further development of building optimisation in the Arctic context based on life cycle assessment. Local conditions and traditions can be taken into account in such optimisations.

Several of the UN Sustainable Development Goals are linked to buildings or construction: Sustainable cities and communities (11); affordable and clean energy (7); industry, innovation and infrastructure (9); climate action (13); and responsible consumption and production (12). The specific links between these goals and the SDWG priority thematic areas focus on:

- infrastructure,
- heritage and culture of Arctic communities,
- science and research for sustainable development,
- sustainable business involvement and development, and
- sustainable energy.

So far, these issues have not been specifically addressed in recent projects of the SDWG. There are direct links between the *Arctic Renewable Energy Atlas* (AREA) project and the proposed Zero Arctic project. The latter can utilise the findings of the former, and develop regional scenarios for the compensation of greenhouse gas emissions with the help of renewable energy. Furthermore, energy-related topics have also been discussed in *Arctic Energy Summits*, but the focus of these valuable events has not made it possible to broaden the efforts to include a life cycle approach or study the embodied energy and embodied emissions of the built environment.

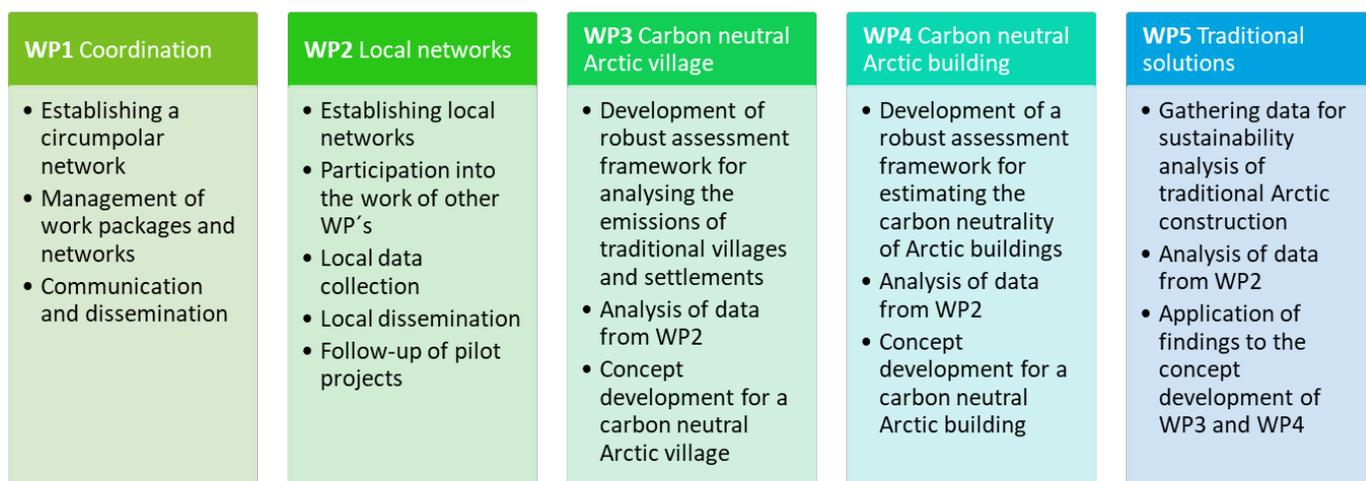
The project will produce new insights and knowledge of how to apply scientific sustainability analysis of buildings to traditional construction approaches. This enables the recognition, development and utilisation of diverse solutions to the common problem of climate change. The findings of the project will benefit building authorities, commissioners of public construction works, designers, planners, constructors and funders. Furthermore, the project offers possibilities for parallel educational projects, research and networking.

### **Activities and Outputs:**

Key tasks of the Zero Arctic project include:

- Establish a network of relevant stakeholders in Arctic countries
- Benchmark the life cycle energy performance and greenhouse gas emissions of Arctic construction
- Analyse the traditional Arctic solutions to sustainable and energy-efficient construction
- Recognise locally-adoptable, cost-optimal and user-centered service and design innovations for reaching carbon neutrality
- Develop concepts for regional carbon neutral villages and buildings
- Arrange stakeholder and expert workshops for key tasks of the project
- Disseminate the findings through local seminars, reports and media
- Enable the capacity for continuous development of Arctic carbon neutral construction

The proposal is to organise the project into five work packages as follows:



**Figure 1.** Work packages of the project.

Several different target groups will benefit from the project. Many benefits will already be gained during the project, but the majority of benefits are likely to be achieved after the project has been locally disseminated. Table 1 summarises the key benefits for different stakeholder groups.

**Table 3.** Benefits for target groups.

Target group	Benefits
Regional construction authorities	<ul style="list-style-type: none"> <li>Knowledge for permitting and inspecting carbon neutral buildings.</li> <li>Regional concepts can first be used for demonstration projects and then gradually applied into others as well.</li> </ul>
Contracting authorities	<ul style="list-style-type: none"> <li>Criteria for commissioning carbon neutral buildings.</li> <li>Criteria for public procurement of construction works.</li> </ul>
Construction companies	<ul style="list-style-type: none"> <li>Concept for carrying out a carbon neutral construction project.</li> <li>Templates for managing the carbon budget of a construction project.</li> <li>Concepts for utilising traditional solutions in building technology.</li> </ul>
Building designers	<ul style="list-style-type: none"> <li>Information and threshold values for designing a carbon neutral Arctic building.</li> <li>Examples of traditional construction solutions that can be used in modern buildings.</li> </ul>
Planners	<ul style="list-style-type: none"> <li>Information and threshold values for planning a carbon neutral settlement</li> </ul>

	<ul style="list-style-type: none"> <li>Proposals for the recognition, development and preservation of regional natural and man-made carbon sinks</li> </ul>
Funders	<ul style="list-style-type: none"> <li>The regional Zero Arctic concept can be utilised for developing criteria for “green funding” or “green mortgages”</li> </ul>
Education sector	<ul style="list-style-type: none"> <li>The concept is suitable for skills development in the fields of building design, construction, maintenance and energy services.</li> </ul>

**Table 4.** Partners’ contribution.

<i>Partner</i>	<i>Contribution</i>
Ministry of the Environment Finland	<ul style="list-style-type: none"> <li>Coordination of the project</li> <li>Dissemination of results</li> <li>Seminar arrangements</li> </ul>
Finnish Environment Institute (invited)	<ul style="list-style-type: none"> <li>Coordination of methodological development in WP3</li> <li>Research work for Zero Arctic concept</li> </ul>
Technical Research Center VTT (invited)	<ul style="list-style-type: none"> <li>Coordination of methodological development in WP4</li> <li>Research work for Zero Arctic concept</li> </ul>
Sámi Museum Siida (invited)	<ul style="list-style-type: none"> <li>Coordination of methodological development in WP5</li> <li>Documentation for WP5</li> </ul>
Government of Canada / Indigenous and Northern Affairs (invited)	<ul style="list-style-type: none"> <li>TBC</li> </ul>
Institute of the North (invited)	<ul style="list-style-type: none"> <li>TBC</li> </ul>
Northern Forum (invited)	<ul style="list-style-type: none"> <li>TBC</li> </ul>
Collaborators from other Arctic States (TBC)	<ul style="list-style-type: none"> <li>TBC</li> </ul>
Observer participants (TBC)	<ul style="list-style-type: none"> <li>TBC</li> </ul>

## Anticipated Outcomes

As a result, the following outcomes will be produced:

- Carbon footprint and energy simulation case studies of Arctic buildings from participating regions that serve as benchmarks for further development
- Documentation of traditional sustainable construction that can contribute to a sustainable and low carbon built environment

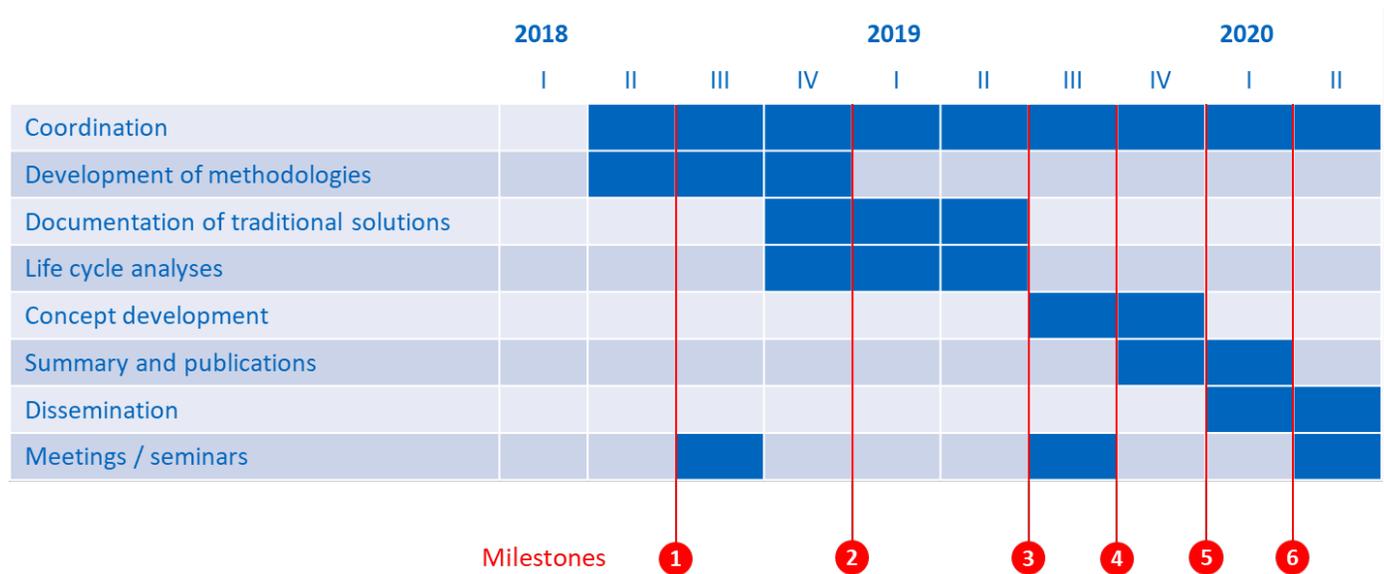
- Regionally-adapted concept descriptions of carbon neutral Arctic villages and buildings
- A network of local stakeholders for further regional implementation of carbon neutrality in Arctic construction

### Integration of Traditional and Local Knowledge

The project will utilize traditional knowledge for the development of carbon neutral construction. There will be a dedicated work package to document, analyze and identify traditional construction solutions that hold the largest potential for reaching carbon neutrality. These traditional solutions will be documented in each participating region. Findings will be analyzed in order to identify approaches that can complement modern construction technologies. Best regional practices for adopting to changing weather, sea level and permafrost conditions will also be studied.

### Timetable and Project Completion

The project is planned to run from August 1 2018 to the end of May 2020. The main tasks are tentatively scheduled as follows:



**Figure 2.** Schedule and milestones.

The methodologies to benchmark life cycle emissions and to collect traditional solutions will first be developed. Thereafter the work will proceed by conducting life cycle analyses in the participating regions and by documenting and analysing local traditional approaches to sustainable construction. These tasks will be carried out by mid-2018. After the analysis of case studies, the development of the “Zero Arctic” concept will be finished by the end of 2018. Project results will be published and

provided for dissemination and further regional use during 2019. There will be three public seminars during the project. Regional workshops and joint consortium meetings will also be organised.

After the project has been finished, the aim is to continue its implementation through the networks that have been developed in the project. For research aspects, European COST Action funding may be applied to keep the research network active.

## **Communications**

The target audiences include external stakeholder groups as well as relevant media channels. External stakeholder groups include building permission and city planning authorities, contracting authorities, designers and planners, construction companies, funders, researchers and the academic / educational sector.

We aim to arrange a project seminar or participate in a relevant professional seminar and in an additional scientific seminar after the results of the project are available.