Pitquhirnikkut Ilihautiniq / Kitikmeot Heritage Society: Tradition and Innovation Meet in the High Arctic

Mantle's expertise with embodied carbon and life cycle assessments helps put Kuugalaaq, a new Inuit cultural centre, on the map.

CHALLENGE

In 2016, when the Nuvavut organization Pitquhirnikkut Ilihautiniq / Kitikmeot Heritage Society (PI/KHS) first dreamed of building Kuugalaaq, a new cultural centre in Cambridge Bay, they were sure of one thing: the construction approach of the 1950s wasn't going to work.

Everywhere they looked, they saw buildings that were sub-standard, high-cost and built with imported, low-grade materials. Moreover, these buildings seemed out of place, unconnected to either Inuinnait culture and lifestyle or the High Arctic climate and landscape.

The guiding vision for Kuugalaaq was to blend traditional knowledge with the latest advances in sustainable design. By drawing on Inuit wisdom and experience, as well as cutting edge materials and technologies, Kuugalaaq would "reimagine the world we leave for future generations."

To better understand the building's carbon use, PI/KHS asked Mantle to answer:

1. What is the building's full carbon footprint—from development through to construction?
2. How does this compare to a similar building constructed in southern Canada?

APPROACH

To realize their vision for the $1.7 million, 1200 sq. ft. Kuugalaaq Cultural Campus, PI/KHS worked with a multi-disciplinary team. This included Mantle, Northern industry partners, Southern research support, and local elders and cultural producers.

To determine the carbon footprint of the proposed cultural centre, Mantle designed three distinct scopes:

1. **Core scope:** Emissions from the structure & envelope materials.
2. **Expanded scope:** Core scope plus emissions from mechanical, electrical & plumbing.
3. **Total upfront scope:** Expanded scope plus emissions from:
   - **Site works:** non-building site energy use, construction equipment used for non-building land and site work, and crates.
   - **Pad spill:** foundation pad replacement due to accidental fuel spill during construction.
   - **Other:** workers' accommodation and air travel during the project planning and construction phases.

For each scope, Mantle modelled three scenarios:

1. Designed
2. Actual
3. Compared to a similar building built in southern Canada.

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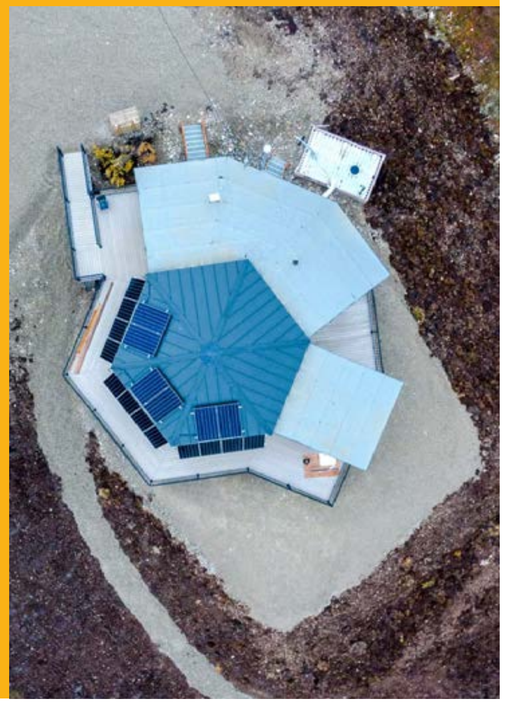
The Kuugalaaq Cultural Campus combines the latest technologies with time-honoured traditions.



Arial view of the Kuugalaaq Cultural Campus.

RESULTS

Mantle's carbon life cycle assessment for Kuugalaaq highlighted the challenges of achieving net-zero buildings in the High Arctic.

Construction-related emissions were calculated 65% higher in Cambridge Bay compared to a similar project in the South. Moreover, Mantle estimated that the savings in transportation-related carbon emissions would be 91% for a similar building in the South.

For all three scenarios, the building elements and systems with the highest embodied emissions are floor & roof construction and facility power generation.

The selection of available construction materials is limited in the Arctic. This means designers and builders focus less on embodied carbon than on other considerations, like: affordability, climate change resiliency, suitability for Arctic winter and 24-hour daylight environments, as well as ease of installation, maintenance, repair, and replacement.

When it comes to operation, the community is solely powered by diesel generators, fueling a grid unable to handle large amounts of renewable energy.

Not surprisingly, the **embodied carbon calculation** revealed that a similar building built in Southern Canada used 30% less carbon than in the Arctic.

For PI/KHS, the embodied carbon analysis was an important component of its made-in-the-Arctic approach to building.

It gave the organization a clear understanding of what it takes to achieve net zero, demonstrated its leadership and vision in addressing climate change, and positioned the organization as a resource for others looking to undertake new building projects in the High Arctic.

Targets such as net-zero carbon are increasingly referenced by government and industry throughout Canada. As Mantle's study shows, however, there are huge barriers to achieving these same goals in the North.

— **Ryan Zizzo** | Founder & CEO | Mantle Developments

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