Sustainability Means Different things to Different People

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Improving the sustainability of new and renovated buildings in cold climates remains a significant and ongoing challenge. It is something that practitioners (architects, engineers and researchers) have been addressing for decades, with many advances being made in the understanding and execution of innovative building systems and technologies. Much of this has been directed at improving the performance of buildings so that we can reduce the impact that the built environment has on the natural environment. But in this process, it also increasingly important to consider that the human element, reflected through society and culture, plays an increasingly important role in making progress - that ensuring that people can comfortably live in and easily engage with the operation of buildings is an essential part of what we as northern practitioners need to understand and incorporate into our work. It is here, on the place where technology and society meet, that the Cold Climate HVAC 2018 conference provided some useful insights.

The international scientific conference began its opening session with a presentation by Keynote Speaker Kristina Mjornell, Business and innovation Manager for Sustainable Cities and Communities at Rise Research Institutes of Sweden. In speaking about her work with different communities in Sweden, Kristina had learned over time the importance of understanding who it is would be involved in or impacted by these initiatives. She noted that understanding the social component of buildings was becoming increasingly significant as Swedish society both evolved and changed. She shared the observation that ‘sustainability means different things to different people’ and that researchers and practitioners needed to understand this reality. To not do so would be to often result in the taking of actions or launching of initiatives that were destined to falter, if not outright fail. While this not the main premise of her talk, it reflected an apparent change that had begun to impact how information and data that was being collected and interpreted in her research projects.

This is in fact, a very significant issue for those of us who are working to bring improvements to the sustainability of the built environment, and the communities where we live and work. In my own work in the Canadian north and Alaska, we commonly address and incorporate cultural understanding and practices into the design of houses and include 'users' in our design and implementation processes. This includes in making decisions on what technologies to use, as well as in how and when we make refinements to how they operate. Yet, amongst building science practitioners it is a common refrain, and one based on honest and understandable frustrations, that the very solutions to building issues that are developed by engineers and architects are often messed to varying degrees by people as soon as they are added to the equation and become occupants of the building in question. Yet, in the end, these very buildings are for people and need to work for them.

Technology and Sustainability

In an afternoon session at the conference titled *Buildings in Operation*, the issue of people and their impact on the use of new technologies in buildings became an important part of the discussion in the session. Reflecting the range of viewpoints offered, there were some who felt that the problem of technology failure lay with people who did not take the time to learn the proper operation of the equipment or systems - including the view that even after education and training was delivered, they would continue to frustrate the operation of a building or piece of equipment 'by not following the rules'. Others felt it was the responsibility of the design community to do a better job with the interface between people and technology, with the auto industry cited as one example that does this well. The attention to detail on the importance of the 'user interface' in the design of dashboards was highlighted as one case in point. While there is always a car manual, it was suggested by more than one person that the more successful examples were realised when the use of the technology was more intuitive - when equipment could be used easily or within in a short period of time worked with without training or guidance.

One of the caveats with using the car industry as an example is that not all of us have the resources for designing and resolving issues that the automotive industry has – where there is often a dedicated designer for the dashboard alone, with each designer also having a team of other designers and engineers to draw upon if needed. Many of us work alone or in small teams, trying to resolve very specific design or technical problems. I include myself in this category. But while I do not have a team to work with, I do have a network of skilled and dedicated professions and trades to draw upon, people who are all too happy to share as they also experience the ongoing challenges that problem solving and developing new ideas brings. Bringing the user into the loop in a meaningful way, particularly when I am working in remote communities where travel and extended stays are time consuming and expensive, remains one of the most significant challenges.

At the conference dinner I sat at a table where we were sharing thoughts on information sharing and the idea that it is important and useful to also consider how people learn from each other. It was noted that people often learn more watching and seeing what they do as neighbours than through sales pitches and technical brochures - that we often use each other to learn about what is successful and to make decisions. An example was shared - when a neighbour has a new window installed, questions from friends and neighbours on how it has worked, from comfort and energy savings, to the work of the installer, will often have a greater influence on whether there will be follow-up projects in the neighbourhood than the ongoing efforts of the salesman trying to make another sale in the area. This is the spread of knowledge through relationships, and it is a factor we often fail to take into account and is an area that is worth continual consideration.

Increasingly though, as reflected in papers and discussions at the conference, technical and social issues are intertwining, pointing towards and acknowledging the important relationship that these have with each other. The connection between technical and social aspects of

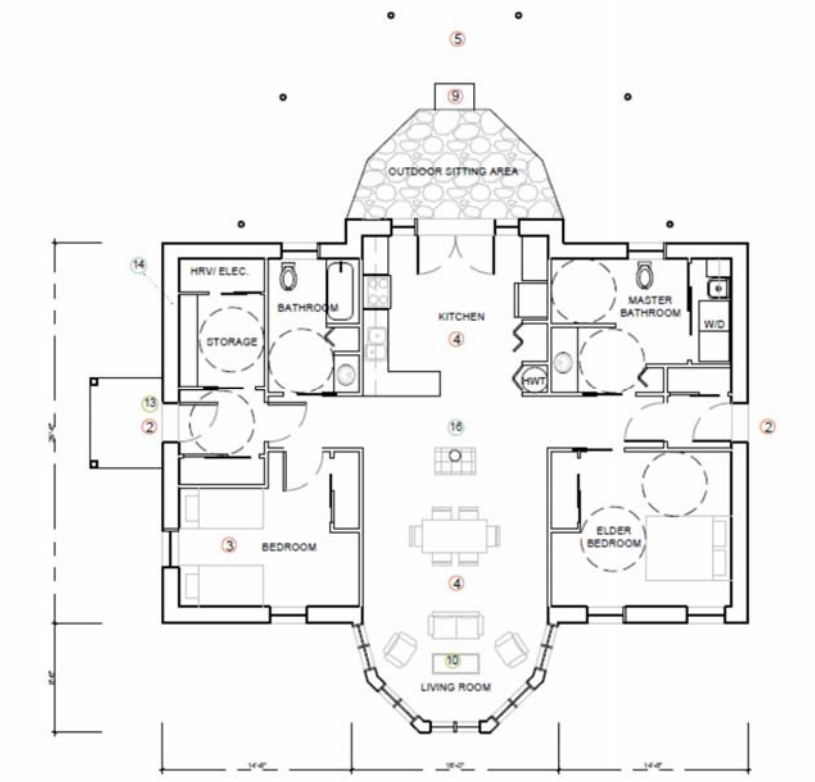
buildings was explored, for example, in the paper *When Buildings Become Intelligent – A Network Analysis of Building Automation, Operation and Competencies*. In the paper, the authors begin from the standpoint that "there is insufficient practical experience and knowledge about the competencies that are required in order to interact with the intelligent building"[i], while going on the note that building 'automation is becoming a problem for many users'. This of course points to the fact that this is not just a technical issue or question but is also a social one where consideration for the people who live and work in buildings needs to be incorporated into the analysis of the operation of the building. The paper highlights the need for more user interaction, the challenge of finding ways to personify systems, and the need to provide ongoing feedback loops in order to learn more about peoples' interactions with building automations. As Martin Kotol, of the DTU's ARTEK Center in Greenland noted, "automation is a good assistant, but a terrible master." Addressing this point is to consider that successful strategies need to contain aspects of both technology and the user.

Engaging in Sustainability

To develop strategies and to learn how people interact with building systems and technologies, as well as what important insights that people can share for the design of buildings, we need to continually find more ways to engage with people. We need to continually observe and learn from each other and to share experiences with what works and what does not. In the post conference tour to the Abisko National Park, I shared a long conversation with our Sami Guide Matthias Mannella on technology, its impact on the Sami way of life, and how technology works for a Sami hunter like him. He also offered valuable insights into the limits to technology for a people like the Sami who, while having one foot planned in the contemporary world they now live, also have one foot firmly planted in their traditional way of life. He spoke about hunting and what it meant in a very personal sense, of the importance of being able to continue to be out on the land, of hunting for food and of how this was part of his way of keeping Sami's traditions alive. His insight on technology was directly related to how using the snowmobile allowed him to bring along his 'hunting tepee', the shelter of preference when being on the land, and also his backcountry skis.

While the snowmobile allowed him to go deeper into the woods, at a point it got in the way, being too noisy, too cumbersome, without enough manoeuvrability. He was well aware that it was this combination of contemporary and traditional equipment that provided him with something special that allowed him to continue the practice of hunting throughout the winter months. Traditional tools like his skis were important both symbolically, as part of the 'traditional way', but also pragmatically as they allowed him to move leave the noise of the snowmobile behind and continue the hunt in a more traditional way. He also spoke of one other quality to this, a more immeasurable but significant element. This was the notion that when working in combination, all these elements were also in tune with being on land that was seen by him and other Sami as part of his home. Being on the land in the winter was to be in a place where his own metabolism could again be 'in tune with the cold'.

I have heard similar words spoken by both Inuit and First Nation elders in the remote northern communities in Canada. They often talk of needing to 'feel the cold', of experiencing, if only for a short time, the sense of its freshness on their face. It is for this reason that, even in winter, the Inuit will often windows in the winter months so they can 'feel the air'. In contrast, designers and builders, who consider the movement of air in terms of ventilation rates and the control of CO2 and H2O levels, these openings bring forth complaints that the occupants of the house compromised the energy efficiency gains of the building and the hard work it took to get these in place. Yet the failing here may be that designers of the house have failed to incorporate these actions into the list of functions that need to be able to occur as part of living in the house. As one example of providing for this, in my own designing of a 'House for Cree Elders', I incorporated spaces where there is easy access to the outside on the most sheltered part of the house that included a place to sit and have a fire. I also oriented the house and included spaces where the elders could see out on the land, to the place where they once moved freely and where they still wanted to have a connection (Figures 1 and 2). While there was, admittedly, an 'energy compromise for doing this, the corresponding reasoning is that this created a better 'relationship' between the occupant and the building, a relationship that I believe will assist ensuring the house is cared for and performs as well as it was designed to do.



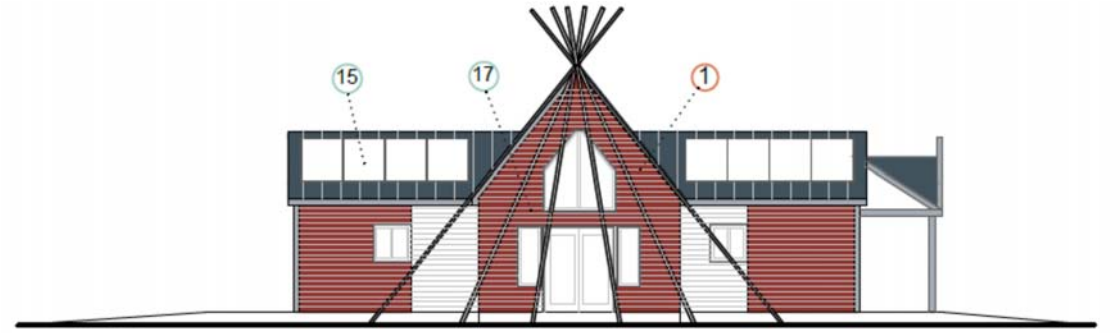


Fig 1 and 2: Culture and Technology are combined in the 'House for Cree Elders"

Social Sustainability

The ideas raised in the previous paragraph introduce the suggestion that both social and cultural qualities need to be part of what sustainability should encompass. Issues with respect to social sustainability appeared in several papers at the conference and were explored in detail in the paper *Atrium in Residential Buildings – A Design to Enhance Social Interaction in Urban Areas in Nordic Climates*. While a previous study had noted that atrium designs in apartment buildings in Nordic climates have a potential to reduce the annual energy use for space heating, this study highlighted how atrium spaces enhanced and provided an important social function in the multi unit housing complex that was studied. Through extensive surveys and interviews, the study showed that the atrium designed residential building, as compared to more traditional apartments, reported a higher frequency of interactions, an enhanced sense of community, and greater activity in the common activities that were organized within the building. The residents knew their neighbours better and as a result, experienced a greater sense of community.

In comparing the atrium building with a traditional apartment building the paper concludes, "that a large proportion of the differences and social aspects between the buildings could be explained by building design, i.e. the atrium as a facilitator for social interactions."[ii] As a practitioner who works with social and technological issues, this begs an interesting question as to whether, in the long dark winters of the north, significant social and cultural design features could facilitate a greater sense of connectedness to any building technologies that might be introduced to improve the functioning and performance of the building, and by implication its important social spaces? The *Atrium in Residential Buildings* paper is an important contribution to this discussion as it begins to look at and consider aspects of design, how these improve the life of occupants, and how this fits into the functioning of the building.

When the conference reception was held at the old Kiruna City Hall, we were able to experience another example of how a large interior space acts as an 'enhancement for social interactions', in this case the central interior courtyard space of the building. The winner of a 1964 Swedish architectural prize, for a time the old city hall was considered to be Sweden's most beautiful public building[iii]. While this 'title' is somewhat surprising when viewing the

building from the outside, the interior space is a tremendous example of good design and an case in point of how compelling spaces provide a context for important social functions in extreme northern climates.

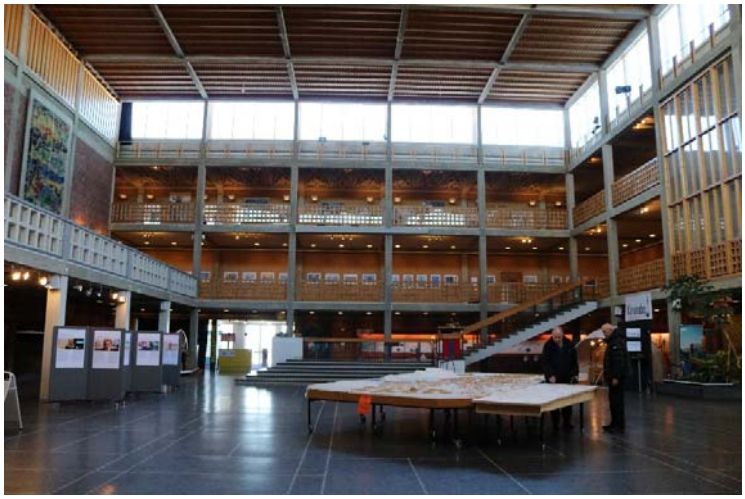


Fig 3: The interior courtyard of the old city hall

Fig 4: Contemporary Lighting with Sami Details

The central courtyard (Figure 3), is lit during the day (except of course for the darkest winter weeks) by natural light from clerestory windows that wrap around three sides of the building, creating an inward looking public space. Gallery spaces on each floor overlook this courtyard, with each office and meeting room entered directly from these gallery spaces. In contrast to the inward-looking courtyard, the offices look out onto the mine and the city around them. With every wall of these gallery used to display a wide range of 'northern art', the interior courtyard effectively becomes the entry point to what has become the municipal art gallery. From an architectural perspective, the interior design is complemented by the simple and tasteful use of materials, the carefully designed contemporary lighting (Figure 4), and the quiet use of Sami iconography. It was not a surprise to me to learn that many locals wanted to preserve this building and that there was a great deal of discussion held in the community regarding the moving of the building as part of the relocation of the city of Kiruna, due to the iron ore mine - with cost constraints and logistics ultimately working against the move. When considering the importance in the north of daylight as part of the creation of liveable and vibrant public spaces, it was not at all surprising to learn that the new city hall, known as Kristallen ('the crystal'), has been designed to let as much daylight in as possible.

Other social aspects being considered as part of the many challenges of moving parts of the City of Kiruna were shared with us in the presentation that was delivered during our tour to the LKAB iron ore mine. The presentation, provided a fascinating overview of the range of issues that the mining company has been taking into consideration in the moving of parts of the city of Kiruna to its new location. For example, while the presentation provided an impressive overview of the technical challenges, including the equipment required to move the existing

small wooden timber multi-unit buildings in the community, it was very notable to learn about the social considerations that were being taken into account as part of this move. That the process was being carried out to ensure that the present occupants of each of the wooden apartment buildings could move back into the apartment that they were in, along with that of their neighbours, was an intriguing example of what might be considered 'social sustainability'. This also appeared to be a significant aspect of the mine's 'social contract' with the community - of ensuring the support of local people for the move.

Cultural Sustainability

A case could be made that moving many buildings in Kiruna also contains elements of cultural sustainability, reflected in both the importance of the buildings and the decision making that made moving the historical wooden buildings a priority. As examined in the article *The Challenge of Energy Efficiency in Kiruna's Heritage Buildings*, the so-called Blackburn timber houses, built in the early 20th century to house workers in the mining company[iv], are included in the historic buildings that are being moved. While the cultural value of moving the Kiruna Church, the great wooden church that draws upon the Sami goahti and reflects aspects of Gothic Revival architecture, is unquestioned, the cultural value of the wooden timber houses requires a more nuanced understanding of historical value.

The Blackburn timber houses are an example of solid log wall construction that is found in older houses throughout Sweden and other parts of Scandinavia, with the historical and cultural value of the buildings contained more in how they were built, than in the architectural details and elements that they reveal. That such a significance was placed on the historical importance of these buildings speaks well of the overall approach that has been taken to the relocation of the community. As noted in the paper, "The timber log structure represents an irreplaceable material document of the technological evolution of the local construction techniques in the passage from traditional to standardized methods in the early history of Kiruna architectures."[v]

While Swedish legislation had previously prescribed that older buildings being moved to a new location had to meet the energy requirements for new buildings, this requirement was not placed on the re-location of these buildings. Nevertheless, some energy retrofit work was carried out in the houses. Technically this resulted in insulation being added to the interior of the walls as part of the energy retrofit, with other retrofit details including new windows and the use of new insulated crawlspaces as replacements for the un-insulated basements that were part of original buildings. It is also worth noting, particularly when considering the different perspectives on 'what is sustainability (?)', that the multidisciplinary method used brought together technical, social and cultural ideas, " merging qualitative and quantitative assessments, and using a value-based approach in the design of energy retrofitting measures for historic buildings."[vi]


Fig 5 and 6: Examples of the wooden buildings in Kiruna that will have to be moved

Culture and the Environment

Understanding and in many ways re-imagining the connection between culture and the environment has been an important part of my own work with First Nations communities in northern Canada. Presently I am working on a project with the Cree nation of Eastmain (CNE) that is a good example of this. Eastmain is a remote First Nations community in northern Quebec where the leadership of the community has proposed to design and build a culturally appropriate net zero energy multi-unit building. Harnessing community support and gathering input from residents on all aspects of the initiative has been an essential component for moving forward. When initially the proposed initiative with people in the community, we focused on how this would deliver dramatic savings in energy costs. Surprisingly, this did not bring out any significant reactions. In the case of this community, a remote town tied into the province of Quebec's extensive hydro electricity grid, their subsidized rates offered little incentive to change. But when this proposal was instead cloaked in terms that related to their own lifestyle, the interest was both immediate and farther reaching.

The Cree Nation of Eastmain is perhaps the most traditional of the eight James Bay Cree communities in Quebec. Hunting remains an important source of food in the community, with most families having remote hunting cabins as well as their homes in the community, often going to their cabins for extended periods of time to hunt. Traditional hunting rituals and ceremonies remain as important cultural events. And while the cost of energy was not a key motivator, the reliability of their energy source and the impact this had on the ease of 'being on the land' was. When it was posed to them that a net zero energy building could offer them protection from extended power outages that often occur in the coldest winter months, potentially causing houses to freeze up prematurely, the conversation changed. The idea that a house without heat would not freeze up for potentially a period of days was seen as a tremendous benefit - as the reality of potential freeze-ups while being out on the land for an extensive period was an ongoing worry. Adding solar panels with some battery storage, and the inclusion of a small wood stove - something that would provide protection for an extended period of time - further added to their interest. So, did the idea that a combining this with smart technologies that would allow them to monitor their house while out on the land for

extended periods to hunt for food. Interest in the project increased dramatically. These were ideas they could related to - ideas that connected to their traditional lifestyle (Figure 7).

Fig 7: The Proposed Eastmain Net Zero Six-Plex

In many ways, it should not be surprising that it is important, if not essential, for all of us who are practitioners of sustainability, to understand the 'culture' of the people where we are carrying out projects. Within this understanding there is much to learn about what motivates people to 'do the right thing'. Consider, for example, how the marketing of sustainability differs between Europeans and North Americans. It appears, from my Canadian perspective, that Europeans react more favourably than North Americans to the idea that there is a need for regulations to drive the sustainability agenda. Using energy efficiency as one example, European modelling tools place greater emphasis on the delivery of reductions in carbon emissions. This approach, while appearing to be well developed in Europe, is still something that is in its infancy in North America. In contrast, North America has taken a more 'market driven' approach (an approach I believe has had limited success) where saving money through energy efficiency has been focused on as the major motivator in driving more sustainable buildings. These two very different realities require very different approaches.

It is significant to note however, that the belief that 'savings in operating costs' is the major driver for sustainable building practices in North America is not always supported by what we find. In a survey carried out by the Canada Mortgage and Housing Corporation on occupants living in the first generation of net zero energy houses in the country, when people who had purchased and lived in net zero houses in Canada were asked what they most like about these houses the high amount of daylight, their comfort (even heat across rooms and no drafts), and how quiet they are[vii] all topped energy savings as qualities that most people highlighted. This of course raises once again the importance for ongoing discourse and learning between practitioners and users.

End Thoughts

As I have been exploring the idea that sustainability means different things to different people and that we have much to learn from each other, I would like to conclude this paper with some final thoughts on Indigenous people and what we have to learn from them. Indigenous people place great value on relationships, especially relationships with the land. They see relationships more as verbs rather than nouns - that relationships connect the way they live, to where they live and to the way they interact with the world. In this they speak of the land being their home

- it is more than something they live on as it cannot be separated from who they are. It is because of this relationship with the land that they give thanks to the animals that they have hunted - acknowledging the life that has been given so that they can live. It governs how they hunt and how much they hunt - where they only hunt to meet their needs. It also governs why they why they place such a high value on protecting the land, often considering the impact of actions over a period of generations.

I have often wondered that if we are to really advance 'sustainability' whether we too need to have a relationship like that with the 'land', with the planet that we live on. One of the ways we most use the land is through the energy that we draw from it. While we use energy and it is a compound that we are continually trying to save, it would be difficult to say that our relationship with it is more than that. We do not give thanks for the energy or other things that the earth has given us - these are instead, simply commodities for our use. I believe this is a place where we have much to learn from Indigenous people, just as there are places where they have much to learn from us. In the post conference tour to the Abisko National Park, our Sami Guide Matthias Mannella, spoke of the importance of dialogue and how it was important in the north of Sweden that all people who use the land - Sami, hunters, environmentalists, miners and others - come together and share perspectives and dialogue. There was, he felt, the need for a greater willingness to learn from each other. In his own words, this was how ' we can create a paradise for all'.

While listening to Matthias share perspectives with me on the Sami way of life, I found myself thinking about the outlook of many Indigenous peoples whose writings I have read, and how in their words and in the ways of life that they follow, they are living representations of the very sustainability values that we are trying to foster. And I wondered whether we will we not continue to fall short of our own hopes for a more sustainable future until we come to an understanding, like Indigenous people, that the earth is our home and begin to consider our actions from this standpoint.

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[i] Forman. M. and Sorensen, N. L., (2017), When Buildings Become Intelligent – A Network Analysis of Building Automation, Operation and Competencies, Aalborg University (2017), P. 1

[ii] Danielski, I., Krook, M., and Veimer, K., Atrium in Residential Buildings - A Design to Enhance Social Interaction in Urban Areas in Nordic Climates, (2017), Mid-Sweden University, P. 10

[iii] retrieved from: www.routesnorth.com/kiruna/kiruna-see-and-do/kiruna-city-hall

[iv] Luciani, A., Lidelow. S., Bhattacharjee, S., and Orn, T., P. 2, The Challenge of Energy Efficiency in Kiruna's Heritage Buildings, Lulea University of Technology, Sweden (2017)

[v] ibid, P. 11

[vi] ibid, P. 12

[vii] Canada Mortgage and Housing Corporation, CMHC Equillibrium Housing Home Ownership/Occupant Qualitative Research Project (2014)