

Complexities in Alaskan Housing: Critical reflections on social forces shaping cold climate building projects

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Abstract

This paper draws on ethnographic fieldwork conducted with Alaskan engineers, builders, and housing experts on cold climate housing design in Native Alaskan communities and explores multiple levels of challenges to designing and building in remote areas. It examines how the history of land ownership and governance in Alaska shapes the imaginaries of engineers and builders working to address housing equity in the state. Specifically, we study cold climate housing projects being carried out in Alaska and compare the design of these projects to wider colonial legacies and failed housing policies. This includes examining both considerations that need to be made at the start of design and engineering projects, as well as how complexity figures into the culture of cold climate engineers and builders in Alaska.

Theoretically, this paper draws on Annemarie Mol and John Law's conceptualization of complexity as a social practice (2002), in which they argue against reductionism by calling attention to the "multiplicity" of ways in which actions and knowledge come into being. In drawing on this work, we seek to engage with multiple histories and worldviews, including dominant notions of "home" that contribute to reproducing housing insecurity and colonial legacies in rural communities (Christensen 2017). Building on this theoretical framework, we thread together a critical description of the social terrain in which engineering and building projects in remote Alaska Native communities are situated. Such situated understandings necessitate engineers and builders working on these projects to think locally while recognizing the broader contributions of home designs developed thousands of miles from the Arctic.

The implications of this complexity, we argue, are important for engineering educators and students to incorporate in their approaches to design and engineering learning opportunities across multiple contexts, including engineering programs, construction, architecture, industrial design, environmental and sustainability science, and the social sciences. To address complex challenges in which these disciplines must all take part, engineers and others who make up these teams of diverse expertise must navigate layers of complexity and understand and value how social forces shape building projects. Cold climate contexts like the ones we describe here provide examples that can engage educators, learners, and practitioners.

“My colleagues outside of Alaska are always amazed at how complicated it is to build homes in rural Alaska,” explained Stefan, an Alaskan housing expert and head of one of 14 regional housing authorities in Alaska. “I know,” agreed Julie, an anthropologist working on affordable housing.¹ “It’s really perplexing to people who don’t understand how different tribal, state, and federal governments work up here. I tell people from the lower 48 about how over a dozen agencies worked with one tribal council that had been trying to get a 3-mile road built for over 20 years. Even the agencies couldn’t keep track of which permit or study was needed, and by the time they were getting somewhere, some of the earlier permits had expired!”

In this paper, we draw on insights gathered from an ongoing ethnographic study examining how historical and current patterns of land ownership and governance impact the development of affordable housing initiatives in remote and predominantly Alaska Native villages². Guided by theoretical lenses that emphasize the critical need for actors to identify and understand the tools they use for organized action (Callon 2002; Latour 2005; Vinck 2003), we track how different modes of complexity come into contact with and affect the planning and implementation of engineering and building projects in remote Alaska Native communities.

Background

In carrying out this research, stories and ruminations have emerged that describe a diverse set of interconnected yet epistemologically distinct issues that those working on building projects in Alaska must continually confront and negotiate. As Stefan and Julie emphasize in the quote above, it's exhausting to have to repeatedly explain and unpack these issues for their colleagues in the “lower 48.”³ At the same time, not sharing enough background information can jeopardize the success of a project. Subsequently, it's not surprising that Alaskan builders and housing specialists at times refer to this tension as “lower 48 ignorance”—a phrase that we have *never* heard any of our research participants say with contempt. Instead, the phrase is usually evoked out of frustration or it is used to contextualize historical challenges. For instance, there is a long and bumpy history of agencies and institutions in the lower 48 developing housing policies without consulting Alaska Natives or Alaskan housing experts (Rittgers 2018). The research participants we have talked to have impressed upon us that these policies are often based on erroneous assumptions about everyday lifestyles and housing needs of people in the North that

¹ Pseudonyms have been used in place of the names of all participants cited in this paper.

² To clarify the term “remote” and the population context, one fifth of the state's population is Alaska Native, there are 229 tribes, and 80% of Alaska Native communities are located off the road system (aka remote).

³ In this paper we use the Alaskan term “lower 48” to indicate the contiguous United States.

create further bureaucratic hurdles for those working to address housing insecurities in Alaskan communities (see section below on Prescriptive Designs; cf. Marino 2015).

Thus, when Stefan talks about how his “colleagues outside of Alaska are always amazed at how complicated it is to build homes in rural Alaska,” he is pointing to a serious problem that hinders the work of public housing specialists in the region. This may be one of the reasons why he encouraged us, while we were discussing the goals of our research project on housing security issues in Alaska, to think about how our research could be used to produce resources for communicating the complexity of issues that impact Alaskan housing projects.

If you could come up with a way to onboard my colleagues in the lower 48 that strengthens rather than further complicates our collaborations, that would be a really amazing and useful outcome of your study.⁴

Naturally, the challenge is that such forms of complexity are not easily broken down into distributed sound bites and talking points. Critical reflection that is grounded in observable actions and reflects wider debates and discourses is essential for developing such resources. Consequently, by ethnographically attending to the themes, tensions, and topics that emerge when people tell stories and reflect on their experiences working on engineering and home building projects in arctic communities, it is possible to begin to develop a framework for mediating across cultural and geographical differences (Keating & Jarvenpaa 2016; Tsing 2005).

This paper threads together descriptions of six different modes of complexity that engineers and builders working in predominantly Alaska Native remote communities have described as being situationally important for designing and constructing culturally and environmentally relevant homes. As the engineers, carpenters, builders, drafters, economists, scientists, policymakers, and homeowners we have spoken to affirm, it is important to unpack the implications that varying situational forces have on building processes. In doing so, engineers and builders can intentionally “think locally” and embrace complexity rather than ignore its impact on joint activities (Escobar 2019). As Annemarie Mol and John Law have argued, the concept of “complexity” can be used to reimagine participatory mechanisms and power structures that shape knowledge production (2002). This in turn requires that ethnographers attend to how notions of reductionism find their way into the social worlds and practices of experts (ibid). By problematizing reductionist approaches to building in the North, it is possible to engage with “multiplicity” not just as an idea but as a social action for engineering and building homes (ibid).

⁴ This quote is paraphrased from field notes taken from a conversation about the goals of our research project, which includes the development of techniques and resources for co-sharing and collaborating across geographical and cultural distances.

Taking this approach may not only strengthen how expert communities collaborate, but also provide educational resources for training engineers and related specialists.

As the field of Engineering Education increasingly prioritizes broadening participation in engineering, these types of ethnographic perspectives can be adopted to encourage design practices that are diverse, equitable, and inclusive. For example, students, educators, and professional engineers may incorporate similar reflective practices that enable them to identify and understand modes of complexity in their projects, which in turn will better prepare them to engage in work that is culturally relevant and sustainable. In addition, the approaches pointed to in this project can be used to make engineering practices relevant and accessible to stakeholders in a range of disciplines via integrating community engagement strategies in design processes. Considering such community-embedded strategies from a learning and listening perspective can, for example, add authenticity to the goals of Citizen Engineering (Nieusma & Riley 2010; Riley & Bloomgarden 2006), a book that argues that “disrupting the notion of engineers’ expertise is central to both non-engineers gaining confidence to attempt engineering and engineers developing epistemic humility to work across disciplines” (Riley et al. 2016). The community-based methods in our project, for instance, seek to set a model for including and valuing local perspectives that will inform future Alaska housing assessments and broaden participation in knowledge generation and approaches to healthy homes. In the process of gathering interdisciplinary specialists and community stakeholders who will facilitate joint activities for the collaborative construction, analysis, and sharing of data, the engineers and builders we are working with are increasing participation in decision-making.

Methods

Each of the modes discussed in this paper index themes that we identified through pattern-coding of interviews and observations of stakeholders involved in collaborative home building projects that are currently being developed for remote (off-the-road) Alaska Native communities. The data includes over 60 interviews conducted over the past 20 months, along with over two dozen meetings, workshops, and observations of building activities involving Alaskan experts from the fields of engineering, economics, public housing, architecture, design anthropology, and the building sciences. Additionally, we have carried out online and phone interviews in remote Alaskan communities and will continue to follow several cold climate housing projects in Alaska over the next year with support from a National Science Foundation grant. Because of the pandemic, this project has employed both remote and in-person research activities. The in-person activities followed IRB policies for conducting safe and responsible research.

In the following section, six different modes of complexity are introduced. Each example indexes “matters of concern” (Latour, 2004) and examines how politics enter into and implicate building science practices and the making of public housing politics. However, our objective

here is not to produce a comprehensive list or promote the idea that these examples operate as standalone phenomena. Rather our objective is to begin a dialogue for generating resources that may better mediate building projects that span geographical and cultural distances. The development of such resources, we argue, may not only strengthen research and building collaborations, but also encourage policymakers to more actively involve actors from Native Alaska communities in their planning activities. Thus, in tracing how social phenomena intersect and shape home building processes in Alaska, this paper provides an orienting tool for approaching and reflecting on how complexity figures not only into engineering and building processes but in the lifeways of Alaskans living in these homes and those in need of housing (Vinck 2003; 2011).

Findings

1. Histories

Everyday life in Alaska is marked by multiple histories, and these histories shape what kinds of considerations need to be considered when working on engineering and building projects. These histories are not uniquely humanistic; they also include the rich historical legacies of Alaska's multispecies landscapes (Tsing 2015), shifting climate conditions (Quackenbush 2021), and the diversity of climate regions, along with the extractionist histories of the state's natural resources and wildlife (Morrow 1994). Each of these factors have given shape to varied ways of living and inhabiting Alaskan communities (Ingold 2013).

There are also multiple histories of innovation in construction and building that existed long before the contemporary culture of construction came onto the scene (Christenson 2017; Marino 2015). As historian Anne Rittgers writes:

For generations, Alaska Native groups have constructed shelters adapted to local environments to escape the elements. Pre-contact homes in Alaska were made with regionally available materials, sized appropriately by region for energy efficiency and fuel sources; and they reflected culturally appropriate designs. Western contact brought changes to shelter in Alaska. With the arrival of non-Native migrants, standards for housing of all Alaskans changed (2018: 8).

While these historical factors have a significant impact on all aspects of social life, many outsiders who have never worked intimately in Alaska Native communities may be surprised by how significant a role history plays when it comes to working on cross-regional projects. As one builder explained, "what works in one community may not work in another." Moreover, as the Alaskans involved in the research informing this paper have attested, the building of a home begins long before a site is prepared. For instance, drawing on her experience working on

building projects in Alaska's Interior, Julie once explained that people often ignore critical issues of home financing and its entanglement with history and culture, but these issues can quickly bring a project to a standstill. Here, history has much to teach us about the future of home building in Alaska, a point Julie emphasized by referring to how history and home financing can be experienced differently across community sites:

[Alaska is diverse...] some communities in Alaska were colonized hundreds of years ago and are well along the path to being banked and enfranchised, et cetera. But in other villages it's possible that the leaders of these communities were born in tents [traditional housing] and English is their second language. [So] Alaskan communities may have very different experiences when it comes to dealing with financing institutions than their neighbors a few hundred miles away who have had significantly more time to navigate these bureaucracies.

Adding to the complexity of these issues is the fact that home financing plays a critical role in shaping public housing projects. Roger, who has worked on both the federal and local side of public housing development, emphasized that addressing housing needs goes far beyond the actual building of a home. That is, it is critical to have the knowledge to design homes that are energy efficient and culturally relevant to the needs of those living in the home, but so too is the financial literacy required for acquiring homes and navigating financial institutions. He explains this point further:

We just can't say we can't do housing in rural Alaska because it costs \$500,000 a house. So, you know, we just can't, I don't buy that. You know, I never have, I think it's expensive [to build homes in Alaska], but the [real] challenge is how do you finance [home building]? And you know there's a path forward [but] it takes people getting on the same page... [Also,] there will never be enough grant money to solve [housing needs in Alaska]. But [if you] essentially use lending and capital markets to build housing you will get a lot further.

The problem Roger pointed out later in this conversation is that many remote communities have not had a history of applying to banks for housing loans, and this process can be extremely complicated. But as he argues, what is often assumed is that taking a loan to build a home is a common practice.

I mean, we all own homes, right? The reason why we are able to own a home and gain equity is because we borrowed money ... to buy the home. I could have never bought my \$300,000 home [based on my] paycheck, and if I did, I'd be dead by the time I could afford it. So financing is really key and getting communities used to that notion of

borrowing money, being on the line to a bank and then getting foreclosed on, is a tough sell.

In summary, Roger, like Julie, reminds us that the past is actively shaping public housing projects in Alaska. This includes the ongoing impact of settler colonialism, but also the modes of resilience that have grown up in different ways across Alaska's culturally and geographically diverse regions. In the following section we will explore these points further, but we want to highlight how a multiplicity of historical forces converge in and through rural home building projects in Native Alaska communities, and how these histories necessitate critical reflection when working on engineering and building projects.

2. Land Ownership and Culture

Land ownership in Alaska is shaped by the Alaska Native Claims Settlement Act (ANCSA), which was passed in 1971, and the 1979 Alaska National Interest Lands Conservation Act (ANILCA), which provided varying degrees of federal protection to over 157 million acres of land. The Native land settlement act (ANCSA) ended a land freeze and allowed construction of the Trans-Alaska Pipeline System to begin, but it “extinguished aboriginal title in Alaska in exchange for \$962.5 million dollars and 44 million acres, about one ninth of the state and nearly as much land as all Indian reservations in the United States combined” (Huhndorf & Huhndorf, 2011: 385). It was unique because this settlement was not organized around reservations, as was historically the case, but around corporate models. As Indigenous and Native American scholars Roy M. Huhndorf and Shari M. Huhndorf write, “ANCSA transferred fee simple title to settlement lands to new for-profit corporations owned by Alaska Natives,” (2011: 385). This capitalist model transferred significant lands, but also took away hunting and fishing rights and did not adequately address issues of sovereignty (ibid). As a result, the law has been mired in controversy for decades because access to and use of land for building homes in communities that fall under the jurisdiction of ANCSA have “transformed communal lands into corporate property” (ibid: 386).

Subsequently, the history of ANCSA continues to this day to play a critical role in building projects for Alaska Natives. This point was underscored by Julie in describing how navigating these policies is “a complicated system” because when engineers or contractors are working with a Native community, approvals are usually required from the village ANCSA corporation that has jurisdiction over the land you are hoping to build on and from the tribal council and municipal government. They are not one and the same:

When you are working on a building project in an incorporated village you will usually work with at least 3 governing entities: the village ANCSA corporation, the city council,

and the tribal government. Each entity has its own jurisdiction, and tribes have the right to government-to-government consultation, for example. But they don't own any land.

In addition, there are often permits required from the U.S. Army Corps of Engineers (if construction involves any impacts to wetlands) and any other state and federal agency with any jurisdiction.

Complicating issues further, building projects can also fall under the jurisdiction of a borough (similar to a county) and a regional ANCSA corporation. Even if a potential homeowner is located in an incorporated city and secures a loan to build a home, they likely need to go through the village corporation to secure land. Additionally, across regional and cultural contexts, communities may have distinctly different notions of what constitutes private property and inheritance. Moreover, as Julie further explained, financial institutions complicate these issues by reproducing settler-colonial ideologies, including the assumption that leaving a will is a ubiquitous concept and that the practice is not cultural or steeped in certain value assumptions about death, kinship, or practices that create structural inequalities through certain conceptions of private property.

3. Cultural Complexities

Working in Alaska requires attending to the complex networks of relationships connecting rural Native and urban communities. Reflecting on this point, Maria, a leader in Anchorage's public housing sector, cautioned against trying to disconnect the two, saying, "In Alaska, rural and urban are kind of the same... If rural Alaska is not successful, urban Alaska is not successful." In making this point, Maria draws attention to the ties that bind many Alaska Natives who are living in urban communities to families, friends, and communities they grew up in.

Maintaining these connections may carry immense responsibilities, like sending money whenever possible to support family members. This point was emphasized in several interviews with housing experts who shared stories of how Alaska Natives from small remote villages migrate to regional hub communities and urban areas to take jobs, access health services, or explore new opportunities not available to them at home. But such movements are often not permanent and even when Alaska Natives spend long periods of time in hubs and urban centers, they often return home for hunting and special occasions.

This continuous movement between small villages, regional hubs, and urban areas also leads to expectations of housing in terms of features and functions. But as one public housing specialist recently explained, the people he worked with in smaller villages on the North Slope tended to prefer designs that were inspired by the design of homes in hub communities and people in hub communities tend to prefer the design styles of urban homes. What this means, then, for those

working to elevate living standards and collaborating with advocates and stakeholders in rural Native communities, is that they can't ignore hub- or urban-inspired design trends and styles. However, because factors of livability and buildability differ across geographical contexts in Alaska, there is a need for flexible ways to achieve standards. These standards can range from safety criteria to energy efficiency requirements, which are important to meet funding requirements and important to occupants to avoid high utility bills. These requirements are more realistic to meet if designs can be adjusted according to climatic, social, and regional differences. As one expert working for a public housing service argued, communities "that are able to use a more flexible model [for designing and constructing homes,] while still showing how complying [with building standards] can be achieved in multiple ways, will be helpful to other communities."

The relationships between culture and housing can also take on many forms. Historically, Alaskans have dealt with what local housing specialists and builders call "prescriptive" housing policies, through which home designs are promoted as viable solutions for addressing housing needs (usually by policymakers in the lower 48). Prescriptive designs, they passionately explain, are often introduced by policy outsiders as the most economical means for making the most out of limited funding streams (an issue that many housing activists in Alaska also have much to say about). But as one leading public housing advocate argued, prescriptive design policies fail because they don't reflect the socio-cultural realities of Alaskans. Or put another way, these designs perpetuate social assumptions and ignore the diversity of people whom public housing authorities are meant to serve.

This point was reinforced during an interview with Maria, the Anchorage public housing leader cited above. When she began this work, she was faced with a housing inventory that did not meet the needs of the community she was serving. As she explained, the organization that she began working for had created one kind of service – one kind of housing resource that limited whom they could serve. She realized soon after starting that her office was full of people with diverse living needs, including housing for single families, senior citizens, and young people just getting started. Working with several agencies, she transformed her organization's housing inventory by building a range of housing options. She explained that this was essential because:

We're not building just one housing widget (i.e., kind or type). We're able to build studios, one bedrooms, four bedrooms, five bedrooms, we can build based on who's walking in the door rather than saying, "Okay, let's get this model designed that we can just repeat over and over and over." That's the hard model. That's what HUD asked us to do.

Working to break out of this mindset and develop policies that support culturally appropriate building strategies for Alaskans also requires working to disentangle rules, definitions, and

practices that were designed to address the very problems they often complicate. For instance, for housing experts like Maria, federal policies concerning “culturally relevant housing” can be problematic when they are misaligned with the on-the-ground realities that define people’s lived experiences. Maria pointed out that when she first began working in public housing, she contacted a federal funder about their policies concerning “building culturally relevant housing”:

When I asked them how they defined it, they looked at me and said, “Well, you know, the housing you grew up in.” And I said, “Seriously, that's not why I'm building, are you kidding me? You want me to live in a place that's either a trailer; a place that has no insulation; that only has one door; with no grass? That's what you want me to build?” Because the housing I know [and grew up in] is not what I want to build for the people [in the community I serve]. So, you know, there are a lot of disconnects here between the federal government and what is real.

As Maria makes clear, cultural complexity is experienced in many different forms, including through housing policies that, while attempting to promote cultural resiliency, are operating on faulty assumptions.

4. Environmental Multiplicities

Cold climate housing builders are quick to point out that environmental factors are one of the key issues that distinguish building designs in Alaska from those in the lower 48. As numerous participants in our study have emphasized, Alaska spans several different climate zones, from coastal rainforest to Arctic tundra. The state is made up of a palimpsest of micro-climates, and in the northern region, climate differences, ecological factors, and multi-species landscapes can look radically different as you travel from the North Slope (Arctic) to the Interior (sub-arctic).

Everyone involved in housing always discusses this diversity of landscapes, natural resources, and climate regimes, but one issue of primary concern is permafrost. Several homeowners we talked to who live in remote Alaska Native villages are facing a myriad of problems due to the thawing permafrost. One interviewee (a Native resident of a predominantly Native community) points to socio-technical questions:

With the permafrost melting and the house sinking, there’s many cracks throughout the home from it being unlevel. And my family has been fortunate to have the tools and equipment and knowledge that we need to maintain the home, to keep it good and healthy. And I know there’s not a lot of other people that have that privilege or have those resources. So I think about how do they maintain their home? Were they trained? If they were trained, how did they get this training? I mean, like who built the house? If you have any questions or concerns, you’d need access to them. And then there are lots of

logistics questions. Do you have the heavy equipment available in your village to transport the house to where it needs to go?

Another issue commonly discussed at length is whether communities have access to gravel or if it will need to be shipped in. Not all building sites require gravel, but most do. And because of the rapid thawing of permafrost in certain areas, even homes that were built correctly are becoming destabilized. As one builder explained:

Even though it's built on a gravel pad, it's still on unstable soils. You've still got hillside type stuff going on and things are gonna move seasonally and houses still have to be leveled. And leveling houses sometimes doesn't happen. We've come back and seen houses that are 10 inches out of level because nobody leveled it and the floor is starting to tear apart. And that's a fact of life. If somebody, if the system had stopped and said, 'Hey, it might cost a little bit more up front, but what you get out the tail-end by driving pilings instead of just this gravel thing, I mean, it's just, – well, that's what we do everywhere.

This builder, speaking from the point of view of working for an organization focused on sustainability, also points out the misalignment between default processes and local resources:

We always use gravel and we don't have gravel here. So we're going to create a quarry and we're going to bring out all of the same equipment. We're going to blow all this rock out of the hillside so we can make gravel pads. And like, oh my gosh, you know, I don't agree. I think it could have been better. And somehow, you know, we said that over and over again, look, guys, you really need to do this, but you know, the system does things a certain way.

Even at latitudes with long periods of darkness, the extremely high costs and complicated logistics of imported diesel fuel make incorporating solar power into energy planning projects desirable both for energy and cost mitigation. Homeowners in one western Alaska community along the Bering Sea coast have seen significant energy savings from installing solar power. Considering the following discussion with a homeowner (a non-Native resident of a predominantly Native community):

Interviewer: Do you think affordable housing projects in your community would benefit from adding solar panels?

Interviewee: Absolutely. Yep... we sell it back to the utility. And it's primarily useful from March to September, [that's when we] benefit most. It's pretty hard to get much from it once you get into October and through February. But I paid almost no electricity from April to August. And that's with our big house. But if I had a smaller house, I think I probably could get money back.

Calculating cost-benefit analyses of any alternative technology is complex, and decision-making can be further complicated in housing projects in remote Alaska Native communities because the decision-makers include not only homeowners and builders, but also Native corporation representatives and government-funded sustainability, architectural, and contract-builder organizations. However, assumptions about the cost of this technology can influence decision-making in building projects, and these assumptions may be based on older models that do not reflect the user-friendly technology of modern solar power or the contemporary need for alternative energy sources that can reduce costs for significant portions of the year.

5. Time Sensitive Logistics

No matter which region, Alaskan weather is unpredictable and adds serious challenges in terms of planning. References to “barges,” “freeze up,” and “break up” are frequently discussed as part of Alaskan building projects because the terms refer to logistical considerations that shape almost all building projects in the region. In the summer, barges bring fuel and other commodities, including building materials, to many communities. In the winter, regional travel occurs over snow and frozen ice, but most commodities are delivered by plane. “Break up” refers to the period in the spring when thaw breaks up ice-covered ocean areas and rivers that are used for over-ice travel in the winter, after freeze up. During break up, travel is very restricted: it is no longer safe to travel over the ice but the water is not yet navigable. Once the sea routes and rivers are navigable, barges begin traveling the waterways, bringing much needed supplies.

The timing of transporting building supplies is also governed by the time needed to get supplies to a community early enough to build that project before winter sets in. If the supplies arrive late in the summer, or the barge is delayed by an entire season, it will likely not be possible to build anything until the following summer. In such cases, planks, insulation, lumber, framing boards, and other vulnerable materials sit through the cold of winter and take the wear and tear of snow loads, moisture build up, and cracking caused by extreme cold. Further complicating the seasonality of building is that many foundation types must be constructed while the ground is frozen or they risk exacerbating permafrost degradation.

When it is possible to build, simple tasks can become even more complicated by a lack of heavy equipment or the inability to repair equipment. In many communities, there is no local hardware store for tools and supplies, meaning they either must be flown in or brought by barge. The current pandemic has further complicated these issues as supply chains have become unstable (Smith 2020; AHBA 2021). Reflecting on this point, Rocky, an expert on modular housing, shared his recent struggles getting materials out to remote Alaskan communities where he is working on several home building projects:

Interviewer: How has the supply chain impacted offsite, modular construction or your business in general?

Interviewee: It's just raised costs for everybody... lumber is three, four times what it should cost. The buildings just cost three times more.... I mean, you hate it when you look out in the yard and it's like, wow, we got \$50,000 worth of lumber... [and you think to yourself] "maybe we should put a fence around it." But it ultimately just increased costs across the board.

Taking these logistical and expense factors into account when planning engineering and building projects is critical for the success of any project, yet even the most experienced builders in the region must adapt their building schedules to numerous obstacles. In part due to these challenges, many home designs developed in the lower 48 fail, because the designs are premised on radically different sets of assumptions about how the movement of supplies and logistics shape construction processes in remote areas of Alaska.

6. Networks of Advocacy & Innovation

The uncertainty and variability of construction logistics in Alaska necessitate the network of housing organizations that advocate for Native Alaskans and work to develop viable and innovative housing designs. These designs often draw on the expertise of local homeowners and community leaders whose nuanced understanding of local environments and cultural histories provide critical resources for addressing dramatic climate change. Collaborations with Alaska Native community stakeholders have also inspired building forms and practices that draw from creative solutions developed by local homeowners. This creativity exchange has led to the development of new home design prototypes and building practices.

Assumptions made by policymakers from urban centers or the lower 48 can influence decisions made by building and engineering organizations in Alaska and in turn impact the well-being of Alaskan communities. An example was shared by a team of builders, architects, and engineers working for Interior Building, a not-for-profit organization in Alaska. This organization had been tapped to advise on the relocation of a community in the western Alaska Bering Sea coastal area that was being forced to relocate from their townsite due to flooding and erosion. To identify "adequate housing" for this community, the team at Interior Building were presented with a plan to reappropriate modular housing buildings that had been constructed several decades before on a military base near Anchorage. The policy specialists imagined the cost of acquiring these structures as a pragmatic solution. However, the Interior Building builders pushed back by questioning the viability of the old barracks, which lacked adequate insulation and were plagued by myriad other defects. Reflecting on this experience, Riley, a builder educator with over 30

years' experience working on cold climate housing projects in Alaska, drew attention to the potentially dire consequences that ignoring the complexity of home design in Alaska carries for local communities:

In [name of community] I was on the periphery of the discussions on how to get homes out to this village that was being relocated because their community was falling into the ocean... and [a lot of] houses no longer had plumbing.... So, they need houses fast, and the state was looking at how they can make this happen fast, and, you know, what's an economical way to do it. And somehow it came up that the military could donate old barracks [...] and that those could be shipped out there... And then an architectural firm gets a hold of it and says, well, you know, we should put two inches of foam board insulation on the outside of these things and make it more energy efficient [before we send them out]....

And when we heard that this was happening... [we knew that] there was a lot of money at stake... [But] those houses would have been health hazards and would have failed in Western Alaska. The foam board would have gotten rainwater behind them, or they would have had condensing events in the wall. And once that happens in those communities, where it's a wet climate, it effectively never dries out. And so, I would guarantee you that within five years, you'd have some serious issues with that construction, and that's money thrown away. But that's your state that is saying, yeah, let's do this. And they're not hurting for smart people, engineers, and inspectors, and everybody else to look at this and put the brakes on it, but nobody wants to why are they hesitating? Why isn't anybody else scared about this? You know, and I think these things gain momentum at higher political levels, and they are just hard to stop.... But we wrote a very stern letter that held people accountable and said "look, if this happens, you're going to be stuck with these problems."

Alaskan builders often like to say that for being such a big place, it's amazing how small it can seem. Although Alaska is the largest state, its 665,384 square miles are cut across by a relatively small cadre of building and engineering institutions involved in remote housing construction projects. The common statement that "it is a very small state" reflects the fact that the entire population (around 700,00), while very spread out, is equivalent to one medium-sized city.

Discussion

Modes of Complexity vs. Lower 48 Ignorance

The complexity of home building in Alaska is not limited to these context-specific factors. As numerous interviewees expressed, it is draining to have to continually explain the complexity of

building in Alaska. It is just as draining, they explain, to be the only one at the table who is able to unpack misguided assumptions underlying a particular proposal or plan. Take for instance, Julie's pointed reflection:

I've been living here studying Alaska for over 20 years and I still feel like I barely scratched the surface of understanding how things work because there's hundreds of distinct communities and tons of federal money and activities. So dealing with the ignorance of people in the lower 48 about Alaska is a huge barrier... Where do you start explaining what permafrost is? Or what settler colonialism is... because the average American just thinks that colonialism is this thing [that happened] in the distant past. But that is not the case here and I think that's hard for a lot of Americans to realize. [For instance] I had somebody who was really educated and lived on the West Coast tell me that ... most Americans don't have any idea that there's indigenous people living and subsisting on their own land [in Alaska]. They just don't have any concept of this.

As a result, the act of balancing tradition and innovation in a challenging natural and social environment becomes a constant engagement with complexity. While many new home designs incorporate laudable sustainability standards and practices, they can also inadvertently promote idealized notions of efficiency over local histories, real world practicality, and vernacular methods for living in the North that ultimately subvert these goals. Rittgers argues:

Historical and economic forces and conditions in rural areas, such as lack of access to local capital, low economic activity, and the absence of financial institutions, relate to the traditional subsistence economies common in rural Alaska. Policy and regulation issues, such as limitations of federal housing laws, absence of public utilities, and difficulty in coordinating agencies, have long hindered access to quality housing. The large number of stakeholders at the local, state, and federal levels complicates policy and regulation issues. Occupant health also falls in this category, primarily factors related to overcrowding and insufficient ventilation, which contributed to the spread and intractability of tuberculosis in the past. (2018: 12)

By analyzing the implications that both building practices (e.g., ventilation systems, air tightness, storage, subsistence food processing, multigenerational living, safety, and agency) and lower 48 assumptions can have on local communities, we advocate reflective, intentional, and local participatory design practices. Taking into account perspectives that are situated in relation to wider socio-political and historical forces, it is possible to develop a richer and more socially situated model for collaborating on building projects in Alaska.

Generating Collaborative Reflections

The modes of complexity this paper describes reflect dynamic and changing phenomena that are continually in flux. As such, this paper introduces a framework for approaching complexity in Alaskan building contexts by outlining several complex points of reflection that collaborators from various backgrounds can draw on to orient themselves to the issues and considerations that have historically shaped home building projects in remote Alaska Native communities. However, this paper does not (nor is it meant to) provide a template or recipe for guiding future building projects involving diverse actors. Instead, this paper offers a conceptual framework for inspiring inquiry and discussion among collaborators, especially those from the lower 48 who have never worked in Alaska before or who have limited on the ground experience with home building in remote Alaska Native communities.

That said, it is important to keep in mind that homeowners, engineers, and builders from Alaska do not regularly use terms like modes of complexity nor refer to theories of reductionism versus multiplicity in their everyday collaborations on building projects. Our conceptual tools help us guide ethnographic interpretations of everyday practices, and while they have a particularly utilitarian role to play in research activities, they do not reflect the everyday discourses and practices. However, the Alaskans that we have talked to and observed for this project do refer to notions of culture, the environment, prescriptive housing, history, and so forth. In other words, the issues of complexity outlined in this paper reflect what Clifford Geertz calls “webs of significance” because they influence how homes are planned and built (1973). This also includes the more-than-human forces that shape building processes, such as the environment, climate, wildlife, and multispecies landscapes (Haraway 2016) and also the socio-material tools and makeup of homes (Vinck 2011; Christensen 2017). By opening space for considering the complexity of home-building, deeper engagements with the social needs of communities can be brought to the forefront of collaborative building projects. This is especially important for collaborations involving stakeholders from both Alaska and the contiguous United States.

In the field of Engineering Education, these issues can become important prompts for deconstructing presumptive practices and methods. For instance, this paper provides both conceptual and applied ways to approach engineering design education as well as strategies for broadening participation in the development of engineering and building projects. It also can be read in relation to work by other researchers who are working to broaden participation in design processes. A good example of this is Edmunds et al., where a mixed group of design specialists, scholars and housing advocates work together to develop new approaches for co-designing homes in a California Native community (2013). In the process they outline methods that reflect the “democratization of scientific practices,” (ibid: 801). By bringing our paper into conversation with Edmunds et al. and related materials, it becomes possible to identify how work in one context both reflects and differs in important ways from those developed in another context.

Why do these differences exist? Why do they share certain overlapping concerns, even if these concerns are carried out in radically different geographic settings? What can be learned by comparing and contrasting one framework to another and how does reflecting on these questions deepen students' understanding of the importance of questioning and being open to continual reflection and inquiry?

Beyond the classroom, this paper can serve as a resource for approaching the design or building of projects in remote Alaska Native communities as a process that requires collaborators to be open to continually learning from one another about the issues of complexity at the heart of building projects in the North. Taking this approach moves the practice of reflection out of the classroom and into applied projects. Educators, mentors, and colleagues can lead teams to generate reflections by being open and taking time to actively listen and question assumptions about building and engineering home solutions rooted in the distinct socio-historical context of the North. Using a model that prioritizes the critical and reflective practices needed to deal with the complexity of 21st century challenges can provide useful pathways and interdisciplinary modes of collaboration.

Conclusion

In conclusion, this paper threads together a critical description of the social, technical, and historical terrain in which building projects in remote Alaska Native communities are situated and the modes of complexity that should be considered as various stakeholders collaborate on these projects. Such situated understandings necessitate that engineers and builders who work on remote Alaska Native building projects take seriously the complexity of issues that converge in and through the building of homes, while also outlining the broader contributions that engineering and building practices developed in Alaska have on engineering and building curricula in the lower 48.

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