COMMUNITIES AND THE PERMAFROST SYSTEM – CREATING CLIMATE RESILIENCY

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Gratitude

I want to thank Jana Pierce, Vicky Wolf, and Billy Connor for an outstanding symposium. This was an action-packed event allowing for productive interaction between all the participants; the folks from the communities, local government, academics, engineers, and industry. This was an outstanding time to see and discuss new issues, especially for those of us who have worked and been to the region previously. Most importantly it allowed us to connect with other subject matter experts for on-site discussions and brainstorming on climate resilience issues, discussing mitigation and adaptation solutions. This was very well done and it would be good to start the planning for a second symposium, hopefully to view the results of an action spurred by this symposium. Or perhaps it is simply another opportunity to bring other SME's to the region and hold a Phase II symposium.

Observations

My observations will build largely around the concept I presented at the symposium; *Communities and the Permafrost System – Creating Climate Resiliency*. I discussed the two primary frozen terrain vulnerabilities of the region. The first, nearly all northern villages are built over very heterogenous permafrost, with respect to the ground ice condition. Without too many technical details, nearly all permafrost terrain contains areas of 'good' permafrost (ice-poor) and 'bad' permafrost (ice-rich). The climate of 30 years ago and before, was more forgiving for structures constructed on ice-rich permafrost where stable conditions could be maintained utilizing tested engineering practices. As the climate continues to warm however, the deteriorating thermal condition will make stable engineering more difficult and more costly and new construction must exploit the areas of ice-poor permafrost. Second, water contains much thermal energy which when allowed to pond or flow over permafrost terrain, can advance the thawing and degradation process occurring under and around infrastructure. The warming climate is increasing precipitation both in the form of rain and snow, and this is expected to increase further as warming continues, adding to the water issue. Thermal degradation will occur without standing or flowing water, but allowing water to go un-checked is absolutely a detriment and very destructive, and often very rapidly. The combination of the existing permafrost condition (ground ice extent), coupled with surface and subsurface water ponding and flow, now becomes an issue for climate resiliency the communities must contend with.

Recommendation

Coincidentally, under a program called 'Silver Jackets' within the US Army Corps of Engineers (USACE), the Alaska District (CE-POA) and CRREL were recently awarded a relatively small fund of money, $140K. Our proposal was to begin the process of creating building standards for

northern communities constructed on permafrost. The idea is not to create rigorous codes requiring continual revision and enforcement, but to create a manual of best practices created by those who have constructed on permafrost and in Alaskan communities, and provide practical, sound measures to not only adequately build for the frozen condition, but also how to build in a warming climate for those communities needing to abandon the current location and relocate elsewhere. This 'best practices' was planned to address issues A to Z; site selection, permafrost investigation, proper foundation selection, construction issues and logistics, maintenance, and early warning monitoring.

My recommendation is to build upon the observations and ideas of the Permafrost Symposium with including information on how to become more climate resilient by taking into account the permafrost condition, while planning and conducting water management. The result will be more robust building standards than what we originally proposed, and will provide for constructing climate change resistant (CCR) or in some cases climate change proof (CCP) communities.

Path Forward

I have reached out already regarding this idea to a few folks who were a part of the symposium, such as Billy Connor and the staff at the former CCHRC, now NREL. We would like to use the amount of money already provided to begin this process of developing the *Frozen Ground Building Standards for Communities.* We plan to reach out to all those who attended the symposium and provide the opportunity to participate. We plan to meet as the primary group and discuss the issue and chart a plan forward, to include main topics to address and how and who will best create those standards. We also will chart the path forward for funding the creation of the building standards and start the process of contacting sources and creating proposals. Finally, we will engage beyond to the communities, other local governments, State agencies, Federal agencies, academics and industry to insure we incorporate all the interested and key players to start this project and get off on the right foot.

Conclusion

Due to this very successful symposium, we plan to capitalize that momentum and create a highly useful deliverable which should allow Alaskan, and other northern communities to effectively plan for and mitigate the issues due to climate warming.