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Defining energy security in the rural North—Historical and contemporary perspectives from Alaska

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ABSTRACT

In this paper we discuss the historical dimensions of energy in rural Alaska to argue that energy security in rural locations involves different considerations than in urban areas, and as such a definition of energy security needs to be downscaled to a place-based perspective, addressing individual and household needs as opposed to national issues of supply, consumption, and distribution. The definition of energy security for local communities that we propose is adapted from the food security literature: having sufficient access to energy generation or provisioning services to conduct a sustainable life. Also similar to the food security literature, the framework we propose includes four dimensions to energy security: availability, access, quality, and stability. This paper applies the proposed definition and framework to the example of rural Alaska. Alaska has an abundance of energy sources, from oil and gas to a host of renewables, however due to colonial legacies, lack of infrastructure, policies and social structure a number of communities in rural Alaska struggle with energy insecurity.

1. Introduction

Energy security is an oft-discussed but rarely elaborated upon component of environmental security and community sustainability [1,2]. Its importance has been elevated by research on the so-called food-water-energy nexus [1,3], but questions remain regarding what exactly constitutes energy security at the household, community, or regional level, as compared to global and national levels where energy security primarily involves whether state governments have control over their energy generation and provisioning resources [2,4–7]. Like its counterparts in the nexus, energy security has different meanings depending on the level and location of analysis; energy security in rural areas often involves different features than in urban ones, and household and community energy security have little in common with energy security when construed in a militaristic or statist sense. For a rural community, energy security can mean resilience and self-sufficiency through an escape from the global carbon "lock in" [8]; for an individual, it may well mean something as simple as being able to survive a cold winter or having a light at home so that children can study at night [9,10].

Sovacool and Brown [4] argue that energy security may ultimately prove to be the most important component of human environmental security, in that energy influences so many different aspects of people's lives, including food production and the distribution and treatment of drinking water. As was the case for making progress on food security research and policy [11], we argue that new place-based perspectives are needed on energy security that scale down focus to the issues affecting individuals, their households and livelihoods. As we describe below, this means paying attention to such diverse issues as breaking out of historical legacies of colonialism and development and the political ecology of energy resources [12,13].

In this paper we illustrate some of the place-based contours of energy security through a discussion of historical and contemporary energy security in the high latitude North. Alaska and the Arctic are well known to the energy security literature because of the oil and gas reserves in the region, but relatively few academic studies to our knowledge have been published that evaluate the energy security of communities in the North. Studies we are aware of for Alaska are government publications and assessment reports for non-governmental organizations [14–18]. The North, while unique, is an exemplar of remote rural issues elsewhere in the world: complicated and unreliable supply chains, limited employment

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and economic development, a history of boom and bust economic development, and rapidly shifting demographics. Alaska is also rich in colonial legacies influencing the local energy discourse directly undermining indigenous practices, which is explored in this paper. In terms of infrastructure, the North shares a number of features with other rural and developing parts of the world, specifically distributed power generation (usually diesel) and the unfeasibility of extending electrical grids [19–21]. Therefore the discussion in this paper has applicability to a wider context than the case study used for illustrating purposes, for example the challenges to energy security that Alaska faces are not unknown to countries in Africa and in South Asia [20–22].

We propose and justify both a definition and framework for energy security that attends to these complex circumstances at the local level. We draw guidance from the food security literature, which as noted has undergone a similar "scaling down" in focus in the last few decades from global and state-level issues to those facing individuals, households, and communities. To illustrate the usefulness of this conceptual framework, we discuss the historical timeline of heat efficiency of homes and food production in rural Alaska and the effect this has had on energy security. We believe there is value in exploring the linkage between the role historical behavior plays in present day energy use and attitudes and how this relates to energy security. We also examine contemporary issues of energy, transportation and food security and how they relate to each other directly affecting the vulnerability and resilience of communities of the region.

While some examples given in this paper refer to specific forms of energy, such as electricity, it should be clarified that the paper as a whole, including the energy security definition, is concerned with household energy use in a broad sense, including electricity, heat, and transportation.

2. Conceptual background

The concept of energy security can be interpreted in a wide variety of ways based on the level and scale of interest, as well as the cultural context, which involves expectations regarding energy availability and also ethics regarding how energy ought best be generated and provisioned. 'Energy generation' as used in this paper describes technologies that convert energy resources into a form useful for human activities. At a national level, energy security is often linked to economic policies, foreign relations, financial affordability and even environmental policies [6,7]. From the perspective of Saudi Arabia, for example, energy security can be construed as securing global demand for their oil and gas resources; conversely in the US, energy security has come to mean securing the supply of oil at low prices, at a predictable and sustainable rate and, increasingly, from national rather than foreign sources [4]. Similarly, for transnational oil and gas producers, energy security is linked to securing access to new reserves and widening the distribution or consumer network, giving them control of the pipeline infrastructure and access to the consumers. Whereas for consumers it likely involves both access to energy supply without disruption and affordability on a reasonable household budget.

On a local level, people's concerns about their energy reliability and affordability also feed into concerns about societal and ecological trade-offs related to electrical power generation and other aspects of their environmental security. For example, local air quality can be severely impacted by emissions from power plants [23], and household air quality can be compromised where people rely on fuel lamps for lighting [10]. Some have proposed biofuels as an alternative to carbon-based energy generation, but biofuel production can usurp land that would otherwise be used to produce food crops. Similarly, some consider hydroelectric energy to be an environmentally friendly form of energy generation, but hydroelectric dams can interfere with fisheries that are important to local food security [24]. Dams can also alter downstream hydrology and affect the flow of tributaries and floodplains [25].

These examples illustrate the many ways that energy security interlinks in a 'nexus' with food security, water security, and environmental health [1,3,26]. This nexus approach is relatively new to the research and development literatures, and is arguably useful because it highlights linkages and potential trade-offs or synergies among these domains.

3. Energy security definition and framework

Energy security is purported as a concept hard to define especially in a global context [27,28,6,29]. Energy supply and demand varies largely based on the size of a country or community, the available local resources, economic development and geopolitical factors and jurisdiction, to name a few [30,31]. What energy security may encompass for a developed country in Europe with a northern temperate climate may not apply to a developing country in Africa with a warm desert climate. The heating needs, fuel resources, economic development, population size and geopolitical factors would likely all be different. One other noteworthy challenge in defining energy security is that developed countries' definition of energy security may not work well for rural communities, in that the latter may have a standard of living closer to a developing country, as our case study of rural Alaska exemplifies. As Martchamadol's [30] research states developed countries' understanding of energy security is often "a resilient energy system and securing the amount of energy required for people's lives, economic and social activities, defense and other purposes for acceptable prices." Developing countries, by comparison, have a differing understanding; "enough energy supply (quantity and quality) to meet all requirements at all time of all citizens at an affordable and stable price, and it also leads to sustain economic performance and poverty alleviation, better quality of life without harming the environment." Furthermore, the energy security literature often focuses on indicators of energy security in a nationalistic sense [2,6,31–33] that may not be appropriate for a local community.

We define energy security as a situation in which people have reliable access to socially acceptable energy generation or provisioning services, at a level sufficient to conducting a sustainable life. This definition is adapted from contemporary definitions for food security [34], with our goal being to "downscale" the energy security discussion to the household and community level in order to capture the varied and often inequitable experiences that local households and communities can have with energy [11].

While not explicitly mentioned in our definition, it is important to clarify that energy efficiency is implied by the definition as a possible means to help achieve energy security. While energy efficiency doesn't directly affect the access to energy generation or provisioning services, it does decrease the amount of energy considered sufficient to conduct a sustainable life. As a result, there are two basic ways to increase energy security: a) increase reliable access to socially-acceptable energy generation or provisioning services; or b) use energy efficiency measures to decrease the amount of energy needed to conduct a sustainable life.

3.1. Framework for energy security

Hughes [27] distills three indicators from the Information Energy Agency's definition of energy security; affordability, availability and acceptability. Similarly, Giampetro et al. [26] discuss issues of availability, viability, and desirability as being central to