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Lessons from the Arctic past: The resource cycle, hydro energy development, and the human geography of Jokkmokk, Sweden

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ABSTRACT

Recent research has identified a series of human geography impacts of natural resource developments in sparsely populated areas like the Arctic. These impacts can be mapped to the 'resource cycle', and arise from periods of population growth and decline, changing patterns of human migration and mobility, changing patterns of settlement, and changes in the demographic 'balance' between males and females, young and old, Indigenous and non-Indigenous. This paper examines the applicability of the resource cycle model in the case of hydro energy development in the Jokkmokk municipality of Sweden. Using quantitative demographic data, media reports, and contemporary accounts of hydro development, the paper describes the human geography of Jokkmokk since the late 19th century. The paper concludes that changes in human geography in Jokkmokk mirror what has been observed in regions dependent on non-renewable resources, although it is difficult to distinguish many impacts from those that might have occurred under alternative development scenarios. The paper identifies a 'settlement cycle' with phases of integrated and separated habitation for populations specifically associated with the development. Settlement dynamics, and the impacts of hydro on Sami geography are areas for further research.

1. Introduction

The purpose of this paper is to examine the relationships between hydro-electric energy ('hydro') developments and the human geography of Arctic regions. The research is framed by theories of the resource cycle and 'staples' economies, which have been shown to influence population development (growth and decline over time), mobility, settlement patterns and demographic 'balance' in sparsely populated resource peripheries [6]. Five Arctic countries already appear among the top ten hydro producers in the world (Canada, United States, Russia, Norway and Sweden), and the Arctic has been identified as a key site for future hydro development [31]. While economic and environmental implications of hydro development in the Arctic are frequently discussed, less attention has been paid to the impacts on human geography. Sweden's Lule River, and particularly the section within the municipality of Jokkmokk, provides a useful case example given its long history of hydro development (starting in the early 1900s), its concentration of projects, and the availability of information about both hydro development and the human geography of the region.

Hydro may be favoured over other energy sources in the Arctic because it is widely viewed as providing renewable energy. It consequently does not appear to be subject to the same challenges of resource depletion as alternatives such as coal, oil and gas. However, hydro projects are similar to other ventures in that they require substantial intervention in the prevailing environmental conditions, and they have variable demands for on-site labour over their lifetimes [35]. Their viability is subject to the vagaries of electricity markets, and the costs of maintenance and upgrading. Hydro developments in Arctic regions such as Jokkmokk might influence human geography directly (by attracting workers to live in the region) and indirectly (by changing cultural practices as a result of the influence of workers coming from outside). These human geography impacts are likely to change over time as labour demands change. This paper investigates whether periods of change in human geography can be mapped to a resource cycle for hydro developments, and whether the human geography impacts risk a demographic 'staples trap' as observed in other resource economies [6,3,16]. The paper makes a contribution to understanding the demographic impacts of energy projects in the Arctic and raises more attention to the importance of assessing the impacts of hydro projects in particular.

The paper proceeds as follows. Firstly, hydro projects are conceptually positioned within the broad phases of the resource cycle.

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The applicability of a resource cycle approach to understanding hydro projects is tested in a case study of the Jokkmokk municipality in northern Sweden. The case study primarily uses demographic data from the late 19th century through to 2010. Gaps in the quantitative data are filled by analysis of contemporary and near-contemporary accounts of hydro in Jokkmokk, and by analysis of media coverage of hydro since the mid-1980s. The paper concludes by proposing how a resource cycle view helps identify (and potentially deal with) some of the human geography opportunities and concerns that might arise from future hydro development in the Arctic.

2. The resource cycle and human geography

Clapp [8] proposed the resource cycle as a way of explaining how public policy often fails to manage resource depletion in fishing and forestry industries in peripheral regions. The resource cycle hypothesis is that these industries proceed through a series of stages that link economic, political and environmental impacts. Clapp proposed 14 distinct stages, which can be summarised into five broad phases:

1. Pre-development—including exploration for the resource, and discover of its existence;
2. Early period—including construction of initial infrastructure to support resource extraction, initial production of the resource, and an initial 'boom' in both economic and political capital;
3. Middle period—profitable operation and expansion, and the beginning of diminishing returns to scale as the 'easy' phase of extraction ends;
4. Decline—increasing labour efficiencies (and consequently lower direct economic returns to communities at the site of extraction), resource depletion, and re-thinking of the viability of the activity which can lead to a moratorium on extraction or abandonment of the project if insufficient resources are available to upgrade or change the operating model; and
5. Transition—a process of 'constructive planning' which seeks alternative uses for the resource and alternative mechanisms for economic development. Constructive planning might also involve implementation of new forms of environmental management aiming to restore or preserve stocks of the depleted resource. Ultimately, closure of the activity becomes one of these management strategies.

Clapp's model is pre-dated by similar resource town lifecycle models [24,4] which included mining as well as forestry and were specifically derived from Canadian experiences. The resource cycle concept has since been integrated with the 'staples thesis' tradition in political and economic geography emerging from Canada in the early 20th century [39]. According to the staples thesis, regions relatively remote from major markets run the risk of becoming economically and politically 'trapped' by over-reliance on the export of minimally processed natural resources. The 'trap' is that the bulk of economic and political resources is invested in supporting the extractive activity during its 'boom' phases, and economic development alternatives become unattainable even after resource depletion (the 'bust') because of institutional lock-in and the sunk cost of the initial investment. International research has shown that countries with a heavy reliance on minimally processed resource exports have stifled economic development compared to those with more balanced portfolios [15]. In more recent times, this has been shown to hold true not just when comparing between countries, but comparing regions within countries [22].

Recently, more attention has been paid to the human geography consequences of resource led development (mining and natural gas) in sparsely populated regions of Australia [6,37]. Resource developments induce a risk of population booms and busts that mimic the economic cycles [42,38,16]. The high levels of migration associated with these cycles put pressure on infrastructure and planning. One way to manage this pressure is to build 'company towns' which are somewhat separated from the rest of the region, and are designed either to house populations not expected to remain for long, or non-resident ('fly-in/fly-out' or long distance commuting) workers. While company towns limit the economic opportunities resource developments may provide for established settlements, they also reduce the burden of expansion (and contraction) for local and regional government [40,36]. Company towns can also have the potential to become viable long-term settlements [20].

There is widespread agreement that resource-based economies develop a male bias in the population, and that this poses social risks [37], although Eilmsteiner-Saxinger [11] cautions that these should not be overstated. The male bias is particularly towards young males, at the expense of families and older people. However, male bias (and young male bias) in sparsely populated areas is not only associated with resource extractive activities. Other activities such as defence, policing, and 'frontier expansion' of religious and government services have also typically been led by males.

The fourth consequence is the impacts of resource led development on Indigenous geographies, which has only recently started to receive attention in the academic literature. Carson [6], for example, argued that Indigenous people in Australia's Northern Territory had become marginalised in the role of 'remote dwellers' as the focus of development shifted towards the main urban and political centre of Darwin. Internationally, including in Arctic areas, there are now prominent debates about the engagement between Indigenous people and resource extractive activities [10]. In general, it is felt that Indigenous people have failed to benefit fully from the economic and social potential of resource developments in the Arctic, and that 'co-benefit' processes are only poorly developed.

The resource cycle approach to understanding long-term impacts of resource development has been criticised on two fronts. The first is that it implies a linear progression through the stages, not allowing for more 'chaotic' progressions of economic cycles that have been observed in real life [26]. Epstein and colleagues [12] among others have suggested instead that the cycle describes a series of states that a resource economy can be in at any given time rather than a precise linear progression. A resource cycle stage may be associated with particular economic, political, or human geography characteristics, but there should not be the implication that the next stage and its accompanying attributes are inevitable.

Resource cycle and 'staples' research also tends to paint a negative view of the consequences of resource-led development [39]. However, there are indications that negative consequences are not inevitable. The example of the alumina town of Nhulunbuy in northern Australia [7] showed that demographic imbalance could be reduced through provisions to attract families and provide opportunities for women and older workers. Likewise, managed growth during an initial boom stage can be used to stimulate ancillary economic activities such as hospitality, retail trade and health and social services which can benefit not just new residents, but long-term and Indigenous residents of the region [18]. Investors in a new hydro development at Storfjord in Norway have helped local businesses such as a commercial laundry become established [1]. These businesses provide alternative sources of employment, particularly for women.

Resource-led development can also attract new people (including international migrants) to live in otherwise declining regions [34], arresting population ageing, and encouraging young people to stay in town to engage in new economic opportunities [5,14]. New developments also often lead to the provision of new infrastruc-