

CANADA'S RESILIENT NORTH: THE IMPACT OF MINING ON ABORIGINAL COMMUNITIES

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ABSTRACT

For decades, the mining sector has been a central economic driver in the Canadian North, and the discovery of large diamond deposits in the Northwest Territories has intensified the speed and scale of development. In the wake of rapid expansion, researchers and communities have scrambled to understand how individuals, families, culture, environment, livelihood, and health might be affected by this industrial environment. There is a need to understand the factors that contribute to positive and negative effects on individuals, families, and communities.

This paper reviews some of the effects that mining industries can have on well-being at the individual, family, and community levels in the Northwest Territories, Canada's fastest growing economy. It does not cover the universe of impacts, but drills into a few effects in an effort to understand and build up a model of resilience, which helps to explain how impacts are distributed, experienced, and mediated. Resilience — the quality that helps communities respond to change and moderate impact — is an under-researched area of impact assessment. After describing the industry, we consider the question: what factors affect whether an individual or community experiences the impact from a mine? We call these "equity factors" and suggest they influence how an impact is distributed across a population.

UNDERSTANDING THE INDUSTRY: MINING CHARACTERISTICS

Northwest Territories properties are affected by mining through the life-cycle of a mineral or metal, from the moment of exploration through to closure and remediation. Mining is a large and diverse occupational sector that varies greatly depending upon such factors as ore body characteristics, mine type, and mine life span, among others. There are more than eight projects at the exploration stage, two operating diamond mines (and a new De Beers mine pending), three or more abandoned mines, and more than ten mines under remediation. A number of common characteristics can be observed about large-scale operating mines in northern Canada.

HIGH WAGES

Mining is the highest resource sector wage occupation in Canada. In a 2000 census by Statistics Canada, the average weekly earnings of employees in the mining sector were \$1,130.50, compared to an average of \$626.45 within

all other industries. Employees working specifically in metal mines did even better, taking home weekly incomes of \$1,196.15 (Statistics Canada, 2000).

Since mineral deposits are often located away from urban centres, many mine employees reside (at least part-time) in remote, northern locations, creating pockets of wealth in unlikely places. Polaris, the most northern Canadian community built around a lead/zinc mine, was the richest neighbourhood in Canada in 1992, with a population of 200 people having a median income of \$92,800 (Anonymous, 1994).

Currently there are many northern and northern Aboriginal people hired at the operating mines, as agreed to in private participation, impact, and benefit agreements signed between impacted communities and mines. For example, in 2003, Diavik Diamond Mines employed 221 Aboriginal employees of a total of 611 (Diavik Diamond Mines, 2003). With a goal of 40% northern Aboriginal hires, this number falls 4% short. BHP Billiton makes similar commitments for its Ekati mine.

CYCLICAL

A second characteristic of mining is its rotational nature. For mine employees, since work-sites are often located away from home, two weeks on-two weeks off schedules are common and day shifts last twelve hours. Miners cycle between periods of complete immersion in work and total lack of it. However, unlike other extractive industries such as forestry, mining is not seasonally constrained by weather conditions, so work is more-or-less constant throughout the year. Both mine workers and the surrounding community are subject to "the mining cycle." The mining cycle is characterized by the activities of exploration, construction, operation (mineral extraction and refinement), mine closure, and reclamation. For miners, this can mean periods of unemployment are common between jobs.

HIGH MOBILITY

Mining is often characterized by transience, indicated by employee turnover, defined as "any employee movement that creates a vacancy on site" (Centre for Social Responsibility in Mining, 2003: 1). In an Australian study of fly-in fly-out (FIFO) operations (Centre for Social Responsibility in Mining, 2003), turnover rates for mining were highest among all professions, reaching up to 33% at some sites. The turnover rate for Nanisivik mine was calculated in 1979 to be 106% for northern males, and 63% for southern male staff (Hobart, 1979). Turnover has the effect of lowering production and employee

morale, and increasing training costs and the risks associated with inexperience (Centre for Social Responsibility in Mining, 2003).

Other aspects of mobility include geographical and temporal transience. As workers near the closure stage of the mining cycle, they are forced to move to new mines still in operation. In doing so, mine workers commonly bring their families, thus establishing "mining communities," which themselves are consequently temporary. With their specialized skills, miners have become global nomads, with some families moving more than 21 times in 19 years (Rhodes, 2001).

REMOTE

Whereas the company town used to be created around an ore body, the Canadian government now encourages temporary, occupationally defined communities as the model for mine development, to discourage the phenomenon of ghost towns. Though transportation services such as plane and vehicle commuting have reduced the need to actually live beside the mine, *de facto* mining towns still exist at the departure points for fly-in-fly-out (FIFO) operations (Kuyek and Coumans, 2003). Thus, while modern mining "ghost towns" are not being created, transience is just as common.

RISK OF INJURY AND EXPOSURE

Historically, the mining industry posed serious occupational health hazards. Since the turn of the century, several improvements in workplace safety have occurred through technological innovations, safe work practices, and policy regulations. These measures have resulted in a decrease in the annual fatality rate (deaths per 100,000 miners) from 329 (average rate from 1911-15) to 25 (1996-97) (Center for Disease Control and Prevention, 1999). Northern mines have capitalized on many of these developments and show strong track records in safety. Diavik Diamond Mines achieved "a new safety milestone of 1.9 million hours without a lost time injury, after 305 consecutive days without a lost time injury" (Diavik Diamond Mines, 2003: 25). The Lost Time Injury Frequency Rate measures the number of lost time injuries per 200,000 hours worked. Diavik has a goal of zero work-related injuries.

RESILIENCE

Resilience lies at the heart of whether an impact is felt or not, because it defines how an impact will be experienced and buffered. It is "the ability of groups or communities to cope with external stresses and disturbances

as a result of social, political and environmental change" (Adger, 2000: 347). Components of resilience generally include:

- ❑ a response to change and shift to a new balance, sometimes to a previous state and sometimes seen to a new higher level of functioning (Kulig, 2004);
- ❑ a period of time from a disturbance to a recovery;
- ❑ *characteristics, institutions* (Adger, 2000) or *norms and values* that buffer people from threat, including either an ability to adapt and learn (Bingeman et al., 2004), or *cultural aspects* such as solidarity, respect for elders (Clauss-Ehlers and Lopez, 2002).

CHARACTERISTICS of either the individual or the group can protect people from the effects from mining. Individuals can shield themselves from stress-related mental health effects of shift work by spending time out on the land between shifts. Spouses can help workers by giving them time and space to adjust to home life at the end of their two-week rotation, or adapting through any one of the five patterns identified by Forsyth and Gramling (1987: see family effects). Or, community leaders may participate in public meetings and planning sessions to identify economic diversification strategies for post-mining.

INSTITUTIONS may hold the key to the expression of resilience. For example, new forms of management or laws may be developed to protect people. In the Mackenzie Valley, the 1998 Mackenzie Valley Resource Management Act has provided for an integrated system of land and water resource management. It has also provided the framework and impetus for the development of social and economic agreements, which require continual data monitoring, northern hiring, and northern subcontracting. These institutional requirements have served to protect the people of the Mackenzie Valley and to share benefits in the North, in a way that no other mine in the past did. Neither the Giant or the Con Mine had any quotas for Aboriginal hiring in the past, and most resource royalties went to the federal government.

NORMS OR VALUES may buffer people from risk. The Mackenzie Valley now hosts a range of new institutions, including Land and Water Boards for each land claim settlement, and a relatively new Impact Review Board. The values that drive these boards are based on the principles of respect, collaboration, and a value for local input; they rely on the frameworks of common property management and adaptive learning. These institutions may therefore provide the basis for continual learning and adaptation to change.

CULTURAL ASPECTS such as solidarity and respect for Elders have been identified as aspects of resilience (Claus-Ehlers and Lopez, 2002). The preservation of tradition through values, language, and customs may influence well-being and protect individuals and communities from mining effects. Traditional healing may address physical, mental, emotional, and spiritual health, any of which may be threatened by direct and indirect mining effects. Further, skills gained through traditional lifestyles may be applicable to mining. For example, men spent long periods of time away from home to hunt, just as occurs in mining rotations.

All of these aspects of resilience can be informed through previous exposure to crises and changing times. Past experiences give communities a better understanding of what to expect in the future, and how to survive these challenges. Older members of a community, who have suffered the consequences of residential school, may be able to help the next generation to avoid experiences with colonial institutions. However, while the experience of colonialism increases resilience in some ways, its devastating effects also weaken resilience and capacity. In managing the environmental disaster at a Uranium Mine in Arizona, the Navajo residents' coping abilities were affected by the legacy of poverty, racism, and government betrayal (Markstrom and Charley, 2003).

Resilience is a complex factor that can be either enhanced or reduced (or both) in multiple ways. How impacts are distributed over a population is affected by equity factors. Table 1, on the next page, reviews the aspects that are generally measured when resilience is evaluated, whether it is observed through the economy, the population, citizen perceptions or governance. These do not relate directly to the characteristics of resilience identified above.

MINING IMPACTS

The characteristics of the mining industry affect what kinds of impacts are felt in a region. Existing mining literature covers issues such as wages, spin-off spending in a region, infrastructure pressures, royalties and taxes, among others (Ballard and Banks, 2003; Freudenburg and Frickel, 1994; Herringshaw, 2004). This article explores a few less considered impacts in detail.

MENTAL STRESS

Long hours and roster patterns characteristic of shift work have been identified by workers as among the most stressful of all working conditions

Table 1

<i>Observing Resilience</i>	<i>Author</i>	<i>Variable</i>	<i>Relationship to EQUITY</i>
<i>Economic</i>	Adger, 2000	Variance in income	Wage labourers in mining in developed countries tend to earn good incomes; the question of who earns this new income and how or if it trickles down to families is key.
	Adger, 2000	Employment rates	Resource dependent towns may experience fluctuations in income due to dependence on a single economy.
	Kimhi and Shamai, 2004	Community finances	Transparency about use of taxation and royalties clarify how institutions buffer and plan for the future.
	Kimhi and Shamai, 2004	Social security of community	Ability to plan for future. Institutional plans, such as diversification of the economy, post-closure planning, will reveal ability to buffer vulnerable through the lifecycle of the mine.
<i>Demographic</i>	Adger, 2000	Crime rates	Reveals the status of mental and physical health of a community, and how social networks are managing potential violence.
	Adger, 2000	Migration and mobility	Reveals structural change in a population and gives clues about potential service and institutional needs.
<i>Perceived Resilience</i>	Kimhi and Shamai, 2004	Citizen preferences for staying or relocating	Subjective measures of how people feel whether their community is responding well to changes associated with mining economy.
	Kimhi and Shamai, 2004; Kulig, 2000	Social relations in community; social capital; stable local organizations	Reveals whether ties in community are strong; and tests for low or high social capital (implying weak linkages and low group participation). Communities with high social capital may be more effective on citizen advisory panels. Pockets of community with low social capital, however, may be the most vulnerable!
<i>Governance</i>	Bingeman et al., 2004	Institutional actions (formal and informal) to buffer against risk	Reveals if norms and values (as informal institutions) are aiding vulnerable to protect themselves from risks and if laws and regulations (as formal institutions) are protecting most vulnerable from risk.
	Kimhi and Shamai, 2004	Trust in community leadership	Vulnerable trust leadership to represent their interests and protect them through the lifecycle of the mine – may affect ability of vulnerable to work on community advisory boards.

(Australian Council of Trade Unions, 2003). Extreme fatigue, resulting from a lack of sleep and disruption of circadian rhythms, can have a wide range of effects, from general inattentiveness to major depression.

Mental stress and anxiety are also created by the nature of the work itself. Due to the high risks involved in the operation of heavy machinery, mine workers require intense concentration over long shifts, while often doing menial or repetitive tasks. Such stress can lead to burnout, leaving workers physically and mentally exhausted by the time their rotation is up (North Slave Metis Association, 2002). Mental anxiety and exhaustion may also pose a physical threat to miner health and safety. Goretskii et al. (1995) found that 50% of operators in their study showed a decrease in concentration by the end of their shift, and 70% suffered from compromised psycho-physiologic parameters. Such mental stress may make workers more prone to occupational accidents, or even off-site ones. Reports of road fatalities during long commutes may also be attributable to mental exhaustion and loss of concentration (Kuyek and Coumans, 2003).

Another mental health risk linked to mining is depression. Depressive disorders in mining may be triggered by a combination of factors including roster schedules, the repetitive nature and high concentration demands of the work, the after effects of job-related physical disabilities, or the closure of the mine and job loss. While, due to high wages, miners typically enjoy lower levels of under-employment during mine operation compared to other resource extraction industries (Slack and Jensen, 2004), they face a more serious threat of post mine lay-off. In Avery et al.'s (1998) study of mining and mental health, following a national pit closure, 52% of unemployed former miners faced psychological disorders. After the Elliot Lake mine closure, health centres began receiving an increased case-load of patients suffering from depression (Robinson and Wilkinson, 1998). Depression is especially dangerous because of its well established link to suicide, though as a group, miners do not suffer significantly higher rates of suicide (Ames, 1985).

ADDICTIVE SUBSTANCES AND HIGH RISK BEHAVIOUR

Mining poses potential risks to the health of northern communities in terms of behavioural changes, as facilitated by increasing incomes. The most obvious of these is alcoholism or drug abuse, as noted in studies at Nanisivik and other northern Canadian sites (North Slave Metis Association, 2002; Brubacher and Associates, 2002). Communities in the North already face serious problems related to alcohol addiction. According to a social indicators

report, the percentage of heavy drinkers (persons 12 years of age and over who consume at least five drinks per occasion more than once a month) in the Northwest Territories in 2001-2002 was over 40%, a rate more than twice that of the Canadian average (Government of the Northwest Territories, 2003). What remains in doubt, however, is whether statistics such as these are exaggerated, subdued, or unaffected by the presence of mining.

There is certainly evidence that mining may create substance abuse problems and/or exacerbate pre-existing addictions. As disposable income increases, mine workers may purchase alcohol for themselves and others. When combined with a lack of both financial experience and the responsibility to support family, as is common for young, male workers, binge drinking can become a main channel for newly acquired earnings (North Slave Metis Association, 2002).

The other path to increased substance abuse, while sometimes synchronous with increased disposable income, is for coping. Due to the increased stresses resulting from mining work conditions (advancement, job insecurity, money management, racism, etc.) and indirect family conflicts (see below), addictive substances may serve as a source of escapism. Drinking has been identified as a coping mechanism to deal with job loss (Gallo et al., 2001), depression (Holahan et al., 2003) family stress — regardless of culture (Orford et al., 2001), and racial discrimination (Martin et al., 2003), but mining studies have not focused on this.

Social and health effects follow heavy alcohol use. While the direct physical health consequences are well known, such as cirrhosis of the liver, brain damage, and fetal alcohol syndrome, indirect effects may be equally damaging. In terms of employment, alcohol has caused miners to miss work (which can lead to dismissal), and created occupational risks, when working while under the influence. While both the diamond mines in the North are dry sites, drugs have made it on site. Diavik Mines has a no-fault treatment policy to help workers kick habits, and they are only tested if they are involved in an incident. A large percentage of crimes, including convictions, assaults, and bankruptcy are related to alcohol. The RCMP estimates that 80% of crime is directly or indirectly related to alcohol or drug abuse (Government of the Northwest Territories, 2002).

Within the family, drinking has created “disrespect for the institution of marriage” (Brubacher and Associates, 2002), and divorces and infidelity have increased correspondingly. Parents suffering from addictions often neglect child-care responsibilities, causing children to have poorer hygiene, show up

to school without lunch, or miss classes all together. Children with alcoholic parents also stand a greater risk of becoming alcoholics themselves (North Slave Metis Association, 2002). Lastly, breaking alcohol addictions is a lengthy and difficult process associated with high levels of anxiety, a tough task for those whose stress level is already very high.

While many sources agree that mining contributes towards increases in alcoholism (Brubacher and Associates, 2002), there are some indications that, in communities with high percentages of heavy drinkers, it may actually alleviate addiction. This reasoning works from the assumption that the substance abuse plaguing many Aboriginal communities has resulted from hopelessness and disempowerment that have come with historic colonial abuses and the loss of traditional lifestyles (Hunter and Desley, 2002). Employment in the mining industry may boost self-reliance, and in turn pride and self-esteem. Further, any initial increases in drinking associated with the opening of the mine may be only temporary. An example is the town of Coppermine, in which an initial 29% increase in alcoholism among Gulf Oil's Inuit workers subsided after a few years (Hobart, 1989), suggesting that alcohol consumption can be a short-term problem mediated with time.

Alcoholism is not the only health-risk/addictive problem that may be enhanced by the high incomes generated by mining. In North Slave Metis Association's (2002) study, 65% of respondents reported that greater personal incomes translate into an increase in gambling. Paralleling the increase in alcohol usage with drinking establishments, gambling may also be enhanced by more businesses or interest in casinos and bingo halls. Even in the absence of infrastructure (buildings, VLTs), gambling continues in the form of back-room poker and blackjack (North Slave Metis Association, 2002). Excessive gambling can lead to financial problems and difficulty paying bills. It also takes time away from spouses and children, which, when combined with the time demands of mining work itself, can lead to neglect. In addition, the addictions fueled by economic growth may not subside when economic recession hits; there is anecdotal evidence from "boom and bust" communities such as Fort Liard that drinking and gambling lifestyles are maintained long past the time when jobs dry up.

Finally, prostitution represents another potentially dangerous behavioural change. Well documented in developing countries (Campbell, 2000), prostitution caters to the high incomes of mine workers. It can negatively affect both miners themselves and the women (or girls) from surrounding communities who are involved in the trade. For the former, infidelity temp-

tations for married workers may be heightened due to long periods of time spent away from spouses, and existing marital friction arising from work-related issues and stress. For the prostitutes themselves, the risk of HIV/AIDS (and other STDs) is increased, a worrisome trend considering the already high rate among Aboriginal Canadians (Royal Commission, 1996).

HUNTING, DIET AND HEALTH

Mining can have a strong influence on the foods consumed by people in the area, both through its effect on animals and people's ability to hunt them. Due to the migration associated with the prosperity of mining projects, mining towns may grow substantially in size. An increased concentration of hunters in a relatively small area puts high pressure on local animal populations (Hobart, 1982). Better hunting technologies, such as rifles and snow machines — equipment that becomes much more feasible to purchase with mining wages — could facilitate increased harvest. Added strain is generated from the associated infrastructure development and human activity that comes with larger population centres.

Participation in the mine economy can also alter the subsistence lifestyle. For people employed by the mine, who work long daily hours and a two week on/off schedule, less time can be spent on the land hunting and fishing. A study of the Slave Lake Metis community found 71% of workers employed by the mine reported spending less time on the land (North Slave Metis Association, 2002). During the time they did have off, workers reported wanting to spend more time at home with their families or simply resting from work. The men from the community of working age, who traditionally do the hunting, are therefore unable to learn traditional skills and ecological knowledge from Elders, or pass this knowledge to the younger generation. Since learning processes in Native societies have historically been oral-based and involve knowledge transmission through *observing*, decreased practice of hunting practices may also signal the loss of associated knowledge.

Cultural festivals and family rituals structured around meat harvests may also be threatened. This condition is further exacerbated because, unlike forestry and other seasonal work, mining is continuous year round and thus does not allow for prolonged hunting trips, necessary due to the long distances sometimes traveled while following herds. The effectiveness of hunters that do go out onto the land can be compromised through the loss of traditional ecological knowledge. As northerners migrate to new mining developments for work, their local expertise of hunting and fishing in their origi-

nal areas may be lost. This can carry negative consequences, especially when considering Weinburg's (1992) assertion that hunting and food gathering knowledge is site-specific (e.g., location of berry patches, direction of caribou migration, etc.). With the development of Faro mine in the Yukon, hunting effectiveness decreased (Weinburg, 1992).

Hunting is not just site specific; it also relies on particular knowledge and relationships to the land. Dene hunters rely on specialized knowledge and power to secure food for their families. This power, known as *ink'on* in Dogrib communities, allows individual hunters to have special communication and relations with specific animals (Helm, 1994). Reduced presence on the land and increased contact with non-Aboriginal values may have the effect of decreasing the number and range of individuals who seek to develop *ink'on*.

While the above effects demonstrate the negative influence of mining on food security and lifestyle, some aspects of mining may promote the harvest of country foods. Increased wages from mining may facilitate the purchase of skidoos, four-wheelers, boats, tents, gasoline, and the associated maintenance costs. In one study of communities in the region of Diavik, 86% of respondents thought that the majority of Diavik workers would buy hunting equipment with mining wages (North Slave Metis Association, 2002). There are spin-off benefits that come from buying equipment. First, better technology translates into increased efficiency and less time spent hunting (Brubacher and Associates, 2002). Given the time constraints already imposed by work, reduced travel-time is especially vital. Second, the purchase of expensive equipment creates spin-off benefits that extend beyond the owner.

The flip side of increased efficiency, of course, is decreased time spent on the land. As people roar through areas they used to travel slowly by dog-team, they are less apt to learn place names. Place names in the Dene culture inscribe the history, including not only grave sites, but also historic, sacred, and cultural events.

FAMILY INTEGRITY AND GENDER ISSUES

As families represent the most fundamental societal unit, it is important to identify ways in which their integrity may be threatened by mining projects. This can generally be grouped into those stemming from increased time demands from work, work associated stresses, and changing familial roles.

With large amounts of miners' time spent working, commuting to and from work, and recovering after shift's end, family time quickly becomes a rare commodity. As time is important for family bonding, reported decreases

in the quantity of time mine workers spend with family may affect the relationships (North Slave Metis Association, 2002). Early data from the Ekati mine shows roughly half of the workers surveyed reported that their primary relationship had stayed the same, as opposed to growing closer or growing apart (Government of the Northwest Territories, 2000). Work may prevent or limit participation in family and community gatherings, as well as activities important for family bonding such as hunting (North Slave Metis Association, 2002).

Quality of family time may also decrease. Workers returning from the field often require a period of readjustment from work to home life. During that period they may be physically exhausted and irritable (North Slave Metis Association, 2002), Forsyth and Gramling (1987) document five adaptive responses among families with periodic father absences, including the replacement of the father with an alternate authority such as an uncle, shifting authority between the mother and father, increasing conflict between partners, and the periodic guest pattern. A few fathers at Ekati and Diavik are reported to pull children from school when they come home from the mine, traveling the roughly 1500 km to Edmonton to spend time with their kids at West Edmonton Mall. "It is like Santa Claus coming home every two weeks," said one wife of a mine worker.

Limited time can lead families to progressively fragment. By decreasing the amount of time for communication, existing problems can be exacerbated and sometimes lead partners to look elsewhere for interaction. The stress associated with mine work is also passed on to other family members. Spouses are required to take up household responsibilities (such as child care) while their partners are away and home recovering, and also must deal with any financial consequences, not from a lack of income, but poor money management. Children also bear the consequences of prolonged absences and family dysfunction. In a 1979 study on the effect of mining rotation schedules on children, 68% of the respondents reported bad consequences for children (Hobart, 1979), such as missing the father, and a need for father's discipline. The BHP Ekati survey reported an impact on children of age 0-4 years old for 49.5% of mine workers with children (Government of the Northwest Territories, 2000). Impacts may lead to children acting out, dropping out of school, or mimicking addictive behaviours (North Slave Metis Association, 2002).

These strains may materialize in family conflict. Violence is already a serious problem in the North; in 2003, the rate of violent crimes per capita in the

Northwest Territories was five times that of the rest of Canada (Government of the Northwest Territories, 2003). There are indications that this situation may be worse due to mining. Brubacher and Associates reported an increase in alcohol-associated abuse of women at Nunavut's Nanisivik mine (2002). In the Northwest Territories, during the period from 1991 until 1996, a 10% increase in the number of single families in the North was observed (Government of the Northwest Territories, 2002).

CULTURE

In the North, colonialism has radically affected Aboriginal well-being and values. Central to the colonial project, and certainly the reason behind both of the Treaties signed in the North, have been mineral and metal resources (Fumoleau, 1975). Treaties served to cut Aboriginal people out from decision-making about the land, paving the way for extractive industries (Fumoleau, 1975). The modern extractive company is usually from the south, and tends to embody Western values, ways of life, and communication styles.

A shift in values towards those embodied in Western wage labour systems may signal deep cultural change. Elders speak of Dene values, including patience, cooperation, sharing, respect of others, consensus, and family reliance (Zoe, 1989), when they speak about the importance of act of hunting together for food. These values may no longer practiced, reinforced, and taught when an individual is constantly engaged in a new system.

Some studies have reported that mining operations have made their communities more individualistic. Miners work hard during their days on and spend hard on themselves during time off (North Slave Metis Association, 2002). Since personal wealth accumulation is "antithetical to Aboriginal values" (North Slave Metis Association, 2002) of reciprocity and collective responsibility, high wages earned by some community members may shape values. The implications of a shift in values are not purely monetary. Individualism can also affect the social network, or "spider web of relations" (Little Bear, 2000), that make up extended families and communities. Many families with one or both parents working at the mine are already experiencing problems with time shortages, due to the demanding nature of shift work (North Slave Metis Association, 2002). Currently, some of these dilemmas are being solved with grandparents or other relatives assuming child-care responsibilities. If a shift in values translates into weaker relations of the wider family and community, however, there may not be people available to assume care of children while parents are working. This concern is especially

relevant considering the high proportion of young people living in the North (Government of the Northwest Territories, 2003).

Other research, however, has demonstrated that mining may actually have a net positive effect on the cultural values it promotes. Jobs created for local communities may help to rebuild some of the values that were lost through the process of colonization. By instilling a sense of independence, freedom, and pride, work in the mining sector can replace the legacy of dependence and poverty left by residential schools and the loss of traditional lifestyles. Work ethic is a highly placed value in Metis culture, making mine work more culturally healthy than welfare reliance (North Slave Metis Association, 2002). Further, increases in disposable income may even promote sharing within the wider community. By virtue of the fact that there are more resources available to purchase communal equipment, there is more to share. At Nanisivik, an increase in sharing was reported — not of money directly — but through snow machines and other equipment the whole community could use (Brubacher and Associates, 2002) after being bought by a mine worker.

The most directly measurable cultural effect is the loss of traditional languages. Language is an important indicator of culture, in that it conveys meaning and holds the keys to identity. Over the last fifteen years, fewer people can speak an Aboriginal language in the Northwest Territories, demonstrated across all age groups and in both urban and rural communities. Overall, it has dropped from 55.6% of the Aboriginal population in 1989, to 45.1% in 1999 (Government of the Northwest Territories, 2003). This trend has been attributed to greater participation in the English labour market, the aging of the most fluent community members, a lack of educational materials and programs in Aboriginal languages, and the migration of non-Aboriginals into the North (Government of the Northwest Territories, 2003).

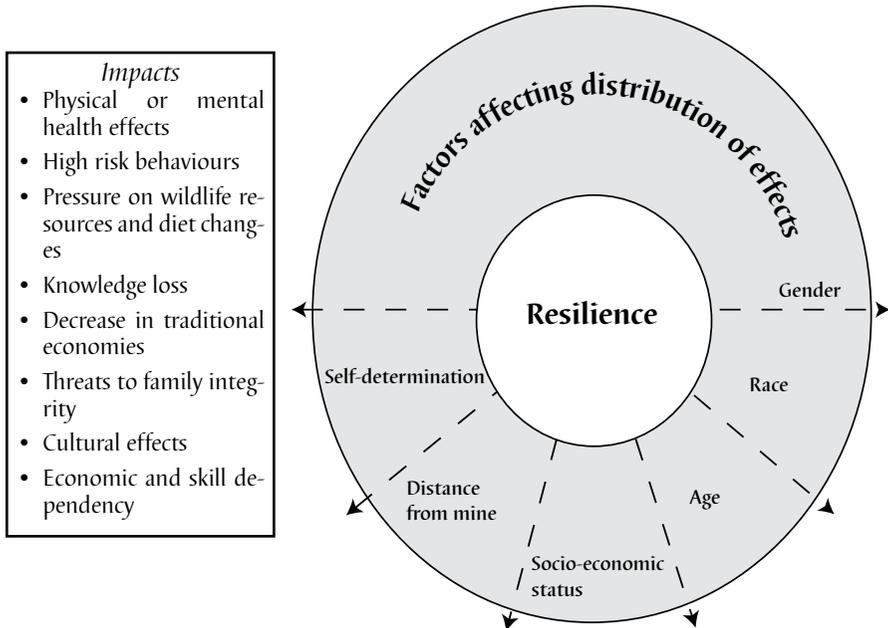
While not solely responsible for trends “occurring prior to the development of the [Northwest Territories] diamond industry” (Government of the Northwest Territories, 2003: 36), mining may contribute to this trend. In the workplace, for example, where workers spend up to twelve hours a day and sometimes several weeks at a time at sites, English predominates. Work safety concerns and policies arising from potential miscommunication prevent any widespread use of Aboriginal languages while on the job. The high wages and job potential of mining have also spawned a migration of non-Aboriginal people seeking work into the North, and larger English-speaking populations increase the need for English services.

EQUITY FACTORS

While many of the effects described are related to the nature of the mining industry (high wages, cyclical work patterns), the way impacts materialize in a community may have more to do with the status of the individual or the community itself. What we term “equity factors” are the interfaces between an impact and how it translates into effects on individual, familial, and community well-being. Resilience is the quality in individuals or communities that helps them to recover from impacts, or mediates whether they are even felt. However, equity factors serve to distribute the most significant benefits – jobs, economic growth, and training (generally to individuals) and costs – environmental, cultural, and familial.

In Figure 1, we portray these “equity factors” and how they can play out to distribute risk and benefit. At the centre of the equity factors is resilience – institutions, values and norms, cultural aspects, and historical experience – the elements that allow a community to respond to risks and recover from shocks. Below each equity factor discussed below is a table, illustrating how resilience may buffer how an impact is distributed.

Figure 1. What Factors Affect Whether an Individual or Community Experiences Impact from a Mine?



SOCIO-ECONOMIC

Probably the most significant direct community benefit of mining is the employment it provides. However, while efforts have been made to ensure employment quotas of local and/or Aboriginal workers, outsiders still disproportionately occupy the highest rank and paid positions. Without training, entry level positions carrying the least opportunity for advancement are the default positions for most Northerners, thus maintaining geographic and racially defined hierarchies.

Mining in the North has favoured communities closest to the mines, with the Indigenous communities signing private agreements with the companies. Communities remote from the mine may be a much lower priority for mine employment. Within a community, employment also favours those with the highest levels of education and experience. In this regard, mining may leave behind those with the lowest education qualifications, and further stratify communities into "haves" and "have nots."

Also, due to the time demands and remote locations associated with shift work and mine operations, mining employment is more feasible for those with the least financial responsibilities: people without families. Thus mining is "disproportionately attractive to those who least need the income and are most likely to spend it wastefully, if not in socially abusive ways" (Hobart, 1982: 72), such as alcohol. Indeed, at Nanisivik mine, 42% of the workers were single and 49% did not have any children (Hobart, 1982). Those who do have families as well as elderly or youth dependents to support are also those most in need of the added income. While there is some evidence that this is only an initial effect (Hobart, 1989), workers that head families spread the wealth and benefits much more widely than the more practically feasible and frequently employed young, single males.

Social stratification may result in lower population health status and well-being (Wilkinson and Marmot, 1999). International evidence comes from Wimberley (1990), whose compilation of studies shows inequality is directly associated with increases in infant mortality, even when health care

Table 2. Resilience Aspects Buffering Social Stratification from Wages

<i>Characteristics</i>	<i>Institutions</i>	<i>Norms</i>	<i>Cultural aspects</i>
Young, single person or adult with supportive family	Quotas for hiring throughout the hierarchy	Sustainable development policies	Sharing of wages through extended family

access is high. Despite the Northwest Territories having incomes well above the Canadian average, there still exist a high proportion of low income earners (Government of the Northwest Territories, 2003).

ENVIRONMENTAL

The environmental risks and benefits associated with mining can contribute to inequity. From the onset, the very location of the mineral deposit determines which communities will collect royalties and employ people. As deposits are often clumped in the same area, some communities may become extremely prosperous while others remain relatively barren. Further, the environmental damage inflicted by the extraction process is not uniform either, its severity depending upon such factors as transportation routes, mine type, ore body characteristics, among others. Since all existing and previous mines are located in traditional territories of the Dene and Inuit, there are impacts on cultural and environmental landscapes, which will disproportionately affect some. Giant Mine has been abandoned by Royal Oak, leaving the toxic legacy of 237,000 tonnes of arsenic in the hands of the government. The government has recently agreed to clean the mine up to industrial standards, but arguably the Yellowknives Dene, who claim the land, have been burdened by contamination from a mine that never employed Aboriginal people.

Table 3. Resilience Aspects Buffering Environmental Risks

<i>Characteristics</i>	<i>Institutions</i>	<i>Norms</i>	<i>Cultural aspects</i>
Strong leaders who work to control land use and contamination	New local land and water boards and the development of closure plans	Equity	Stewardship ethic and the perceived relationship between humans and the environment

RACE

Certain groups can be discriminated against, either as a group through actions that exclude them, or as a group by exposure to undue risk. Gold mines in the Territories rarely hired Aboriginal workers and they participated only through the informal economy, providing firewood and goods to mine workers. Now, hiring quotas serve to ensure Aboriginal hiring. While mines have goals of hiring Aboriginal people at senior levels, educational requirements inhibit movement through hierarchies.

**Table 4: Resilience Aspects Buffering Social Stratification from Wages:
Race**

<i>Characteristics</i>	<i>Institutions</i>	<i>Norms</i>	<i>Cultural aspects</i>
Ability to get along with people of different racial backgrounds	Funds for Aboriginal training	Human rights	?

GENDER

Women are especially vulnerable to inequity as they experience more of the negative effects of a mine. Some of these gender-specific consequences include higher rates of depression (Burvill and Kidd, 1975), risk of poverty, increased STD incidence due to rape and prostitution (Oxfam Australia, 2002), and reduced levels of participation in development decisions (Oxfam Australia, 2002). For those that are able to find work in the male-dominated mining industry, women often face sexist views that limit career advancement (Gibson and Scoble, 2004; Tallichet, 2000). Further, in many instances, the burden of shift rotation stress and addictive problems (especially alcoholism) that mine work causes in men, is passed on to women through abusive relationships, increased conflict, and an abdication of household and child rearing responsibilities.

Gender equality is well recognized in the context of development as a key indicator of well-being. The influence of women on societal well-being is largely felt through the significant role they play within the family, especially with children. The inclusion of women in areas such as education, for example, has been found to produce a wide range of socioeconomic and health benefits, such as increased economic growth, reduced fertility and child mortality, and lower rates of under-nutrition (Abu-Ghaida and Klasen, 2004). The heavy effect of gender equity on child development indicators and, as such, future community well-being, underscores the importance of this factor.

**Table 5. Resilience Aspects Buffering Social Stratification from Wages:
Gender**

<i>Characteristics</i>	<i>Institutions</i>	<i>Norms</i>	<i>Cultural aspects</i>
Tenacity and belief in self	Quotas for hiring and funds for training of women	Human rights	Differentiated roles in families that translate to mines

SELF-DETERMINATION

Communities that are self governing may have new abilities to control activities that take place on their lands. While some literature suggests that new structures of self governance hold little promise for empowerment (Irlbacher Fox, 2005; Nadasdy, 2003), some communities, such as the Tlicho, are hopeful as they become decision-makers on their land. As a group asserts decision-making power over their destiny, they may begin to control the effects of mining through their own institutions that are developed based on traditional governance models. This authority combined with the new institutions and continued reliance on Dene values and norms may enhance the resilience of groups affected by mining. Groups that have concluded self-government agreements may be more resilient than those who are still negotiating.

Table 6: Resilience Aspects Buffering Social Stratification from Wages: Self-determination

<i>Characteristics</i>	<i>Institutions</i>	<i>Norms</i>	<i>Cultural aspects</i>
Self government agreement	Local institutions with local Boards	Self determination	Traditional governance styles, e.g., chief talks to and supports workers at mine

CONCLUSION

The many paradoxes outlined in this paper may be reflective of a wider issue facing the North. As the demand for materials pushes southern-based industries into more and more remote places at larger and larger scales, northern development seems unavoidable. Yet, this occurs in a time of devolution and self government, while new institutions are forming.

Communities are seeking to negotiate the ways in which these changes occur so that they can understand, influence, and adapt to them. If mining is to be more than simply a method of getting northern resources to southern markets, or "capitalism with an Aboriginal face" (Newhouse, 1993), all players must work towards a self-defined community health and well-being. To that end, increased research into resilience and well-being indicators will prove a valuable tool, allowing us to buttress the key elements and track how benefits and impacts are distributed.

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