Strategies for Large Oil and Gas Companies Operating to Support Sustainable Development and Environmental Safety in the Russian Arctic

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Abstract. IAs conventional oil and gas sources become less productive, unconventional hydrocarbon sources become more attractive due to new technologies and become the target of expanded exploration. Oil and gas development in the Arctic is challenging but promising, the largest reserves of Oil and Gas in the Arctic are on the Arctic Shelf in Russia. Most Arctic communities, especially indigenous communities, depend on fishing, hunting, and gathering, this requires the preservation of environmental health. In this article we tried to delineate a strategy for large oil and gas companies to diversify risk by proposing a form of social entrepreneurship that works for environmentally vulnerable regions with low infrastructure or skilled labor. With this framework, large oil and gas companies could effectively and reliably support smaller-scale enterprises preserving environmental health and creating an innovative business ecosystem that promotes a Arctic. Our model could also lead to local and indigenous entrepreneurship and a more equitable distribution of wealth in the Arctic.

1 Introduction

The Russian Arctic is experiencing dramatic environmental and social changes because of global warming and extractive operations such as hydrocarbon production. Russia's Arctic Regions have a low population density, low levels of infrastructure and generally low GDP per capita. The Arctic population depends on the exploitation of natural resources, with indigenous regions strongly depending on subsistence fishing. Social conditions are generally lower than in mainland Russia. Some Arctic regions have high unemployment, low wages, and poor health conditions.

This study attempts to illustrate some of the challenges faced by oil and gas development in the Russian Arctic, and offers an investment framework for large oil and gas companies in the Arctic that can maximize social welfare while preserving renewable resources. This framework is created for the Russian Arctic in contrast to Scandinavian models, which apply to higher-income population with less cultural diversity and population structure.

2 Methodology

The literature used for this paper includes articles of Dr. Fadeev [1] and Dr. Ilinsky [2] on sustainability, as well as more specific material cited for its environmental and social importance, such as the articles by Unguryeanu and Chaschin et al. [3, 4]. The holistic nature of our study means that besides theoretical principles of management we must examine environmental, biological and social data. Overall, the authors agree with the need for more involvement of stakeholders, but highlight the contributions of new technologies on the analysis of human impact on the environment and long-term socio-environmental consequences. For this purpose we used quantitative and qualitative methods, and examined interdisciplinary research by Arctic scientists and experts based on publications of the Arctic council and Nordic Council of Ministers. Quantitative analyses were obtained from several sources, such as state, national, Arctic Council and Large Marine Ecosystem framework suggested by One Shared Ocean, collected in PAME publications.

Most of our parameters are objective, but in the formulation of our framework we use some qualitative research, this research combines several parameters and is reflected in the Human Development Index.

In calculating the social contribution (including the environmental component of social welfare in the Arctic) of oil and gas companies, we have analyzed several social components, such as infrastructure, education and tax revenue, which we measure in investments when possible, but in areas with low

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transparency or conversion of investment to projects. For example, some of the roads built in the Arctic region translates into savings of 10 dollars per kilometer [1]. Most of these factors have been gathered in the Human Development Index [1, 2].

3 Results

Managing oil and gas resources in vulnerable regions like the Arctic requires a more holistic approach to operations that include consideration of environmental factors, environmental and socialist factors, human populations, and cultural dynamics. Oil and gas operations need to prioritize environmental factors since most of the coastal population depends on local natural resources, including a larger-than-usual percentage of fish protein [2]. Small spills have global implications because of the connections between Arctic countries, which are exacerbated by security considerations. In hhe strategy of Russia for development of the Arctic, human development is a priority along with environmental security. Russian oil and gas companies should integrate these environmental principles from the design stage of sites and the evaluation of licenses.

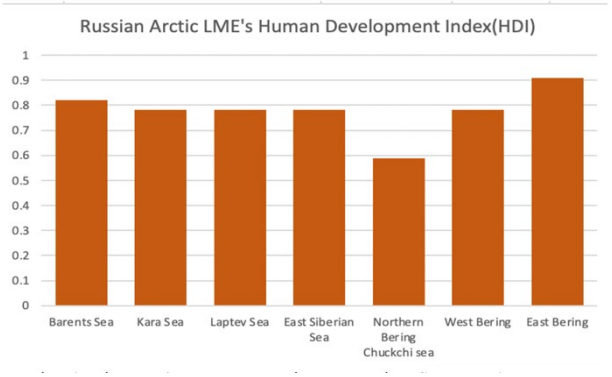

Fig. 1. Russian LME's Human Development Indexes.
Calculating social contribution of oil and gas companies.
Source: PAME

We analyzed several social components, such as infrastructure which we measure in investments when possible but in areas with low transparency or conversion of investment to projects. For example, some of the roads built in the Arctic region, translates into savings of 10 dollars per kilometer [3].

Some of the Arctic regions suffer from low wages and from low job opportunities [3]. To calculate income, we calculate income growth divided by prices growth in the Arctic region. The impacts on health can be calculated by the percentage of days lost or days missed from school because of health reasons, it can also be calculated by hospital expense per patient in the region.

Satisfaction with life is a subjective factor and is best calculated by questionnaire, indirectly it can be verified by mobility, but emigration may not reflect dissatisfaction with current life conditions if low income or low level of savings may keep the population from moving to other regions. life satisfaction can also cause declining birth rates and drug problems, which further reduce income and social development [4].

The social mobility factor can be related to education and social investment per child or student. However, education is not the only factor affecting mobility; family capital, passed down to the generation's can provide a similar advantage [4,1].

3.1. Environmental Service Preservation

Since oil and gas are non-renewable resources that largely affect renewable resources by diminishing their quality, quantity, and availability, the balance of production of oil and gas must be examined in the range of diminishing returns to a resource that is more durable and has limits where its renewability is compromised. Damage to fisheries or to forestry due to oil spills can affect the structure and long-term viability of environmental services. Poor populations are more than 45% more dependent on ecosystem services than urban populations, and therefore more vulnerable to the effects of climate change [5].

Although the consequences of oil and gas exploration are dramatic, there are technologies that can mitigate all of them, and many of them have been developed by small and medium-sized enterprises. Some of those technologies have been tested in warmer environments, such as biological solvents and some filtration systems. The cost of some of these technologies has declined due to competition and market effects, however, they show a slower rate of development when prices of oil and gas are lower, and so we can predict a post-Covid recession and subsequent decline in demand and contraction of the oil and gas service industry. The big oil and gas companies should invest in these technologies to reduce further liabilities and create more affordable investment systems. In Norway, large oil companies provide loans and grants to smaller enterprises to spread risks. Russian oil and gas companies should be incentivized to do so as well [3].

Some technologies, such as enhanced oil recovery, reduce the amount of space and resourced used for oil extraction and therefore two of the biggest environmental risk variables. Unfortunately, some of the chemicals and processes employed in these techniques, such as sound, can affect some organisms, such as whales and dolphins. Acids can also dissolve shells of crustaceans and corals. Other biocompatible chemicals such as lubricants or phthalates can bioaccumulate, affecting fisheries and agricultural productivity [2]. Production debris can also reduce both predation and reproductive success by affecting the communication of organisms leading to lower reproductive success or predation. Seismic activity has been shown to alter the behavior of whales and dolphins. Changes in nutrients can facilitate the establishment of invasive species, and accelerate eutrophication of waterways, reducing survival of fish and crustaceans [6]. These effects will affect the success fishing, hunting, and agriculture.

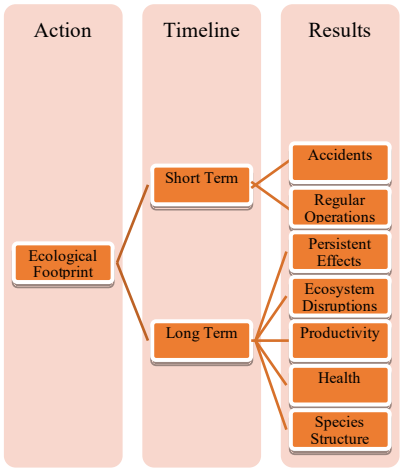

Fig. 2. Long and short- term environmental effects, Source: authors)

3.2 Framework for Arctic Social Investment

The introduction of digital technology, machine learning and remote operations can cut costs due to predictive maintenance and better risk assessment. These technologies help in both ways, reducing the costs of catastrophic events, and improving the quality of processes by ensuring optimal conditions operational conditions for all components and better use of labor force. Digital technologies can further reduce the number of accidents that affect human health and design systems that better manage the hazards of the workplace [6].

Using the LME framework, we observe that more rural areas have lower GDP and greater dependence on fish sources. A more damaged environment with higher risks requires more extensive management initiatives. Large oil and gas companies can implement initiatives that are more significant in its impact than smaller companies, as in the example of the production reduction agreements in central Texas. Large companies also can also pass on the high costs of innovation and competitive challenges to smaller companies and later either absorb them or continue partial ownership. Socially and environmentally, the process is complex [7].

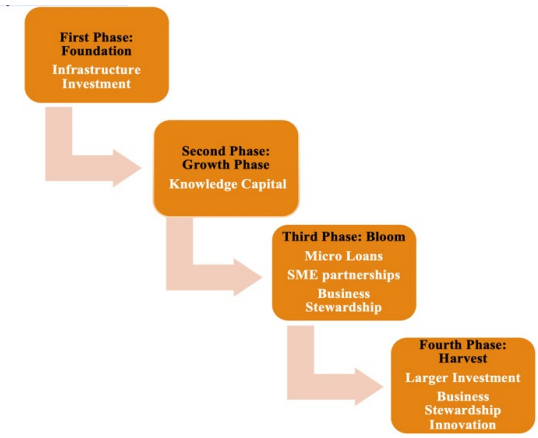

Fig. 3. Arctic social investment framework for large companies; source: authors

The first phase of investment should create conditions that can make the population capable of entrepreneurial functions, such as engineering education, skills development, languages, computer skills.

The second "Growth" phase intensifies education and professional investments, empowering an already skilled population with small grants, knowledge training, and further, investments that increase, usually without return. This phase can be accomplished with the support of government.

The third phase or "Blossom" involves the beginning of a strategy of building service companies that are still managed and advised by larger companies and management consultants who scan the most prospective companies, which are mostly owned by the larger company and still dependto some extent on the experience and reputation of the larger company, as well as guarantors of loans. Returns are low. Most investments at this stage are still considered social enterprises.

Phase 4 or "Harvest" creates well-funded clusters of companies that have already shown the ability to generate profits and focus on technology and services, with higher wages in this phase and possible returns on investment. Large oil and gas companies can then choose whether to continue as joint ventures or separate ventures, and receive patents created jointly, but without confidentiality agreements that can thwart competitiveness. The benefits are economic in nature and create secondary social benefits.

We believe that in some areas, such as Sakhalin and Yamal, Gazprom and Yamal LNG are between the first and second phases, and Rosneft is in the first stage of investment in its Arctic enterprises [2, 3, 7]. This is a good point to analyze their social investment strategy according to our framework.

We propose a diversified social investment strategy for major oil and gas companies to counterbalance some of the inefficiencies that have made rent revenues and local taxes ineffective in reaching poor and disadvantaged communities, particularly those located far from urban centers, which is a common condition for Russian Arctic communities, and for remediation of structural inequalities, particularly among indigenous communities. Indigenous communities suffer from higher rates of mortality, cardiovascular disease, injuries, and suicide. The most significant factor influencing poor health is indigenous ancestry. In the Russian Arctic, 40 different tribes are registered, 98,651 people in 2010, representing only 5.5% of the general population of the Arctic, and an increase of almost 1% [8, 1].

to optimize sustainable development in the Arctic with a focus on the prosperity of local populations, particularly indigenous and vulnerable groups, we chose a business stewardship system based on the concepts of social entrepreneurship, which is better suited to the structure of the Russian energy industry and may also be suitable for other countries that once had large state companies, or still have large state companies, that are vertically integrated and represent a large share of the domestic and export market. An energy environment with few big players tend to concentrate capital and

weaken competition, resulting in a low development of the service industry; however, in some cases, like in Norway, a large company can spread risk by investing in smaller companies that specialize in services and produce innovative technologies, which in the case of Norway was also product result of government support [2, 10].

Some community investment models create a central tribal or local government, but if these communities have limited technological expertise, this investment will not lead to innovative products or services, and they may not support a robust service industry.

A new business model created specifically for the Russian Arctic may be more adequate to address the social problems of the region and to integrate and administer knowledge capital and avoid the Dutch curse of countries with a large base of natural resources that do not distribute benefits among the population. Since Russia's mineral rights are owned by the state, the model of Alaska or Canada may not be appropriate, and besides, the infrastructure of Russia is not as developed as in Norway. the concentration of capital in Russia also benefits from the stability of investments and the fluidity of capital resources, which can support the creation of a strong service industry even at times when oil prices oil may be low. Stability of investment is important for a population that does not generally have a large social network, as in Scandinavian countries. Russian entrepreneurs also do not have the financial opportunities available to North Americans and Western Europeans.

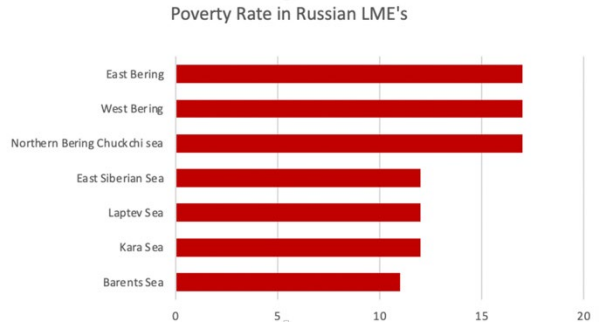

Fig. 4. Poverty rate in different LME's. Source: PAME

Structural inequality is aggravated by concentration of opportunity and capital, which become a loop that is extremely hard to overcome, as poverty leads to poor nutrition, poor health, lack of motivation and addictions [4]. There are several places where there are good opportunities to break this loop. For poor families, this can mean dependence on some social services that provide skills for parents and an advantage in education for children. These services may be just enough to survive but not enough to thrive, unlike middle-class families who have more support. Mentors and volunteers can overcome lower level of education of parents, less abundance of skills for better jobs, and other inequalities arising from the transfer of intellectual, emotional, and financial capital [8]. Gazprom and Rosneft already offer mentoring and skills development initiatives, but they can still be improved to intervene promptly at the most significant stages of development. This means early education and technological assistance to remote communities to ensure that they have access to quality education and training, this payment can also be non-financial, but can be translated into tax credit for the first steward company. Business stewardships may be most effective where there is no history of entrepreneurship or where there may be limited access to capital and training [7].

Table 1. Summary of contribution of benefits. Source: authors: PAME

Benefits	Charity	Social Responsibility	Small Business Investment and Microloans	Business Stewardship
Personal Development	Neutral, dependency	Reparative	Empowering, Enabling	Empowering, Enabling
Sustainability	Low, seasonal	As long as trigger exist	Long term if guided	Long term
Reinvestment in community	None	Possible but low	Long term if successful	Long term, preparing for transitions.
Risk	Misrepresentation	Misrepresentation	Medium dependent on control	Low by diversification
Returns	None	None	Medium	Low
Permanence	Ephemeral	<1 year	Average >5 years	Longer than Business Cycle
Immigration	Encourages	Neutral Local Action	Neutral if Native Focused	Discourages by nurturing Local Business

Social indicators show the advantages of business stewardship as they fill the capital and knowledge gaps that arise from charitable investments, the perceived cosmetic value of social responsibility and short-term or compensatory outcomes and the weakness of unsupported microloans.

Many authors agree that charitable support alone does not address long-term vulnerabilities of the community and can be low or seasonal and fail to develop the abilities of the local population [9,3,6]. They do not empower psychologically or emotionally, and they can lead to underdevelopment of abilities in the population. Strategic investments, such as educational programs for oil and gas professionals, produce immediate results, enabling the population to access jobs and are more participatory, but are still worth less than the ability of local people to become business owners and develop technologies that may be more suited to their environment and culture [2]. Participation is essential for the distribution of benefits and a more equitable distribution of wealth derived from the exploitation of natural resource [8].

Over the past 20 years, corporate social responsibility has expanded to the concept that business is an integral part of society and should be designed in a manner that is socially beneficial to society by creating more than profits, employment, or an increase in the tax base. This concept of social entrepreneurship not only absorbs the externalities usually addressed under social corporate responsibility, but also increases the social capital of the community by creating goods for the better functioning of society. Society, in its turn, returns investments in social goods, such as a better educated or more productive workforce. Investments in social capital can

also return to companies in the form of reduced disruptive crime or higher productivity [9]. Currently, the lack of effectiveness of social investment by Shell has translated into piracy and disruption of operations for Shell in Nigeria.

Table 2. Economic Indicators of Arctic LME's; source: PAME

LME	Poverty Rate	Population	Rural %	Fishing Revenue $
Barents Sea	11%	2,023,335	33%	556,441,114
Kara Sea	12%	276,868	43%	826,300
Laptev Sea	12%	31,013	100%	2,989,354
East Siberian Sea	12%	34,151	100%	1,344,326
Northern Bering Chuckchi sea	17%	56,490	100%	327,890,066
West Bering/ East Bering	17%	310,725	31%	71,489,6683

3.3 Business Stewardship as a solution for Russian Arctic Development

The concept of "business stewardship" is similar to that of social entrepreneurship, but it is adapted to the functions of large companies that now today take the place of former state-owned enterprises. Soviet companies may have invested on long-term projects that did not bring immediate profits, because they considered it their duty to support employment and industry in times of recession. Russian oil and gas companies tend to be large, operate on down- stream, upstream and midstream, and have the flexibility to absorb price shocks better than service companies. The business stewardship model can do a better social job of creating social benefits and still profit from each new business it steers until the time of maturity, when most processes can be delegated to the new enterprise. Our model of business stewardship in the Arctic satisfies long- and short-term sustainable development goals, improving the quality of life through investment in infrastructure and technology development, scientific leadership, and stakeholder involvement at all stages.

Figure 5. Business stewardship elements. Source: authors

Social enterprises in the UK lead in innovation at 65.8% compared to 42.5 SMEs and offer innovation processes at 47.9% compared to 19.2% of SMEs [10]. This hands-on l experience is the result of knowledge transfer and sustainability. It is similar to the process of an apprenticeship. Local and indigenous communities also transfer knowledge to the initial business steward. At the end of the term, results are evaluated and ownership can be transferred if goals and standards have been met. There may be stipulations that the initial investment can be paid out as seed money for new enterprises without interest and in shorter time frame [9]. This community investment model is more suitable for areas where the history of entrepreneurship has been short, or where a transition to other production modes or industries is needed. The parent company provides direction and expertise to drive innovation [10,13]. Business parks and incubators may have limited success where there are few elements to create a profit-conductive ecosystem. Another factor that has been shown to limit the success of business incubators is remoteness from learning and activity centers. In this way, business incubators can discriminate against vulnerable populations where transportation is challenging. Digital connections can also help coordinate contribution of local professionals [3].

4 Discussion

Preservation of the environment in vulnerable areas like the Arctic is essential to the long-term survival of local and indigenous communities. Some indicators of the environmental health needs to be updated more regularly because of global climate change, which is more acutely felt in the Arctic. Unfortunately, there is scarce data on the success of social entrepreneurship in former socialist countries. Most of the data come from developing nations in Asia or Latin America that lack access to education, science, and industrial development [7]. Russia has a high literacy rate and a large professional class, but it lacks financial tradition and reliable methods of facilitating credit to small entrepreneurs [9]. Some initiatives of the Russian government have tried to address his gap, but it remains an obstacle for most entrepreneurs, as does the low rate of savings which is affected by low wages [9].

Although some research has been done in the area of quantifying social benefits of environmental services, it needs to be reconsidered in light of. Arctic conditions [6, 13]. One measure could be the salaries of consultants or contractors who would do similar work. some time and service trading platforms, like Time Republik, have attempted to quantify this benefit as a tradable option. More research is needed on fair quantification of ecosystem services and their long-term losses, as well as the optimization of social benefits and transferring them to the community.

5 Conclusions

Russian Arctic regions depend on ecosystem services that account for a larger share than the average income of the most vulnerable populations, such as indigenous communities, therefore it is essential for oil and gas companies to respect the long-term quality of such ecosystems [8, 13].

The Russian Arctic is home to a small population that have some common features in its range. This population is dependent on environmentally vulnerable regions. poverty levels in most coastal areas are similar, and so is the dependence on natural resources and subsistence farming. Current industrial development is relatively low and largely dependent on extractive industries, especially of oil and gas. High levels of poverty tend to put pressure on animal and plant species through poaching and pollution [14].

Development in the Russian arctic requires not only investment in infrastructure, but also an understanding that the building infrastructure will take time and that investment cycles must focus not only on economic growth, but also on sustainable growth that creates well-being for local people while preserving the quality of their environmental resources.

Large oil and gas companies are heirs to the strength and resilience of the former Soviet state-owned companies. These companies could engage in investment strategies, in addition to charitable spending and corporate social responsibility, to promote local empowerment through entrepreneurship [13].

Our study explains the fundamentals needed in the Arctic for the development of successful entrepreneurship with a low economic footprint that preserves the integrity of renewable resources.

Our analysis suggests a strategy of business stewardship that has both social and profitable overtones and transfers knowledge along with ownership, minimizing risk for both start-up and mature companies and fostering innovation. Business stewardship will create prosperity that extends beyond the presence of oil and gas in the Arctic region.

Business innovation has to do with reducing environmental impact by reducing waste and integrating sustainable goals from the outset [15].

The final option for creating prosperity for oil and gas corporations is likely to be a combination of these different strategies, suited to each region and community with its individual characteristics.

The strategy of business stewardship promises to benefitlocal and indigenous communities by preserving their natural capital and distributing the wealth created by the exploitation of natural resources, as well as providing them with a higher level of participation on their own development.

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