

PREDICTING MINING COMPANY-STAKEHOLDER CONFLICT AND
INCORPORATING SOCIAL CONDITIONS INTO MINING
PROJECT VALUATION

by

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ABSTRACT

External stakeholders are becoming increasingly involved in mine design and permitting decision-making. Yet, the systems in which mining investment decisions take place do not fully capture the importance of stakeholder influence on the success or failure of a mining venture. Conventional mine planning and permitting methods elevate technical expertise, conventional views of risk management, and financial justifications as the drivers of “objective” decision making. The rising influence of external stakeholders to mining project outcomes means that stakeholder attitudes on mining, and institutional trust, and local environmental knowledge must be integrated into the decision-making systems in more comprehensive ways. This dissertation is a compilation of three research papers which seek to answer the following research questions:

1. How can governments better integrate local communities’ perceptions and concerns into mine permitting decisions?
2. What are the most important indicators of company-stakeholder conflict?
3. How does stakeholder opposition affect the valuation of a mining property?

This dissertation informs these questions with three research activities:

A case study of the National Environmental Policy Act (NEPA) at the Donlin Gold project in Western Alaska: The National Environmental Policy Act requires US regulators to consult local stakeholders and include their concerns in an Environmental Impact Statement (EIS). At the Donlin project in Western Alaska, the Army Corps of Engineers included Alaskan Native tribes as cooperating agencies in the analysis in addition to conventional public comment meeting. This attempt at improved stakeholder involvement had some successes, but it also highlights divergent goals within NEPA and a lack of trust between local stakeholders and regulators. Tribes were able to push for examination and disclosure of some of their environmental concerns but remain frustrated with NEPA’s limitations with respect to transform findings into enforceable protections.

A statistical examination of the social and environmental variables as indicators of company-stakeholder conflict: Prediction of company-stakeholder conflict remains a weak

point in mine design and planning. This research statistically examines a database of mining properties and develops multiple linear regression models to identify the most important indicators of mining company-stakeholder conflict. These models find that the following conditions are the strongest indicators of future conflict: the conflict history of the mining property, the conflict history in the mining region, proximity to artisanal mining, and anticipated physical and economic displacement of local people.

A decision tree model which incorporates company-stakeholder conflict into a mining project's valuation: Mining investment decisions rely on a company's financial valuation of a mining project. The discounted cash flow methodology is the foundation of these valuations. This research developed a tool for capturing the financial risk associated with higher likelihoods of company-stakeholder conflict by quantifying the risk of forced project abandonment. This research presents a decision tree model for calculating the expected cost of company-stakeholder conflict. The model concludes that even moderate conflict likelihoods can reduce the net present value (NPV) of a mining project by hundreds of millions of dollars.

Collectively these studies conclude that external stakeholders are undervalued by mining's present decision-making paradigms. This dissertation calls on companies and governments to place a greater emphasis on external stakeholders' perspectives on mining. It recommends that companies and governments engage these stakeholders in permitting and mine design processes such that these decisions include nuanced understandings of how a mine will affect local people and how local people will affect a mine.

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DEDICATION

for

Sarah Teschner

my most supportive stakeholder

CHAPTER 1: MINING COMPANIES, COMMUNITIES, AND CONFLICT

1.1. Mining Company-Stakeholder Conflict

On a sunny day in 2013, residents of the rural Peruvian region of Cajamarca marched to a small lake in the Andes Mountains. They held signs saying “Conga ¡No Va!” (No to Conga!) and “Aqua Si, Oro No” (Water Yes, Gold No). If the mining plans went ahead, the lake would be drained and covered with a tailings impoundment as part of a new copper and gold mine. Protesters viewed the lake as agriculturally and culturally important and they did not want it destroyed. Scenes like this one were commonplace in Cajamarca starting two years earlier. Protests began in earnest in 2011 after talks between local community members and the company had broken down. Mining opposition protestors blocked major roads with boulders, dozens of people were injured, schools and hospitals in Cajamarca were forced to close, and the Peruvian President declared a state of emergency (Els, 2011). The roads, schools and hospitals soon reopened; but the Minas Conga project never recovered. In 2015, mid-way through a \$5 billion construction investment to open the mine (Jamasmie, 2016), Newmont Mining Corporation walked away from the property saying that “Under the current social and political environment, the Company does not anticipate being able to develop Conga for the foreseeable future.” (Newmont Mining, 2015, p. 22).

Cases like Minas Conga are increasingly common in the world's mining districts. Stakeholders strongly resist mining at properties such as Pebble in Alaska (Holley & Mitcham, 2016), Far South East/Lepanto in the Philippines (Stark, et al., 2006), Obuasi in Ghana (Okoh, 2014), and countless others. Some, like Minas Conga, stall indefinitely. Many lower-profile cases never result in outright project suspension, but still strain company-stakeholder relationships and alter the course of mining activities and investments. The effect of these cases is an elevated attention to the importance of external stakeholders in the success or failure of mining ventures. Mining companies and industry consultancies like Rio Tinto, Environmental Resources Management, and SRK Consulting increasingly report that “above ground” risks now vastly outweigh “technical” risks to mining projects (Rio Tinto, 2011; Upton, 2016; Environmental Resources Management, 2016).

Over the past two decades, scholars have found that stakeholders resist mining projects for a variety of specific social and environmental reasons. This body of work encompasses a wide range of mining commodities, geographic locations, and conflict scenarios. Conde (2017) provides a literature review which concludes that local communities resist mining when there are perceived environmental impacts they deem as unacceptable or they lack sufficient representation in the mining decision making processes.

Mining company-stakeholder conflicts typically manifest around competition for access to land and environmental resources. Stakeholders resist mining due to actual and anticipated impacts on forests (Akpalu & Parks, 2007; Temper & Martinez-Alier, 2013), water (Adler, et al., 2007; Li, 2015), alpine glaciers (Urkidi, 2010), and fisheries (Holley & Mitcham, 2016). These resources are frequently connected to local communities traditional livelihoods including agriculture (Haarstad & Floysand, 2007; Avci & Fernandez-Salvador, 2016), and subsistence hunting and fishing (Coumans, 2011). Sometimes stakeholders do not oppose mining per se, rather *who* should be allowed to mine. Artisanal miners often predate the arrival of large-scale companies and oppose large scale mining when they are threatened with displacement (Hilson & Yakovleva, 2007; Carstens & Hilson, 2009; Teschner, 2013). Conflict over environmental resources can include disputes over which institutions should control access to land -- highlighting conflicts between state and traditional land tenure systems (Banerjee, 2000; Martin, et al., 2016).

Weak government institutions can exacerbate company-stakeholder conflicts when these institutions fail to help companies and stakeholders manage the processes of change (Arellano-Yanguas, 2011; Jaskoski, 2014). This problem is particularly salient when stakeholders do not trust their government's mechanisms of securing consent from local communities (Martin, et al., 2016). Distrust can stem from previous instances of government-sanctioned violence against stakeholders who opposed mining (Teschner, 2013; Martin, et al., 2016) or general insecurity due to armed conflicts in the mining region (Holden & Jacobson, 2007). Alternatively, effective government institutions can help companies and stakeholder avoid conflict when these institutions involve local stakeholders in mining decision-making and are transparent about their dealings with companies (Costanza, 2016).

1.2. Defining the Stakeholder

The International Finance Corporation (IFC) defines a stakeholder as “persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome” (International Finance Corporation, 2014, p. 10). For a mining project, this definition includes people and organizations within the company (e.g. company employees, investors, sub-contractors, etc.) and those outside the company (e.g. local residents, politicians, government regulators, labor unions, non-governmental organizations [NGOs], customers, and suppliers). In the context of mining and its relationships to broader society, authors commonly use the term stakeholder to refer specifically to *external* stakeholders. Interwoven into this nomenclature is the term “community,” which often refers to people and institutions in the proximity of a mining property; however, the term can also include external stakeholders from further afield who have linkages to the mining property such as NGOs, traditional owners of land, and religious organizations (Evans & Kemp, 2011).

This dissertation uses the term stakeholder to refer to external stakeholders specifically. The intention in employing this term rather than others (such as “community”) is to suggest an expansive definition of the people and organizations that are impacted and affect mining project outcomes from outside the company’s walls. Used in this dissertation, the term is meant to capture local and non-local people, local and national politicians, local and international NGOs, and other similar people and groups.

1.3 The Rise of International Standards

The relationship between mining companies and stakeholders garnered mainstream attention from the mining industry, governments, and policymakers beginning in the early 2000s. One of the most important institutions to come out of this early period is the International Council on Mining and Metals (ICMM). According to the ICMM website, the council was founded in 2001 to respond to an industry that was experiencing “growing community unrest, criticism from civil society and broader public opposition.”¹ In 2002, the founding member companies of the ICMM including many of the world’s largest mining companies, including AngloAmerican, AngloGold

¹ <https://www.icmm.com/en-gb/about-us/our-organisation/annual-reviews/our-history>

Ashanti, BHP, Freeport McMoRan, Newmont Mining, and Rio Tinto. The companies endorsed the findings of the “Breaking New Ground” report by the International Institute for Environment and Development (2002). This document detailed how the mining industry had failed to meet the expectations of global society and called for fundamental changes to the way the industry manages its environmental impacts and relationships with stakeholders. The newly formed ICMM distilled these findings into its ten guiding principles. Of these ten principles, four explicitly relate to company-stakeholder relationships:

- Principle 3: Uphold fundamental human rights and respect cultures, customs and values in dealings with employees and others who are affected by our activities.
- Principle 6: Seek continual improvement of our environmental performance.
- Principle 9: Contribute to the social, economic and institutional development of the communities in which we operate.
- Principle 10: Implement effective and transparent engagement, communication and independently verified reporting arrangements with our stakeholders (International Council on Mining and Metals, 2003).

Since its inception, the ICMM has played an important role in the evolution of the mining industry’s increased focus on its societal impacts. The organization now includes 27 of the world’s largest mining companies and 36 industry associations from around the world. The ICMM has published countless reports and guidance documents aimed at helping companies improve their environmental and social performance. In 2020, the ICMM released an updated set of principles aimed at aligning the mining industry’s standards with international development targets such as the United Nations Sustainable Development Goals (United Nations, 2015) and the Paris Agreement on Climate Change (United Nations, 2016).

Shortly after the ICMM released its seminal principles, the IFC published its Environmental and Social Performance Standards (International Finance Corporation, 2006). These standards defined requirements for companies to manage labor relations, the wellbeing of local communities, involuntary resettlement, indigenous peoples, and cultural heritage. The IFC has built upon the Performance Standards with numerous guidance documents for companies and investors, including specific handbooks on engaging with stakeholders in developing countries

(International Finance Corporation, 2007) and its recommended stakeholder engagement practices for junior-sized firms (International Finance Corporation, 2014). In 2012, the IFC updated these standards and integrated them into their broader Sustainable Development Framework (International Finance Corporation, 2012).

According to the IFC, the goals of these standards are to: 1. To improve the IFC's own decision making and lending practices, 2. To help companies manage their environmental and social impacts, and 3. To improve the development outcomes of on-the-ground investments such as mining projects (International Finance Corporation, 2012, p. 3). Company-led environmental and social due diligence assessments form the foundations for these standards. Such assessments inform the design of a company's Environmental and Social Management System from which the IFC audits their clients social and environmental performance. Although the IFC only enforces the Performance Standards for its client companies, these standards have become the de facto best practices for the mining industry, particularly those companies conducting business in developing countries. Furthermore, the IFC Performance Standards inspired the creation of the Equator Principles, a set of standards interwoven with the IFC Performance Standards and other international development goals which has been widely adopted by private financial firms that provide financing to mining companies (Equator Principles, 2020).

Though widely accepted, the implementation of the IFC Performance Standards and Equator Principles has received mixed reviews. Wright (2012) for example, notes that the Performance Standards and the Equator Principles have elevated the role of environmental and social impacts in financial decision-making. But he also found that they are employed unevenly across the financial industry and that a lack of transparency has failed to curtail lending to projects and companies with poor environmental and social impacts. Industry watchdog organizations including Oxfam and the Center for International Environmental Law have submitted reports to the United Nations arguing that the Performance Standards and Equator Principles lack adequate enforcement mechanisms to ensure that companies uphold international standards of human rights (Herz, et al., 2008).

1.4 Social License to Operate (SLO)

At the center of the corporate adoption of environmental and social standards is the need for a company to maintain a "social license to operate" (SLO). Thomson and Boutilier (2011)

define the SLO as “a community’s perceptions of the acceptability of a company and its local operations”. The term first appeared in the late 1990s originally employed by executives in the paper industry to highlight the need for voluntary standards as an effort to stave off additional government regulation (Kirsch, 2014, p. 209). Soon after, Placer Dome executive, Jim Cooney, applied the term to the mining industry (Prno, 2013). Cooney and others observed that stakeholders were increasingly aligning with international non-governmental organizations (NGOs) and learning about other communities’ experiences with mining through these networks. At that time, Cooney perceived an increase in local stakeholders seeking extralegal assurance from mining companies that their communities would receive “the same deal” as stakeholders in other parts of the world (Cooney, 2017).

The minerals industry has had a long history of dubious business practices and associated public opposition. In 1906, public concerns about land fraud and coal price gouging by mining companies prompted the Theodore Roosevelt administration to restrict companies’ access to federal land in the United States (U.S.) and briefly establish federally regulated coal prices. By the 1960s, Americans added environmental damage to their concerns about mining (Switzer, 1997). Montrie (2003), chronicled industrial sabotage of Appalachian coal mines in the 1960s where protestors destroyed equipment and set fire to mining company buildings. These protesters saw mining companies as destroying agricultural lands while simultaneously failing to pay adequate wages to local workers. Growing recognition of industry’s impact on the environment gave rise to the U.S. environmental legislation of the 1970s including the establishment of the Environmental Protection Agency, the National Environmental Policy Act, the Clean Water Act, and the Clean Air Act. These laws inspired similar legislation around the globe (Mandelker, 2010).

In the late 1990s and the early 2000s the effects of economic globalization changed the dynamic between the mining industry and the public. While the globalization paradigm is commonly associated with the growth of transnational power of corporations, Haarstad and Floysand (2007) argued that this period also saw a “restructuring of social, political, and economic processes” that connected mining communities around the world and elevated the influence of mining opposition movements. They found that stakeholders at Tambogrande in Peru leaned on globalized networks to highlight how their case aligned with global concerns about environmental justice. They leveraged support from international organizations and linked the mining project’s

negative impacts to issues of national Peruvian identity and neo-colonial domination of the Peruvian people. Their movement earned international financial support from non-governmental organizations, and eventually lead to the Peruvian government revoking mining permits for the project. The Tambogrande deposit remains undeveloped and is credited with inspiring other mining opposition movements throughout South America (Haarstad & Floysand, 2007).

1.5 Corporate Social Responsibility (CSR)

Mining companies responded to the pressures on their industry by adopting voluntary social and environmental standards under the banner of corporate social responsibility (CSR). As originally conceived, CSR was a philanthropic activity rooted in ethics (Friedman, 1970; Carroll, 1991). But by the late 1990s, the concept of CSR had begun to shift as society increasingly held businesses to social standards that went beyond the legal requirements and were now integral to profitability. Outside the mining industry, consumers were reporting that a company's social responsibility was a key factor in their purchasing decisions. Consumers boycotted Nike for labor practices they saw as exploitative, and Union Oil and PepsiCo for their business ties to Burma, where activists believed the military government was violating human rights (Vogel, 2005).

The entrance of mining companies into the CSR landscape came at a time when CSR was evolving from a philanthropic activity to a business strategy. Visser (2011) branded this new line of thinking "CSR 2.0" to differentiate it from the philanthropic CSR of Friedman (1970) and Carroll (1991). Meanwhile, many in the mining industry abandoned the term "CSR" entirely, choosing to brand social activities under the heading of "sustainable development", "social performance", "social investment", "environmental and social governance" or similar language which they felt linked their social programs more directly to the survival and profitability of their company (Dashwood, 2012, pp. 36-72).

Modern mining firms embrace CSR as part of their business activities. In 2017, Gold Fields' CEO Nick Holland declared that social investment, technological innovation, and environmental advancements are critical pieces of his "mine of the future" because he believes that societal pressures have increased the time and risk associated with developing mining projects (Holland, 2017). Gary Goldberg, CEO of Newmont, highlights environmental, social, and economic performance as the three pillars of the company's future sustainability (Newmont Mining, 2015).

Despite the corporate popularity of CSR, it is not always clear how and to what extent company-led programs improve mining's impacts on local communities, or even reduce company-stakeholder conflict. Dashwood (2012) concludes that mining companies' CSR activities are largely driven by evolving industry norms and community pressures rather than project risk conditions. Owen and Kemp (2017) question whether CSR programs address the gap between community expectations and mining company actions, or simply mask mining's negative effects on local stakeholders. Furthermore, they argue that companies' CSR programs can be shallow, disingenuous, and potentially damaging because CSR conflates corporate self-interest with a desire for local stakeholder benefits.

1.6 Balancing Risks and Benefits

Few tools exist to help companies balance stakeholder priorities with the financial priorities of the business. For this reason, CSR programs sometimes seem decoupled from the problems they aim to address. This fact is exemplified by the investment strategies that companies use for the CSR programs they deploy. Companies sometimes apply seemingly arbitrary formulas to determine the funding and activities within their programs. For example, Gold Fields' mines in Ghana invest \$1 per ounce of produced gold plus 0.5% of pre-tax profits to CSR programs (Gold Fields, Ltd, 2011), and Freeport McMoRan's Indonesian operations allocate 1% of revenue to community investment (Freeport McMoRan, 2017). These programs result in many millions of dollars for CSR, and a structured commitment to social programs. But, it is hard not to notice that these formulas are tied to mine production, rather than the concerns of stakeholders. In Ghana, for example, the formula used by Gold Fields directed more investment towards social programs at the Tarkwa mine than at the Damang mine, despite the fact that Damang had a recent history of conflict and Tarkwa did not (Teschner, 2013).

To address this challenge, several researchers have attempted to quantify company-stakeholder conflict risk. Davis and Franks (2014) determined that social conflicts can cost a large mine \$20 million per week, but they were unable to provide more granular guidance about how site- or conflict-specific conditions might affect this number. The IFC's Financial Valuation Tool (commonly called the FV Tool) attempts to use site-specific criteria, but the tool relies on a subjective quantification of both risks and the potential effects of mitigation activities (International Finance Corporation, 2017). For example, the tool asks the user to input an

individual risk such a ‘lawsuit’ and quantify the potential costs of this risk, and the company’s perception of their ability to control the outcome. Mining executives who were consulted for the present research said that they were more comfortable with Davis and Franks’ simplified number than the FV Tool. They suggested that the FV Tool was an attempt “to do too much” and complained that it required “an army of consultants” to make it function.

The quantification of the risk of company-stakeholder conflict remains a weak point in the mine planning and development process. At its most benign, this problem results in companies investing in social programs when they need not do so. More commonly though, companies underinvest in their relationships with stakeholders, invest in programs and the activities that do not align with stakeholders’ concerns, or invest too late, leading to social conflict that might have been avoided. In some cases, companies enter into projects unaware that the company-stakeholder conflict risks are extremely high, and become embroiled in a conflict over a property that was unlikely to ever result in a successful mine.

1.7 The Perspective of this Dissertation

This dissertation primarily considers company-stakeholder relationships from the perspective of mining companies and government regulators. The reason for this choice is the belief that companies and governments currently lack appropriate tools for incorporating stakeholder perspectives into their decision-making processes.

This dissertation views company-stakeholder relationships from the neoliberal perspective. In this framing, the SLO and the CSR programs *are* tools of corporate self-interest. As critics of the industry posit, “What business case value would [SLO] offer if communities were unable to negatively impact on the operation?” (Owen & Kemp, 2015, p. 35). Without the rise of significant opposition, mining companies would not focus on social and environmental impacts. From the perspective of this dissertation, mining companies employ the term SLO and deploy CSR programs per the advice of Friedman (1970) who argued that the “social responsibility of business is to increase its profits” and advocated for social investment spending only when it was in the direct self-interest of the business. This view suggests that corporations are amoral when it comes to their relationships to society (Bone, 2012).

If we accept Friedman's view that companies are beholden only to their shareholders, then it is imperative that companies have tools to understand how socially unacceptable corporate behavior translates into cost and business risks. This dissertation's author views the rise of the SLO paradigm generally, and CSR programs specifically, as important for two primary reasons: First, globalization of telecommunications and the internet have increased the visibility of mining corporations' negative impacts on local people. Societies are using the tools of globalization to demand that companies comply with international norms *and* align with local expectations of ethical business behavior. From the perspective of the author, these pressures move the mining industry in a net positive moral direction. Second, the power of stakeholder support or opposition to mining projects in the globalized context now transcends power structures that have previously limited local stakeholders' voices in mining project decision making.

1.8 Purpose of This Research

Mining's external stakeholders are likely to view the risks and benefits of mining quite differently than the mining company. These divergent views create a disconnect among project risks, company CSR programs, and the future viability of a mining venture. This condition stems in part, from an inability to quantify the effect that company-stakeholder relationships and stakeholders' relationships to the environment are likely to have on a mining investment. This dissertation is a compilation of three research papers that explores this topic. These papers seek to answer three research questions through the following research activities:

- **How can governments better integrate local communities' perceptions and concerns into mine permitting decisions?** Chapter 2 examines the implementation of the National Environmental Policy Act (NEPA) at the Donlin Gold project in Western Alaska. NEPA serves as the baseline for the permitting decisions of federal and many state agencies. The law requires multiple rounds of public consultation and extensive disclosure of a project's environmental impacts for the purposes of *both* agency decision making and public awareness. The NEPA process at Donlin employed some unique elements of stakeholder involvement in the process such as including Alaskan Native tribes as cooperating agencies. This chapter discusses the successes and failures of Donlin's NEPA process with respect to bringing stakeholder concerns into the decision-making process, and the barriers in the law to building trust among local stakeholders, the mining company, and regulators.

- **What are the most important indicators of company-stakeholder conflict?** Chapter 3 presents a statistical examination of social and environmental variables' relationships to company-stakeholder conflict. This chapter employs a database of 23 mining properties to identify the features that are the best indicators of future company-stakeholder conflict. The chapter discusses these indicators and how these findings may affect the decisions of companies, investors, policy makers, and governments.
- **How does stakeholder opposition affect the valuation of a mining property?** Chapter 4 suggests a framework for translating company-stakeholder conflict risk into financial risk to mining companies. This model overlays the average frequency of a company-stakeholder conflict onto the project's discounted cash flow model. The method uses a decision-tree analysis to determine the effects of company-stakeholder conflict risk on the net present value (NPV) of the property. This study finds that even moderate levels of conflict result in the erosion of hundreds of millions of dollars in project value.

CHAPTER 2: PARTICIPATION OR FRUSTRATION? LOCAL STAKEHOLDERS AND THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA): DONLIN GOLD PROJECT, WESTERN ALASKA

2.1 Abstract

This chapter examines the implementation of the National Environmental Policy Act (NEPA) at the Donlin Gold project in Western Alaska. Regulators interviewed for this study reported that the Donlin Environmental Impact Statement (EIS) was detailed and thorough, especially compared to other EIS studies with which those regulators had been involved. Additionally, Donlin's EIS involved local tribal governments as cooperating agencies, a stakeholder engagement approach that was unique and potentially innovative. Yet, many stakeholders felt that these efforts were insufficient. Nearly all local stakeholders interviewed for this study expressed frustration with the NEPA process and the regulators who implemented it. They reported that they felt patronized by a bureaucratic process that focused on fitting stakeholder concerns into technical and scientific disciplines for analysis by outside experts. Many local stakeholders reported feeling unrepresented in the EIS and that stakeholders' local knowledge was undervalued by regulators during the process.

Despite their nearly universal frustrations with the EIS process, interviewed stakeholders expressed differing perspectives on whether the Donlin deposit should be developed into a mine. At the time of this research, public opinion on Donlin was divided. Some stakeholders expressed support for the mine expressing a view that it could be source of economic stability that would enhance the continuation of local traditions and lifestyles. Some of these stakeholders cited their trust of Donlin Gold, LLC., the project's proponent, which has had a presence in the region for decades. Many other local stakeholders strongly opposed the mine. They viewed the mine and the company as a potential threat to the environmental resources that are fundamental to local traditions and lifestyles. These stakeholders were skeptical of the company expressing the belief that company employees minimized the proposed mine's environmental risks and that the company was buying support from local stakeholders through corporate social responsibility programs.

This study adds to the literature on the power imbalances and politicization of information that underpins technocratic approaches to impact assessment. It concludes that simply augmenting the quantity of scientific study is unlikely to achieve NEPA's goal of stakeholder involvement in the impact assessment process. Rather, regulatory personnel must focus on building trust between their agencies and local communities through 1) collaborative implementation of NEPA that elevates the importance of local knowledge in agency disclosure and permitting actions and 2) transparent dialogue with local stakeholders early in the process about NEPA's limitations with respect to turning stakeholders' concerns into enforceable project requirements.

2.2 Introduction

This paper examines the implementation of the National Environmental Policy Act (NEPA) at the Donlin Gold project in Western Alaska. In July 2018, the Army Corps of Engineers published a 10,000 page Final Environmental Impact Statement (EIS) for Donlin. The EIS disclosed the proposed mines potential impacts to the natural environment, local socio-economic systems, and human health. In August 2018, the Army Corps of Engineers (Army Corps) and the Bureau of Land Management published a Record of Decision (ROD) recommending that the project receive a Section 404 Clean Water Act Permit, and a Section 10 Rivers and Harbors Act Permit from the Army Corps; and approval for rights of way and other lesser permits from the Bureau of Land Management. The Final EIS and ROD represented the culmination of a seven-year long process of public comment, scientific study, and project impact disclosure.

The communities of the Middle Kuskokwim region, the most proximate to the mine, have had a decades-long relationship with Donlin Gold, LLC, the project's proponent. The company's corporate social responsibility programs, hiring practices, and personal contact with community leaders have focused heavily on this region. Stakeholders from these communities were more likely to express support for developing the project. They reported a relatively high level of trust in the company and a belief that the mines economic benefits would outweigh the risks. Stakeholders further downriver in the Lower Kuskokwim region were more likely to oppose the mine. They commonly reported that they thought the environmental costs of the mine were being minimized, that their concerns were not adequately incorporated into the EIS process, and that any benefits that come from the mine would not outweigh the costs to their ways of life.

Underpinning the local debate about Donlin are stakeholder concerns about the NEPA process itself: What level of understanding is sufficient to meet NEPA's requirements of environmental disclosure "to the fullest extent possible" (National Environmental Policy Act, 1969)? Which impacts are important enough to warrant additional study, mitigating measures, or a decision to mine development entirely? How are a mine's predicted negative impacts weighed against its potential benefits? And perhaps most critically, who gets to decide? The EIS process at Donlin sought to incorporate local stakeholders' views in a unique and innovative way. Tribal governments worked as cooperating agencies in the process alongside the Army Corps of Engineers, the Bureau of Land Management, and others. The quantity of environmental, social, and public health information that regulators gathered on Donlin resulted in a Final EIS document that was over 10,000 pages. And yet, stakeholders expressed distrust and strong frustration with the EIS process and the regulators who implemented it regardless of whether those stakeholders supported *or* opposed the development of the mine.

Stakeholders criticized the EIS's public comment process, saying it was insufficient and that agencies did not listen to them. They complained that communities' local knowledge of the environment was marginalized in favor of fractionalizing complex concerns into technical and scientific categories that could be analyzed by outside experts. Through their cooperating agency roles, tribal governments pushed for the EIS to examine impacts to species and subjects that had little previous documentation in western science. Their efforts resulted in EIS chapters specifically relevant to their concerns. Yet, these tribal governments found themselves frustrated when the EIS predicted negative impacts but required no mitigating actions of their causes.

The Army Corps for their part, reported a tension in the Donlin NEPA process between the wide breadth of environmental impact disclosures that many stakeholders expected, and the limited permitting authorities of the federal agencies. Indeed, NEPA is both a disclosure law *and* is meant to inform subsequent federal actions. In the case of Donlin, the Army Corps noted that many of the impacts that the Donlin EIS disclosed, including some of those championed by cooperating agency tribes, did not fall under federal permitting authority. These impacts were left unresolved by the process.

This paper asks what we might learn from the Donlin EIS story? What should local stakeholders expect of NEPA? How can the EIS process improve to meet the needs of an American

population that is increasingly concerned about mining's environmental impacts? And how should the agencies charged with implementing NEPA seek to engage with a growing number of stakeholders who want their voices heard in resource development decision-making processes?

2.2.1 Environmental Impact Statements and NEPA

The U.S. National Environmental Policy Act was passed in 1969 and signed into law in 1970 (National Environmental Policy Act, 1969). It represented the first major piece of legislation to come out of the American environmental movement of the 1960s and '70s. The law requires that the federal government consider environmental consequences alongside the economic and technical benefits of proposed projects and seek public input in the decision-making process. NEPA has been called the “Magna Carta of environmental law” (Mandelker, 2010, p. 293) and was used as a model for environmental regulations in many other countries (Morgan, 2012). In seven pages, the law outlines a grand view of the role that environmental considerations should play in federal decision-making, saying that the aim is:

...to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans. (National Environmental Policy Act, 1969, p. Section 101)

The law tasks each generation as an environmental trustee for the next; calling for prioritization of an environment which supports diversity, protects national heritage, and reduces risks to health and safety, and aiming for the maximum attainable reuse of non-renewable resources.

Perhaps more importantly, NEPA mandates that government agencies employ interdisciplinary approaches to quantifying potential environmental impacts, evaluate possible alternatives, and document these findings in a public statement (National Environmental Policy Act). Unlike most environmental regulations in the U.S., NEPA requires agencies to comprehensively disclose project impacts, but it does not require any specific environmental actions or set any environmental standards. A court decision in 1989 solidified the view that NEPA does not “mandate particular results” and instead that the law “prescribes the process for

preventing uninformed – rather than unwise – agency action” (Robertson v. Methow Valley Citizens, 1989). Environmental advocates point to this case as one that both strengthened the extensiveness of NEPA’s reach and limited its effectiveness at elevating environmental concerns (Sowards, 2019).

The teeth of the law reside in the threat of legal scrutiny against agencies that produce impact statements that are incomplete or that falsely minimize the environmental risks (Dreyfus & Ingram, 1976). Legal challenges have indeed been critical to codifying NEPA’s mandate. From 1974 to 2004 there were an average of 95 NEPA cases per year decided in the courts (Austin, et al., 2004). Since its inception, the law has evolved to fundamentally change the way U.S. federal agencies manage environmental considerations. Because of the breadth and depth of scientific study required by the modern permutation of NEPA, the resulting documents have become the de facto basis for subsequent permitting actions by states and the federal government.

NEPA provides an expansive vision for the limits of its mandate, calling for agencies to consider environmental concerns “to the fullest extent possible,” and provides language interpreted by courts to mean that agencies must adhere to the NEPA statutes unless they are specifically prohibited from doing so under other laws. When the law went into effect, early NEPA scholars considered how far these limits would stretch. Hanks and Hanks (1970) posited:

Must [the agencies] bring all of their activities into conformity with the policies of the Act? For example, is the Act applicable to the [Atomic Energy Commission] when it licenses nuclear power plants? The [Army] Corps of Engineers when an application seeks a fill or construction permit? The Secretary of [Housing and Urban Development] when he approves the redevelopment plan of a local redevelopment agency? The [Federal Housing Administration] when it insures home mortgages in a subdivision development? The [Interstate Commerce Commission] when it has been asked to approve the discontinuation of commuter train service? In every one of these cases a potentially detrimental environmental impact exists. In every one there is a causal connection between the government action and the environmental impact.

Indeed, most of these examples are now considered under NEPA’s purview. Moreover, the level of detail required to comply with the law became ever more rigorous and specific over time.

Dreyfus and Ingram (1976) note that some early EIS documents were excessively short (only three pages in length in some cases) leading to litigation from environmental activist groups. These legal challenges and subsequent court decisions upholding the law's mandate of public disclosure have resulted in increasingly lengthy permitting timelines and correspondingly large EIS documents. The Council on Environmental Quality reported that the mean Final EIS compiled between 2013 and 2017 was 669 pages with approximately 3% of Final EIS documents exceeding 2000 pages (Council on Environmental Quality, 2019).

In the decades since its passage, legal challenges and Council on Environmental Quality directives have transformed NEPA into the bureaucratic process shown in Figure 2.1. In recent decades, major mining projects almost universally require a full EIS, and the Donlin project is no exception. Although the U.S. government does not keep comprehensive data on the costs of NEPA analyses, the Department of Energy (DOE) reported that their average cost of producing an EIS between 2003-2012 was \$6.6 million (U.S. Government Accountability Office, 2014). In the case of large private sector projects such as Donlin, large portions of these costs are borne by the company.

In the case of private-sector projects such as the development of a mine there is a tension in NEPA between its environmental disclosure mandate, and the scope of the federal decisions it is aiming to inform. In the mining context, federal agencies regulatory power is typically limited to the issuance of permits. This goal promotes a technocratic approach to impact examination rooted in determining whether or not the agency should issue specific environmental permits with specific issuance criteria. Yet, NEPA's mandate requires that regulators examine and disclose concerns from non-permitting federal agencies, state agencies, and the public – leaving the potential for NEPA to identify some environmental concerns, but not provide resolutions (Langberg, 2014).

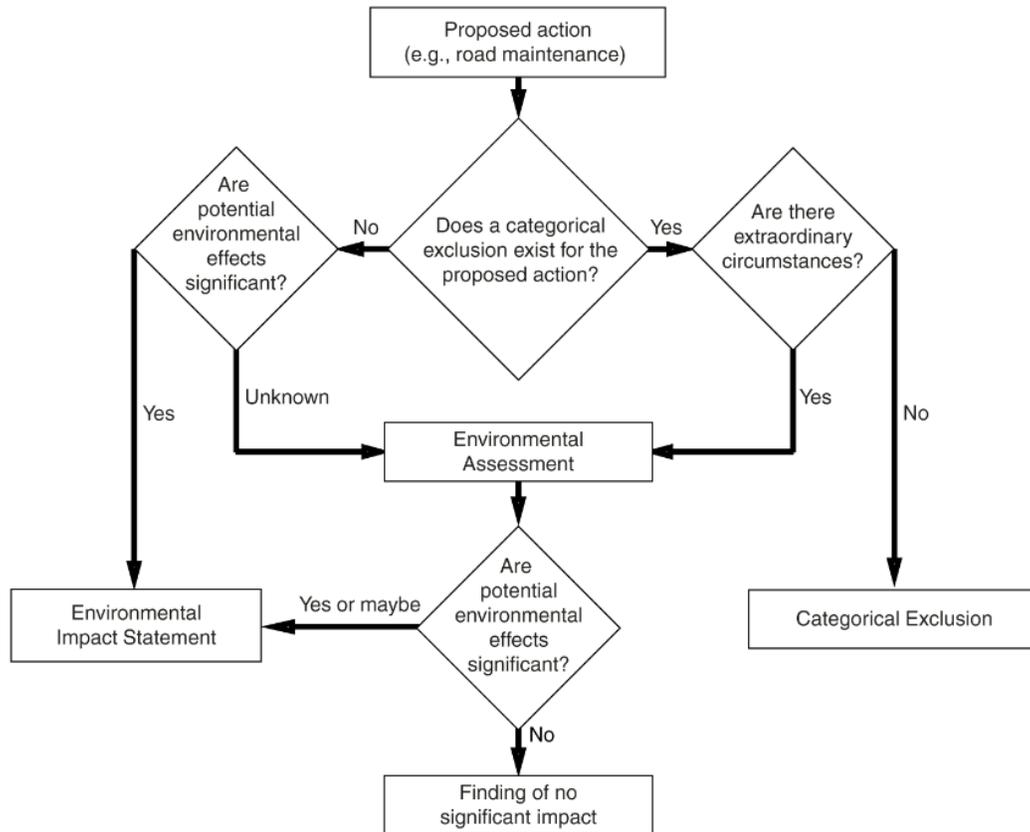


Figure 2.1: Flow chart of the NEPA process. Taken from the US Government Accountability Office (2014).

The influence of NEPA and other similar impact assessment processes around the world has led to the global rise of a technocratic approach to environmental policy-making (Yap, 1990; United Nations Environmental Program, 2004). This paradigm purports to elevate “evidence-based policy” above political beliefs (Cashmore, et al., 2010). Yet, many scholars point out that these processes themselves constitute political advocacy because they seek to impose a set of norms around which impacts should be considered and which methods are deemed acceptable for assessing these impacts. Promoters of the rationalist (i.e. scientific) assessment methodologies assume that scientific and planning experts are neutral to project outcomes and therefore serve as independent evaluators (Morgan, 2012). Critics argue that this assumption is not only false (Cashmore, et al., 2010), but also creates power imbalances between those that have access to highly-educated technical experts (i.e. government and corporations) and those who do not (i.e. local communities and marginalized groups) (Lane & Corbett, 2005). Critics also argue that elevating scientific expertise minimizes the contributions of local and indigenous environmental

knowledge (Hanna, et al., 2014). In the context of projects involving Native Americans and Alaskan Natives specifically, Dongoske et al argue that (2015) NEPA promotes a western worldview that marginalizes native peoples and perpetuates colonialist attitudes. Many Native American people view the US government as complicit in private companies' exploitation of tribal lands and people, often bolstered by permitting laws they view as inadequate (Allison III, 2015).

Lawrence (2013) notes that stakeholders will only remain involved in the impact assessment process if they see it as legitimate and a reasonable path to their desired outcomes. Stakeholders that feel marginalized are likely to disconnect from a process like NEPA and employ alternative techniques to achieve their objectives instead – such as direct opposition to the project's proponent. Modern NEPA primarily seeks to achieve the goal of legitimate public involvement through a process of public consultation. The intent of NEPA's public consultations are to provide a mechanism for non-agency stakeholders to raise concerns and prompt agencies to examine unique local conditions. The law's custodians have aspired to allow the public a “relatively high level of influence in our decision making” (U.S. Council on Environmental Quality, 2007, p. 3), advocating that such collaboration can result in a fairer process, prevent conflict, make project implementation easier, and (most relevant to the present study) promote greater trust by “increasing public confidence in the government” (p. 5). Despite these efforts, critics of environmental impact assessments still argue that stakeholders are marginalized by the processes' technical emphasis.

Industry critics of NEPA point out that the law is excessively cumbersome. They argue that the process has been used as a tool by activists to obstruct agency decision-making through the law's primary enforcement mechanism, litigation (and in the case of mining, delay implementation of the mine) (Mandelker, 2010). Unsurprisingly, the mining industry is quick to highlight the money and time that NEPA costs companies. A report compiled for the National Mining Association claims that permitting a new mine in the U.S. takes 7-10 years, compared to approximately 2 years in Canada and Australia. The association blames the extended timeline on NEPA in general, and specifically on the inefficiencies associated with government agencies leading the NEPA process (as opposed to the mining companies themselves) (SNL Metals & Mining, 2015).

The present study recognizes the systemic shortcomings of NEPA. Indeed, some interviewees for this study (both project proponents and opponents) expressed the view that NEPA is fundamentally flawed and should be dramatically changed or entirely replaced. Respecting these views, this paper assumes that NEPA will remain at the foundation of federal environmental decision making for the foreseeable future and that improvements to the law will happen incrementally. The case study presented here adds to the body of work calling for improvement in how regulators manage stakeholder participation in the NEPA process, reaching the important conclusion that increasing the quantity of public comment and/or scientific study is insufficient to address many stakeholders' concerns around how the law treats them and the information they contribute. This paper considers how other elements of NEPA, namely its almost exclusive reliance on expert-led scientific studies, may be limiting the law's potential for broader stakeholder involvement. This work affirms the calls of the Council on Environmental Quality and scholars that there are opportunities for improving stakeholder trust and its environmental impact conclusions by improving NEPA's implementation.

2.2.2 The Donlin Gold Project

The Donlin Gold project is a proposed open pit mine that would produce one million ounces of gold per year over a mine life of 27 years. At the time of this research, the project was in the advanced permitting stage. If built, it would be one of the largest gold mines in the world. The project is located 280 miles west of Anchorage in an area known as the Yukon-Kuskokwim Delta region. The deposit is 10 miles north of the small village of Crooked Creek (See Figure 2.2). The mine site would consist of a 2.2 mile long by 1.0 mile wide open pit, a mill with a capacity of 59,000 tons per day, a 2,350 acre waste treatment facility, a 2,240 acre waste rock facility, and a natural gas-fired 227 megawatt power plant (See Figure 2.3). The mine would have a 5,000 foot-long airstrip and a 30 mile-long road connecting the mine site to a barge landing on the Kuskokwim River. Most of the project's materials, fuel, and equipment would be transported to the site on river barges during the open-water season, typically May to October. To supply the power plant, the company would build a 300 mile-long natural gas pipeline from the mine site to the Cook Inlet (U.S. Army Corps of Engineers, 2018).

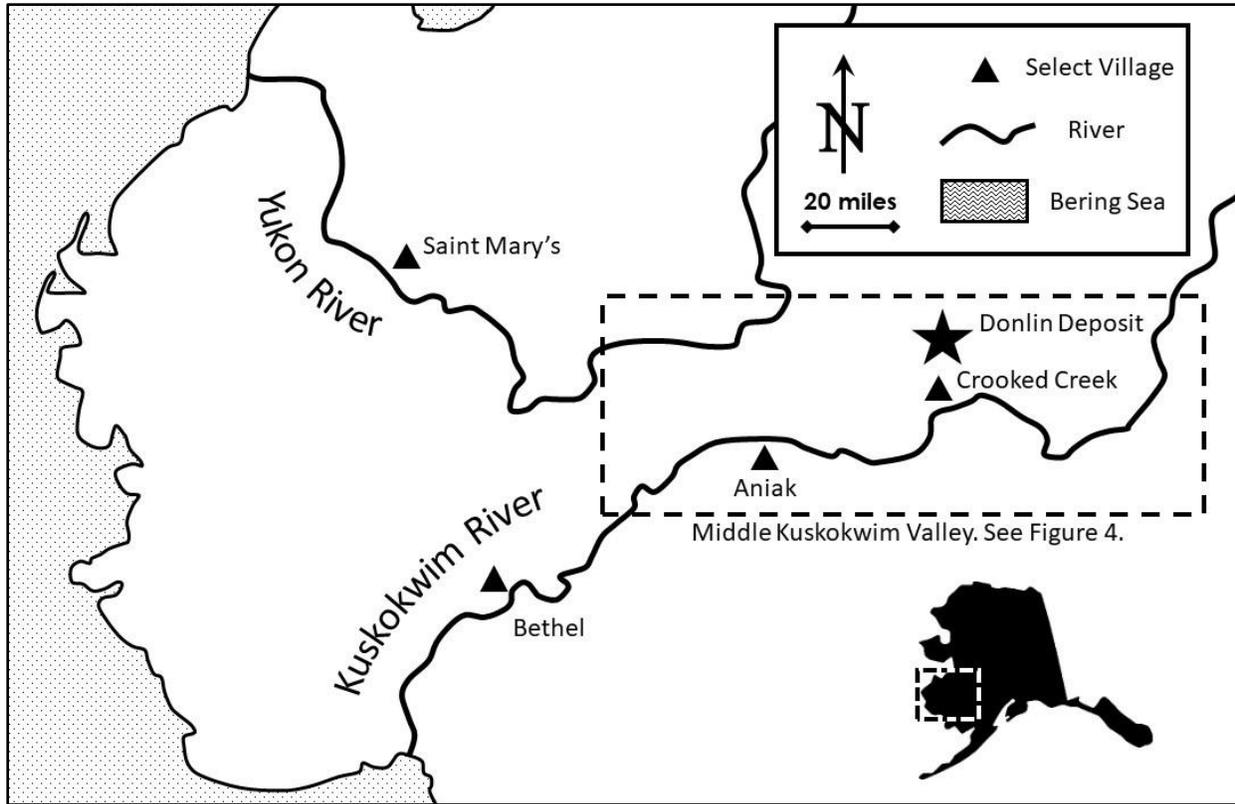


Figure 2.2: Map of the Yukon-Kuskokwim Delta region showing the location of the Donlin deposit and select villages in the region. The dashed area indicates the Middle Kuskokwim region. See Figure 2.4 for a detailed map of that area.

The Donlin project is owned by the Donlin Gold company. The company has its corporate offices in Anchorage and two small community relations offices in the Kuskokwim region located in the villages of Bethel and Aniak. The Donlin project is Donlin Gold’s only asset. At the time of this dissertation, Donlin Gold was 50% owned by Vancouver-based junior mining firm NovaGold Resources, which reported Donlin as its only source of mineral resources and reserves (NovaGold Resources, 2018). The other 50% of Donlin Gold was owned by the Toronto-based mining giant Barrick Gold Corporation, which reported producing over 4.5 million ounces of gold and 382 million pounds of copper from 19 mines around the world in 2018. In addition to these operating mines, they report five properties (including Donlin) in their project development pipeline (Barrick Gold Corporation, 2018).

The mineral rights on the Donlin property are owned by the Calista Corporation, and the surface rights are owned by The Kuskokwim Corporation. Both organizations are categorized as Alaskan Native Corporations, which were created by the Alaskan Native Claims Settlement Act

(ANCSA) of 1971 and are entirely owned by Alaskan Native shareholders. In addition to the Donlin property, the Calista Corporation holds the mineral rights and some surface rights on behalf of 56 villages in the lower Yukon River, the Middle and Lower Kuskokwim River regions, Nunivak Island, and the Bering Sea coast along the Yukon-Kuskokwim Delta². The Kuskokwim Corporation holds approximately one million acres of surface rights on behalf of the ten villages in the Middle Kuskokwim region³.

The period since the passage of ANCSA accelerated changes in Alaskan Native communities that were already in motion. Since the late 1800s, the people of the Kuskokwim had been adapting their cultural practices in response to western missionaries, traders, and early explorers looking for gold, furs, and shipping passages. These influences gradually pushed Yup'ik people away from their traditional lifestyles, lessened their dependence on subsistence hunting and fishing, and increasingly introduced money and wage-labor into the economic system in the region (Oswalt, 1990). Native Corporations are implicated in continuing this trend of globalization, bringing services like western healthcare, internet access, and electricity to their shareholder communities, but also diluting traditional culture (U.S. Government Accountability Office, 2012). Many people do not view the Native Corporations favorably. Some scholars have argued that the need for financial solvency requires the corporations to sacrifice cultural preservation in favor of resource development (Anders & Anders, 1986). Indeed, some interviewees for the present study expressed this view as well, noting that the goals of the Calista Corporation and those of tribal governments in the Kuskokwim region often conflict.

² <https://www.calistacorp.com/lands/regional-overview/entitlement-natural-resources/>

³ <http://kuskokwim.com/our-corporation/our-villages/>

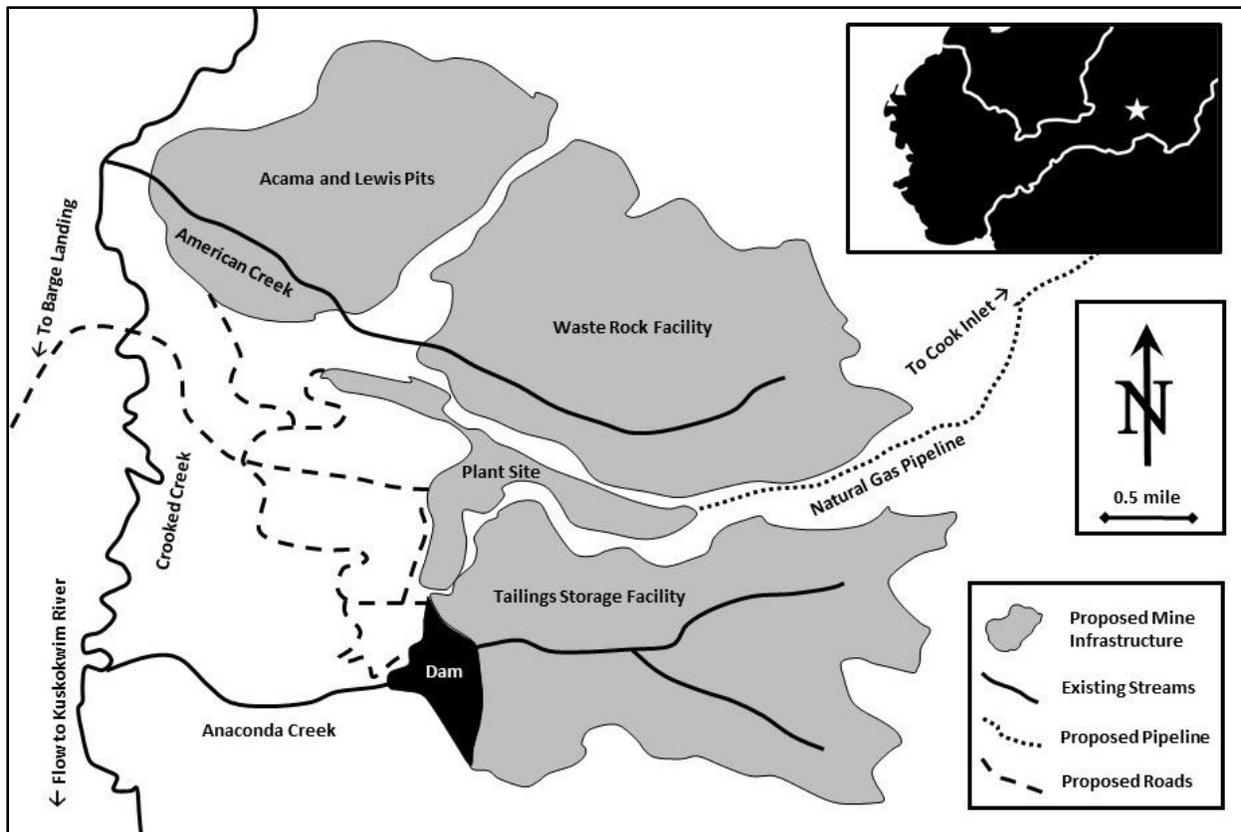


Figure 2.3: Map of proposed Donlin Mine infrastructure. Adapted from Army Corps of Engineers (2018).

The Kuskokwim region is sparsely populated by rural Alaskan communities. The Bethel Census Area, which is a 45,500 square mile area comprising the Lower and Middle Kuskokwim region, has a population of approximately 18,000 people, nearly 7,000 of whom live in the area's largest town, Bethel. Alaskan Natives, primarily from the Yup'ik language group, make up about 84% of the region's population with white and other non-native peoples comprising the remainder (U.S. Census Bureau, 2017). The ten villages that comprise the Middle Kuskokwim region are the closest to the Donlin Project and would likely feel the greatest impact from mining activities should the mining project go forward. The villages of the Middle Kuskokwim are extremely remote, accessible only by light aircraft via small, dirt airstrips; or by snowmobile during winter; or by boat during the summer. The most recent US census found that the total population of these ten villages was 1,379 and that two of the villages (Napaimute and Georgetown) were only seasonally occupied, having no permanent residents (See Figure 2.4).

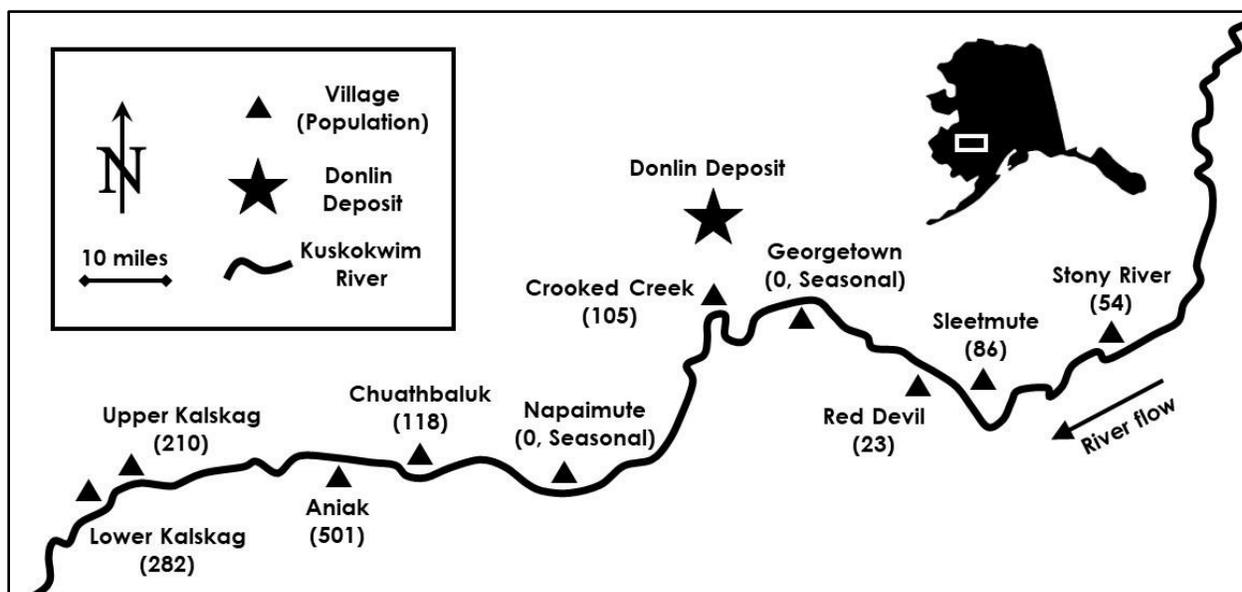


Figure 2.4: Middle Kuskokwim region showing the Donlin project location and stakeholder villages. Map adapted from The Kuskokwim Corporation⁴. Population data from 2010 US Census.

2.2.3 Methods

This research was conducted between November 2017 and February 2020. The work included 30 semi-structured interviews with 30 stakeholders. Twenty-six (27) of the interviews were conducted one-on-one. Three (3) interviews were conducted with small groups (two or three interviewees) arranged according to the interviewees' preference. The lead author conducted a ten-day field visit to the Lower and Middle Kuskokwim regions, and Anchorage in early April 2018. During this visit, the author collected most of the in-person interviews. Some pre-trip interviews, and post-trip follow-up interviews were conducted over the phone. Interviewees were initially identified through contacts at Donlin Gold, the Center for Science and Public Participation (CSP2), and by reaching out to authors of relevant local newspaper editorials. Additional interviewees were identified through snowball sampling, where interviewees are asked to identify other potential candidates. In addition to formal interviews, the lead author had numerous casual conversations about Donlin with local stakeholders in the Kuskokwim region.

The population of the Middle and Lower Kuskokwim region is quite small, so many people have held multiple roles with respect to the Donlin project. Local community members were

⁴ <https://kuskokwim.com/>

sometimes current or former company employees, had worked with regulators or contractors on a study related to the project's EIS, and/or held positions in tribal government or one of the native corporations. Likewise, some interviewees had worked on the project with regulatory agencies, and then at different times for Donlin Gold or its contractors. Others had previously held positions with government agencies where they had worked with NEPA on projects unrelated to Donlin.

The 30 interviewees can be grouped in to the following categories: eight (8) Donlin Gold employees or contractors who *are not* residents of the Kuskokwim region; three (3) Donlin Gold employees or contractors who *are* residents of the Kuskokwim region; eleven (11) residents of the Kuskokwim region who had not worked for the company; three (3) native corporation employees; and four (5) employees of federal, state, or local government agencies. Fourteen (47%) of the interviewees self-identified as Alaskan Native.

The Donlin project's design process and NEPA analysis is well documented in the public domain. The, ROD, Final EIS, Draft EIS, Scoping Report, plus records and transcripts of stakeholder meetings, design alternatives, and permit applications are publicly available dating back to 2012. Coupled with academic literature, these documents provide the basis for both this paper's historical context and the discussion of the mine's technical design and proposed infrastructure.

2.3 Results and Discussion

The following sections discuss interviewees' detailed perspectives and experiences with Donlin in three important ways: First, the "2.3.1 Rural Alaska, Livelihoods, and Subsistence" section describes rural lifestyles in the Kuskokwim region and how practices like subsistence hunting and fishing set the stage for residents' perspectives on Donlin and many of their contributions to the Donlin EIS. Second, the "2.3.2 NEPA at Donlin Gold," and "2.3.3 Stakeholder Comments in the EIS Process" sections show how these perspectives aligned and mis-aligned with the findings of the EIS. Third, the "2.3.4 Whom Do Local Stakeholders Trust?" and "2.3.5 Alaska Ballot Measure 1" sections discuss how stakeholders' relationships with Donlin Gold and government agency regulators contributed to their support or opposition to the Donlin mine at the conclusion of the NEPA process at Donlin.

2.3.1 Rural Alaska, Livelihoods, and Subsistence

Stakeholders' perceptions on the resiliency of the Kuskokwim region's local customs and the environmental resources that support it form an important backdrop to the story of the Donlin project and its EIS. There are two competing paradigms on how the Donlin mine would affect the Kuskokwim region. In one perspective, the proposed mine is viewed as a source of economic stability that would enhance the continuation of local customs and lifestyle. From the other perspective the mine is a potential threat to these traditions, the environmental resources fundamental to local ways of life, and could lead to increases in social ills like alcohol and drug abuse. Nearly all stakeholders interviewed for this work expressed some recognition of *both* paradigms; but how they weighed these competing narratives largely determined their support or opposition to the proposed mine.

Most people in the Kuskokwim region practice a subsistence or mixed-economic lifestyle where fishing, hunting, and gathering of natural berries and plants constitute important traditional activities and provide a large percentage of their food supply. Alaskan law recognizes subsistence hunting, fishing, and gathering as a customary activity that supports the traditions and economies of rural Alaska. This tradition includes a non-monetary trade where Alaskan Natives share harvests with families and others far from the harvest source. The practice is regulated by the Alaskan Department of Fish and Game, which issues subsistence permits and enforces bag limits. These permits are issued to Alaskan residents when the harvests are intended for:

“...direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation, for the making and selling of handicraft articles out of nonedible by-products of fish and wildlife resources taken for personal or family consumption, and for the customary trade, barter, or sharing for personal or family consumption...” (AS 16.05.940 (33)).

Among residents of the Kuskokwim region, “subsistence” is used to refer to whatever hunting, fishing, or gathering activity is seasonally appropriate in that moment. Kuskokwim region residents discussed engaging in subsistence activities as part of their regular routine. These activities are closely tied to community values; family cultures; and identities as rural, Alaskan Natives. Alaskan Native interviewees expressed a belief that subsistence activities created cohesion in their villages. Elders discussed how the work of hunting, fishing, and gathering provided a link between the modern generations and their ancestral heritage. They described how

subsistence activities created multigenerational linkages; requiring the labor of everyone in the family to help catch, process, and store fish and big game during the salmon runs and hunting seasons. Children who had left the region for jobs in urban areas often return to their home villages to help during the busy subsistence seasons, especially the summer salmon runs.

Despite its deep historic roots, the activities of modern subsistence are not primitive. Rather, they closely resemble their commercial and sporting parallels. Subsistence hunters use modern firearms, all-terrain vehicles, and snowmachines⁵ to pursue moose, musk ox, and caribou. Residents fish for salmon with nylon gill nets cast from aluminum skiffs outfitted with outboard motors. These tools and the fuel to run them require money and are especially expensive in rural Alaskan communities like those in the Kuskokwim region. As one interviewee put it “[Modern subsistence is] not the subsistence my grandparents experienced ... modern subsistence takes money.”

Rural lifestyles and the subsistence activities that support them are central to the cultural identity of the Kuskokwim region. However, elders interviewed for the present study reported a declining interest in subsistence among younger people in the villages and increased outmigration of young people to urban centers like Anchorage and Fairbanks. A study of new enrollees in the Anchorage school system by Lowe (2010) quantitatively supports this observation. Among new enrollees from off-road communities⁶, the greatest number came from the Bethel Census Area (around 13%). Lowe’s conclusions align with those of Kuskokwim region interviewees who cite better employment opportunities, improved access to education for children, and the high cost of living in rural communities as the most common reasons that people moved away from their rural villages. Improved education levels and elevated economic class seem to be positive determinates of this outmigration. For example, one interviewee who had worked for Donlin in the past said that his employment with the company enabled his family to move to Anchorage. Interestingly, he also reported that his family remains active in his home village, especially during the summer

⁵ In Alaskan terminology, a snowmobile is called a “snowmachine” or a “sno-go”

⁶ Large portions of Alaska are not connected by any roads to the state’s major cities. Unsurprisingly, these jurisdictions have their own unique sets of socio-economic challenges. Studies often find it useful to separate the on-road and off-road communities into two distinct populations when analyzing socio-economic data.

salmon fishing season. This movement exemplifies a strategy of “circular migration” observed by Lowe (2010) where families aim to maintain connections to their home communities despite living elsewhere.

Youth outmigration is not the only threat to subsistence. Rural residents worry that even if younger people were not leaving, that future environmental conditions may not support the subsistence harvests that their communities have relied upon in the past. Interviewees most commonly expressed concerns about king (Chinook) salmon (*Oncorhynchus tshawytscha*). The king is the largest species of salmon and temporally the first salmon species to run in the Kuskokwim River each season. The kings typically appearing just as residents’ stores from the previous year’s harvest have been depleted. Therefore, the king species has represented an important proportion of the annual subsistence harvest in recent decades.

The Kuskokwim king salmon have seen steep population declines since a peak run in 2004. Since 2010, king salmon stocks have been well below historical averages; and since 2014, harvests have been below Alaska Fish and Game’s estimate of the amounts necessary for subsistence (Smith & Liller, 2018). The reasons for these declines are not clear. One study from the nearby Yukon River suggests that decreased survival of juvenile fish may play a role (Murphy, et al., 2017). Fish biologists consulted for the current research believe that the decline of kings in the Kuskokwim is likely complex and multivariate. To promote the king salmon’s recovery, Alaska Department of Fish and Game placed moratoriums on commercial and sport fishing during the king salmon run and imposed extensive restrictions on subsistence fishing during these times as well. Since the king run overlaps with that of the chum salmon run (*Oncorhynchus keta*), the restrictions aimed at protecting the kings have also reduced harvests of chum (Tiernan, et al., 2018).

Fishing restrictions are credited with recent increases in the number of kings in the Kuskokwim River, but stocks remain well below average (Tiernan, et al., 2018). Despite the weak numbers, the Alaska Department of Fish and Game remains under pressure from residents to allow

more subsistence harvesting. At a Kuskokwim Salmon Management Working Group⁷ meeting in Bethel, residents from around the Kuskokwim region cried as they explained that some people in their communities had nothing to eat. One woman likened the fishing restrictions to “a moratorium on grocery stores” and another decried “We are hungry up here!” (Demer, 2017).

In the context of the Kuskokwim region’s reliance on subsistence activities, the Donlin EIS focuses heavily on the proposed mine’s potential impacts on subsistence resources, especially the health of salmon populations in the Kuskokwim River and salmon spawning areas in tributaries near the Donlin deposit that would be destroyed if the mine goes ahead.

2.3.2 NEPA at Donlin Gold

Donlin Gold applied to begin its EIS process in July 2012. The U.S. Army Corps of Engineers (Army Corps) became the lead government agency on the EIS. Cooperating agencies included four other federal agencies (Bureau of Land Management, Pipeline and Hazardous Materials Safety Administration, the US Environmental Protection Agency, the US Fish and Wildlife Service), the State of Alaska, and six tribal governments (Akiak Native Community, Knik Tribal Council, Native Village of Napaimute, Native Village of Chuathbaluk, Village of Lower Kalskag, and the Village of Crooked Creek)⁸.

In order to become a cooperating agency on an EIS, the agency must have “jurisdiction by law” or “have special expertise with respect to an environmental issue” (40 CFR 1501.6). The tribal governments argued that they had a legal jurisdiction over villages in the greater mine-affected area and that their knowledge of the local socio-environmental conditions constituted a special expertise. Stakeholders and regulators working on the project noted that involving tribal governments in this way was a first for a NEPA analysis of a major mining project in Alaska. Becoming cooperating agencies meant that the tribes sat at the table alongside the federal regulators, providing technical reviews and advocating for special studies throughout the EIS

⁷ The KRSMWG is a multi-stakeholder group of fishery users and Alaska Department of Fish and Game established in 1988 as a means of including local stakeholders in the management of the Kuskokwim River fishery.

⁸ The names of the tribal governments in this paragraph adhere to their full, formal titles as they appear in the EIS documents. Some names are shortened in later mentions in the text for the sake of brevity and ease of reading.

process. The role came with some constraints; cooperating agency tribal representatives were prohibited from discussing details of the cooperating agency meetings outside the cooperating agencies group, including with their own constituents and non-cooperating agency tribal governments.

Most of these tribal governments had limited staffing and resources to help them manage and review the numerous studies and documents that were part of the EIS process. In one village, for example, these responsibilities fell primarily on the tribal administrator, whose daily responsibilities were to coordinate and manage town government activities and services for the tribal council. This person reported that they quickly found the cooperating agency role overwhelming and excessively time consuming. That community reportedly contributed little to the EIS through its cooperating agency role. Interviews with other stakeholders indicated that some other tribal governments who had signed on as cooperating agencies had similar experiences.

Of the six tribal governments, the villages of Chuathbaluk and Napaimute contributed most consistently and significantly to the process. In the case of Chuathbaluk, this relatively strong involvement was likely because the Chuathbaluk Tribal Council designated their Brownfields Coordinator⁹, a person already in an environmental role in the community, to handle their EIS activities, and they received technical support from a non-profit organization called the Center for Science and Public Participation (CSP2). Similarly, the village of Napaimute hired staff who had formerly worked as scientists with the US Forest Service and US Fish and Wildlife Service. These individuals were familiar with NEPA and the EIS process. In some instances, these individuals volunteered their time, and some received some funding through grants from the Western Mining Action Network¹⁰ or from the Indian Environmental General Assistance Program (IGAP), a program established by the federal government in 1992 to improve the capacity of Native American and Alaskan Native tribal governments to manage environmental programs.

Tribal personnel in Napaimute and Chuathbaluk said that they believed their involvement as a cooperating agency was productive. They believed they were able to highlight data gaps in

⁹ This position is responsible for considering cleanup and possible redevelopment of environmentally contaminated properties.

¹⁰ <https://wman-info.org/>

the EIS and push for additional scientific studies, making the process more comprehensive. They also believed that they were able to hold the Donlin Gold company accountable to answering their questions within the context of the cooperating agency meetings. They cited that one of their most significant contributions was ensuring the inclusion of impacts to rainbow smelt (*Osmerus mordax*) in the EIS. These fish are harvested by residents for food and are also an important prey species for larger riverine fish like pike and sheefish. Like salmon, rainbow smelt are anadromous, living most of their lives in the ocean only coming into rivers to spawn.

Prior to the EIS, there was little western scientific documentation of rainbow smelt in the Kuskokwim, but residents' local knowledge of the species pinpointed their spawning areas near the villages of Upper and Lower Kalskag. This contribution prompted a three-year survey documenting that the fish spawn over a two- to seven-day period in middle to late May. The eggs incubate on gravel and sand substrates as shallow as five feet for about three weeks (U.S. Army Corps of Engineers, 2018, pp. 3.13-42). These results validated concerns about the effects of proposed river barging activities and prop wash from the barging tugboats. The Final EIS concluded:

During the 2015 rainbow smelt spawning survey, spawning occurred as shallow as 8.7 feet along a relatively confined channel segment. The propeller scour of passing tug traffic in such locations could have resulted in detectable incidents of injury or mortality to incubating fish eggs or population-level effects depending on the tug's horsepower rating and engine speed. Because of the relatively shallow depth across this particular channel segment, it is unlikely that impacts to incubating rainbow smelt eggs could have been avoided by altering the line of travel of barge traffic. Similar impacts to other resident fish species that might spawn in shallow segments of the mainstem channel also would be at risk. (U.S. Army Corps of Engineers, 2018, pp. 3.13-125)

Despite the findings cooperating agency tribes expressed frustration that the Army Corps did not add any mitigation measures to the EIS's alternatives to account for the findings. When asked about these frustrations, an Army Corps employee who worked on Donlin explained that the Army Corps does not have authority to enforce prop wash-related impacts. This person noted that NEPA has a broad disclosure mandate which includes things like the impacts on rainbow smelt. However, the law's ability to impose environmental standards is limited to the permitting

authority of the federal agencies. In the case of Donlin the permitting authority of the Army Corps is specifically linked to the Clean Water Act and the River and Harbors Act.

Interviewees from the cooperative agency tribes reported fatigue with the EIS process. Despite a sense of exhaustion, they expressed a duty to their communities, stating that local residents were relying on them to represent their interests. They said that they had insufficient time or technical expertise to review lengthy scientific documents at the level of detail they would have liked. They complained that federal agencies discussions were overly technical for tribal audiences. “It’s hard for me to get people to want to learn about this stuff” said one tribal representative, referring to the highly technical studies that make up the majority of the EIS. One tribal representative sighed and said, “I didn’t realize the study would be so big.”

2.3.3 Stakeholder Comments in the EIS Process

There were two formal public comment periods since the inception of the EIS process at Donlin: one during the scoping stage, and a second after the release of the Draft EIS. In 2012 during the scoping stage, the Army Corps and Donlin held public meetings in 14 locations¹¹. The intent of these meetings is to gather feedback from community members with the aim to identify the most salient concerns for consideration in the subsequent design alternatives analysis phase. In total, 468 people attended the EIS scoping meetings and 134 people provided comments (U.S. Army Corps of Engineers, 2013). After the publication of the Draft EIS in November 2015, the Army Corps held public meetings in 17 locations¹² in early 2016. The purpose of these meetings was to solicit public comment about the findings of the Draft EIS and incorporate these perspectives in the Final EIS and ROD. The Final EIS reports that the Draft EIS meetings had a total of 1004 attendees and 204 comments. In total (including comments received by mail and email) the Army Corps reported that they received 529 unique submissions containing over 5,000 substantive comments on the Draft EIS (U.S. Army Corps of Engineers, 2018).

¹¹ Bethel, Aniak, Crooked Creek, Anchorage, Nunapitchuk, Akiak, McGrath, Hooper Bay, Toksook Bay, Quinhagak, Saint Mary’s, Emmonak, Holy Cross, and Kipnuk.

¹² The 14 communities that hosted scoping meetings plus Tyonek, Lower Kalskag, and Chuathbaluk.

The Army Corps coded the public comments into dozens of categories including: Acid Rock Drainage (Code: ARD); Birds (BIRD); Fish (FISH); Public Health (PHL); Traditional Culture and Way of Life (TWL); Research, Monitoring, and Evaluation Needs (RME); Legislative and Regulatory Process (LEG); and many others. These categories were broken into sub-categories which attempted to summarize the comments around a particular subset of the topic. For example, the Scoping Report described the comment group FISH 4 this way:

FISH 4: Commenters are concerned that the project would adversely affect fish (and other wildlife including microorganisms) in the same way that the NYAC Mine¹³ [*capitalization included in original*] has affected fish in the Tuluksak River and its drainages. The Draft EIS should describe the potential risk and consequences of contaminated water releases from the mine. (U.S. Army Corps of Engineers, 2013)

Other comment groups provided even more detailed discussion in bullet lists, such as this comment group, FISH 12:

FISH 12: Commenters are concerned that all fish species and habitats in the project area should be identified. The Draft EIS should:

- Evaluate the types of resident and anadromous fish resources in American and Anaconda creeks
- Identify streams, lakes, and other aquatic habitats that support anadromous or resident fish that may be affected by the proposed project
- Identify streams crossed by the pipeline that support anadromous or resident fish species; and
- Describe whether the kettle lakes have been surveyed for fish, as they are potential water sources. (U.S. Army Corps of Engineers, 2013)

These types of categorizations placed stakeholder concerns within particular scientific disciplines so they might be analyzed by experts in the context of specialty studies. As the above

¹³ The Nyac Mine is a gold mine located about 60 miles east of Bethel, also on tribal land owned by the Calista Corporation.

examples show, many comment summaries began to form the structure of the EIS's scientific explorations. Undoubtedly, this approach captured some types of concerns well, especially those that fit well into an environmental science discipline. Comments categorized like these resulted in detailed scientific work on the fish species in the Kuskokwim and how the proposed mine might affect various aspects of their lifecycles.

Responding to the above comments, the Final EIS (in the executive summary) included these statements under the heading "Fish and Aquatic Resources" when analyzing Donlin's design alternatives:

The Transportation Corridor includes roughly 199 miles of the Kuskokwim River, habitat characterized by sediment-rich, low-gradient, meandering channels of water depth that fluctuates with tides and seasons. At least 27 species of freshwater and anadromous fish are found here. (U.S. Army Corps of Engineers, 2018)

and;

Just under 8 miles of streambed would be removed, representing about 8 percent of the Crooked Creek watershed. Habitat in American Creek and Anaconda Creek, which supports about 200 coho salmon, would be lost. Stream flow changes would be seasonal, with greatest reductions during winter months, affecting resident fish more than salmon. (U.S. Army Corps of Engineers, 2018)

More information supporting these statements can be found in the body of the Final EIS; and in even more detail in the studies themselves, detailed maps, and mitigation plan descriptions in various sub-sections of the report and appendices. Local residents who had experience in these scientific disciplines found this level of detail helpful at answering specific scientific questions. But, local residents, especially those with less formal scientific training, reported that they struggled to navigate the EIS and that they felt that important information was often difficult to find and poorly distilled for non-technical audiences.

Although the scientific detail may be well captured and analyzed for some parts of the residents' comments, other types of concerns were lost. To illustrate this point, re-consider FISH 4. The commenters were indeed expressing a concern about fish biology, *and* they were expressing a concern about the environmental track records of the mining industry and its

regulators. Recognition of the multifaceted nature of stakeholder concerns underscores the fact that such concerns cannot be satisfactorily addressed by a technical study in a single scientific discipline. Embedded in the concerns are questions about stakeholders' abilities to trust Donlin Gold, the Calista Corporation, regulators, and potential future property managers to adapt to changes and keep the stakeholders' interests in mind. The concept of trustworthiness; in particular the track records of the company, property owner, and regulatory bodies; is not addressed at all in the EIS. Addressing comments like these more holistically requires a less disciplinarily siloed approach to triaging stakeholder comments than the one observed in the Donlin EIS. Future lead agencies should interrogate their NEPA implementation against the law's interdisciplinary goals.

2.3.4 Whom Do Local Stakeholders Trust?

The Donlin project has a long history with the stakeholders in the Middle Kuskokwim region. The company (called Placer Dome in the earlier years) began exploring at Donlin in the mid-1990s and hired people from the region. In their first 110-day field season, which overlapped with the summer salmon runs, the operations manager at that time reported that the company had a 320% turnover rate among locally hired employees. In the years that followed, the company embarked on a community engagement campaign to understand and solve their turnover problem. Employees of the company and local community elders reported that Placer Dome employees interviewed employees who had quit, their supervisors, family members, and village elders.

An anthropologist who studied the Yup'ik for decades observed that Yup'ik people are "typically modest and reserved, ... made requests indirectly, were non-aggressive, and strove mightily to avoid confrontations" (Oswalt, 1990, p. xiii). Yup'ik interviewees for the present study described their own culture as "quiet" and "non-confrontational" and that withdrawing from a situation (like resigning from a job) was often viewed as preferable to being perceived as inciting a disagreement. Through their early engagements, company management learned that non-local supervisors did not understand these cultural dynamics. Company supervisors were also failing to recognize signs of struggle from local employees who were living in an exploration camp, separated from their families and subsistence lifestyles. The company learned more about the role that drug and alcohol abuse played among their employees and in their employees' families. Perhaps most importantly, the company came to better understand the communities they were

working in, interacted intimately with local leaders and families, and developed deeper relationships with the people of the Middle Kuskokwim region.

Learning from these experiences, the company hired and trained more local supervisors and gave people who were terminated for substance-abuse-related issues the option to return after a one-year waiting period and successful passage of a drug test. Two years later, the then-operations manager reported that the turnover rate had dropped to around 5%. Donlin employees and many community members cite this early employment challenge as the event that drove the company to develop relationships and company-community trust. They believe that the employment challenge and its resultant company-community engagement set the stage for the company's future relationship with the stakeholders of the Middle Kuskokwim region.

Over the past two decades, the company (now under the name Donlin Gold) has maintained a significant presence in the Kuskokwim region throughout its exploration activities and into the EIS processes. Donlin Gold has sponsored numerous local events including sled dog races, high school basketball teams, and water safety initiatives. As a result, the company logo is seemingly ubiquitous in the Kuskokwim region: on life jackets, sweatshirts, coffee mugs, gymnasium score boards, local bulletin boards, and attached to numerous cultural and sporting events. Donlin Gold has a grant program where community organizations can apply for funding to support projects in language, culture, education, and environment. The grants have been used for dance festivals, basketball camps, school textbooks, Yup'ik dictionaries for local libraries, and taking local high school students on university tours. One community member expressed that "Donlin is so normal around here."

Beyond traditional corporate social responsibility activities, current and former Donlin staff are quick to highlight that the company has integrated into the local community as a corporate neighbor. During exploration activities, staff reported that they routinely helped village elders travel between villages by providing seats on company airplanes that transported employees between the villages and the work site. The company reported that they frequently sent employees to local funerals and helped provide food for guests. During a flood in the village of Crooked Creek in 2011, Donlin staff recounted how they suspended exploration activities to set up their camp as an emergency shelter and airlifted people out of the village.

However, some stakeholders spoke critically about Donlin Gold and its employees. Some interviewees were skeptical of the company, saying “Donlin tells you what they want you to know” – believing that the company was not always fully transparent, and that the company was downplaying the project’s risks and inflating its benefits. One interviewee believed that the company was pressuring reporters at the local newspaper to write favorably about the project. Another said that the company was “buying support” of village elders and other influential people through their grant program and other corporate social responsibility initiatives. Nevertheless, many of these same critics believed that Donlin followed the laws, and that the EIS work the company conducted was thorough. One steadfast Donlin critic even said “Donlin’s plans are much better than Pebble” – referring to the highly controversial proposed copper-gold mine nearly 200 miles south.

Although Donlin has earned a relatively high level of trust in the Middle Kuskokwim region, government agencies were viewed very differently. Supporters *and* opponents of the project commonly viewed environmental regulators as political actors whose goal was to permit a mine, rather than to protect the environment or the interests of local people. People involved in the EIS process expressed frustration with the amount of turnover at the Army Corps, especially in the role of the Donlin EIS Project Manager¹⁴. Interviewees said that they had trusted some of these managers but felt that others were either untrustworthy or that they never had sufficient time to get to know the person before they left the position.

There was a persistent opinion among interviewees that people at federal regulatory agencies did not understand the Kuskokwim region, and that they were unwilling to learn. One community member said, “I don’t believe that the permitting folks understand the communities out here.” Others noted that employees of these agencies hardly ever spent more than a few hours in local communities, flying in from Anchorage prior to a public meeting or another appointment and flying back again immediately after. “You’ve already talked to us longer than anyone from the EPA [Environmental Protection Agency]” a village employee said to the current study’s lead author mid-way through a 90-minute interview. During an interview with an employee based in

¹⁴ Four different people managed the Donlin EIS for the Army Corps between 2012 and 2018. Three held the position permanently and one held the position in interim between permanent appointments.

Anchorage working on Donlin for a federal agency, the employee seemed to confirm these interviewees' concerns by saying "There is no outrage [to the mine] in the communities [of the Kuskokwim region]" – overlooking the region's non-confrontational culture and demonstrating a lack of awareness of some residents who strongly oppose the mine and feel alienated by the EIS process.

Community members and tribal employees also worried about the state agencies' role in the Donlin permitting process. Many interviewees believed that the Alaskan Department of Natural Resources and the Alaskan Department of Environmental Quality had failed to properly enforce environmental laws at mines in other parts of the state. The author of the current study does not intend to validate nor refute these claims. Interviewees believed that these agencies' ability to uphold environmental regulations was dependent upon who holds political office in the Alaska state capital of Juneau, and specifically how much money those office holders allocated to the agencies for travel to remote mining projects to conduct environmental monitoring activities.

Regarding the Donlin EIS process specifically, many stakeholders expressed a frustration that some studies conducted by the state agencies for the EIS had not been made public saying that this lack of transparency limited stakeholders' abilities to provide feedback on the project. During the lead author's field visit, community members were especially focused on a Health Impact Assessment (HIA) conducted by the Alaska Department of Health and Social Services. An Alaskan Department of Health and Social Services employee who worked on the HIA said in an interview that the HIA for Donlin and its inclusion in the EIS were robust, especially compared to other EISs this person had worked on. The person reported being pleased with how the HIA was included in the Final EIS saying "human health was at the decision-making table." Nevertheless, some project-opponents remain skeptical of the Army Corps and the Department of Health and Social Services' motives for not releasing the original HIA report and speculated in interviews that the Army Corps did not accurately represent the HIA's findings.

Compared to the Draft EIS, the page count of the Final EIS ballooned to double the size -- over 10,000 pages in total. The Draft EIS that had been released six months earlier and was the basis for the final round of public comment meetings. Some stakeholders expressed anger that they did not get to comment on the Final EIS saying that they were forced to comment on incomplete information. A local radio station summarized the sentiment on the relative size of the Final EIS

by saying “It’s massive. It would change the Kuskokwim as we know it. And you only have 30 days to read it.” (MacArthur, 2018).

2.3.5 Alaska Ballot Measure 1

Interviews for the current study suggested that overall support for building the Donlin mine was relatively high in the communities of the Middle Kuskokwim region, and there was less support for the mine in the Lower Kuskokwim region. Interviewees noted this disparity and suggested that this could be because the communities of the Middle Kuskokwim have seen greater benefits and have built stronger trust with Donlin through the company’s community engagement initiatives. It may also be that a higher percentage of residents of Middle Kuskokwim communities have worked for the company; Middle Kuskokwim residents who were current and former employees commonly expressed first-hand examples of why they trust the company. For example, one interviewee told of a small environmental spill where they observed the company management prioritizing remediation of the contamination and documenting the incident. Whatever the reason, the perception that Donlin had greater support among the most proximate Middle Kuskokwim communities, and less support in the Lower Kuskokwim, is corroborated by the state-wide election results of 2018 State Ballot Measure 1, commonly known as the “Stand for Salmon” initiative.

Ballot Measure 1 would have applied new standards of permitting to infrastructure that would affect bodies of water used by salmon and other anadromous fish species. It was also seen as a mechanism to retard mining development. Petitioning for Ballot Measure 1’s inclusion on the state-wide ballot originated in the Bristol Bay area, where many local residents were opposed to the nearby Pebble mining project. The Pebble project’s opponents quickly became the face of support for the measure. The measure’s website argued that the measure improved safeguards to protect the environment and salmon-dependent communities, specifically from “dishonest foreign mining corporations”¹⁵. The Alaskan mining and oil and gas industries campaigned strongly in opposition to the measure, claiming it was both extreme and unnecessary, and that it would make future mining and oil and gas development in the state impossible. These industries contributed

¹⁵ www.standforsalmon.org/get-the-facts

the bulk of the nearly \$12 million raised to oppose the measure, including \$1.2 million in contributions from Donlin Gold (The Midnight Sun, 2018).

When Alaskans went to the polls, Measure 1 was widely viewed as a referendum on the future of mining in Alaska. This framing was especially true in the Kuskokwim region where the Tribal Council in Bethel linked their support for Measure 1 specifically to their opposition to Donlin (Shallenberger, 2018). The vote in November 2018 closely coincided with the release of the Donlin Project’s ROD and the completion of the EIS process. For these reasons, the voting results in the Kuskokwim region may be interpreted as proxy for views on the Donlin Project at that moment in time.

Figure 2.5 shows the results of the measure among the precincts in the Lower and Middle Kuskokwim region. There is clearly more support for mining among the communities of the Middle Kuskokwim (Lower Kalskag and upriver) where only 41% of voters supported the measure. Conversely, the voters of the Lower Kuskokwim (Tuluksak and downriver) voted strongly (68%) in favor of the measure.

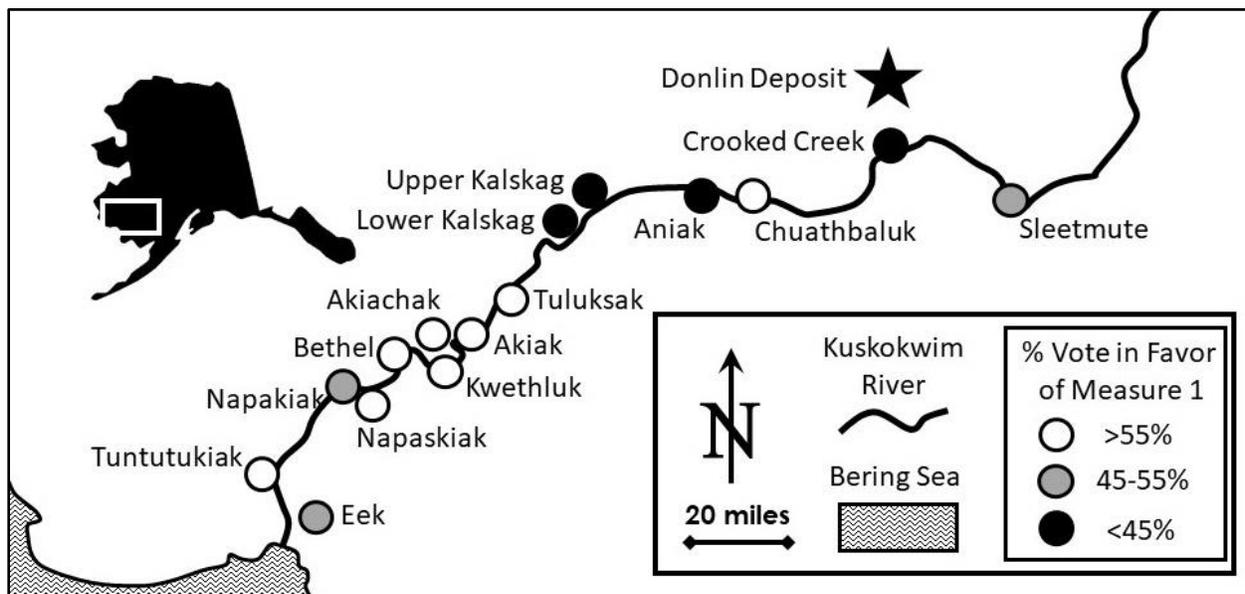


Figure 2.5: Map of the Middle and Lower Kuskokwim River precincts and the percent of voters who cast ballots in favor of 2018 State Ballot Measure 1, known as “Stand for Salmon”. The measure was widely viewed as a referendum on mining with those favoring mining voting against the measure. Note that support for the measure was strong from Tuluksak downriver, and opposition to the measure (support for mining) was stronger from Lower Kalskag and upriver.

The one outlier of this trend is the precinct of Chuathbaluk, which is located in the Middle Kuskokwim. That precinct voted strongly in favor of the measure. It is not entirely clear why Chuathbaluk's stance on Measure 1 differs from other nearby communities. Interviews from the current study hint that the tribal government's participation as a cooperating agency played a role in the village's decreased level of support for the Donlin mine. This conclusion is difficult to quantitatively verify however, as the other tribal government that contributed significantly to the EIS, Napaimute, is a seasonal village and does not have its own voting precinct. Even more ambiguous are the causal mechanisms for this condition. Did the cooperating agency role decrease the village's support for Donlin? Or, did their lack of support for Donlin motivate the village to participate as a cooperating agency? The current study cannot answer these questions.

2.4 Conclusions

Communities expressed frustrations with both how the Army Corps implemented the public comment process and how local stakeholders' feedback was integrated into the Final EIS. Much of this frustration stemmed from the tension in NEPA between 1) building the foundation for the Army Corps and Bureau of Land Management's subsequent permitting actions, and 2) NEPA's mandate to examine and disclose a broad range of environmental impacts. The later portion of the Donlin EIS was undoubtedly expansive and included many issues that cooperating agency communities and the public at-large identified as important. Yet, even though studies like the rainbow smelt survey identified possible negative impacts from the project, they did not result in enforceable design changes nor permitting requirements.

The NEPA and the EIS processes made some innovative strides toward greater stakeholder inclusion at Donlin, but still left some people feeling that their voices were not heard. The inclusion of tribal governments as cooperating agencies, for instance, was welcomed by interviewees as a positive means of stakeholder involvement, provided they had sufficient technical support to engage with the process. Cooperating agency communities that had technical support said that they felt they could push the company to better explain project alternatives, flag gaps they saw in the science, and push for more comprehensive analysis in some places. But, cooperating agency communities who lacked technical support contributed little to the process in the cooperating agency role.

The current study suggests that local stakeholders' trust of Donlin Gold, especially in the Middle Kuskokwim region, was an important part of the company's successful navigation of the NEPA process. In the years of exploration work that the company and its predecessors conducted in the area, they came to understand the dynamics of the local culture, built relationships with local people, and became integrated into the socio-economic systems of the Middle Kuskokwim region. Entering the NEPA process, company employees felt that they were able to lean on these experiences to inform both their proposed design and their engagement strategies during the EIS process. "None of the stakeholder concerns surprised us" said one company official. Officials from the company reported that they were pleased with the EIS process and its outcomes.

The Final EIS was lengthy and scientifically detailed. Many agency employees and some local stakeholders commented on the thoroughness of the scientific inquiry, especially compared to other EISs they had seen. However, that same scientific detail coupled with the seven-year timeline, and enormous page-count of the EIS also alienated many stakeholders, including some who were charged with representing their communities in the cooperating agency meetings. Every interviewee who held one of these positions complained about the report's length and the scientific writing. Even the communities that had specialized technical support felt overwhelmed by the process and were unable to comment to their own satisfaction on the wide range of subjects that required review.

Frustrations with the EIS's length and technical nature were reported even more profoundly by stakeholders who were not involved in cooperating agency meetings. Interviewees expressed difficulty distilling the EIS's conclusions to answer the question they really wanted to know: how the project was likely to affect their lives. Many of these people had engaged with Donlin Gold employees for years prior to the EIS, expressing thoughts and concerns throughout the history of the company's activities in the area. These people commonly said that they had more access to the company directly than through the EIS process and that the regulators who oversaw the process had not listened to them. They expressed frustration that they were sometimes forced to comment on the EIS based on incomplete information (such as the late-released HIA), and they desired to be more involved in the decision-making around when there was sufficient information to conclude the analysis.

In contrast to their long history of engagement with the Donlin Gold company, many local stakeholders had little or no first-hand experience with the regulatory agencies until the EIS process began. Local stakeholders expressed many negative perceptions about the Army Corps and other agencies and those agencies' implementation of the NEPA process. Many stakeholders held the opinion that the agencies exist to permit projects for companies, not to protect local stakeholders or the environment. One interviewee stated, "It's not fair that two people [The Army Corps and Donlin Gold] are going to make this choice" Another suggested that the problem was more related to agencies' lack of cultural understanding of the Yup'ik people specifically and rural Alaska in general. "[The agencies] don't understand the people out here" and "The agencies do not work well with tribes" said interviewees expressing frustration about times they felt that regulators did not listen to them or failed to understand their concerns.

Regulators clearly entered the Donlin EIS process with less local experience in the Kuskokwim region than Donlin Gold. Stakeholders' lack of trust in the regulatory agencies reflected this shortcoming. The permitting actions vs. general disclosure tension in NEPA exacerbated this problem. If agency employees had spent more time in the Kuskokwim region, they might have improved their trustworthiness in the eyes of local stakeholders. Perhaps even more importantly, the education of local stakeholders about NEPA (particularly its limitations) and the methods of engagement with local stakeholders during the process could also be improved. One Kuskokwim region resident suggested that the agencies hold workshops¹⁶ with local stakeholders so that agency employees and community members could work to understand and address environmental challenges as a team, rather than the one-way format of public comment meetings. The author believes that an approach like this deserves consideration for future EIS work.

Undoubtedly, a major mining project like Donlin will have significant and complex impacts on the environment. Detailed impact assessments are unquestionably necessary to understand and characterize the baseline environmental conditions and the potential impacts of the proposed mine. However, if the regulatory procedures and results are excessively segregated into

¹⁶ This idea has also been promoted at the embattled Pebble project as a means to improve community participation in that project's development and permitting decision processes (Holley & Mitcham, 2016).

those related to subsequent permitting and those that are not, the outcomes of the EIS risk become detached from stakeholders' concerns. As this study showed, this dichotomy can leave many stakeholders feeling that their concerns are not being taken seriously and that the conclusions of the NEPA process are illegitimate. Regulators must tailor their management of the NEPA process to maximize the EIS's rigor *and* elevate meaningful contributions from local stakeholders including local knowledge of the environment.

2.5 Acknowledgments

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We are enormously grateful.

2.6 Dedication

For Uncle Ernest Larson (1923-2019), who brought me to Alaska for the first time in 1997

CHAPTER 3: THE INDICATORS OF MINING COMPANY-STAKEHOLDER CONFLICT: A LINEAR REGRESSION APPROACH

3.1 Abstract

This study uses multiple linear regression models to identify the factors that are the best indicators of mining company-stakeholder conflict. The study examines a database of 23 mining properties which includes social and environmental indicators from an anonymous major mining company (Company X), data on company-stakeholder conflict events, and macroeconomic statistics for the countries where the properties are located. The database was used to develop 39 multiple linear regression models using a forward stepwise selection algorithm. The paper discusses the variables which showed statistical significance ($p < 0.05$) to company-stakeholder conflict in the greatest number of models. This study concludes that the following conditions have the most statistically significant relationships to conflict: past mining conflict in the subject property's region, anticipated physical and economic displacement of local stakeholders, and past conflict at the subject property itself. This study presents the model with the most explanatory power ($R^2 = 0.35$) and demonstrates how this methodology might be used to predict future company-stakeholder conflict at the Donlin Gold property in Western Alaska.

3.2 Introduction

Conflicts between mining companies and communities are increasingly common and increasingly costly (Franks, 2009). Deposits like Pebble in Alaska (Holley & Mitcham, 2016), Far South East/Lepanto in the Philippines (Stark, et al., 2006), Minas Conga in Peru (Woods, 2014), and others are slated for development by companies, but remain perpetually resisted by local and international stakeholders who see these mines as incompatible with their communities and natural environments. These conflicts can last years and cost millions of dollars to companies (Davis & Franks, 2014), host governments (Jamasmie, 2015), and mining opponents. Mining-sympathetic governments in Peru (BBC News, 2012), Myanmar (Jamasmie, 2014) and Indonesia (Michaels, 2011) have directed violence at mining opponents, killing and injuring demonstrators. Mining opponents may spend years and many thousands of dollars resisting a mining venture and suffer financial repercussions for a failed opposition (Barnsley, 2018). Stakeholder opposition to mining has become so common that mining companies like Rio Tinto; consultancies like Environmental

Resources Management, and SRK Consulting; and investment firms like Ernst and Young increasingly report that “above ground” risks now outweigh “technical” risks to the mining industry (Environmental Resources Management, 2016; Rio Tinto, 2011; Upton, 2016; Mitchell, 2019). Industry watchdog groups have labeled the current state of company-community conflict in some countries “Condition Critical” (Oxfam America, 2009).

What can mining companies do to avoid properties that have high likelihoods of company-stakeholder conflict? Which features of a mining property suggest that the property is at higher risk for conflict? This research employs multiple linear regression modeling to answer this question. Economic scholars commonly employ regression modeling because the method allows researchers to examine complex systems and isolate the effects of particular variables of interest. Using regression modeling techniques, scholars have tested countless systems including: the indicators of a country’s participation in International Monetary Fund lending programs (Conway, 1994), the effects of natural resource abundance on economic development (Sachs & Warner, 2001), and the factors that elevate a country’s risk for an outbreak of civil war (Collier & Hoeffler, 2004).

As a matter of convention, the present study uses all uppercase notation to refer to specific variables in the database (e.g. CONFLICT). Multi-word variables are linked with an underscore to indicate that they are a single variable (e.g. MINING_LEGACY). Themes and broader concepts are written in lowercase (e.g. conflict, and mining legacy). The dependent variable in this study is CONFLICT. This variable represents the mining-company stakeholder conflict that occurred at a particular mining property *after* the independent variables were recorded. This research tests which social and environmental variables are statistically significant indicators of CONFLICT.

3.2.1 Company-Stakeholder Conflict in the Literature

This section paves the way for discussions about the construction of this study’s database. In the literature discussion that follows, the present study’s relevant variables are indicated in parenthesis to show how the variables in the database connect to the literature and broader themes of environmental and social justice. There is a large body of scholarly work examining mining company-stakeholder conflicts through qualitative case studies. These studies include a wide range of mining commodities, geographic locations, and conflict scenarios. The overarching conclusion of this literature is that stakeholders resist mining when they anticipate environmental impacts they

deem as unacceptable, or when they lack sufficient representation in the mining decision making processes (Conde, 2017). And still, the individual conflict cases are as unique as the locations, communities, and companies they involve.

Mines often compete for physical space with local communities who have settled on and around the mineral deposit. Developing the mine frequently requires displacing local agricultural activities, and in some cases, entire communities (COMMUNITY_RESETTLEMENT) (Downing, 2002). Owen and Kemp (2015) showed how physical displacement of communities created risks for the affected people despite international efforts to establish norms around displaced peoples' rights to compensation, livelihood restoration, and handling of stakeholder grievances. They note that displacement was often forced (rather than voluntary) leaving affected stakeholders with little formal power to negotiate favorable returns. Terminski (2013) stated that mining resettlements can be particularly "socially inflammatory" (p. 61) when compared to other development-induced involuntary resettlements (like the construction of dams and transportation infrastructure) because mining displacement is more likely to occur in places where individual property rights are weak and displaced people are vulnerable.

Artisanal mining is a critical economic activity in rural communities of mineral resource-rich developing countries (ARTISANAL_MINING) (Hentschel, et al., 2002; Tschakert, 2009). Mining companies may displace artisanal miners to make way for large-scale mine development. When threatened with possible displacement, artisanal mining stakeholders frequently resist the activities of large-scale mining (Hilson & Yakovleva, 2007). Unlike other livelihoods like agriculture, artisanal miners frequently operate informally, and may be regarded by the state as operating illegally (Hentschel, et al., 2002; Teschner, 2013). Underpinning artisanal mining conflicts are divergent land access systems (LAND_OWNERSHIP). Unlike large-scale mining firms, informal artisanal miners typically receive permission to mine through local land-tenure systems that are unrecognized by the state, further limiting the formal paths for adequate restitution and conflict resolution (Smith, et al., 2017).

Access to water is another common theme in many mining conflicts. In arid climates, competition for fresh water can pin companies against local stakeholders (WATERSHED_SENSITIVITY). Li (2015) documented calls of "Water, yes! Gold, no!" by anti-mining protestors in Peru as they fought to stop the *Minas Conga* project that would have destroyed

four mountain lakes the protestors viewed as culturally and agriculturally important. Holley and Mitcham (2016) discussed conflict over the proposed Pebble Mine in Alaska. There, stakeholder concerns included acid mine drainage (ARD_POTENTIAL), which could potentially damage the downstream salmon fishery (Bebbington & Williams, 2008). The company initially attempted to deescalate the conflict through an independently-facilitated public dialog on the projects' environmental studies, but the process was never completed because the mining firm Anglo American withdrew from the investment saying that it wanted to focus on "lower risk projects" (Cockerham, 2013).

Mining's proximity to protected areas or sacred locations is also documented in the conflict literature (PROXIMITY_TO_PROTECTED_AREA). Akpalu and Parks (2007) discussed the case of tropical rainforests in Ghana that have religious as well as economic significance to local populations. They suggested that government taxation policies could limit conflict between mining firms and stakeholders over forest resources. Yet, they noted the current mining taxation rates in Ghana were too low to properly balance the prioritization of these resources. In the case of the Indian state of Odisha, the government had attempted to place monetary values on forests in order to prioritize some land for development and other land to be preserved for its environmental qualities. But, after local stakeholders protested planned bauxite mining in a forest they regarded as sacred, courts sided with the protestors claims, halting future mining indefinitely (Temper & Martinez-Alier, 2013).

The role of government mechanisms of power and decision-making are cited as important factors in company-stakeholders conflict (GOVERNMENT_CAPACITY). Arellano-Yaguas (2011) concluded that local governments that lacked the capacity to manage and deploy mining revenues for society's benefit exacerbated company-stakeholder conflict in Peru. Conflict can also arise when government is ineffective at securing the consent of local stakeholders for mining activities (Smith, et al., 2017). Alternatively, Costanza (2016) provided an example of how *effective* government institutions mitigated company-stakeholder conflict in rural Guatemala by establishing strong stakeholder participation mechanisms. These mechanisms led to effective use of mining revenues in local economic development projects. The problem of legitimacy is especially important in the context of mining projects on indigenous lands where international

standards mandate that companies and governments obtain free, prior, and informed consent (FPIC) from indigenous stakeholders in advance of mining (Mahanty & McDermott, 2013).

Why some stakeholders resist mining is the focus of much scholarly work, but a few studies explore the mechanisms of mining opposition through a lens of economic rationalism. Haslam and Tanimoune (2016) correlated Latin American mine site features with company-stakeholder conflict using logit modeling. Their study concluded that the drivers of conflict were linked to economic factors like the economic opportunities in local communities (GDP_PER_CAPITA), the mining firm being foreign owned or owned by a state (as opposed to locally owned), and the ineffectiveness of local institutions at serving mine-proximate communities (GOVERNMENT_CAPACITY). Work by Avic and Fernandez-Salvador (2016) in Ecuador compared the effectiveness of mining resistance movements at the Mirador and Intag projects. Their work concluded that stakeholders must have a critical mass of opposition under a unified identity to oppose mining companies. These findings suggested that stakeholders' willingness to engage in conflict may be a function of their perceptions of their economic losses and their perceived likelihood of successfully stopping the mine.

The involvement of an international non-governmental organization can increase the exposure of a company-stakeholder conflict (Urkidi, 2010). The present study includes negative publicity of a mining company by an NGO in the definition of a company-stakeholder conflict (CONFLICT_HISTORY) per the example of Davis and Franks (2014). Adyin et al (2017) used network modeling to explore why NGOs may choose to support some mining opposition movements and not others. They concluded that an NGO can increase the perception that their opposition to mining has been successful by involving a network of NGOs in their activities. They also found that NGOs may become involved in an anti-mining conflict that is perceived to be successful in order to increase the perception of their own NGO's legitimacy.

Present and future conflicts can be rooted in long-standing grievances from past conflicts (CONFLICT_HISTORY). Hilson and Yakovleva (2007) provided an example from Prestea, Ghana, where old grievances from company-stakeholder conflicts in the 1980s spurred repeated episodes of company-community conflict into the late 2000s. Li (2015) concluded that stakeholders resisted mining because companies exhibited patterns of behavior which entrench patterns of distrust. Dissatisfaction with one mining project may lead to mining opposition at other

properties (MINING_LEGACY). The mining protests at Tambogrande for example, were credited with inspiring mining opposition movements at other properties in Peru (Haarstad & Floysand, 2007).

3.2.2 Attempts to Resolve Company-Stakeholder Conflict

Scholarly work and many international watchdog groups have largely concluded that conflicts originate when mining companies disregard the concerns of local stakeholders (Jenkins, 2004; Conde, 2017) or when companies lack sufficient understanding of the complex socio-environmental spaces where they mine (Li, 2015). Mining companies have high profile corporate social responsibility programs through which companies make investments in social and economic development of local stakeholder communities. These programs invest in job training for local stakeholders, build schools and healthcare facilities, train teachers and healthcare workers, and provide start-up resources for local business (Raufflet, et al., 2014). It is not clear how effective these programs have been at reducing company-stakeholder conflict. Critics still argue that corporate social responsibility programs are driven by evolving industry norms rather than stakeholders concerns (Dashwood, 2012) or that these programs fail to address the fundamental injustices that underpin corporate relationships with local people (Owen & Kemp, 2017).

In conjunction with the efforts of individual companies, international organizations like the International Finance Corporation (IFC) and industry groups like the International Council on Mining and Metals (ICMM) have developed best practice guidelines for mining company engagement with stakeholders. The IFC's Environmental and Social Performance Standards direct companies to track how their businesses impact the following: labor, resource use efficiency, local communities, land and resettlement, biodiversity, indigenous peoples, and cultural heritage (International Finance Corporation, 2012). Formally, the Performance Standards only apply to companies in which the IFC invests, but they have nevertheless become the de facto mining industry standard for environmental and social practices. Mirroring the IFC, the ICMM has a set of guidelines and toolkits around environmental and social issues for their member companies (ICMM, 2018). Both organizations advocate that strong social and environmental performance reduces risks to companies.

Although the goals of the IFC standards and ICMM guidelines are much broader than simply reducing company-stakeholder conflict, mining companies have adopted these standards

(at least in part) with conflict-reduction goals. Major mining firms now track the IFC and ICMM-prescribed variables across their project portfolios. The anonymous mining company which supplied the social and environmental data for this study (we call Company X) is a signatory to the ICMM and internally assesses its mining properties against the IFC Performance Standards. Although the results of the present study are most directly applicable to Company X itself, the company's indicators were intentionally constructed to mirror those of internationally recognized standards, which provides an opportunity for the conclusions of this study to be applied across the industry.

3.3 Database Construction Method

This work uses a database of information from 23 projects and mines, with 19 independent variables for each property. The properties come from five continents (Africa, Asia, Australia, North America, and South America). The properties are located in developing countries (n = 11) and developed countries (n = 12). The author populated the database with information from three sources: social and environmental due diligence ratings for these properties by Company X, macroeconomic indicators from the World Bank, and a catalog of conflict events compiled by the present study's author.

3.3.1 Mining Company's Social and Environmental Due Diligence Ratings

Company X's data on social and environmental ratings were compiled as part of that company's environmental and social due diligence process. Each property is one in which Company X has an ownership stake (n = 11), or a property that Company X considered acquiring through a merger or acquisition (n = 12). Company X rated each social or environmental condition on a 0 to 4 scale, with 4 being the most favorable condition from the perspective of the company. Company X's due diligence assessments were conducted between April 2016 and April 2018.

Company X's original due diligence analysis includes six variables it categorized as environmental, and ten categorized as social. Of these, the present study's database adopts three environmental variables and six social variables. These variables are shown in Table 3.1. Three of Company X's environmental variables and two social variables were not included in the present study's database because they represented similar conditions to, and correlated strongly with, another variable that is included. For example, for the present study's variable

WATERSHED_SENSITIVITY, Company X asked the question “Is this project located in sensitive watershed such as in municipal water supply?” This question is similar to another variable in Company X’s analysis where the company asks the question “Is obtaining a water supply a risk to the project?” Since these variables correlated strongly with one another and are both assessing water resource sensitivity, the later was excluded from the present study’s analysis.

One environmental variable was not included due to a lack of statistical variation. For this variable Company X asked, “Is there a negative water balance due to low precipitation and high evaporation?” Of the 23 total projects in the database, the company gave 21 of them a rating of 4 out of 4 on this question, and the remaining three were given a 2 out of 4 rating. The author determined that this variable showed insufficient variation to provide value to this analysis.

Table 3.1: Social and environmental variables used in this study. These variables were assessed by Company X on a 0 to 4 scale as part of their environmental and social due diligence process. The Question column includes Company X’s defining question as it appears in their due diligence process. Company X’s criteria for each of these variable’s rating and their normalized rank conversion values is show in Table 3.9 in Section 3.10 Supplemental Material.

Variable	Category	Question
WATERSHED_SENSITIVITY	Environmental	Is this project located in sensitive watershed such as in municipal water supply?
ARD_POTENTIAL	Environmental	Is there ARD [Acid rock drainage] potential?
PROXIMITY_TO_PROTECTED_AREA	Environmental	Is the project located in or near a protected area? [protected forest, natural heritage area, national parks, etc.]
LAND_OWNERSHIP	Social	Who owns the property?
SOCIAL_UNREST	Social	Is there a current or historical presence of social conflict or unrest within 2 hours of the project site?
MINING_LEGACY	Social	Is there a current or historical presence of mining activities with a negative legacy/reputation within close proximity of the project site?
GOVERNMENT_CAPACITY	Social	Is there a sense of the level of local government capacity? [lower capacity governments received a lower rating]
COMMUNITY_RESETTLEMENT	Social	Will a resettlement be necessary?
ARTISANAL_MINING	Social	Is there a presence of artisanal and small-scale miners?

The author converted Company X's 0 to 4 ratings into normalized rankings. This transformation means that these indicators were analyzed relative to each other, rather than in absolute terms. This transformation also helps to avoid statistical challenges associated with using ranked categorical data (Cohen, 1988). The most favorably rated property (or properties) in an indicator category received a transformed value of 1.00, and the least favorably rated property (or properties) received a rating of 0.00. For example, if the company rated a water resources indicator at five different properties with values of 2, 3, 3, 4, 4; the analysis would rank these as 0th, 1st (tied), 1st (tied), 3rd (tied), 3rd (tied), and then transform these rankings set into the normalized values 0.00, 0.33, 0.33, 1.00, 1.00 by dividing them by the highest ranking value (3 in this example). Table 3.9 in the 3.10 Supplemental Material shows how to convert each variable to its corresponding normalized ranks.

The literature on mining company-stakeholder conflict suggests that conflict can be multivariate. To allow for this possibility in the models, the author created some simple index variables from the nine primary social and environmental variables. The ENVIRONMENTAL_INDEX captures the average magnitude of all environmental variables. The LAND_&_WATER_INDEX considers possible interdependence of water and land related stresses. The GOVERNANCE_INDEX captures the region's political stability. And, the PHYSICAL_DISPLACEMENT_INDEX considers the social and economic displacement of local stakeholders at the properties.

Table 3.2: Index variables built from the nine primary social and environmental variables.

Variable	Category	Description
LAND_&_WATER_INDEX	Social & Environmental	Index of LAND_OWNERSHIP and WATER_SENSITIVITY. An indicator of local stakeholders' overall sensitivity to environmental and land tenure changes.
ENVIRONMENTAL_INDEX	Environmental	Index of the three environmental variables: WATER_SENSITIVITY, ARD_POTENTIAL, and PROXIMITY_TO_PROTECTED_AREA. An indicator of the overall environmental conditions at the property.
GOVERNANCE_INDEX	Social	Index of GOVERNMENT_CAPACITY and SOCIAL_UNREST. An indicator of the governance conditions affecting the property.
PHYSICAL_DISPLACEMENT_INDEX	Social	Index of ARTISANAL_MINING and COMMUNITY_RESETTLEMENT. An indicator of the effect of displacement of existing activities that the development of a mine would require.

3.3.2 Conflict Events

The data for the variables CONFLICT and CONFLICT_HISTORY were generated by the present study's author. These variables are both measured in units of average number of conflict events per year. CONFLICT captures the period of time *after* Company X's due diligence analysis. CONFLICT_HISTORY captures the period of time *prior* to the environmental and social due diligence analysis. For each property, the author identified a major local newspaper and searched the archives of the paper from January 1, 2005 through October 1, 2019. The author cataloged the following types of events per the conflict definition criteria of Davis and Franks (2014) and the author's previous example (Teschner & Holley, 2019). Each event represents an event where the promotor aimed to halt or delay mining-related activities:

- 1) Procedural conflict (litigation, formal complaints to administrative bodies, or negative publicity through international non-governmental organizations [NGOs])
- 2) Physical protest (marches, strikes, or blockades)
- 3) Violence inflicted on people or property

Following the author's previous example (Teschner & Holley, 2019), and to retain consistency with Davis and Franks' (2014) conflict definitions, the author grouped temporally related actions by the same stakeholder(s). For example, if a stakeholder group held protest marches opposing a mining project and then filed a legal action against the mining project in close temporal proximity, the two activities would be recorded together as a single conflict event.

Conflict events that occurred prior to the mining company's social and environmental due diligence analysis (CONFLICT_HISTORY) would have been known to the evaluators at the time of their analysis and may have influenced their ratings. This is especially true for the variable MINING_LEGACY which consider the company-stakeholder conflict history of the region. Conflict events that occurred after the due diligence analysis (CONFLICT) could not have been known to Company X, and therefore these events serve as an effective dependent variable from which to test the indicators.

Company X's due diligence analyses were not conducted concurrently and therefore the pre- and post- due diligence time periods are of different lengths for each property. To account for

these variations, CONFLICT and CONFLICT_HISTORY are normalized by time and recorded in units of conflict events per year. For example, if the company conducted its due diligence analysis on October 1, 2016, and the news source’s first coverage of the property was October 1, 2010, then the author would divide the pre-analysis conflict events by 6.0 years and save this value as the datum for CONFLICT_HISTORY. The post-analysis conflict events would be divided by 3.0 years and saved as the property’s datum for CONFLICT. If a property had news coverage predating 2005, then January 1, 2005 was used as the earliest coverage date. The author chose 2005 as the starting point for the analysis because newspapers typically had archives dating back this far.

3.3.3 Macro-Economic Indicators

A country’s dependence on mining and oil and gas has been linked to underwhelming macroeconomic development outcomes (Davis & Tilton, 2005). Some scholars suggest that this factor contributes to social discontent with mining (Loayza, et al., 2013). The database in the present study includes three macro-economic variables. These variables control for country-wide conditions that may affect company-stakeholder conflict outcomes. Two variables are measures of the country’s economic development level (GPD_PER_CAPITA_RANK, and HDI_RANK), and the third is a measure of the host country’s dependence on mineral resources (MINERAL_EXPORTS).

Table 3.3: Macro-economic variables from the World Bank’s development indicators database (World Bank, 2019).

Variable	Category	Description
GDP_PER_CAPITA_RANK	Macro-economic	The host country’s gross domestic product (GDP) per capital rank (of 225 countries). Lower values indicate a higher GDP per capita.
HDI_RANK	Macro-economic	The host country’s rank on the Human Development Index (HDI). Lower values indicate higher levels of development.
MINERAL_EXPORTS	Macro-economic	The host country’s mineral exports a share of its total exports. Higher values indicate more export dependence on mining.

3.3.4 Data Quality

This analysis partially relies on data provided by Company X. The company compiled these data for the purpose of conducting their own internal risk analysis. The evaluation of the properties was not perfectly uniform. Properties were evaluated over a period of approximately

two years, and different people within the company evaluated different properties. Moreover, the evaluators and the company had different levels of experience with the subject properties and based their ratings on varying quantities and qualities of information. The most obvious disparity in the level of information is between properties the company owns (n = 11) versus those it considered acquiring (n = 12). Ratings for those properties the company owns were conducted by site-based staff who have detailed experience at the property and with the property's stakeholders. Ratings for potential acquisitions were conducted primarily by corporate-level staff relying on data supplied by the property's owner and from publicly available information.

Both the company's properties and potential acquisition properties are evenly distributed across developing and developed countries. The average GPD_PER_CAPITA_RANK value for company owned properties is 77.4 and the potential acquisition properties is 74.6. However for all but two variables in the database, the mean values were lower (more risk) for the potential acquisition properties than they were for the properties the company owned (the exceptions are GOVERNANCE_INDEX and GOVERNMENT_CAPACITY). Interestingly the mean values of CONFLICT for the company owned and potential acquisition properties are very similar (0.16 and 0.17 respectively), and the CONFLICT_HISTORY mean is *lower* (less conflict) for the potential acquisition properties than the owned properties (0.06 versus 0.11). These observations suggest that Company X's employees introduced a positive bias toward their own properties when rating the variables.

Of the 23 properties, eight have non-zero values for CONFLICT and six have non-zero values for CONFLICT_HISTORY. This research relied on publicly available news sources to populate these two variables. For some properties, especially those located in countries where press freedom is limited, company-stakeholder conflicts may be under reported. Reporters Without Borders produces an annual Press Freedom Index in which they rate countries on a scale of 0 to 100, with lower values representing more press freedom. The present study's database contains two properties that are in countries with 2019 Press Free Index Ratings between 35 and 55 (categorized as "bad" by the index) (Reporters Without Borders, 2019). Of these two properties, the present study's author identified conflict events at one of them, but not the other. The present study's author could not verify whether or not unreported conflict events occurred at this property nor any of the others in the database.

Finally, the database includes a wide variety of variables, but these variables are far from an exhaustive list of the impacts that mines can have on the environment and society. The omitted conditions include some that are considered important by international standards like the United Nations Sustainable Development Goals (United Nations, 2015). For example, the database is missing environmental data on air quality including emissions related to climate change, and how a mine might affect local biodiversity including endangered and threatened species. Some social conditions are also absent, including how a mine would affect human health, or gender inequality. The database also lacks variables that might *positively* influence stakeholders' perceptions of mining like the number of people employed at the property or the tax revenues that the company pays to local government.

3.4 Methods

This section discusses the statistical methods the study employs to test whether social and environmental variables are indicators of mining company-stakeholder conflict. This study uses CONFLICT as its dependent variable. This variable represents the average conflict event frequency at a property after Company X recorded the social and environmental variable values.

The author examined the Pearson's correlation coefficients (ρ) of the dependent variable CONFLICT to all independent variables (See Table 3.4)¹ to determine which variables show the strongest stand-alone relationships to CONFLICT. This study discusses the correlation coefficients' magnitudes per the example of Cohen (1988, pp. 75-108): Coefficients with absolute values less than 0.30 have a weak correlation, 0.30 to 0.50 a moderate correlation, and greater than 0.50 a strong correlation. The author also examined the p -values of all of the independent variables with respect to each other for the purpose of evaluating multicollinearity (See Table 3.10 in the 3.10 Supplemental Material).

The author employed a forward stepwise selection algorithm to identify the multiple linear regression model that best predicts CONFLICT from the suite of independent variables in the database. To avoid over-interpreting the data, the present study limits the algorithm to regression

¹ A complete table of correlation coefficients for all variables is included in the Supplemental Material at the end of this chapter.

models with two independent variables. This forward stepwise selection algorithm starts by selecting the variable with the strongest correlation to CONFLICT, in this case MINING_LEGACY, and then constructs a series of models using MINING_LEGACY and the remaining variables. The algorithm then notes the model with the largest R^2 value in this series.

The forward stepwise selection process can fail to identify the most predictive model when the variable with the strongest ρ -value to the dependent variable is not contained in the most predictive model. To guard against this possibility, the author employed this same algorithm five additional times, each time forcing the algorithm to start with the next strongest CONFLICT corollary. In addition to MINING_LEGACY ($\rho = -0.48$), these variables are: HDI_RANK (0.46), PHYSICAL_DISPLACEMENT_INDEX (-0.44), CONFLICT_HISTORY (0.44), ARTISANAL_MINING (-0.43), and GDP_PER_CAPITA_RANK (0.42) (See Table 3.4).

Independent variables that are multicollinear should not be placed into the same linear regression models. This study considers independent variables with correlations greater than or equal to absolute values of 0.30 as multicollinear (Cohen, 1988, pp. 75-108). After models with multicollinear variables were excluded, the algorithm produced a total of 39 unique models from which to choose the most predictive model. A full table of these models, including their R^2 values and statistically significant variables is shown in Table 3.11 in Section 3.10 Supplemental Material.

Finally, the author demonstrates the possibilities for this modeling approach by applying the study's most predictive model to the case of the Donlin property in Western Alaska. Donlin is a large gold deposit currently in the advanced stages of permitting. The author worked with Company X to rate Donlin for each of the variables used in this study using the same method that the company used in its due diligence analysis. Donlin is an interesting case for this demonstration because the site has a documented history dating back over a decade, yet the first (and only documented conflict event to date) occurred in 2018. This demonstration shows how the risk of conflict changed when this conflict event occurred.

Table 3.4: Pearson’s correlation coefficients (ρ) of independent variables with the dependent variable CONFLICT.

Indicator	Category	ρ with CONFLICT
MINING_LEGACY	Social	-0.48
HDI_RANK	Macro-Economic	0.46
PHYSICAL_DISPLACEMENT_INDEX	Social	-0.44
CONFLICT_HISTORY	Social	0.44
ARTISANAL_MINING	Social	-0.43
GDP_PER_CAPITA_RANK	Macro-Economic	0.42
COMMUNITY_RESETTLEMENT	Social	-0.38
GOVERNANCE_INDEX	Social	-0.36
GOVERNMENT_CAPACITY	Social	-0.34
SOCIAL_UNREST	Social	-0.29
LAND_OWNERSHIP	Social	0.13
ARD_POTENTIAL	Environmental	0.10
PROXIMITY_TO_PROTECTED_AREA	Environmental	0.10
MINERAL_EXPORTS	Macro-Economic	0.08
ENVIRONMENTAL_INDEX	Environmental	0.07
LAND_&_WATER_INDEX	Social & Environmental	0.06
WATERSHED_SENSITIVITY	Environmental	-0.03

3.5 Results and Discussion

This section presents the results of multiple linear regression models and the variables that are the best indicators of CONFLICT. The study found that variables measuring past conflict, and the mine’s predicted physical and economic displacement of local stakeholders are the most statistically significant indicators of future company-stakeholder conflict. The study also found that the environmental variables in this study were not good indicators of future conflict. The following section discusses how these variables manifested in the study’s models.

3.5.1 Regression Models

The most predictive model ($R^2 = 0.35$) comprises the independent variables that rate the region’s mining legacy (MINING_LEGACY) and the past conflict frequency at the subject mining property (CONFLICT_HISTORY). In this model, MINING_LEGACY is significant at the 95% confidence level and CONFLICT_HISTORY is significant at the 90% confidence level (Table

3.5). This model suggests that the best indicators of future conflict are past instances of conflict at the subject property itself *and* from other nearby properties. It makes sense that these two variables form the most predictive model because they directly measure past conflict between mining companies and stakeholders in and around the subject property. All the other variables in this study are one step removed from conflict itself, and instead measure particular issues that may or may not create strain in those relationships.

Although this model only explains about a third of the variation in CONFLICT, the relationship between MINING_LEGACY and the model's constant is compelling; the values are both approximately 0.30. Since the maximum possible value of MINING_LEGACY is 1.00, the model suggests that a property in a region with a highly positive mining legacy (a value of 1.00) will have a future conflict-frequency that is almost entirely dependent on the conflict history at the property itself. These coefficients also mean that the most favorably rated possibility (MINING_LEGACY = 1.00 and CONFLICT_HISTORY = 0.00) will have a predicted CONFLICT value of 0.01 (an average of one conflict every 100 years). Intuitively this makes sense; no mining property has a zero chance of conflict and the least conflict-prone mining properties should have expected conflict values that are very small but not negative.

Table 3.5: Multiple regression for CONFLICT using MINING_LEGACY and CONFLICT_HISTORY as independent variables.

<i>Multiple Regression for CONFLICT</i>	Multiple R	R-Square	Adjusted R-square	Std. Err. of Estimate	Rows Ignored	Outliers
<i>Summary</i>	0.59	0.35	0.29	0.23	0.00	0.00
<i>Regression Table</i>	Coefficient	Standard Error	t-Value	p-Value	Confidence Interval 95%	
					Lower	Upper
Constant	0.31	0.11	2.89	0.01	0.09	0.54
MINING_LEGACY	-0.30	0.13	-2.21	0.04	-0.58	-0.02
CONFLICT_HISTORY	0.57	0.29	1.93	0.07	-0.04	1.18

The algorithm identified two other models with R^2 values greater than 0.30. The first model used CONFLICT_HISTORY and PHYSICAL_DISPLACEMENT_INDEX ($R^2 = 0.32$), and the second used CONFLICT_HISTORY and ARTISANAL_MINING ($R^2 = 0.32$) (See Table 3.6 and

Table 3.7). Both PHYSICAL_DISPLACEMENT_INDEX and ARTISANAL_MINING correlate strongly with MINING_LEGACY ($\rho = 0.64$, and 0.67 respectively), suggesting that these three variables are capturing much of the same variation as MINING_LEGACY. Yet, these two models are less compelling than the model in Table 3.5 due to their slightly lower R^2 values, and because the independent variables are only significant at the 90% level. Their lower predictive power is likely due to the fact that the PHYSICAL_DISPLACEMENT_INDEX and ARTISANAL_MINING variables are measuring highly contentious issues, but are one step removed from measuring conflict itself. Nevertheless, these two models highlight the importance of the variable CONFLICT_HISTORY as a CONFLICT predictor. For a complete list of all 39 models run for this study, their statistically significant variables, and their R^2 values, see Table 3.11 in 3.10 Supplemental Material.

Table 3.6: Multiple regression for CONFLICT using PHYSICAL_DISPLACEMENT_INDEX and CONFLICT_HISTORY as independent variables.

<i>Multiple Regression for CONFLICT</i>	Multiple R	R-Square	Adjusted R-square	Std. Err. of Estimate	Rows Ignored	Outliers
<i>Summary</i>						
	0.56	0.32	0.25	0.23	0.00	0.00
	Coefficient	Standard Error	t-Value	p-Value	Confidence Interval 95%	
<i>Regression Table</i>					Lower	Upper
Constant	0.36	0.14	2.50	0.02	0.06	0.65
PHYSICAL_DISPLACEMENT_INDEX	-0.30	0.16	-1.91	0.07	-0.63	0.03
CONFLICT_HISTORY	0.57	0.30	1.90	0.07	-0.06	1.20

Table 3.7: Multiple regression for CONFLICT using ARTISANAL_MINING and CONFLICT_HISTORY as independent variables.

<i>Multiple Regression for CONFLICT</i>	Multiple R	R-Square	Adjusted R-square	Std. Err. of Estimate	Rows Ignored	Outliers
<i>Summary</i>						
	0.56	0.32	0.25	0.23	0.00	0.00
	Coefficient	Standard Error	t-Value	p-Value	Confidence Interval 95%	
<i>Regression Table</i>					Lower	Upper
Constant	0.30	0.11	2.62	0.02	0.06	0.54
ARTISANAL_MINING	-0.25	0.13	-1.94	0.07	-0.52	0.02
CONFLICT_HISTORY	0.60	0.30	2.01	0.06	-0.02	1.22

3.5.2 Correlations and Statistical Significance

This study found that conflict history variables and variables that represent a mine's anticipated physical and economic displacement are the best indicators of future company-stakeholder conflict. This study found only two regression models where an environmental variable was a statistically significant indicator of CONFLICT. PROXIMITY_TO_PROTECTED_AREA is significant at the 90% confidence level when paired with GDP_PER_CAPITA_RANK ($R^2 = 0.29$) or when paired with HDI_RANK ($R^2 = 0.24$). These results can be compared to social variables like MINING_LEGACY that is significant at the 95% confidence level in six models, PHYSICAL_DISPLACEMENT_INDEX (95% in four models), and ARTISANAL MINING (95% in six models). Some macro-economic variables also outperformed environmental variables as indicators of CONFLICT. HDI_RANK is significant at the 95% confidence level in six models, and GDP_PER_CAPITA_RANK is significant at the 95% confidence level in four models (and 90% level in two additional models). These findings suggest that a property's environmental impacts are poor indicators of mining company-stakeholder conflict, especially compared to that property's social variables, or even compared to some macroeconomic variables that reflect country-wide economic development conditions.

3.6 Applying the Model: The Case of the Donlin Gold Project

This section demonstrates how this modeling method can be applied to a particular mining property for the purpose of predicting future company-stakeholder conflict. This section applies the regression model in Table 3.5 to the Donlin Gold project in Western Alaska. The Donlin Gold project is a proposed open pit mine approximately 280 miles west of Anchorage. Donlin Gold, LLC, the project's owner, has proposed to produce one million ounces of gold per year over a mine life of 27 years (U.S. Army Corps of Engineers, 2018). The company completed their Environmental Impact Statement and received a favorable Record of Decision from the Army Corps of Engineers and Bureau of Land Management in August 2018. At the time of this research, the project was in the advanced permitting stage.

The presents study's author worked with Company X to rate Donlin for the variables used in this study using the same 0 to 4 rating methodology the company employed in its due diligence analysis. These values and their corresponding normalized ranks are shown in

Table 3.8. Donlin has news coverage dating back over a decade (11.2 years). Donlin has had only one company-stakeholder conflict event in that recorded history. In 2018, around the time of the Record of Decision, a group of Alaskan Native tribes filed a lawsuit against the Alaska Department of Natural Resources and held anti-Donlin marches claiming that they were not properly consulted during the Environmental Impact Statement process (Shallenberger, 2018; Associated Press, 2019). These values result in a CONFLICT_HISTORY of 0.09.

Company X’s rating method gave Donlin a rating of 2 for the region’s mining legacy. This was because of the property’s relative proximity to the embattled Pebble project located approximately 200 miles to the south. Conflict between the Pebble Limited Partnership and local stakeholders has made Pebble one of the most controversial mining properties in the world (Snyder, 2014). The rating of 2 in the mining legacy category places Donlin in the riskiest third of the database by this metric (MINING_LEGACY = 0.33).

Table 3.8: Data for the Donlin property, Western Alaska. The “Due Diligence Rating / Units” column shows the values of the source data. The “Value for the Model” column shows the transformed values that are input into the model.

Variable	Due Diligence Rating / Units	Value for Model
MINING_LEGACY	2	0.33
HDI_RANK	rank of 188	8
PHYSICAL_DISPLACEMENT_INDEX	index	1.00
CONFLICT_HISTORY	events/year	0.09
ARTISANAL_MINING	4	1.00
GDP_PER_CAPITA_RANK	rank of 220	13
COMMUNITY_RESETTLEMENT	4	1.00
GOVERNANCE_INDEX	index	0.84
GOVERNMENT_CAPACITY	3	0.67
SOCIAL_UNREST	4	1.00
LAND_OWNERSHIP	3	0.25
ARD_POTENTIAL	3	0.36
PROXIMITY_TO_PROTECTED_AREA	2	0.20
MINERAL_EXPORTS	% of exports	0.03
ENVIRONMENTAL_INDEX	index	0.19
LAND_&_WATER_INDEX	index	0.13
WATERSHED_SENSITIVITY	2	0.00

3.6.1 Regression Modeling

The regression model in Table 3.5 is applied to the Donlin case. This model predicts the relationship to future conflict shown in Equation 1:

$$[1] \quad \text{CONFLICT} = -0.30 * \text{MINING_LEGACY} + 0.57 * \text{CONFLICT_HISTORY} + 0.31$$

When the values for Donlin ($\text{MINING_LEGACY} = 0.33$, and $\text{CONFLICT_HISTORY} = 0.09$) are applied to this equation, the model predicts a CONFLICT value of 0.26, or an average of approximately one conflict every 4 years.

The 2018 conflict event shows that there is some direct stakeholder opposition to Donlin. Employing this model again, the author considers how the prediction would change if 1) the conflict had never occurred or 2) if there had been twice as many conflicts in the same period. To consider these possibilities the author re-ran the Donlin model using a CONFLICT_HISTORY values of 0.00 and 0.18. These values resulted in CONFLICT values of 0.21 and 0.31 conflicts per year respectively.

The model is only explaining about a third of the variation in CONFLICT. Therefore, these results should be taken with some caution. However, this model takes an important step toward quantifying company-community conflict likelihood and quantitative inputs for subsequent decision-making tools. One of these tools is Teschner and Holley's decision tree model which uses conflict likelihood as an input to estimate the impacts of conflict on a mining project's cash flow (Teschner & Holley, 2019). That decision-tree model is explained in detail in Chapter 4.

3.7 Interpretations and Conclusions

This study found that a mining property's conflict history and the conflict history of other properties in the region are the best indicators of mining company-stakeholder conflict. Other variables that showed statistically significant relationships to conflict are those that measure the mine's physical displacement of communities and proximity of artisanal mining. For the purposes of comparing mining properties' susceptibility to company-stakeholder conflict, these variables are the most useful.

Environmental variables showed little statistical significance to conflict. This finding is initially surprising considering that so many company-stakeholder conflicts seem to center on

environmental issues. Yet, further examination of the variables in the database may explain this inconsistency. The environmental variables capture very specific site conditions. `ARD_POTENTIAL`, for example captures whether the rocks in the mine are likely to generate acid rock drainage. Similarly, `PROXIMITY_TO_PROTECTED_AREA` captures the physical distance of the mining property from a protected natural space. Neither of these variables capture how people feel about these conditions, or if they are comfortable with the company's plans to mitigate the risks. The data contained in these variables do not represent any mitigation measures, nor whether stakeholders consider these issues an important concern. Alternatively, this study's high-performing variables like `CONFLICT_HISTORY` and `ARTISANAL_MINING` directly measure the relationship between the company and stakeholders or how those stakeholders will be affected by mining company actions. Underlying these higher performing variables are nuanced narratives about people's relationships to mining, governments, the environment, and each other. These stories already include elements of stakeholders' perspectives and priorities concerning the environment as well as how their culture, and economic livelihoods connect to a mine's environmental impacts.

The specific characteristics of mining's negative environmental impacts are highly varied across mining methods, commodity types, and geographic locations. Even more varied are how these environmental impacts affect the unique social and economic conditions around each mining property. It is likely that the present study's database is simply too small to capture this variety and level of nuance. Therefore, this study is inconclusive about whether environmental conditions may be used as conflict indicators. The findings suggest that evaluators should consider environmental conditions within a mining property's specific socio-economic context, particularly how negative environmental conditions might impact local stakeholders economic and livelihood activities.

The locations of communities and the presence of artisanal miners in a country almost always predate the arrival of a large-scale mining company. The findings of the present study that community resettlement and physical displacement are the strongest indicators of conflict support the conclusions of other scholars who found that displacing people and their livelihood activities leave stakeholders in a vulnerable position (Owen & Kemp, 2015). Particularly when these displacements are involuntary, displaced people may have few options to have their voices heard

and advocate for their positions. This study does not include specific data on displacement of agriculture or other livelihood activities. However, the importance of all of the livelihood-related variables in this database suggests that agriculture displacement may be a good indicator of conflict as well.

The macroeconomic indicators that had strong relationships to conflict suggest that less developed countries have higher likelihoods of conflict. Less-developed countries tend to have weaker institutions to protect mining stakeholders or incorporate their views into decision-making processes. Scholarship on the resource curse suggests that natural resource-dependent countries underperform in terms of economic growth (Ross, 1999). Countries with weak institutions are also less effective at transforming mining revenues into benefits for these stakeholders (Arellano-Yanguas, 2011). These authors suggest that mining stakeholders in less developed countries are either more aggrieved by mining than stakeholders in more developed countries; or they have fewer non-conflict mechanisms by which to raise their concerns to the company and/or government. This finding may also be caused by company-stakeholder conflict leading to poorer macroeconomic outcomes for the host countries. Company-stakeholder conflict, especially conflicts that result in project delays, could spook potential investors, prompting them to invest in other locations.

This study's most predictive model included the region's mining legacy and the conflict history at a subject property. It may be tempting for these users to elevate the importance of these two variables at the expense of other variables in this study that were poorer performers. The author cautions against this oversimplification. Unlike the rest of the variables in this dataset, MINING_LEGACY and CONFLICT_HISTORY measure the same conditions as the dependent variable, CONFLICT (i.e. instances of conflict). Therefore, these two values already capture a complex set of conditions that resulted in conflict or mitigated conflict. Intrinsicly embedded in each CONFLICT_HISTORY and MINING_LEGACY datum are stories of environmental conditions, stakeholders' livelihoods, politics, mining company (mis)behavior, unique personalities, personal relationships, and numerous other factors – all sitting over a macroeconomic backdrop. All these factors lead to that property's particular conflict outcome. The fact that this study found that the best indicators of future conflict are the conflicts of the past may simply be pointing us toward what we already know: understanding the drivers of any mining

company-stakeholder conflict are complex; each country, company, community, and mining property is unique; and attempting to generalize their origins should be done with extreme humility.

3.8 Acknowledgments

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We are enormously grateful.

3.9 Dedication

For my children, Alan and May. I am hopeful that the minerals your generation needs will be produced more cleanly, and less contentiously than those we mine today. --BT

3.10 Supplemental Material

Table 3.9: List of variables, sources, and conversions from categorical data to normalized ranks. A value of NA in the "Units / Normalized Rank Conversion" column indicates that the database contains no variables with this value. [1/3 continued on next pages]

Variable	Category	Description / Question	Source	Units / Normalized Rank Conversion
Socio-Environmental Variables (Ranked on a 0-4 scale by the company and then converted to normalized ranks for analysis in the present study)				
WATERSHED_SENSITIVITY	Environmental	Is this project located in sensitive watershed such as in municipal water supply? No - 4; Yes, low-medium risk - 3; Yes, medium-high risk - 2; Yes, high risk - 1; Yes, Extreme risk - 0	Mining company's due diligence analysis	No (4): 1.00 Yes, low-med risk (3): 0.40 Yes, med-high risk (2): 0.00 Yes, high risk (1): NA Yes, extreme risk (0): NA
ARD_POTENTIAL	Environmental	Is there ARD [Acid rock drainage] potential? No - 4; Yes, low-medium risk - 3; Yes, medium-high risk - 2; Yes, high risk - 1; Yes, Extreme risk - 0	Mining company's due diligence analysis	No (4): 1.00 Yes, low-med risk (3): 0.36 Yes, med-high risk (2): 0.09 Yes, high risk (1): 0.00 Yes, extreme risk (0): NA
PROXIMITY_TO_PROTECTED_AREA	Environmental	Is the project located in or near a protected area? No - 4; Yes, low-medium risk - 3; Yes, medium-high risk - 2; Yes, high risk - 1; Yes, Extreme risk - 0	Mining company's due diligence analysis	No (4): 1.00 Yes, low-med risk (3): 0.60 Yes, med-high risk (2): 0.20 Yes, high risk (1): 0.00 Yes, extreme risk (0): NA
LAND_OWNERSHIP	Social	Who owns the property? Company or project - 4; Government or private - 3; [Undefined] - 2; Communal - 1; Unclear or overlapping tenure - 0	Mining company's due diligence analysis	Company/Project (4): 1.00 Government/Private (3): 0.25 [Undefined] (2): NA Communal (1): NA Unclear/Overlapping (0): 0.00
SOCIAL_UNREST	Social	Is there a current or historical presence of social conflict or unrest within 2 hours of the project site? No - 4; Yes, low-medium risk - 3; Yes, medium-high risk - 2; Yes, high risk - 1; Yes, Extreme risk - 0	Mining company's due diligence analysis	No (4): 1.00 Yes, low-med risk (3): 0.27 Yes, med-high risk (2): 0.09 Yes, high risk (1): NA Yes, extreme risk (0): 0.00

Table 3.9 [2/3 continued]

MINING_LEGACY	Social	Is there a current or historical presence of mining activities with a negative legacy/reputation within close proximity of the project site? No - 4; Yes, low-medium risk - 3; Yes, medium-high risk - 2; Yes, high risk - 1; Yes, Extreme risk - 0	Mining company's due diligence analysis	No (4): 1.00 Yes, low-med risk (3): 0.58 Yes, med-high risk (2): 0.33 Yes, high risk (1): 0.18 Yes, extreme risk (0): 0.00
GOVERNMENT_CAPACITY	Social	Is there a sense of the level of local government capacity? High capacity - 4; Medium-high capacity - 3; [Undefined] - 2; Low-medium capacity - 1; Low capacity - 0	Mining company's due diligence analysis	High capacity (4): 1.00 Med-high capacity (3): 0.67 [Undefined] (2): NA Low-med capacity (1): 0.58 Low capacity (0): 0.00
COMMUNITY_RESETTLEMENT	Social	Will a resettlement be necessary? No resettlement required - 4; Fewer than 50 households - 3; [Undefined] - 2; Fewer than 100 households - 1; More than 100 households - 0	Mining company's due diligence analysis	No resettlement (4): 1.00 <50 households (3): 0.25 [Undefined] (2): NA <100 households (1): NA >100 households (0): 0.00
ARTISANAL_MINING	Social	Is there a presence of artisanal and small-scale miners? Not present - 4; In the country - 3; [Undefined] - 2; Within 2-hours - 1; On the property - 0	Mining company's due diligence analysis	Not present (4): 1.00 In the country (3): 0.88 [Undefined] (2): NA Within 2-hours: 0.25 On the property (0): 0.00
LAND_&_WATER_INDEX	Social& Environmental	An indicator of local stakeholders' sensitivity to environmental changes. Lower values represent more environmentally sensitive stakeholders.	Compiled from company generated variables	Mean of the LAND_OWNERSHIP, and WATER_SENSITIVITY normalized ranks.
ENVIRONMENTAL_INDEX	Environmental	An indicator of the overall environmental conditions at the property. Lower values represent higher risk environmental conditions from the mining company's perspective.	Compiled from company generated variables	Mean of the WATER_SENSITIVITY, ARD_POTENTIAL, and PROXIMITY_TO_PROTECTED_AREA normalized ranks.

Table 3.9 [3/3 continued]

GOVERNANCE_INDEX	Social	An indicator of the overall social and governance conditions affecting the property. Lower values represent poorer social and governance conditions.	Compiled from company generated variables	Mean of the GOVERNMENT_CAPACITY, and SOCIAL_UNREST normalized ranks.
PHYSICAL_DISPLACEMENT_INDEX	Social	An indicator of the overall displacement of existing activities that the development of a mine would require. Lower values represent more displacement.	Compiled from company generated variables	Mean of the COMMUNITY_RESETTLEMENT, and ARTISANAL_MINING percentiles.
Conflict Event Variables				
CONFLICT	Conflict	Number of conflicts per year that occurred after the property's data of analysis	Generated from publicly available news stories by the current study's author	Units of Conflicts / Year
CONFLICT_HISTORY	Conflict	Number of conflicts per year that occurred before the property's data of analysis	Generated from publicly available news stories by the current study's author	Units of Conflicts / Year
Macroeconomic Variables				
GDP_PER_CAPITA_RANK	Macro-economic	The host country's gross domestic product (GDP) per capital rank (of 225 states). Lower values indicate a higher GDP per capita.	World Bank	Units of GDP per capita rank
HDI_RANK	Macro-economic	The host country's rank on the Human Development Index (HDI). Lower values indicate higher levels of development.	World Bank	Units of HDI rank
MINERAL_EXPORTS	Macro-economic	The host country's mineral exports a share of its total exports. Higher values indicate more export dependence on mining.	World Bank	Units of %

Table 3.10: Pearson's correlation coefficients (ρ) for all variables in this study. [1/3 continued on next pages]

	GDP_PER_CAPITA_RANK	MINERAL_EXPORTS	HDI_RANK	WATERSHED_SENSITIVITY	LAND_OWNERSHIP	LAND_&_WATER_INDEX	
GDP_PER_CAPITA_RANK	1.00	-0.23	0.99	0.03	-0.33	-0.16	...
MINERAL_EXPORTS	-0.23	1.00	-0.26	0.24	0.23	0.27	...
HDI_RANK	0.99	-0.26	1.00	0.04	-0.32	-0.15	...
WATERSHED_SENSITIVITY	0.03	0.24	0.04	1.00	0.54	0.88	...
LAND_OWNERSHIP	-0.33	0.23	-0.32	0.54	1.00	0.87	...
LAND_&_WATER_INDEX	-0.16	0.27	-0.15	0.88	0.87	1.00	...
ARD_POTENTIAL	-0.01	0.42	-0.01	0.47	0.34	0.46	...
PROXIMITY_TO_PROTECTED_AREA	-0.17	0.24	-0.15	0.23	0.63	0.49	...
ENVIRONMENTAL_INDEX	-0.06	0.40	-0.05	0.78	0.70	0.84	...
SOCIAL_UNREST	-0.69	0.17	-0.68	0.04	0.27	0.17	...
GOVERNMENT_CAPACITY	-0.87	0.03	-0.88	-0.10	0.11	0.00	...
GOVERNANCE_INDEX	-0.88	0.11	-0.88	-0.04	0.21	0.10	...
COMMUNITY_RESETTLEMENT	-0.62	0.33	-0.62	0.16	0.47	0.35	...
ARTISANAL_MINING	-0.80	0.40	-0.85	0.00	0.28	0.16	...
PHYSICAL_DISPLACEMENT_INDEX	-0.78	0.40	-0.81	0.08	0.40	0.27	...
MINING_LEGACY	-0.61	-0.02	-0.66	0.24	0.41	0.37	...
CONFLICT_HISTORY	0.37	-0.15	0.34	-0.28	-0.11	-0.22	...

Table 3.10 [2/3 continued]

		ARD_POTENTIAL	PROXIMITY_TO _PROTECTED _AREA	ENVIRONMENTAL _INDEX	SOCIAL_UNREST	GOVERNMENT _CAPACITY	
GDP_PER_CAPITA_RANK	...	-0.01	-0.17	-0.06	-0.69	-0.87	...
MINERAL_EXPORTS	...	0.42	0.24	0.40	0.17	0.03	...
HDI_RANK	...	-0.01	-0.15	-0.05	-0.68	-0.88	...
WATERSHED_SENSITIVITY	...	0.47	0.23	0.78	0.04	-0.10	...
LAND_OWNERSHIP	...	0.34	0.63	0.70	0.27	0.11	...
LAND_&_WATER_INDEX	...	0.46	0.49	0.84	0.17	0.00	...
ARD_POTENTIAL	...	1.00	0.38	0.75	0.24	-0.16	...
PROXIMITY_TO _PROTECTED_AREA	...	0.38	1.00	0.72	0.27	-0.11	...
ENVIRONMENTAL_INDEX	...	0.75	0.72	1.00	0.23	-0.15	...
SOCIAL_UNREST	...	0.24	0.27	0.23	1.00	0.54	...
GOVERNMENT_CAPACITY	...	-0.16	-0.11	-0.15	0.54	1.00	...
GOVERNANCE_INDEX	...	0.04	0.09	0.03	0.87	0.89	...
COMMUNITY _RESETTLEMENT	...	0.16	0.24	0.25	0.50	0.30	...
ARTISANAL_MINING	...	0.04	0.10	0.06	0.52	0.64	...
PHYSICAL_DISPLACEMENT_INDEX	...	0.10	0.18	0.16	0.55	0.53	...
MINING_LEGACY	...	0.16	0.18	0.26	0.59	0.55	...
CONFLICT_HISTORY	...	-0.14	0.26	-0.06	-0.26	-0.45	...

Table 3.10 [3/3 continued]

		GOVERNANCE _INDEX	COMMUNITY _RESETTLEMENT	ARTISANAL _MINING	PHYSICAL _DISPLACEMENT _INDEX	MINING_LEGACY	CONFLICT _HISTORY
GDP_PER_CAPITA_RANK	...	-0.88	-0.62	-0.80	-0.78	-0.61	0.37
MINERAL_EXPORTS	...	0.11	0.33	0.40	0.40	-0.02	-0.15
HDI_RANK	...	-0.88	-0.62	-0.85	-0.81	-0.66	0.34
WATERSHED_SENSITIVITY	...	-0.04	0.16	0.00	0.08	0.24	-0.28
LAND_OWNERSHIP	...	0.21	0.47	0.28	0.40	0.41	-0.11
LAND_&_WATER_INDEX	...	0.10	0.35	0.16	0.27	0.37	-0.22
ARD_POTENTIAL	...	0.04	0.16	0.04	0.10	0.16	-0.14
PROXIMITY_TO _PROTECTED_AREA	...	0.09	0.24	0.10	0.18	0.18	0.26
ENVIRONMENTAL_INDEX	...	0.03	0.25	0.06	0.16	0.26	-0.06
SOCIAL_UNREST	...	0.87	0.50	0.52	0.55	0.59	-0.26
GOVERNMENT_CAPACITY	...	0.89	0.30	0.64	0.53	0.55	-0.45
GOVERNANCE_INDEX	...	1.00	0.45	0.66	0.62	0.65	-0.41
COMMUNITY _RESETTLEMENT	...	0.45	1.00	0.68	0.90	0.49	-0.23
ARTISANAL_MINING	...	0.66	0.68	1.00	0.93	0.67	-0.17
PHYSICAL_DISPLACEMENT_INDEX	...	0.62	0.90	0.93	1.00	0.64	-0.22
MINING_LEGACY	...	0.65	0.49	0.67	0.64	1.00	-0.20
CONFLICT_HISTORY	...	-0.41	-0.23	-0.17	-0.22	-0.20	1.00

Table 3.11: Table of regressions run for this study. Values in parentheses indicate the model's R² value. ** indicates that the variable is significant at the 95% level. * indicates that the variable is significant at the 90% level. [1/2 continued on next page]

REGRESSION SERIES	MINING_LEGACY	HDI_RANK	PHYSICAL_DISPLACEMENT_INDEX
MINING_LEGACY			
HDI_RANK			
PHYSICAL_DISPLACEMENT_INDEX			
CONFLICT_HISTORY	(0.35) MINING_LEGACY** CONFLICT_HISTORY*		(0.32) PHYSICAL_DISPLACEMENT_INDEX* CONFLICT_HISTORY*
ARTISANAL_MINING			...
GDP_PER_CAPITA_RANK			...
COMMUNITY_RESETTLEMENT			...
GOVERNANCE_INDEX			...
GOVERNMENT_CAPACITY			...
SOCIAL_UNREST			...
LAND_OWNERSHIP			...
ARD_POTENTIAL	(0.26) MINING_LEGACY** ARD_POTENTIAL	(0.24) HDI_RANK** ARD_POTENTIAL	(0.21) PHYSICAL_DISPLACEMENT_INDEX** ARD_POTENTIAL
PROXIMITY_TO_PROTECTED_AREA	(0.27) MINING_LEGACY** PROXIMITY_TO_PROTECTED_AREA	(0.32) HDI_RANK** PROXIMITY_TO_PROTECTED_AREA*	(0.23) PHYSICAL_DISPLACEMENT_INDEX** PROXIMITY_TO_PROTECTED_AREA
MINERAL_EXPORTS	(0.22) MINING_LEGACY** MINERAL_EXPORTS	(0.25) HDI_RANK** MINERAL_EXPORTS	...
ENVIRONMENTAL_INDEX	(0.27) MINING_LEGACY** ENVIRONMENTAL_INDEX	(0.26) HDI_RANK** ENVIRONMENTAL_INDEX	(0.21) PHYSICAL_DISPLACEMENT_INDEX** ENVIRONMENTAL_INDEX
LAND_&_WATER_INDEX		(0.25) HDI_RANK** LAND_&_WATER_INDEX	(0.23) PHYSICAL_DISPLACEMENT_INDEX** LAND_&_WATER_INDEX
WATERSHED_SENSITIVITY	(0.24) MINING_LEGACY** WATERSHED_SENSITIVITY	(0.21) HDI_RANK** WATERSHED_SENSITIVITY	(0.19) PHYSICAL_DISPLACEMENT_INDEX* WATERSHED_SENSITIVITY

Table 3.11 [2/2 continued]

REGRESSION SERIES		CONFLICT_HISTORY	ARTISANAL_MINING	GDP_PER_CAPITA_RANK
MINING_LEGACY				
HDI_RANK				
PHYSICAL_DISPLACEMENT_INDEX				
CONFLICT_HISTORY				
ARTISANAL_MINING	...	(0.32) CONFLICT_HISTORY* ARTISANAL_MINING*		
GDP_PER_CAPITA_RANK	...			
COMMUNITY_RESETTLEMENT	...	(0.27) CONFLICT_HISTORY* COMMUNITY_RESETTLEMENT		
GOVERNANCE_INDEX	...			
GOVERNMENT_CAPACITY	...			
SOCIAL_UNREST	...	(0.22) CONFLICT_HISTORY* SOCIAL_UNREST		
LAND_OWNERSHIP	...	(0.22) CONFLICT_HISTORY** LAND_OWNERSHIP	(0.25) ARTISANAL_MINING** LAND_OWNERSHIP	
ARD_POTENTIAL	...	(0.22) CONFLICT_HISTORY** ARD_POTENTIAL	(0.20) ARTISANAL_MINING** ARD_POTENTIAL	(0.21) GDP_PER_CAPITA_RANK* ARD_POTENTIAL
PROXIMITY_TO_PROTECTED_AREA	...	(0.19) CONFLICT_HISTORY** PROXIMITY_TO_PROTECTED_AREA	(0.20) ARTISANAL_MINING** PROXIMITY_TO_PROTECTED_AREA	(0.29) GDP_PER_CAPITA_RANK** PROXIMITY_TO_PROTECTED_AREA*
MINERAL_EXPORTS	...	(0.24) CONFLICT_HISTORY** MINERAL_EXPORTS		(0.21) GDP_PER_CAPITA_RANK** MINERAL_EXPORTS
ENVIRONMENTAL_INDEX	...	(0.20) CONFLICT_HISTORY** ENVIRONMENTAL_INDEX	(0.19) ARTISANAL_MINING** ENVIRONMENTAL_INDEX	(0.23) GDP_PER_CAPITA_RANK** ENVIRONMENTAL_INDEX
LAND_&_WATER_INDEX	...	(0.22) CONFLICT_HISTORY** LAND_&_WATER_INDEX	(0.20) ARTISANAL_MINING** LAND_&_WATER_INDEX	(0.22) GDP_PER_CAPITA_RANK** LAND_&_WATER_INDEX
WATERSHED_SENSITIVITY	...	(0.20) CONFLICT_HISTORY** WATERSHED_SENSITIVITY	(0.18) ARTISANAL_MINING** WATERSHED_SENSITIVITY	(0.17) GDP_PER_CAPITA_RANK* WATERSHED_SENSITIVITY

CHAPTER 4: THE COST OF MINE SUSPENSION FROM SOCIAL CONFLICT: A DECISION-TREE MODEL

A paper published in the *Journal Resources Policy*¹

Benjamin Teschner^{2,3}, and Elizabeth Holley

4.1 Abstract

This paper presents a method which incorporates the risk associated with project suspension from social conflict into a mining project's net present value (NPV). The model applies a series of decision trees to a project's discounted cash flow (DCF) allowing for the chance of project suspension from a company-community conflict event. The model determines a social-risk-adjusted NPV for the project based on the likelihood of project suspension and the potential loss of future opportunity. This paper applies the model to a generic mining cash flow using two different approaches to estimating the project's likelihood of suspension and compares the efficacy of each method. The paper then applies the model to the proposed Pebble Project in Southwestern Alaska. The work concludes that after the risks associated with stakeholder opposition are accounted for, the NPV of the Pebble Project drops from approximately \$6 billion to \$1.1 billion. The model translates stakeholder concerns and priorities into potential financial consequences for investors, thereby demonstrating the business case for incorporating stakeholder positions into mine design and planning.

4.2 Introduction

Social conflicts between mining companies and stakeholders increasingly account for delay or complete stoppage of mining projects, and lasting frustrations in stakeholder communities (Okoh, 2014; Woods, 2014; Jamasmie, 2015). In the late 1990s, many mining companies began to recognize that stakeholders had the ability to grant or withhold a mining project's social license to

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operate (SLO) (Thomson & Boutilier, 2011). Since then, the industry has increasingly focused on the effects of mining development on local communities and the role stakeholders play in defining the success or failure of a mining venture (Humphreys, 2000; Cambell & Roberts, 2010; Dashwood, 2012; Prno, 2013). The SLO is so critical that some mining companies and consultancies report that social and “above ground” risks vastly outweigh technical risks to mining projects (Rio Tinto, 2011; Environmental Resources Management, 2016; Upton, 2016; Mitchell, 2019). These conditions necessitate the development of new approaches that incorporate the social conditions of a mine site into the mine planning and valuation process.

This paper presents a decision-tree model which translates stakeholders’ concerns and priorities into an estimate of monetary risk to the investors. The model incorporates the risk associated with project suspension from social conflict into a mining project’s valuation. The model considers the possibility that stakeholders may revoke the company’s SLO at any stage of the mining lifecycle. The model then applies a series of decision trees to the project’s cash flow to translate this possibility into financial risk. The method determines a social conflict risk-adjusted net present value (NPV) for the project based on the likelihood of forced social conflict-induced project suspension and the potential loss of future opportunity for the investor.

By accounting for the potential financial consequences of developing a mining venture in a confrontational or community-inclusive environment, the model highlights the importance of stakeholders’ priorities and perspectives in determining a mining venture’s success or failure. At the project level, an investor can employ this model to determine: the risk-neutral cost of suspension from social conflict; the risk neutral value and timing of conflict within project stages (exploration, feasibility, construction, operation, and closure); and, if applied to multiple projects, the value and timing of social risk across the investment portfolio.

Although this model does not inform a company or stakeholders *how* to manage social risks at a mining property, the results can be used to inform a development decision and, should the project move forward, the results can be used to plan investment in stakeholder engagement programs. The current prevailing approach to social risk management in the mining industry is corporate social responsibility (CSR); social and environmental efforts that move beyond the standards of legal compliance (Dashwood, 2012). Other scholars have connected CSR to an “insurance effect” on a company’s share price when they experience negative legal or regulator

actions (Godfrey, et al., 2009). The model proposed in this paper suggests that financial value at the project-level can be similarly improved by reducing the chance of company-community conflict; for example, by employing stakeholder engagement programs and beyond-compliance efforts which address stakeholders' concerns.

The relationship between a company and stakeholders develops early in the project lifecycle when stakeholders begin to assess the legitimacy of the company and potential acceptance of the mining project (Boutelier & Thomson, 2011; Thomson & Boutilier, 2011). Accordingly, guidance documents from organizations including the International Finance Corporation (IFC) (2007), and International Council on Mining and Metals (ICMM) (2012) recommend that companies and stakeholders pursue meaningful engagement early in the project. The model proposed in this paper quantitatively demonstrates the impact of stakeholder influence early in the mining lifecycle, providing project-level justification for these recommendations.

4.2.1 Accounting for Social Risks

The mining industry's current convention to accounting for increased social risk is to apply a higher development 'hurdle rate' to a project, thereby increasing the predicted profitability required to trigger development (Davis, 2001; Perrott-Humphrey, 2011, p. 70). Even if the risk could be accurately captured in the hurdle rate increase, this approach relies on two assumptions: The first is that social risks behave incrementally (i.e., that the risk may result in increased costs or decreased revenue by a certain percentage, but does not terminate the project outright); and the second assumption is that the risk is constant over the life of the project. Scholars have questioned both of these assumptions when analyzing social and other non-technical risks in mining projects (Cambell & Roberts, 2010; Trench, et al., 2014).

Economic scholars have long recognized the inadequacies of the traditional discounted cash flow (DCF) approach for under- or over-valued projects when compared to the project's risks (Black & Scholes, 1973; Gentry & O'Neil, 1984; Dixit, 2001; Schwartz & Trigeorgis, 2001). From the perspective of the model in this paper, the most pertinent alternative to DCF method is Espinoza and Morris's (2013) approach which decouples the discount rate from the project risks by accounting for risk as an annual insurance cost, a method they called decoupled net present value (DNPV). Espinoza and Rojo (2015) later showed how this method can be applied to the valuation of solar energy project, and Shimbar and Ebrahimi (2017) used it in their analysis of an

oil and gas investment. As exemplified by these applied examples, the DNPV approach relies heavily on the ability to quantify a risk in dollar values either by having an insurance market for the risk, or by connecting these risks directly to particular public policy changes that would affect the revenues and/or costs to the investment.

Perhaps the most widely cited study on the cost of social conflict in mining is the work of Davis and Franks (2014) who determined that social conflict cost a large mine \$20 million per week. This estimate stresses the importance and scale of mining's social risks, but is too granular to inform decisions at an individual mine or project. Conversely, the International Finance Corporation's (IFC) Financial Valuation Tool (commonly called the FV Tool) attempts to use site-specific criteria but relies on a subjective assessment of both social risks and the potential effects of mitigation activities (International Finance Corporation, 2017). For example, the tool asks the user to input an individual risk such as "lawsuits" and quantify the potential costs of the risk's outcome, as well as the individual's perception of the company's ability to control the risk's outcomes in a percentage. The tool is overly reliant on the company's perception of what stakeholders value and their own effectiveness at CSR programs in order to quantify their social investments (Lukic, et al., 2011).

The method presented in this paper aims to make the accounting of social risk less subjective by incorporating quantitative likelihoods of conflict-induced suspension⁴. The approach presented in this paper allows technical experts to examine the factors that may contribute to a project's suspension without being forced to consider the financial effects at the same time. This method allows these experts to employ the tools that they have already developed to determine levels of community acceptance (Prno, 2013; Que & Awuah-Offei, 2014), and then apply these to predict their financial effects on the future of the project.

4.3 Structure of the Model

A conventional DCF model assumes that a mine will operate continuously from the start of construction through its designed mine life and into closure. The traditional approach predicts

⁴ This model does not account for the costs associated with shorter-term delays from company-community conflict. These types of delays are beyond the scope of this model but can also represent significant costs to investors.

a single NPV for the project based on that designed life. The model proposed here builds upon the DCF model by recognizing that operating through the entire mine life is not a given, but that there is a chance in any year that stakeholders could choose to revoke the company's social license to operate and force the mine's suspension. Therefore, instead of limiting the model to a single end-of-mine-life NPV, the model calculates a unique NPV for a scenario in which that year is the end of the mine's life. Each value represents a possible outcome that the cash flow is interrupted prior to its designed completion, rendering any future investment and/or return impossible. The model calculates the risk cost of these possible premature suspensions based on the likelihood of each outcome and the corresponding loss of future opportunity. This cost can be subtracted from the DCF-determined NPV to determine a social-risk adjusted NPV for the project as a whole.

4.3.1 Model Assumptions

The model assumes that if a project is suspended, no more money needs to be spent, and no additional revenues can be recovered. This means that costs associated with closure should be captured in the DCF model as a development cost (such as the posting of a reclamation bond). It also means that the costs associated with abandonment of a project are assumed to be zero, and that if the project had to be suspended, it has no remaining value in salvage or as a saleable asset. If these values are not zero, then they should be added to the model in each year's decision value.

This paper adheres to mining industry convention with respect to the notation of project years. Year one (Y_1) is defined as the first year of production. Prior years included in the model are expressed as values less than one. For example, construction may be Y_0 and feasibility Y_{-1} . These numeric values are used in the example cash flow in section 3.0 and the application of the model to the Pebble Project in section 4.0. In the generic case described in section 2.2, the paper uses Y_A and Y_Z as the first and last year of analysis, respectively. This generic notation intends to highlight that the modeler may begin and end an analysis at any point in the project lifecycle, from exploration through the final years of production.

4.3.2 Model Formulation

The model calculates a series of NPV values for each project year defined by equation 1, where V_x is the NPV of the mine if it was forced to suspend at the end of year x , f_{NPV} is the NPV function (discounted at the cost of capital) and C_x is the cash flow for year x in units of currency.

The model stores these possible project outcome values as results if the venture was forced to suspend at the end of year x . These values assume that all costs for that year have been spent and all revenues for that year have been recovered at the moment of suspension.

$$[1] \quad V_x = f_{NPV}(C_A, \dots, C_{-1}, C_0, C_1, \dots, C_Z)$$

The model constructs a decision tree from the project's cash flow. In each year, the project may suspend or continue operations (Figure 4.1). When a venture reaches each project year, the chance that a social conflict event will force it to suspend in that year is defined as P_x . The social conflict risk-adjusted value of the project at any point is therefore the weighted average of all future project outcomes.

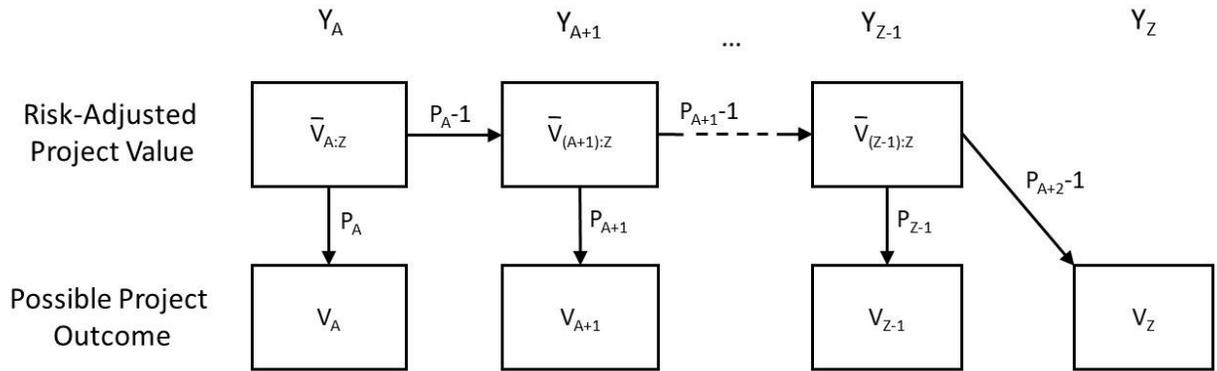


Figure 4.1: Decision tree for the proposed model showing the project's possible outcomes (V) and the risk-adjusted project value at each decision point (weighted average of all future V values). Each column represents a project year (Y).

The likelihood that the project advances through project year x (defined as Q_x) is the product of the likelihood of the venture reaching that project year, and the likelihood that it will not be suspended in that year. These values can be calculated using Equation 2. The likelihood that the project reaches its full designed life (Q_Z) is calculated using Equation 3. As the project advances through time, past decision points are removed from the calculation and the Q_x values increase accordingly.

$$[2] \quad Q_x = Q_{x-1}(1 - P_x)$$

$$[3] \quad Q_Z = 1 - \sum_{i=A}^{Z-1} Q_i$$

Using these values, the modeler can calculate the likelihood that an operation would be suspended in a given future year (S_x) by taking the product of the likelihood that a project reaches that year, and the likelihood that it will be suspended in that same year (Equation 4). Therefore, the sum of all S_x values represents the likelihood that the project will be forced into suspension due to social conflict at some point during the period of analysis.

$$[4] \quad S_x = Q_x P_x$$

With these values, the model calculates the risk associated with social-conflict-induced suspension. In any given year x , the social-conflict-suspension risk (R_x) is defined as the amount of risk that is reduced by the project advancing from year x to year $x+1$ (Equation 5). The sum of all future R_x values (R_{total}) represents the total social-conflict-induced-suspension risk in the project (Equation 6). This R_{total} value can be thought of as the ‘risk cost’ associated with the social conflict conditions at the project. It is equivalent to the conventional, DCF NPV (or V_z) less the social conflict risk-adjusted NPV.

$$[5] \quad R_x = \frac{\sum_{i=x+1}^Z V_i S_i}{\sum_{i=x+1}^Z S_i} - \frac{\sum_{i=x}^Z V_i S_i}{\sum_{i=x}^Z S_i}$$

$$[6] \quad R_{total} = \sum_{i=A}^Z R_i$$

4.4 Application to a Simplified Case

This section applies the model to a simplified project cash flow shown in Table 4.1. This cash flow supposes a mining venture that has recently completed its pre-feasibility analysis; investors are considering whether to advance the project further. The pre-feasibility study estimates that a complete feasibility study and permitting would cost \$25 million, and construction costs would be \$300 million. The mine would have a six-year life with net revenue of \$100 million in each year of production. The study’s conventional DCF analysis determines that the property has an NPV of \$275 million (undiscounted) and an Internal Rate of Return (IRR) of 20%.

Table 4.1: Generic project model showing cash flow (C_x) values and associated NPV outcomes (V_x) for each project year (Y_x). The V_x values are undiscounted for the purposes of illustrating the model's effects.

Year: (Y)	-1	0	1	2	3	4	5	6
Stage:	Feas	Cons	Oper	Oper	Oper	Oper	Oper	Oper
Cash Flow: C_x	(\$25)	(\$300)	\$100	\$100	\$100	\$100	\$100	\$100
NPV if Suspended: V_x	(\$25)	(\$325)	(\$225)	(\$125)	(\$25)	\$75	\$175	\$275

The obvious challenge with this modeling method is assigning values for P_x . Similar to Espinoza and Morris's (2013) decoupled NPV approach, the method proposed in this paper requires that the estimation of critical risk-quantifying parameters (P_x and its subsets) be done by technical experts in the socio-economic factors of mining projects. Clearly, there is substantial opportunity for additional research on the methods of transforming easily measurable project variables into conflict and project-suspension likelihoods. These challenges notwithstanding, a strength of this model is that places the expertise of the social specialists alongside that of engineers, geologists, metallurgists, and other technical professionals whose calculations and assumptions have long formed the foundation for a mining project's valuation.

The following sections discuss two potential approaches for estimating P_x , the literature supporting these different approaches, and application of each approach to the simplified project model.

4.4.1 Approach 1: Suspension Likelihood as a Function of Project Stage

Previous studies suggest that company-community conflict risks are significantly higher in the early stages of a mining venture, particularly during the feasibility (including permitting), and construction stages (Davis & Franks, 2014; International Finance Corporation, 2014; Trench, et al., 2014). These studies suggest that P_x values should be higher during feasibility and construction than they are during operations. Davis and Franks (2014) provide some clues to the relative magnitude of these changes in their study on the cost associated with company-community

conflict. Their work examined 50 cases of prolonged company-community conflict⁵ and noted both the mines' stage and whether the company had been forced to suspend or abandon mining-related activities due to the social conflict (See Table 4.2).

The suspension likelihood is probably higher at the early stages because these the most physical change occurs in these periods, and stakeholders have the greatest number of formal mechanisms to challenge a company's plans to develop the mine. Qualitative studies show some examples of these mechanisms. At the Polymet project in Minnesota, stakeholders sued the U.S. Fish and Wildlife Service and the state's Department of Natural Resources challenging their environmental impact conclusions during the project's feasibility and permitting stage (Karnowski, 2018; Phadke, 2018). At Minas Conga in Peru, the materialization of environmental impacts during the construction stage resulted in community protests, forcing Newmont to suspend construction activities (Woods, 2014, pp. 654-680).

Trench et al. (2014) observe that unlike technical risks, which gradually decrease over the life of the mine, non-technical risks are relatively low in exploration, spike in feasibility and construction, then steadily decline as the project moves to production. Pierre Lassonde, former CEO of Newmont, noted a precipitous drop in junior companies' share prices as their project advances to feasibility. He attributed this drop to the notion that the feasibility study frequently sheds light on the project's specific risks and complications – noting that “reality sets in” (Lassonde, 1994). Although Lassonde did not specifically identify social risk, many of the complications modern feasibility studies identify fall into this category. Lassonde observes that the company's value does not fully recover until production, when the project has shown it can overcome its unique challenges.

⁵ Davis and Franks' 'prolonged conflicts' are not rigidly defined, but include least one of the following types of activities when conducted with the goal of disrupting mining activities: Procedural conflict (litigation, formal complaints to administrative bodies, or negative publicity through international non-governmental organizations); physical protest (marches, strikes, or blockades); violence to property (private or publicly owned); and/or violence to persons (resulting in injury or death).

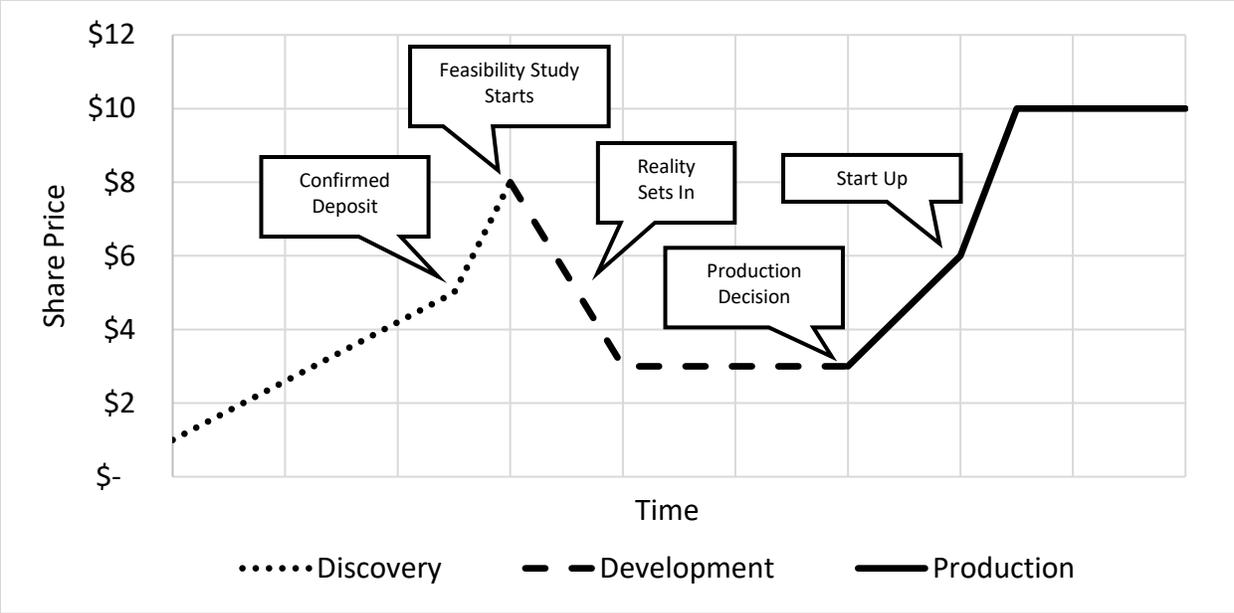


Figure 4.2: The “Lassonde Curve” showing a generalized plot of a junior mining company's share price over time. All the annotations in the original figure, with the exception of the "Feasibility Study Starts" box which was added per Lassonde's discussion of the figure in the text (Lassonde, 1994, p. 134).

Table 4.2: Chances of suspension or abandonment of a mining property if a major company-community conflict event occurs. The statistics are adapted from Davis and Franks (2014) showing the number of cases (n) they examined in each stage and the percent of conflicts in that stage that resulted in suspension. Davis and Franks identify two different forced-stoppage outcomes they call ‘suspension’ and ‘abandonment.’ For the purposes of the work in this paper these two outcomes have been combined and labeled ‘suspension.’

Mining Stage When A Major Conflict Occurs	Result of Conflict	
	Not Suspended	Suspended (P _s)
Exploration (n = 3)	67%	33%
Feasibility & Pre-Feasibility (n = 9)	22%	78%
Construction (n = 9)	56%	44%
Operations (n = 23)	91%	9%
Expansion (n = 5)	80%	20%
Closure (n = 1)	100%	0%

If the modeler accepts the relatively high suspension likelihoods in the early stages, Davis and Franks’ numbers comprise one half of the P_x value. Because Davis and Franks only examined cases where company-community conflict was occurring, their values represent the likelihood of suspension *if* a company-community conflict occurs in a particular project stage (P_s). To complete

the P_x value, the modeler must determine the likelihood that conflict will occur in the first place (P_c) and take the product of the two sub-variables to determine P_x (See Equation 7). A modeler may determine a P_c value for their case by examining the conflict history of the site in question. If there is little data or only a short project history, the modeler may examine the conflict histories from other mines and projects in the region to estimate this value.

$$[7] \quad P_x = P_c P_s$$

Using this approach, the modeler can then apply a uniform P_c value across the project life to account for the project's specific social risk environment. Since conflict events between companies and communities are significantly more frequent than outright suspensions (International Council on Mining and Metals, 2015), this approach has the added advantage that representative P_c data for the subject site may be easier to obtain. Indeed, company-community conflict events are usually considered "material information" with respect to the mining company's valuation on major stock exchanges, so these events are typically recorded in the company's public records. Alternatively, local and international media outlets commonly report company-community conflicts, providing another record of the quantity and timing of conflict events. Determining a useful P_c value may be as simple as adding up these events and dividing by the period of time analyzed.

Figure 4.3 shows the risk by project year for P_c values of 0.045, 0.225, and 0.450. These values correspond to average P_x values of 0.01, 0.05, and 0.10 respectively over the life of the example project. The risk in feasibility is lower than construction because the opportunities for losses are relatively low, even though the likelihood of suspension is relatively high. If the project is forced into suspension during feasibility, the investors only lose the relatively small investment that they made in the feasibility study. However, once the project proceeds to construction, the mine's development costs are sunk, and the only means of recovering these costs are through the future production of the mine. Even though the likelihood of suspension during construction is about half that of feasibility, the consequences of losing the enormous construction investment prior to any revenue recovery make the risk in this stage extremely high.

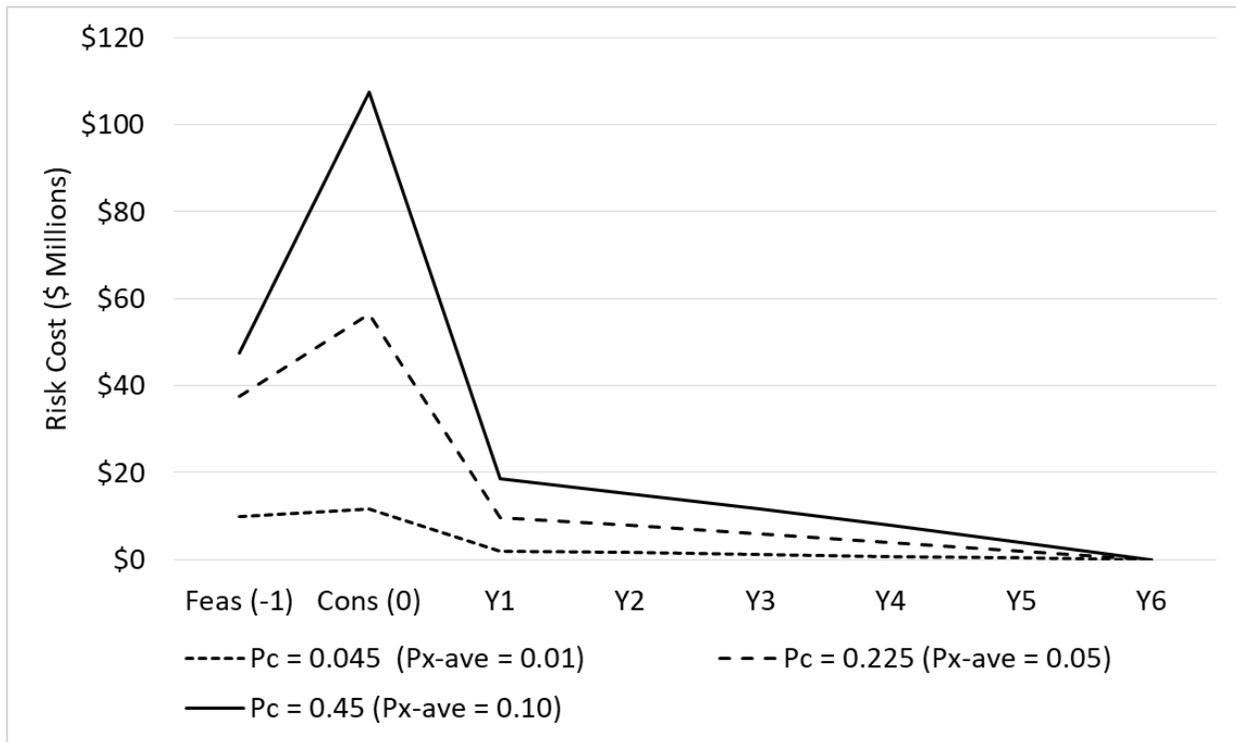


Figure 4.3: Risk cost by stage for P_x values calculated using P_s values from Davis and Frank’s (2014) project-suspensions by stage statistics (shown in Table 4.2). P_c values were chosen such that the mean P_x value (P_{x-ave}) for each iteration corresponds with those in Figure 4.4

4.4.2 Approach 2: Uniform Suspension Likelihood

Davis and Franks’ statistics on conflict-induced suspensions by stage represent a relatively small number of cases, and their report cautions that their “case analysis does not purport to reflect the circumstances of the entire extractive sector” (Davis & Franks, 2014, p. 16). Therefore, there may be situations in which application of a uniform P_x value over the project’s life is more appropriate than the stage-dependent P_x presented in Approach 1. A uniform P_x value is especially appropriate if the period of analysis represents only a single project stage (such as operations) where year-to-year conditions and social impacts are relatively consistent. To apply this approach, the modeler must generate P_x from quantification of social-conflict-induced suspensions at other similar properties.

Figure 4.4 shows the risk by project year for P_x values of 0.01, 0.05, and 0.10. Note that compared to the stage-dependent P_x approach, this method returns lower risk values in feasibility and construction, but maintains relatively high risk as the project moves to operations. These conditions result in a more aggressive valuation (NPV is higher) because it reduces the magnitude

of the risk spike associated with investment in construction. Despite the constant likelihood of suspension, the risk still increases significantly for all P_x values when the project moves from feasibility to construction due to the sudden injection of sunk capital costs.

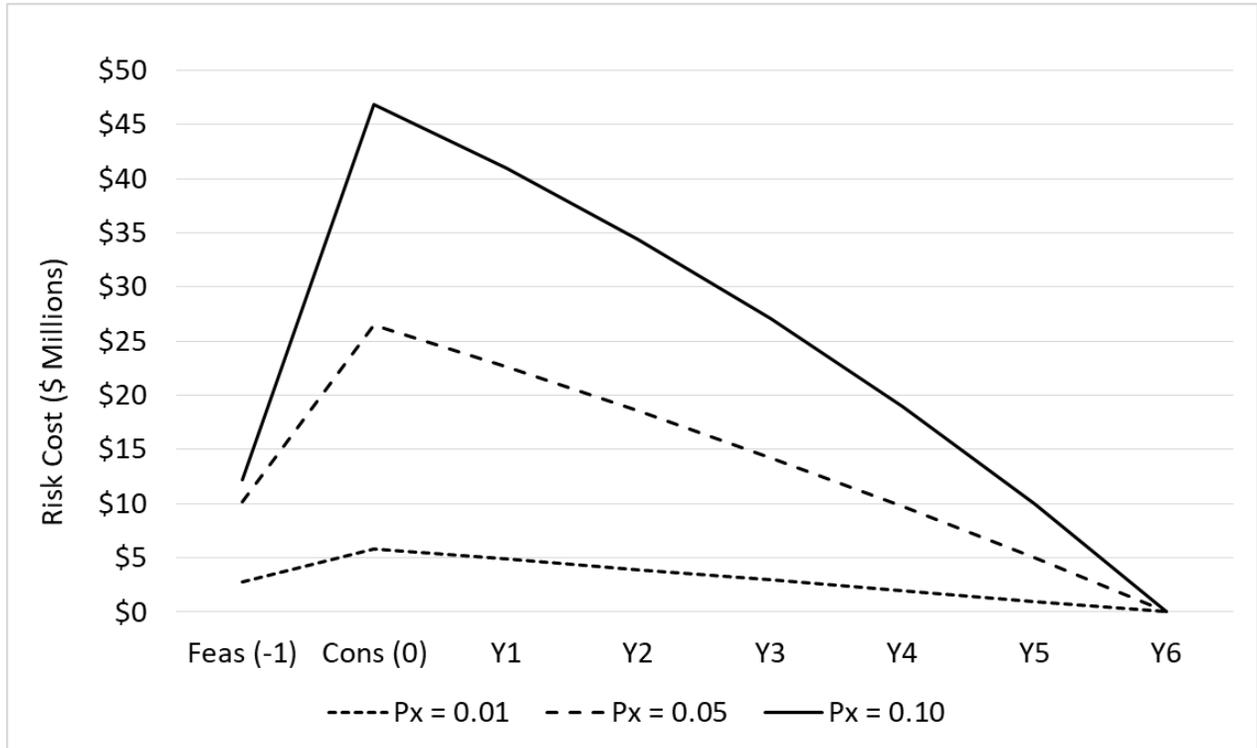


Figure 4.4: Risk cost by stage for P_x values of 0.01, 0.05 and 0.10. For this approach, a uniform P_x is selected for the entire life of the venture.

4.4.3 Cases of Extreme P_x Values

The examples shown in Figure 4.3 and Figure 4.4 demonstrate that risks in all stages increase as the likelihood of suspension increases. However, this condition only holds true in cases of low to moderate suspension likelihood (P_x) values. In cases of extremely high P_x values, the model produces a unique condition with respect to the feasibility stage (regardless of which approach the modeler takes to estimating P_x). The risk in a given year is defined as the amount that the total project risk *decreases* by advancing the project through that year. As P_x increases for a given project, the amount of risk in feasibility reaches a peak and then begins to decline, eventually becoming negative for cases of extremely high P_x (See Figure 4.5). The model suggests that in cases where company-community conflict potential is exceptionally high as indicated by feasibility risk becoming negative, the total project risk can *increase* by advancing the project. The

reason for this oddity is that the high P_x creates positive value in feasibility by allowing the project the opportunity to suspend when consequences are relatively low, so that the project never reaches the very high risk construction stage when the consequences of suspension would be extremely high.

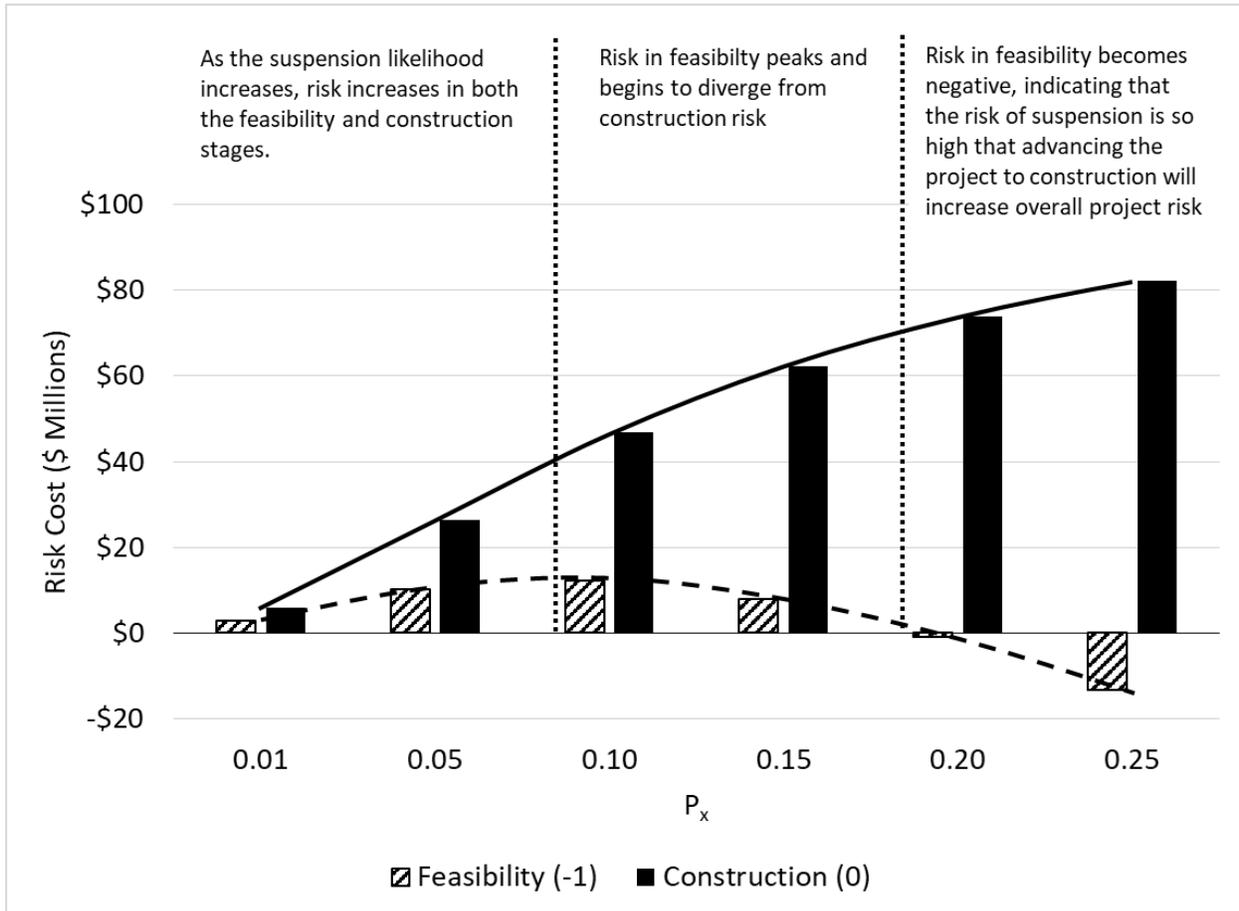


Figure 4.5: Risk in feasibility and construction stages for the uniform P_x example case. Note that the risk in construction increases as P_x increases. The risk in feasibility reaches a peak at an approximate P_x value of 0.10 and then becomes negative for P_x values of 0.20 and greater.

In the extremely high risk cases (P_x values on the right side of Figure 4.5), the model suggests that the risk-averse investor should exit the project prior to construction, even if that exit comes at a cost, because the risk-adjusted NPV will be *lower* if such a socially controversial project moves ahead. One example of a company paying to exit a highly controversial project is the Mount Emmons Project, near Crested Butte, Colorado. In 2013, U.S. Energy initiated the permitting process for a plan to mine 17-20 million pounds of molybdenum per year for 33 years (CNBC,

2013). Local stakeholders had opposed mining activities at Mount Emmons since the 1970s arguing that mine development conflicts with the outdoor recreation and tourism activities that drive the local economy (Blevins, 2016). Freeport McMoRan took over the property in 2016. Only three years after the permitting process was initiated, the company signed a memorandum of understanding with the U.S. Forest Service and local and state governments agreeing to cease mineral exploration and mine development activities at the property and pay \$2 million for the continued operation of a facility that treats acidic water from historic mine workings (Crested Butte News, 2016). Mount Emmons had been called “the longest running mine battle in the West” (Blevins, 2016) and the likelihood of continued stakeholder opposition was extremely high. Therefore, exiting the project at the cost of \$2 million was preferable to attempting to advance such a controversial mining venture any further.

4.5 Application of the Model to the Pebble Project, Southwest Alaska

This section applies the model to the Pebble Project in Southwestern Alaska, using the stage-dependent P_x estimation approach. Pebble is a large porphyry copper-gold-molybdenum deposit at the headwaters of the Bristol Bay salmon fishery, about 200 miles southwest of Anchorage. Stakeholders have been concerned about the proposed mine’s environmental effects on the downstream salmon fishery and whether this risk is worth the potential economic benefits to the community (Holley & Mitcham, 2016). From 2007 to 2013, the project was under consideration for development by the Pebble Limited Partnership, a 50:50 partnership between the Canadian junior company Northern Dynasty Minerals Limited, and the major mining company Anglo American PLC. The project’s 2011 feasibility study proposed a 45-year mine life, in which an average of 84 million tons of ore would be processed per year. Using the company’s projections of long-term metal prices and a discount rate of 7%, the feasibility study concluded that the project had a pre-tax NPV of about \$6 billion and an IRR of 14% (Northern Dynasty Minerals, 2011). At the time of the present study, the project remains undeveloped.

The model constructed here uses only data that would have been known to the market at the time that the 2011 feasibility study was released, including the projected cash flow from that study, and company-community conflict events that occurred in 2011 or prior. All of the data used in the present analysis were reported in the public realm. The model uses Northern Dynasty Minerals’ projected cash flows from the 2011 study to calculate V_x values. For this case study, the

model uses the company's "45-year Reference Case" cash flow, which is the more conservative of the two 45-year cases they offer in the report. The model returns similar results for the company's more project-favorable "Prevailing Metal Prices" cash flow, so these results are not shown.

To simplify the case slightly, the model only analyzes the first ten years of the project life: four years of construction activities, and the first six years of production. The model assumes that if the mine reaches production year six (Y_6) without being suspended, then it will complete its designed 45-year life. This simplification allows the modeler to avoid over-extrapolating the P_x values generated from data in the early 2000s into the 2040s or beyond. The simplification therefore accepts the diminishing influence of distant discounted cash flows.

4.5.1 Estimating P_c

The model applies the stage-dependent approach to P_x , using Davis and Franks' statistics for P_s and an estimated P_c value of 0.38. In order to estimate P_c , major conflict events were identified in news archives from the Anchorage Daily News, which is a major newspaper in Alaska. The newspaper began covering the Pebble Project consistently in 2004 when Northern Dynasty announced that it would be advancing the project to the feasibility stage. Based on the newspaper articles published on the project from 2004 through 2011 (the year the feasibility study was completed), the modelers identified three distinct stakeholder-led efforts to halt the Pebble Project (Table 4.3). The events shown in Table 4.3 fall into Davis and Frank's category of procedural conflict, specifically: litigation, and formal complaints to administrative bodies. Discretion is required when deciding which events should be counted as significant and how different sub-events should be grouped. In this case, the P_c of 0.38 was calculated by dividing three major company-community conflict events by the eight-year period prior to the release of the feasibility study.

Table 4.3: Major company-community conflict events at the Pebble Project from 2004 to 2011.

Conflict Event	Description	Time Period
Statewide Ballot Measure 4	Bristol Bay residents successfully petitioned for a state-wide ballot measure increasing the standards that new large-scale mines must meet when discharging water into potential drinking water sources and salmon habitat. The measure was defeated by state-wide voters (Bluemink, 2007; 2008a; 2008b).	The petition for the ballot measure was submitted in Juneau in April 2007 and Alaskans voted on the initiative in November 2008. A number of sub-events associated with the measure occurred between these dates*.
Native Corporations Sue State Regulators	Nine Alaskan Native Village Corporations sued the state of Alaska claiming that the Department of Natural Resources had issued exploration permits at Pebble without properly seeking public input. State judges eventually ruled against the Native Corporations (Bluemink, 2009; 2010).	The suit was filed in July 2009 and went to trial in December 2010.
Lake and Peninsula Borough 'Save Our Salmon' Initiative	Residents of Alaska's Lake and Peninsula Borough voted 280-246 to disallow permits for any mining activity that would have 'significant impacts' on salmon habitat. The state courts later voided the law on the grounds that the state legislature, not local boroughs, has authority over mineral resources (Cockerham, 2011).	The initiative passed on a vote in October 2011. Legal challenges had been filed by the Pebble Partnership earlier in 2011 ¹ .

* The law was struck down in 2014 (Demer, 2014), which is outside the time period analyzed in the present study. Even though the result would not have been known during 2011, the effort to pass the initiative would have been known. The effort is what constitutes the conflict event, not the result, so the event should be included in the P_c calculations.

4.5.2. Adjusted Valuation for the Pebble Project

Using P_x values estimated by combining Davis and Franks' statistics with the project history analysis, the model determines a social conflict risk-adjusted NPV of \$1.1 billion for Pebble, which is about \$4.8 billion dollars less than the traditionally-determined valuation (See

Table 4.4 4.4). The model shows that the highest risk years are during the four years of construction, reaching a peak in the final year of construction (Y_{-1}). At that point, investors have sunk \$4.6 billion into the project, have not yet seen any returns on that investment, and there remains a relatively high chance of suspension if a conflict occurs (See Figure 4.6).

Table 4.4: Risk-Adjusted valuation of the Pebble Project accounting for stakeholder opposition to the mine. The valuation represents an analysis of data that would have been available to the market at the time of Northern Dynasty’s 2011 feasibility study.

Year	-4	-3	-2	-1	1	2	3	4	5	6-45
Stage	Cons	Cons	Cons	Cons	Oper	Oper	Oper	Oper	Oper	Oper
C _x : Cash Flow (Billions)	-\$1.00	-\$1.00	-\$1.10	-\$1.50	\$0.20	\$0.90	\$1.00	\$0.90	\$0.80	\$55.10
V _x : NPV@7% if suspended (Billions)	-\$0.93	-\$1.81	-\$2.71	-\$3.85	-\$3.71	-\$3.11	-\$2.49	-\$1.96	-\$1.53	\$5.88
P _s : Chance of suspension if a conflict occurs	0.44	0.44	0.44	0.44	0.09	0.09	0.09	0.09	0.09	0.09
P _c : Chance of conflict	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
P _x : Chance of suspension from social conflict	0.17	0.17	0.17	0.17	0.03	0.03	0.03	0.03	0.03	0.03
R _x : Risk in Project Year (Billions)	\$0.41	\$0.66	\$0.97	\$1.39	\$0.29	\$0.28	\$0.27	\$0.26	\$0.25	\$0.00
R_{total}: Total Risk (Billions)	\$4.76									
Risk-Adjusted NPV: (Billions)	\$1.13									

The social conditions that were present at the Pebble Project at the time of the 2011 feasibility study represented a substantial risk to the project’s future profitability, as indicated by the risk-adjusted valuation presented here. Since then, the Pebble Project has seen continued opposition from stakeholders including: marches (Demer, 2013; DeMarban, 2018a), preemptive boycotts of the mine’s products by major jewelers (Bluemink, 2008d; Associated Press, 2009), and another state-wide ballot initiative aimed at stopping the project (DeMarban, 2018b). There is some indication that Northern Dynasty recognized the threat that this social opposition posed as early as 2008 when they began a larger public relations effort and established a fund to support community development in Bristol Bay. Despite these attempts to improve the project’s public image (Bluemink, 2008c), strong stakeholder opposition to the project persisted.

In 2013, after investing over half a billion dollars into Pebble over the previous six years, mining giant Anglo American withdrew from their partnership with Northern Dynasty, citing that they preferred to focus their investments on projects with “lowest risks” (Cockerham, 2013). After the US Environmental Protection Agency (EPA) received “multiple inquiries, concerns, and

petitions” (U.S. Environmental Protection Agency, 2014) from project stakeholders, the Obama-era agency embarked on a study which concluded that development of the Pebble Mine would “jeopardize the long-term health and sustainability of the Bristol Bay ecosystem” pursuant to the Clean Water Act (U.S. Environmental Protection Agency, 2014). The EPA affirmed its decision under the subsequent Trump administration, which restricts the likelihood of mine development at Pebble (Eilperin & Dennis, 2018).

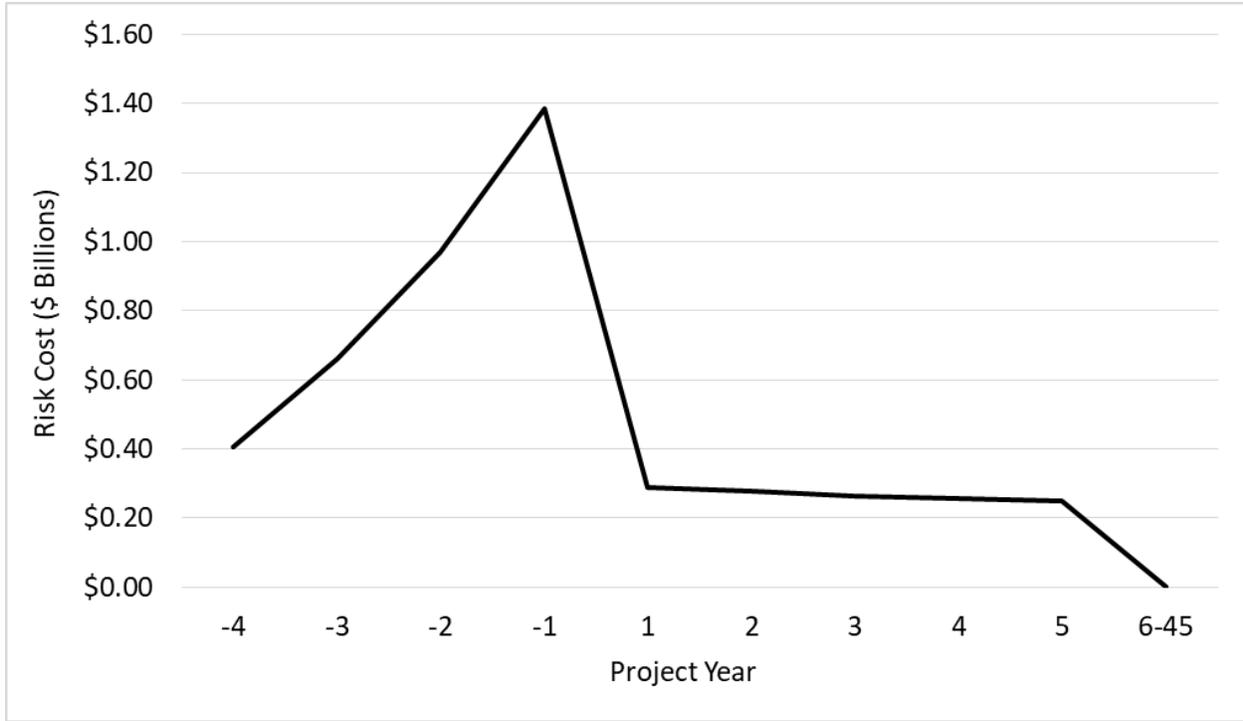


Figure 4.6: Social conflict risk for the first ten years of the Pebble Project. The model shows that the value of the project is \$4.8 billion lower than traditional DCF methods, resulting in a risk-adjusted NPV of \$1.1 billion.

4.6 Conclusion

The decision-tree valuation model presented in this paper provides a tool for a modeler to capture the impact of stakeholders in a mining project valuation. The model allows stakeholders’ perspectives to be considered alongside the other variables that inform a mining development decision. Using these numbers, an investor can make a more informed decision on whether a mining project should move forward, and if so, how and when design alternatives and community engagement programs could be employed to minimize company-community conflict and increase the project’s value.

This approach calls on investors to look critically at mining projects where there is social opposition. As is demonstrated in the Pebble case study, major stakeholder concerns increases the likelihood that investors will be forced to walk away from a project prior to receiving a return on their investment. In cases where stakeholders actively oppose the venture, this opposition can represent a substantial risk to the project that can be quantified in the erosion of billions of dollars in project value. In case of extreme conflict, investors may even increase the project's overall risk by advancing it beyond feasibility.

4.7 Acknowledgments

Thanks to Dr. John Grubb, Dr. Ian Lange, Lukas Fahle, and Marion Nicco who provided helpful discussion and support during this work.

5.1 Conclusions and Potential Applications

This research demonstrates that the relationships between mining companies and their stakeholders can strongly influence whether a mining venture is successful or not. As stakeholders become increasingly concerned about mining decision-making, the tools for evaluating mining projects must better incorporate stakeholder perspectives. Conventional mine planning and permitting evaluations currently undervalue stakeholder perspectives. These systems center around western scientific expertise, corporate perspectives on risk management, and financial valuations of mineral deposits as justifications as the drivers of “objective” decision making. This dissertation supports the assertion that companies and regulators must better incorporate, stakeholders perspectives on mining, local environmental knowledge, and institutional trust in their analyses. This section summarizes the conclusions of each of the dissertation’s research questions.

How can governments better integrate local communities’ perceptions and concerns into mine permitting decisions?

The study of Donlin in Chapter 2 found that the Army Corps of Engineers employed conventional public comment periods and also included Alaskan Native tribes as cooperating agencies in the NEPA process. These stakeholder consultation methods had some successes. For example, cooperating agency tribes were able to push for examination and disclosure of some of their environmental concerns. But, the study also highlighted divergent goals within NEPA between informing specific federal permitting actions and the wider mandate for environmental impact disclosure. Cooperating agency tribes were frustrated with NEPA’s inability to transform findings related to their concerns into enforceable protections when they fell into the latter category.

This study concludes that the technocratic approaches to project evaluation favored by companies and regulators around the world can limit local stakeholder involvement in mining decision-making process. These approaches elevate the role of highly educated experts, many of whom lack personal connections to the people and environmental conditions at the subject mining

property. When decision-making methods limit the inclusion of local stakeholders' voices, they risk ignoring important stakeholder concerns. Undervaluing these concerns forces stakeholders to express their concerns through extralegal mechanisms like company-stakeholder conflict.

This study concludes that in order to address these problems, government regulators must adapt their processes to evaluate local stakeholder concerns in early project decision-making. This includes making more space in permitting processes for including local environmental knowledge and elevating that knowledge alongside the findings of external subject matter experts. Achieving this goal will require regulators to focus on building trust with local stakeholders early in the impact assessment process.

What are the most important indicators of company-stakeholder conflict?

The conflict modeling study in Chapter 3 presents a statistical examination of social and environmental variables' relationships to company-stakeholder conflict. The chapter found that the following conditions were the best indicators of future company-stakeholder conflict: 1. Previous conflict between mining companies and stakeholders in the region, 2. Anticipated physical and economic displacement of stakeholders, and 3. The company-stakeholder conflict history at the subject property. These findings suggest that companies and governments should examine these conditions when attempting to compare conflict risk from one mining property to another.

This study could not identify any environmental variables that were statistically significant indicators of conflict. This is probably because of the specific nature of the environmental variables and because of the small size of the database. However, the study concludes that how environmental conditions affect the unique social and economic conditions around each mining property likely play an important role in conflict. The findings suggest that evaluators should consider environmental conditions within a mining property's specific socio-economic context, particularly how negative environmental conditions might impact local stakeholders economic and livelihood activities.

How does stakeholder opposition affect the valuation of a mining property?

The decision-tree model in Chapter 4 suggests a framework for translating company-stakeholder conflict risk into financial implications for companies. This model overlays the

average frequency of a company-stakeholder conflict onto the project's discounted cash flow model to determine the "risk cost" associated with stakeholder opposition. This study finds that even moderate levels of conflict result in the erosion of hundreds of millions of dollars in project value and that high levels of conflict can turn a financial asset into a liability. This study suggests that companies should allocate significant resources to addressing stakeholders' concerns and thereby reducing the risks to their projects. Moreover, these findings suggest that investors should look critically at mining projects where there is social opposition.

Collectively these three studies conclude that external stakeholders are undervalued by mining's present decision-making paradigms. This dissertation calls on companies and governments to place a greater emphasis on external stakeholders' perspectives on mining. It recommends that companies and governments engage these stakeholders in permitting and mine design processes such that these decisions include nuanced understandings of how a mine will affect local people and how those people will affect a mine.

5.2 Recommendations for Future Work

This research raised several questions that the author was unable to pursue. This section discusses the most potentially impactful opportunities for future work.

5.2.1 Continued Examination of Donlin

Donlin remains compelling as a case of company-stakeholder relationships. The present study tracked Donlin through the completion of the National Environmental Policy Act (NEPA) process, but the Donlin story is continuing to evolve. Although the NEPA process is complete, the impacts of the NEPA process are yet to be fully determined. Many local stakeholders who were involved in the NEPA process remain frustrated with the process, government regulators, and the Donlin Gold company. In the 2-year period between the author's field work in the Kuskokwim Valley and the completion of this dissertation, Donlin Gold has received most of the permits it needs to advance the project. In that same period, the mine's opponents have become more organized and vocal. Other scholarly work suggests that the feasibility stage is the highest-risk period for company-stakeholder conflict (Davis & Franks, 2014). In addition, the last publicly-available cash flow for Donlin (NovaGold Resources, 2011) suggests that the project is only

marginally economic, even without stakeholder opposition. This set of conditions presents a compelling case for further work. Some questions include:

- How will the recent increase in stakeholder opposition to the Donlin mine affect the company's decision whether to advance the mine to the construction stage?
- What will be the lasting legacies of the NEPA process at Donlin? Will stakeholders' concerns about issues like the degradation of rainbow smelt populations come to fruition? If so, will these impacts motivate additional conflict? Or, will opposition to the mine fade as the project advances?
- What elements of NEPA at Donlin will permitting agencies choose to continue in other locations? Will agencies such as the Army Corps of Engineers continue to view Alaskan Native and American Indian tribes as potential cooperating agencies? Will the public consultation processes in NEPA evolve from the one-way public comment model to something closer to the collaborative workshop that some of this study's interviewees recommended?

It was tempting throughout this study to compare Donlin to the case of Pebble. Pebble is located approximately 200 miles to the south and is one of the most controversial mining projects in the world. Compared to Pebble, Donlin has not seen the same quantity of local nor international opposition. The opportunity for a comparative study of Donlin and Pebble is ripe, especially as Donlin appears to be advancing and Pebble remains stalled. A comparative study could address some of these questions:

- Why are the apparent outcomes at Donlin and Pebble so different? What are the key differences between these projects?
- How has the relatively high level of opposition at Pebble and the lower level of opposition at Donlin affected the market's valuation of these properties?
- How do stakeholders' attitudes towards NEPA differ at each property? Do Pebble stakeholders view the NEPA process and Army Corps differently in light of the differing project outcomes?

5.2.2 Refining the Conflict Risk Model

The company-stakeholder conflict risk model presented in Chapter 3 is a unique attempt to develop a statistical tool for evaluating conflict indicators at a mining property. This study identified some of the most important variables that may predict company-stakeholder conflict. Yet, there remains significant potential to refine this tool, improve its predictive power, and evaluate a wider selection of variables. The model in this study was built using only 23 mining properties, and all of the social and environmental variables were evaluated by a single company. The most obvious opportunity for improvement is to expand the database to include a greater number of properties, and companies. With a larger database, future researchers may be able to quantitatively examine a wider variety of variables, attempt more complex models, and move from models that evaluate the important conflict indicators to one which could serve to predict conflict within a more useful range of error. For example:

- This study's database did not have enough properties to test the relationship of project stage to conflict. Could a larger statistical analysis confirm the findings of Davis and Franks (2014) that early-stage projects are at higher risk for conflict?
- The relationship between environmental variables and conflict could be tested further. Although the present study included environmental variables, the small size of the dataset may have masked the effects of individual environmental conditions.

5.2.3 Improving the Social Risk Decision Tree Model

The social conflict valuation model presented in this dissertation is a tool to help companies and investors evaluate the financial value of company-stakeholder conflict risk in a proposed mining project. Using this approach, the proposed research provides a method that avoids the cumbersome and subjective weaknesses of approaches like the IFC's FV Tool (International Finance Corporation, 2017), while expanding upon Davis and Frank's (2014) work to integrate site-specific conditions into mine valuation.

However, project suspension is not the only cost associated with poor company-stakeholder relationships. Some costs occur even in the absence of major conflict events. These costs might include reputational costs, stock price erosion, short-term production losses, and others

(Davis & Franks, 2014). As scholars begin to better understand these other costs and how they are triggered, the model proposed here could be expanded to include them. For example:

- How does the outbreak of a conflict affect a property's valuation in equity markets? If the effects are lasting, could these outcomes be included in the model?
- How could the model be adapted to account for shorter-term project delays which do not force a company to walk away from a property indefinitely?
- Are there costs when stakeholders distrust a company, even if that distrust does not ever manifest in outward conflict?
- The conclusions of this study's conflict modeling work suggest that company-stakeholder conflicts have elements of self-perpetuation (i.e. having a conflict history indicates that future conflict is more likely). How does the transition from no conflict to having a single conflict affect future mining outcomes?

5.3 Final Thoughts

As with any research project, this one is influenced by my own past experiences, perspectives and biases. I am the product of a western engineering education, a career working for mining companies, and world view that values the benefits of liberal economics. I hail from a rural American upbringing that was not influenced by the benefits nor costs of nearby mineral resource development. Although I have striven mightily to temper my biases throughout the work; and owe enormous debt to my advisor, many stakeholders in the Kuskokwim region, and others for help in this regard, I know that these influences are powerful and cannot be completely expunged.

Some people will disagree with my interpretations and conclusions throughout this dissertation. In the Donlin case study specifically, many people expressed these disagreements to me directly when I shared early drafts of that chapter with them. One of my primary aims of the subsequent revisions was to better capture these views while remaining true to different perspectives from other interviewees. I am hopeful that at the very least, those that dislike my findings see this work as an honest attempt to tell the Donlin story. I also expect that some readers of the later chapters will find my statistical modeling and the financial valuation of people's complex feelings, cultures, and perceptions as insensitive, if not entirely heartless. I see and feel

these problems too. As I wrote these chapters, I reflected on the many people I know who live in mine-proximate communities, many of whom feel negative impacts from mining every day. I am hopeful that my work contributes to the betterment of their lives by shining a light upon the costs and risks that companies and governments shoulder when they ignore or undervalue those stakeholders' experiences. I am hopeful that this work prods companies to more seriously consider the implications of investing in controversial mineral properties and thereby avoid conflict.

This work aims to uncover some of the mystery surrounding stakeholders' growing influence on mining projects and their opposition to many of them. I am hopeful that this work convinces some people that company-stakeholder conflict is not abstract, it is not random, it is likely predictable, and even preventable. At the very least, this work demonstrates that these relationships are important at all intellectual levels: from the theoretical perspective of alternate project valuation methods, to the management of a company portfolio, to the permitting process of an individual mine, to the views and lived experiences of individual people. If nothing else, I am hopeful that the reader comes away from reading this dissertation with an appreciation for the scale of these challenges, the importance of these challenges to our global society, and the difficulties that remain in solving them.

REFERENCES

- Adler, R. A., Claasen, M., Godfrey, L. & Turton, A. R., 2007. Water, mining, and waste: An historical and economic perspective on conflict management in South Africa. *The Economics of Peace and Security Journal* 2, pp. 33-41.
- Akpalu, W. & Parks, P. J., 2007. Natural resource use conflict: Gold mining in tropical rainforest in Ghana. *Environmental and Development Economics* 12, pp. 55-72.
- Allison III, J. R., 2015. *Sovereignty for Survival: American Energy Development and Indian Self-Determination*. New Haven and London: Yale University Press.
- Anders, G. C. & Anders, K. K., 1986. Incompatible Goals in Unconventional Organization: The Politics of Alaskan Native Corporations. *Organization Studies*, pp. 213-233.
- Arellano-Yanguas, J., 2011. Aggravating the resource curse: Decentralisation, Mining and Conflict in Peru. *Journal of Development Studies* 47, pp. 617-638.
- Associated Press, 2009. *Anchorage Daily News: Class ring makers join boycott against Pebble Mine - PRICELESS PROPERTY: Environmental concerns outweigh need for gold..* [Online] Available at: <https://infoweb.newsbank.com/resources/doc/nb/news/12B1AFDEAFA36B58?p=AWNB> [Accessed 18 January 2019].
- Associated Press, 2019. *Anchorage Daily News: Alaska Village Council Association Withdraws Support for Proposed Gold Mine.* [Online] Available at: <https://www.adn.com/business-economy/2019/09/26/alaska-village-council-association-withdraws-support-for-proposed-gold-mine/> [Accessed 21 December 2019].
- Avci, D. & Fernandez-Salvador, C., 2016. Territorial dynamics and local resistance: Two mining conflicts in Ecuador compare. *The Extractive Industries and Society* 3, pp. 912-921.
- Aydin, C. I., Ozkaynak, B., Rodriguez-Labajos, B. & Yenilmez, T., 2017. Network Effects in Environmental Justice Struggles: An Investigation of Conflicts Between Mining Companies and Civil Society Organizations from a Network Perspective. *PloS One* 12, p. e0180494.
- Banerjee, S. B., 2000. Whose Land Is It Anyway? National Interest, Indigenous Stakeholders, and Colonial Discourses: The Case of the Jabiluka Uranium Mine. *Organization and Environment* 13, pp. 3-38.
- Barnsley, W., 2018. *Adani to Make Indigenous Opponent Pay Legal Costs.* [Online] Available at: <https://www.brisbanetimes.com.au/politics/queensland/adani-to-make-indigenous-opponent-pay-legal-costs-20181229-p50oqi.html> [Accessed 8 March 2020].
- Barrick Gold Corporation, 2018. *The New Value Champion: Annual Report*, Toronto, Canada: s.n.

BBC News, 2012. *Peru Anti-Mine Protest Crackdown*. [Online] Available at: <https://www.bbc.com/news/av/world-latin-america-18245875/peru-anti-mine-protest-crackdown> [Accessed 8 March 2020].

Bebbington, A. & Williams, M., 2008. Water and Mining Conflicts in Peru. *Mountain Research and Development* 28, pp. 190-196.

Black, F. & Scholes, M., 1973. The Pricing of Options And Corporate Liabilities. *Journal of Political Economy* 81.1, pp. 637-654.

Blevins, J., 2016. *Crested Butte celebrates as longest running mine battle in the west nears end*. [Online] Available at: <https://www.denverpost.com/2016/10/01/crested-butte-longest-running-mine-battle/> [Accessed 30 January 2019].

Bluemink, E., 2007. *Anchorage Daily News: Bristol Bay residents submit petition for vote on Pebble - CLEAN WATER: Three present list of signatures to challenge mining*. [Online] Available at: <https://infoweb.newsbank.com/resources/doc/nb/news/118C6F3612EFBB88?p=AWNB> [Accessed 14 January 2019].

Bluemink, E., 2008a. *Anchorage Daily News: Neither side can agree on what Ballot Measure 4 says, will do - Proposed mining law goes before voters*. [Online] Available at: <https://infoweb.newsbank.com/resources/doc/nb/news/122B8B3F2A5C0650?p=AWNB> [Accessed 14 January 2019].

Bluemink, E., 2008b. *Anchorage Daily News: Vote shows which rural areas back mining - MEASURE 4: Support for initiative was in Bristol Bay and Bethel*. [Online] Available at: <https://infoweb.newsbank.com/resources/doc/nb/news/122DD9DCAF0CE818?p=AWNB> [Accessed 14 January 2019].

Bluemink, E., 2008c. *Anchorage Daily News: Pebble prospect mining interests fund endowment - \$5 MILLION: Money to be used for fisheries and economic development*. [Online] Available at: <https://infoweb.newsbank.com/resources/doc/nb/news/11EFFBFAB5D6E1F8?p=AWNB> [Accessed 18 January 2019].

Bluemink, E., 2008d. *Anchorage Daily News: Jewelers announce opposition to Pebble prospect's 'dirty gold' - Companies call for protection of river drainages*. [Online] Available at: <https://infoweb.newsbank.com/resources/doc/nb/news/11ED049C4F68EE58?p=AWNB> [Accessed 18 January 2019].

Bluemink, E., 2009. *Anchorage Daily News: Suit filed to halt Pebble - Permit Process: Group says state didn't allow public input on giant mining prospect.* [Online] Available at: <https://infoweb.newsbank.com/resources/doc/nb/news/129CEC3DC9E737A0?p=AWNB> [Accessed 14 January 2019].

Bluemink, E., 2010. *Anchorage Daily News: Legality of Pebble work questioned in court - CIVIL TRIAL: State issued permits without public input, plaintiffs say.* [Online] Available at: <https://infoweb.newsbank.com/resources/doc/nb/news/1340155EB1CE80E8?p=AWNB> [Accessed 14 January 2019].

Bone, J., 2012. The Deregulation Ethic and the Conscience of Capitalism: How the Neoliberal 'Free Market' Model Undermines Rationality and Moral Conduct. *Globalizations* 9, pp. 651-665.

Boutelier, R. G. & Thomson, I., 2011. Modeling and Measuring the Social License to Operate: Fruits of Dialogue Between Theory and Practice. *International Mine Management*, July.

Cambell, G. & Roberts, M., 2010. Permitting a New Mine: Insights from the Community Debate. *Resources Policy* 35, pp. 210-217.

Carroll, A. B., 1991. The Pyramid of Corporate Social Responsibility: Toward the Moral Management of Organizational Stakeholders. *Business Horizons*, Issue July-August, pp. 39-48.

Carstens, J. & Hilson, G., 2009. Mining, grievance and conflict in rural Tanzania. *International Development Planning Review* 31, pp. 301-326.

Cashmore, M., Richardson, T., Hilding-Ryedvik, T. & Emmelin, L., 2010. Evaluating the effectiveness of impact assessment instruments: Theorising the nature and implications of their political constitution. *Environmental Impact Assessment Review* 30, pp. 371-379.

CNBC, 2013. *U.S. Energy Corp. to Post Its Mount Emmons Mine Plan of Operations on Its Website.* [Online] Available at: <https://www.cnbc.com/id/100690612> [Accessed 30 January 2019].

Cockerham, S., 2011. *Anchorage Daily News: Voters approve anti-Pebble initiative by 34 votes - Court Next: Lake and Peninsula Borough law will be challenged.* [Online] Available at: <https://infoweb.newsbank.com/resources/doc/nb/news/13A78F9A5B67F208?p=AWNB> [Accessed 14 January 2019].

Cockerham, S., 2013. *Anchorage Daily News: Anglo American Pulls Out of Proposed Pebble Mine.* [Online] Available at: <https://www.adn.com/economy/article/anglo-american-pulls-out-proposed-pebble-mine/2013/09/16/> [Accessed 8 February 2020].

Cohen, J., 1988. *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. New York: Lawrence Erlbaum Associates Publishers.

Collier, P. & Hoeffler, A., 2004. Greed and Grievance in Civil War. *Oxford Economic Papers* 56, pp. 563-595.

Conde, M., 2017. Resistance to Mining. A Review. *Ecological Economics* 132, pp. 80-90.

Conway, P., 1994. IMF Lending Programs: Participation and Impact. *Journal of Development Economics*, pp. 365-391.

Cooney, J., 2017. *Social License to Operate - Jim Cooney*. [Online] Available at: <https://www.youtube.com/watch?v=NkQMq0gIEYU> [Accessed 11 October 2017].

Costanza, J. N., 2016. Mining conflict and the politics of obtaining a social license: Insight from Guatemala. *World Development* 79, pp. 97-113.

Coumans, C., 2011. Whose Development? Mining, Local Resistance, and Development Agendas. In: *Governance Ecosystems*. London: Palgrave Macmillan, pp. 114-132.

Council on Environmental Quality, 2019. *Length of Environmental Impact Statements (2013-2017)*, Washington, DC: s.n.

Crested Butte News, 2016. *Memorandum of Understanding for Mt. Emmons*. [Online] Available at: <http://crestedbuttenews.com/2016/02/memorandum-of-understanding-for-mt-emmons/> [Accessed 30 January 2019].

Dashwood, H. S., 2012. *The Rise of Corporate Social Responsibility: Mining and the Spread of Global Norms*. Cambridge, United Kingdom: Cambridge University Press.

Davis, G. A., 2001. One Project, Two Discount Rates. *Business Valuation Review* 20.1, pp. 18-23.

Davis, G. A. & Tilton, J. E., 2005. The Resource Curse. *Natural Resources Forum*, Volume 29, pp. 233-242.

Davis, R. & Franks, D., 2014. *Cost of Company-Community Conflict in the Extractive Sector*, Cambridge, Massachusetts: Harvard Kennedy School.

DeMarban, A., 2018a. *Anchorage Daily News: Pebble protesters rally in Anchorage as Army Corps gets input on environmental review - It was the biggest protest since Pebble Limited Partnership filed a plan with the Corps in December in hope of one day receiving permission*. [Online] Available at: <https://infoweb.newsbank.com/resources/doc/nb/news/16B6595AB3D8E748?p=AWNB> [Accessed 18 January 2019].

DeMarban, A., 2018b. *Anchorage Daily News: After a year of debate and millions spent on the campaign, Alaska voters will decide Stand for Salmon measure - Supporters say Ballot Measure*

I will protect fishing and industry projects. [Online]
Available at:
<https://infoweb.newsbank.com/resources/doc/nb/news/16F6883BB5BDB4A8?p=AWNB>
[Accessed 18 January 2019].

Demer, L., 2013. *Anchorage Daily News: Legal fees spur protest.* [Online]
Available at:
<https://infoweb.newsbank.com/resources/doc/nb/news/149A77FAB738A860?p=AWNB>
[Accessed 18 January 2019].

Demer, L., 2014. *Anchorage Daily News: Judge Tosses Ballot Measure Attempting to Block Pebble Mine.* [Online]
Available at:
<https://infoweb.newsbank.com/resources/doc/nb/news/14CB3F7BD168C1B0?p=AWNB>
[Accessed 18 January 2019].

Demer, L., 2017. *Anchorage Daily News: Where are the kings? Kuskokwim River may see its worst run on record.* [Online]
Available at: <https://www.adn.com/alaska-news/rural-alaska/2017/06/22/where-are-the-kings-kuskokwim-river-may-see-its-worst-run-on-record/>
[Accessed 4 March 2019].

Dixit, A., 2001. Investment and Hysteresis. In: *Real Options and Investment under Uncertainty*. Cambridge Massachusetts & London, UK: MIT Press, pp. 153-178.

Dongoske, K. E., Pasqual, T. & King, T. F., 2015. Environmental Reviews and Case Studies: The National Environmental Policy Act (NEPA) and the Silencing of Native American Worldviews. *Environmental Practice* 17, pp. 36-45.

Downing, T. E., 2002. *Avoiding New Poverty: Mining-Induced Displacement and Resettlement*, International Institute for Environment and Development / World Business Council for Sustainable Development: Mining, Minerals and Sustainable Development.

Dreyfus, D. A. & Ingram, H. M., 1976. The National Environmental Policy Act: A View of Intent and Practice. *Natural Resources Journal*, Issue April, pp. 243-262.

Eilperin, J. & Dennis, B., 2018. *Washington Post: In reversal, EPA deals setback to controversial gold mining proposal in Alaska.* [Online]
Available at: https://www.washingtonpost.com/national/health-science/in-reversal-epa-deals-setback-to-controversial-gold-mining-proposal-in-alaska/2018/01/26/75d73aae-0206-11e8-bb03-722769454f82_story.html?noredirect=on&utm_term=.dc762c669e58
[Accessed 18 January 2019].

Els, F., 2011. *Peru Declares State of Emergency Over Cajamarca Gold Mine Protests.* [Online]
Available at: <https://www.mining.com/peru-declares-state-of-emergency-over-cajamarca-gold-mine-protests/>
[Accessed 11 February 2020].

- Environmental Law Institute, 2004. *Judging NEPA: A "Hard Look" at Judicial Decision Making Under the National Environmental Policy Act*, s.l.: Environmental Law Institute.
- Environmental Resources Management, 2016. *New Realities Facing the Mining and Metals Industry*, s.l.: ERM.
- Equator Principles, 2020. *EP4: A Financial Industry Benchmark for Determining, Assessing and Managing Environmental and Social Risk in Projects*, s.l.: s.n.
- Espinoza, D. & Morris, J. W., 2013. Decoupled NPV: A Simple, Improved Method to Value Infrastructure Investments. *Construction Management and Economics*, 31(5), pp. 471-496.
- Espinoza, R. D. & Rojo, J., 2015. Using DNPV for valuing investments in the energy sector: A solar project case study. *Renewable Energy*, Volume 75, pp. 44-49.
- Evans, R. & Kemp, D., 2011. Community Issues. In: *SME Mining Engineering Handbook*. Lakewood, Colorado: Society for Mining, Metallurgy and Exploration, pp. 1767-1777.
- Franks, D., 2009. *Avoiding Mine-Community Conflict: From Dialogue to Shared Futures*. Santiago, Chile, s.n.
- Freeport McMoRan, 2017. *Sustainability, Communities, Indonesia*. [Online] Available at: <https://www.fcx.com/sustainability/communities/community-investment/indonesia> [Accessed 14 December 2017].
- Friedman, M., 1970. The Social Responsibility of Business is to Increase its Profits. *The New York Times Magazine*, 13 September.
- Gentry, D. W. & O'Neil, T. J., 1984. Accounting for Risk in Mining Investments. In: *Mine Valuation Analysis*. New York: Society of Mining Engineers, pp. 375-390.
- Godfrey, P. C., Merrill, C. B. & Hansen, J. M., 2009. The Relationship Between Corporate Social Responsibility and Shareholder Value: An Empirical Test of the Risk Management Hypothesis. *Strategic Management Journal* 30, pp. 425-445.
- Gold Fields, Ltd, 2011. *Annual Report*, Johannesburg, South Africa: Gold Fields, Ltd.
- Haarstad, H. & Floysand, A., 2007. Globalization and the power of rescaled narratives: A case of opposition to mining in Tambogrande, Peru. *Political Geography* 26, pp. 289-308.
- Hanks, E. H. & Hanks, J. L., 1970. An Environmental Bill of Rights: The Citizen Suit and the National Environmental Policy Act of 1969. *Rutgers Law Review*, Issue 230, pp. 230-272.
- Hanna, P., Vanclay, F., Langdon, E. J. & Arts, J., 2014. Improving the Effectiveness of Impact Assessment Pertaining to Indigenous Peoples in the Brazilian Environmental Licensing Procedure. *Environmental Impact Assessment Review*, pp. 58-67.
- Haslam, P. A. & Tanimoune, N. A., 2016. The Determinants of Social Conflict in the Latin American Mining Sector: New Evidence with Quantitative Data. *World Development* 78, pp. 401-419.

- Hentschel, T., Hruschka, F. & Priester, M., 2002. *Global Report on Artisanal and Small-Scale Mining*, London: International Institute for Environment and Development and the World Business Council for Sustainable Development.
- Herz, S., Genovese, K., Herbertson, K. & Perrault, A., 2008. *The International Finance Corporation's Performance Standards and the Equator Principles: Respecting Human Rights and Remediating Violations?*, s.l.: Center for International Environmental Law, Bank Information Center, BankTrack, Oxfam Australia, World Resources Institute.
- Hilson, G. & Yakovleva, N., 2007. Strained relations: A critical analysis of the mining conflict in Prestea, Ghana. *Political Geography* 26, pp. 98-119.
- Holden, W. N. & Jacobson, R. D., 2007. Mining amid armed conflict: nonferrous metals mining in the Philippines. *The Canadian Geographer* 51, pp. 475-500.
- Holland, N., 2017. *Mine of the Future*. Johannesburg, Gold Fields, Ltd..
- Holley, E. A. & Mitcham, C., 2016. The Pebble Mine Dialogue: A Case Study in Public Engagement and the Social License to Operate. *Resources Policy* 47, pp. 18-27.
- Humphreys, D., 2000. A Business Perspective on Community Relations in Mining. *Resources Policy*, pp. 127-131.
- ICMM, 2018. *Performance Expectations*, s.l.: International Council on Mining and Metals.
- International Council on Mining and Metals, 2003. *ICMM Sustainable Development Framework: ICMM Principles*, s.l.: s.n.
- International Council on Mining and Metals, 2012. *Community Development Toolkit*, London, UK: s.n.
- International Council on Mining and Metals, 2015. *Research on Company-Community Conflict*, London: s.n.
- International Finance Corporation, 2006. *International Finance Corporation's Performance Standards on Social & Environmental Sustainability*, Washington, DC: IFC.
- International Finance Corporation, 2007. *Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets*, Washington, D.C.: s.n.
- International Finance Corporation, 2012. *Performance Standards on Environmental and Social Sustainability*, s.l.: s.n.
- International Finance Corporation, 2014. *A Strategic Approach to Early Stakeholder Engagement: A Good Practice Handbook for Junior Companies in the Extractive Industries*, Washington, D.C.: s.n.
- International Finance Corporation, 2017. *Financial Valuation Tool for Sustainability Investments*. [Online]

Available at: <https://www.fvtool.com/>
[Accessed 18 December 2017].

International Institute for Environment and Development, 2002. *Breaking New Ground: Mining, Minerals, and Sustainable Development; The Report of the MMSD Project*, s.l.: Earthscan.

Jamasmie, C., 2014. *One Dead, 20 Hurt in Protests Against Copper Mine in Myanmar*. [Online] Available at: <https://www.mining.com/one-dead-20-hurt-in-protests-against-copper-mine-in-myanmar-76686/>
[Accessed 8 March 2020].

Jamasmie, C., 2015. Over \$21bn worth of mining projects delayed in Peru due to social conflict. *Mining.com*, 8 October.

Jamasmie, C., 2016. *Community opposition forces Newmont to Abandon Conga Project in Peru*. [Online] Available at: <https://www.mining.com/community-opposition-forces-newmont-abandon-conga-project-peru/>
[Accessed 11 February 2020].

Jaskoski, M., 2014. Environmental licensing and conflict in Peru's mining sector: A path-dependent analysis. *World Development* 64, pp. 873-883.

Jenkins, H., 2004. Corporate Social Responsibility and the Mining Industry: Conflicts and Constructs. *Corporate Social Responsibility and Environmental Management* 11, pp. 23-34.

Karnowski, S., 2018. *Twin Cities Pioneer Press: Environmentalists go to court to fight PolyMet mine permits*. [Online] Available at: <https://www.twincities.com/2018/12/03/environmentalists-go-to-court-to-fight-polymet-mine-permits/>
[Accessed 14 December 2018].

Kirsch, S., 2014. *Mining Capitalism: The Relationship Between Corporations and Their Critics*. Oakland, California: University of California Press.

Lane, M. B. & Corbett, T., 2005. The tyranny of localism: Indigenous participation in community-based environmental management. *Journal of Environmental Policy and Planning* 7, pp. 141-159.

Langberg, S., 2014. A "Full and Fair" Discussion of Environmental Impacts in NEPA EISs: The Case for Addressing the Impacts of Substantive Regulatory Regimes. *Yale Law Journal*, pp. 716-756.

Lassonde, P., 1994. *The Gold Book: The Complete Investment Guide to Precious Metals*. Toronto, Canada: Penguin Books & The Financial Times.

Lawrence, D. P., 2013. *Impact Assessment: Practical Solutions to Recurrent Problems and Contemporary Challenges*. 2nd ed. Hoboken, New Jersey: John Wiley & Sons.

- Li, F., 2015. *Unearthing Conflict: Corporate Mining, Activism, and Experience in Peru*. Durham and London: Duke University Press.
- Loayza, N., Mier y Teran, A. & Rigolini, J., 2013. *Poverty, Inequality, and the Local Natural Resource Curse*, s.l.: The World Bank, Latin America and the Caribbean Region.
- Lowe, M. E., 2010. Contemporary Rural-Urban Migration in Alaska. *Alaska Journal of Anthropology*, 8(2), pp. 75-92.
- Lukic, J., Jones, V. N. & Bhalla, A., 2011. *Valuing Returns on Sustainability Investments: Linking Local Impact and Business Value*. Santiago, Chili, International Seminar on Social Responsibility in Mining.
- MacArthur, A. R., 2018. *KYUK: Regulators release 10,000-page environmental document on proposed Donlin mine*. [Online] Available at: <https://www.ktoo.org/2018/04/28/regulators-release-10000-page-environmental-document-on-proposed-donlin-mine/> [Accessed 30 April 2019].
- Mahanty, S. & McDermott, C. L., 2013. How Does 'Free, Prior and Informed Consent' (FPIC) Impact Social Inequality? Lessons from Mining and Forestry and Their Implications for REDD+. *Land Use Policy* 35, pp. 406-416.
- Mandelker, D. R., 2010. The National Environmental Policy Act: A Review of Its Experience and Problems. *Journal of Law & Policy*, Volume 32, pp. 293-312.
- Martin, T., Rodriguez, M. C. & Mendex-Montalvo, M., 2016. *Tragadero Grande: Land, human rights, and international standards in the conflict between the Chaupe family and Minera Yanacocha*, Washington, DC: Resolve.
- Michaels, S., 2011. *Is a U.S. Mining Company Funding a Violent Crackdown in Indonesia?*. [Online] Available at: <https://www.theatlantic.com/international/archive/2011/11/is-a-us-mining-company-funding-a-violent-crackdown-in-indonesia/249164/> [Accessed 8 March 2020].
- Mitchell, P., 2019. *Top 10 Business Risks Facing Mining and Metals*. [Online] Available at: https://www.ey.com/en_gl/mining-metals/10-business-risks-facing-mining-and-metals [Accessed 15 December 2019].
- Montrie, C., 2003. *To Save the Land and People: A History of Opposition to Surface Coal Mining in Appalachia*. The University of North Carolina Press: s.n.
- Morgan, R. M., 2012. Environmental Impact Assessment: The State of the Art. *Impact Assessments and Project Appraisal*, 30(1), pp. 5-14.

Murphy, J. M. et al., 2017. Juvenile Chinook Salmon abundance in the northern Bering Sea: Implications for future returns and fisheries in the Yukon River. *Deep-Sea Research II*, Volume 135, pp. 156-167.

National Environmental Policy Act, 1969. *Public Law. 91-190, 42 U.S.C. 4321-4347*. s.l.:s.n.

Newmont Mining, 2015. *Annual Report Pursuant to Section 13 or 15(d) of the Securities and Exchange Act of 1934*. [Online] Available at: <https://www.sec.gov/Archives/edgar/data/1164727/000155837016003258/nem-20151231x10k.htm>

Newmont Mining, 2015. *Gary Goldberg Talks Sustainability: A Core Part of Newmont's Strategy and Values*. [Online] Available at: <http://www.newmont.com/newsroom/newsroom-details/2015/Gary-Goldberg-Talks-Sustainability--A-Core-Part-of-Newmonts-Strategy-and-Values/default.aspx> [Accessed 11 October 2017].

Northern Dynasty Minerals, 2011. *Northern Dynasty Receives Positive Preliminary Assessment Technical Report for Globally Significant Pebble Copper-Gold-Molybdenum Project in Southwest Alaska*. [Online] Available at: <https://www.sec.gov/Archives/edgar/data/1164771/000106299311000722/exhibit99-1.htm> [Accessed 15 January 2019].

NovaGold Resources, 2011. *Donlin Creek Gold Project*, s.l.: s.n.

NovaGold Resources, 2018. *Annual Report*, Vancouver, Canada: s.n.

Okoh, G. A., 2014. Greivence and conflict in Ghana's gold mining industry: The case of Obuasi. *Futures* 62, pp. 51-57.

Oswalt, W. H., 1990. *Bashful No Longer: An Eskimo Enthohistory, 1778-1988*. Norman and London: University of Oklahoma Press.

Owen, J. R. & Kemp, D., 2015. Mining-Induced Displacement and Resettlement: A Critical Appraisal. *Journal of Cleaner Production* 87, pp. 478-488.

Owen, J. R. & Kemp, D., 2017. *Extractive Relations: Countervailing Power and the Global Mining Industry*. New York: Routledge.

Oxfam America, 2009. *Mining Conflicts in Peru: Condition Critical*, Boston: s.n.

Perrott-Humphrey, F., 2011. Market Capitalization. In: P. Darling, ed. *SME Mining Engineering Handbook, 3rd Edition*. Englewood, Colorado: Society for Mining, Metallurgy, and Exploration, pp. 65-71.

Phadke, R., 2018. Green energy futures: Responsible mining on Minnesota's Iron Range. *Energy Research & Social Science*, Volume 35, pp. 163-173.

- Prno, J., 2013. An analysis of factors leading to the establishment of a social license to operate in the mining industry. *Resources Policy* 38, pp. 577-590.
- Que, S. & Awuah-Offei, K., 2014. *Identifying Critical Factors That Influence Community Acceptance of Mining Projects*. Salt Lake City, Utah, Society for Mining, Metallurgy and Exploration.
- Raufflet, E., Cruz, L. B. & Bres, L., 2014. An Assessment of Corporate Social Responsibility Practices in the Mining and Oil and Gas Industries. *Journal of Cleaner Production*, pp. 256-270.
- Reporters Without Borders, 2019. *Press Freedom Index*. [Online] Available at: <https://rsf.org/> [Accessed 3 April 2020].
- Rio Tinto, 2011. *Survey on Stakeholder Engagement*, London: s.n.
- Robertson v. Methow Valley Citizens* (1989).
- Ross, M. L., 1999. The Political Economy of the Resource Curse. *World Politics* 51, pp. 297-322.
- Sachs, J. D. & Warner, A. M., 2001. The Curse of Natural Resources. *European Economic Review*, pp. 827-838.
- Schwartz, E. S. & Trigeorgis, L., 2001. Real Options and Investment under Uncertainty: An Overview. In: *Real Options and Investment under Uncertainty: Classical Readings and Recent Contributions*. Cambridge, Massachusetts & London, UK: MIT Press, pp. 1-16.
- Shallenberger, K., 2018. *Alaska Public Media: First Y-K Delta Tribe Marches Against Donlin Gold in Bethel*. [Online] Available at: <https://www.alaskapublic.org/2018/06/27/first-y-k-delta-tribe-marches-against-donlin-gold-in-bethel/> [Accessed 26 November 2019].
- Shallenberger, K., 2018. *KYUK: Bethel ONC Tribe Passes Resolution Supporting Salmon Ballot Initiative*. [Online] Available at: <https://www.kyuk.org/post/bethel-onc-tribe-passes-resolution-supporting-salmon-habitat-ballot-initiative> [Accessed 23 April 2019].
- Shimbar, A. & Ebrahimi, S. B., 2017. Modified-Decoupled Net Present Value: The Intersection of Valuation and Time Scaling of Risk in Energy Sector. *Environmental Energy and Economic Research*, 1(4), pp. 347-362.
- Smith, N. J. & Liller, Z. W., 2018. *2017 Kuskokwim River Chinook Salmon Run Reconstruction and 2018 Forecast*, Anchorage: Alaska Department of Fish and Game.
- Smith, N. M., Smith, J. M., John, Z. Q. & Teschner, B. A., 2017. Promises and preceptions in the Guianas: The making of an artisanal and small-scale mining reserve. *Resources Policy* 51, pp. 49-56.

SNL Metals & Mining, 2015. *Permitting, Economic Value and Mining in the United States*, London, UK: The National Mining Association.

Snyder, S., 2014. Bristol Bay Wild Salmon, Pebble Mine, and Intractable Conflict: Lessons for Environmental Studies and Sciences. *Environment: Science and Policy for Sustainable Development*, 52(2), pp. 17-26.

Sowards, A. M., 2019. *NEPA transformed federal land management — and has fallen short*. [Online]

Available at: <https://www.hcn.org/issues/52.1/reckoning-with-history-nepa-transformed-federal-land-management-and-has-fallen-short>

Stark, J., Li, J. & Terasawa, K., 2006. *Environmental Safeguards and Community Benefits in Mining: Recent Lessons from the Philippines*, Falls Church, Virginia: USAID and Foundation for Environmental Security & Sustainability.

Switzer, J. V., 1997. *Green Backlash: The History and Politics of Environmental Opposition in the U.S.*. Lynne Rienner Publishers: Boulder, Colorado.

Temper, L. & Martinez-Alier, J., 2013. The god of the mountain and Godavarman: Net present value, indigenous territorial rights and sacredness in a bauxite mining conflict in India. *Ecological Economics* 96, pp. 79-87.

Terminski, B., 2013. *Development-Induced Displacement and Resettlement: Theoretical Frameworks and Current Challenges*, Geneva, Switzerland: s.n.

Teschner, B., 2013. How you start matters: A comparison of Gold Fields' Tarkwa and Damang mines and their divergent relationships with local small-scale miners in Ghana. *Resources Policy* 38, pp. 332-340.

Teschner, B. & Holley, E., 2019. The cost of mine suspension from social conflict: A decision tree model. *Resources Policy*, p. 101443.

The Midnight Sun, 2018. *There are five companies that have each spent more than \$1 million opposing the salmon initiative: State of the Race*. [Online]

Available at: <http://midnightsunak.com/2018/08/09/there-are-five-companies-that-have-each-spent-more-than-1-million-opposing-the-salmon-initiative-state-of-the-race/>

[Accessed 23 April 2019].

Thomson, I. & Boutilier, R. G., 2011. Social License to Operate. In: *SME Mining Engineering Handbook*. Littleton, Colorado: Society for Mining, Metallurgy and Exploration, pp. 1779-1796.

Tiernan, A., Lipka, C. & Smith, N., 2018. *Kuskokwim River Salmon Stock Status and Kuskokwim Area Fisheries, 2019: A Report to the Alaska Board of Fisheries*, Anchorage: Alaska Department of Fish and Game.

Trench, A., Packey, D. & Sykes, J. P., 2014. Non-Technical Risk and Their Impact on the Mining Industry. *Mineral Resource and Ore Reserve Estimation*, pp. 605-617.

- Tschakert, P., 2009. Recognizing and Nurturing Artisanal Mining as a Livelihood. *Resources Policy* 34, pp. 24-31.
- U.S. Army Corps of Engineers, 2013. *Donlin Gold Project Environmental Impact Statement Final Scoping Report*, Anchorage, AK: URS Alaska, LLC.
- U.S. Army Corps of Engineers, 2018. *Donlin Gold Project Final Environmental Impact Statement*, Jber, Alaska: s.n.
- U.S. Census Bureau, 2017. *Bethel Census Area, Alaska*. [Online] Available at: <https://www.census.gov/quickfacts/bethelcensusareaalaska> [Accessed 11 December 2018].
- U.S. Council on Environmental Quality, 2007. *Collaboration in NEPA: A Handbook for NEPA Practitioners*. Washington, DC: s.n.
- U.S. Environmental Protection Agency, 2014. *Proposed Determination of the U.S. Environmental Protection Agency Region 10 Pursuant to Section 404(c) of the Clean Water Act, Pebble Deposit Area, Southwest Alaska*, Seattle, Washington: Region 10.
- U.S. Government Accountability Office, 2012. *Regional Alaskan Native Corporations: Status 40 Years after Establishment, and Future Considerations*, s.l.: s.n.
- U.S. Government Accountability Office, 2014. *National Environmental Policy Act: Little Information Exists on NEPA Analyses*, s.l.: GAO-14-369.
- United Nations Environmental Program, 2004. *Environmental Impact Assessment and Strategic Environmental Assessment: Towards an Integrated Approach*, Geneva, Switzerland: UNEP.
- United Nations, 2015. *Transforming Our World: The 2030 Agenda for Sustainable Development*, s.l.: sustainabledevelopment.un.org.
- United Nations, 2016. *Paris Agreement*, s.l.: United Nations Treaty Collection.
- Upton, M., 2016. *Quantifying the Impact of Social License for Investment Decision-Making*. Presented April 26, s.n.
- Urkidi, L., 2010. A global environmental movement against gold mining: Pascua-Lama in Chile. *Ecological Economics* 70, pp. 219-227.
- Visser, W., 2011. *The Age of Reesponsibility: CSR 2.0 and the New DNA of Business*. s.l.:Wiley.
- Vogel, D., 2005. *The Market for Virtue: The Potential and Limits of Corporate Social Responsibility*. Washington, DC: Brookings Institution Press.
- Woods, C. S., 2014. It isn't a state problem: The Minas Conga mine controversy and the need for binding international obligations on corporate actors. *Geo. J. Int'l L* 46, p. 629.

World Bank, 2019. *World Development Indicators*. [Online] Available at: <https://data.worldbank.org/> [Accessed 26 November 2019].

Wright, C., 2012. Global Banks, the Environment, and Human Rights: The Impact of the Equator Principles on Lending Policies and Practices. *Global Environmental Politics* 12, pp. 56-77.

Yap, N. T., 1990. Round the peg or square the hole? Populists, technocrats and environmental assessment in third world countries. *Impact Assessment* 8, pp. 69-84.