

Deficiencies in Assessment of External Costs from the Tenas Project

A Review of Telkwa Coal's Environmental Impact Assessment in Support of Its Application for an Environmental Assessment Certificate for the Tenas Project

June 2022

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I. INTRODUCTION AND SUMMARY

Telkwa Coal Limited (Telkwa Coal) is proposing to construct, operate, and then reclaim the Tenas Project, a new open-pit coal mine located about 25 kilometres south of Smithers, British Columbia. The proposal calls for producing about 750,000 – 825,000 tonnes of metallurgical coal per year. Telkwa Coal anticipates that the coal would travel by rail to Prince Rupert for export to steel mills in Asia. Before implementing the project, Telkwa Coal must secure an Environmental Assessment Certificate and, in pursuit of this objective, it has submitted to the BC Environmental Assessment Office (EAO) a [report](#) that it claims provides a comprehensive assessment of the project’s potential environmental impacts. EAO has invited public comment on the report through July 3, 2022.

Telkwa Coal submitted its environmental assessment to EAO as part of [the agency’s process to](#) “[ensure] that any potential environmental, economic, social, cultural and health effects that may occur during the lifetime of a major project are thoroughly assessed. Environmental assessments are managed by the EAO, a neutral regulatory agency within the provincial government that works with and seeks input from scientific professionals, Indigenous groups, proponents, the public, local governments, and federal and provincial agencies to ensure that no adverse effects are missed.”

To satisfy these standards, the environmental impact assessment for the Tenas Project must fully identify, describe, and assess the project’s environmental and social impacts, risks, and other concerns so that communities and decision-makers can take them into account when evaluating the project. The origins for these requirements reach back to the 1970s, when communities in Canada and across the globe became increasingly aware that, although private-sector projects often generated net internal benefits for their sponsors, they also imposed large net costs on others through their adverse impacts on the environment, local communities, and global society. These external costs materialized whenever a project caused people and entities to lose something important to them. Concern was heating up, both because these “external” costs (Figure 1) to society as a whole were large and rapidly becoming larger, and because project developers often ignored them. Communities, hence, often had no advance warning of the adverse impacts a project would impose on them, and no information about how to avoid the costs or receive compensation. Decision-makers often had little or no information about the external costs when they approved projects, but then, after the costs materialized, conceded that they would not have approved the project had they had full, advance knowledge. Increasingly, the consequences and inequities – from local to global – were severe, with deaths and injuries to humans, livestock, and wildlife. In

FIGURE 1. PROJECTS HARM SOCIETY WHENEVER THEY IMPOSE EXTERNAL COSTS ON OTHERS

Internal Cost	= Borne By Project Proponents
External Cost	= Borne By Everybody Else = Harm To Society

many instances, analyses showed the net external costs exceeded the net internal benefits to project sponsors.

These concepts apply to the Tenas Project. As with any project that alters the use of natural resources, or modifies their structure, the Tenas Project likely will impose external costs on workers, families, businesses, communities, and future generations.

In short, to earn the coveted Environmental Assessment Certificate, Telkwa Coal must:

- a. Give stakeholders the information they need to understand and anticipate the external costs the Tenas Project likely will impose on them and to assess options for remedying the external costs.
- b. Give governmental decision-makers the information they need to determine if they should proceed with the Tenas Project because its potential benefits likely will outweigh its external costs, or, alternatively, if they should reject the project because the overall costs to society likely will exceed the benefits.

The environmental report Telkwa Coal submitted for review by EAO and the public satisfies neither of these requirements. It does not come close. The report does not even attempt to identify, describe, and assess all the external costs likely to result from implementation of the Tenas Project. As a consequence, if decision-makers and citizens rely solely on the report, they cannot make a reasonable, fully informed assessment of the costs likely to result from a decision to move forward with the Tenas Project. Readily available, relevant information excluded from the report, however, strongly indicates it would be prudent for decision-makers and citizens to conclude there is a substantial probability that society will experience external costs that exceed the benefits, so that implementing the Tenas Project would diminish, not enhance, the overall, future well-being of local households, citizens of British Columbia, all Canadians, and people throughout the globe.

The following sections of this document describe these deficiencies in Telkwa Coal's environmental report. They show that the potential external costs are both numerous and severe, enough so that the EAO should not grant an Environmental Assessment Certificate for the Tenas Project unless and until Telkwa Coal fully corrects the deficiencies by using all relevant information to provide decisionmaker and the public with a comprehensive understanding of the project's potential external costs. To facilitate the analysis of the deficiencies in the existing environmental report, the following sections look separately at the external costs that implementation of the Tenas Project potentially would impose on society through its impacts on:

1. The climate crisis
2. The biodiversity/ecosystem crisis
3. Air, water, noise, and light pollution
4. Jobs, workers, families, and communities
5. Risk

II. FAILURE TO ASSESS EXTERNAL COSTS FROM NEGATIVE IMPACTS ON CLIMATE

The production of coal at the Tenas Project would generate both benefits and costs. The benefits are measured by the revenues Telkwa Coal would receive from selling the coal. costs include economic damage imposed on society as a whole. Economists commonly apply the term, “external costs” to describe these costs because they accrue to workers, families, businesses, communities, and future generations who lie outside the pool of individuals and institutions that exert decision-making authority over timber production or directly receive the revenues. The external costs from coal production would materialize in many ways. One critically important set of external costs would arise from the project’s intensification of the climate crisis.

This section describes the climate-related external costs of timber production from two perspectives:

- A. The total costs to society
- B. The costs borne by today’s children

A. TOTAL COSTS TO SOCIETY

Telkwa Coal has indicated that the Tenas Coal project would produce, on average, 750,000 tonnes of metallurgical coal per year for 22 years. The production and use of this coal from the Tenas Project will substantially increase atmospheric greenhouse gases, equivalent to 2.33 million metric tons of CO₂ per year.¹ These numbers indicate that the project will generate emissions equivalent to 51.26 million metric tons of CO₂ total (Figure 2).

A	B	C	D
Estimate of the Social Cost of CO ₂ (US\$/metric ton)	\$50 (US Interim)	\$417 - \$800 (Ricke et al. 2018)	\$562 - \$3,319 Kikstra et al. 2021)
CO ₂ Emissions, Annual (metric tons)	2.33 million	2.33 million	2.33million
Climate-Related External Cost, Annual (US\$)	\$0.1 billion	\$1.0 – \$1.9 billion	\$1.3 – \$7.7 billion
CO ₂ Emissions, Total (metric tons)	51.26 million	51.26 million	51.26 million
Climate-Related External Cost, Total (US\$)	\$2.5 billion	\$21.4 – \$41.0 billion	\$28.8 – \$170 billion

Figure 2: Potential CO₂ Emissions and Resulting Climate-Related External Costs Annual and Total

¹ Chernaik, M, 2022. Technical Review of the BC EAO EAC Application – Tenas Project Atmospheric Environment Valued Component Greenhouse Gas (GHG) Emissions

These increases in atmospheric carbon dioxide will impose economic costs on society for the foreseeable future, by exacerbating the many components of the climate crisis. It will make heatwaves, droughts, and wildfires more frequent and intense, for example. Many economists have developed estimates of the economic damage per metric ton of carbon dioxide, commonly called the “social cost of carbon dioxide” (sometimes abbreviated as the “social cost of carbon”).

These external costs are complex and difficult to measure, but three landmark estimates illustrate the potential range of damage. In 2016, U.S. federal agencies estimated that each metric ton of CO₂ added to the atmosphere will cause economic damage of about US\$40-\$50.² The agencies acknowledged that the true social cost is considerably higher, insofar as these numbers rest on some powerful simplifying assumptions and fail to incorporate the full range of potential damage likely to result from increases in atmospheric CO₂. The Biden Administration currently is using the upper bound of this estimate, US\$50 per metric ton, until courts will allow it to use an updated estimate.

Since 2016, researchers have continued to develop new estimates of the social cost of carbon dioxide, using updated assumptions and data. One prominent study, published in 2018, found that each metric ton of CO₂ added to the atmosphere will impose economic damage of US\$417, and perhaps as high as US\$800.³ Another concluded that the social cost of carbon dioxide is at least US\$562 and perhaps US\$3,319 per metric ton.⁴ These estimates of the social cost of carbon dioxide – US\$50 at the lower end, up to US\$3,319 at the upper end – provide the basis for developing provisional estimates of the climate-related external costs that will be imposed on by the Tenas Project. Figure 2 shows that the project’s annual climate-related external costs from the production and use of coal from the project will be about US\$0.1 – US\$7.7 billion. Overall, the production and use of coal from the project will impose external costs on society totaling about US\$2.5 – US\$170 billion.

There is a high likelihood that the negative impacts on societal well-being will be even greater than those shown in Figure 2. This conclusion is supported, for example, by more than 11,000 scientists who warned in 2019 that we now are facing a climate emergency that threatens human existence:

“[W]e declare, with more than 11,000 scientist signatories from around the world, clearly and unequivocally that planet Earth is facing a climate emergency. ... The climate crisis has arrived and is accelerating faster than most scientists expected.... It is more severe than anticipated, threatening natural ecosystems and the fate of humanity....”⁵

In 2021, almost 14,000 scientists expanded the warning, concluding that the climate emergency is even more dire than previously expected, and calling for immediate, transformative action to slow and halt catastrophic trends:

“On the basis of recent trends in planetary vital signs, we reaffirm the climate emergency declaration and again call for transformative change, which is needed now more than ever to protect life on Earth

² [EPA Fact Sheet: Social Cost of Carbon.](#)

³ Ricke, K., Drouet, L., Caldeira, K., and Tavoni, M. (2018). [Country-Level Social Cost of Carbon.](#)

⁴ Kikstra, J., P. Waidelich, J. Rising, and others. 2021. [The Social Cost of Carbon Dioxide Under Climate-Economy Feedbacks and Temperature Variability.](#)

⁵ Ripple, W.J., et al. 2019. [World Scientists’ Warning of a Climate Emergency.](#)

and remain within as many planetary boundaries as possible. The speed of change is essential....”⁶

In 2022, the Intergovernmental Panel on Climate Change (IPCC) warned:

“Climate change is affecting nature, people’s lives and infrastructure everywhere. Its dangerous and pervasive impacts are increasingly evident in every region of our world. These impacts are hindering efforts to meet basic human needs and they threaten sustainable development across the globe. ...

“All life on Earth – from ecosystems to human civilization – is vulnerable to a changing climate. Since the first IPCC reports, the evidence has become stronger: our world is warming and dangerous climate change and extreme events are increasingly impacting nature and people’s lives everywhere.

...

“Climate change impacts are expected to intensify with additional warming. It is also an established fact that they are interacting with multiple other societal and environmental challenges. These include a growing world population, unsustainable consumption, a rapidly increasing number of people living in cities, significant inequality, continuing poverty, land degradation, biodiversity loss due to land-use change, ocean pollution, overfishing and habitat destruction as well as a global pandemic. Where trends intersect they can reinforce each other, intensifying risks and impacts, which affect the poor and most vulnerable people the hardest.”⁷

Given these warnings, there is no reasonable excuse for the deficiency in Telkwa Coal’s environmental report that comes from its failure to provide a comprehensive assessment of the climate-related external costs that the Tenas Project will impose on society. To rectify this deficiency, it must quantify all of the greenhouse-gas emissions – direct, indirect, and induced – that might result from implementation of the project. In particular, this quantification must include potential emissions on-site, from transportation of the coal, and from use of the coal. Telkwa Coal also must then describe and estimate the potential economic costs that these emissions would impose on society.

B. THE COSTS BORNE BY TODAY’S CHILDREN

Another deficiency in its failure to address climate-related external costs comes from Telkwa Coal’s failure to use readily available information that shows steps decision-makers in Australia have taken to describe and diminish the climate-related costs that a proposed coal mine would impose on children. To help in its deliberations in a lawsuit seeking to halt expansion of a coal mine, a Federal Court in Australia asked an independent expert witness to describe the costs that foreseeable changes in climate will impose on the country’s children over their lifetime. The expert looked at just three of the many types of climate-related costs: (1) reductions in home values resulting from increased probability of wildfires and other risks, (2) reductions in earnings as workers and farmers experience lower productivity in response to more intense heatwaves and other climate impacts, and (3) negative health impacts resulting from higher temperatures. The analysis found that if current trends in the atmospheric levels of greenhouse gases continue, each of today’s children will experience costs of about US\$126,000 over their lifetime because of just these three impacts of climate change.⁸

⁶ Ripple, W.J. 2021. [World Scientists Warn of a Climate Emergency](#).

⁷ IPCC. 2022. [Sixth Assessment Report: Impacts, Adaptation and Vulnerability](#).

⁸ Mallon, K. 2020. [Independent Expert Report by Dr. Karl Mallon](#). Amount shown in U.S. dollars, equivalent to the original estimate in Australian dollars.

This analysis provides useful insights into the economic importance of the climate-related external costs that will result from future timber production on trust lands. The analysis indicates that, unless steps are taken to markedly reduce increases in atmospheric CO₂, just three types of climate impacts will impose costs of US\$126,000 onto each of the 873,749 and 7.19 million individuals currently under age 18 in British Columbia and Canada, respectively.⁹ For this group as a whole and over their lifetime, the cost will total US\$110 billion and US\$906 billion, respectively (Figure 3).

Population of British Columbia Under Age 18 (2020)	873,749
Climate-Related Costs Each Will Experience Over Lifetime	US\$126,000
Total	US\$110 bil.
Population of Canada Under Age 18 (2020)	7,190,000
Climate-Related Costs Each Will Experience Over Lifetime	US\$126,000
Total	US\$906 bil.

Figure 3. Costs To Today’s British Columbians and Canadians Under Age 18, Over Their Lifetime, from Three Types of Climate Impacts If Current Trends Continue

The Australian court’s recognition of these findings highlights some of the economic consequences that could follow if Telkwa Coal were to implement the Tenas Project.¹⁰ The court declared that, although withholding governmental approval for the mine, by itself, would not free today’s children from all these costs, it would be consistent with the government’s obligation to protect children from climate-related harms. Specifically, withholding approval for the mine would provide benefits for today’s children through two pathways. One, it would ensure that the incremental increases in CO₂ emissions, which would result if government approved the mine, will not intensify the climate harms today’s children will experience from emissions elsewhere. Two, it might show the way and facilitate taking other appropriate actions to reduce CO₂ emissions that otherwise would harm today’s children.

Similar reasoning applies to the Tenas Project. If Telkwa Coal were to cancel the project, it would decrease or eliminate the project’s incremental CO₂ emissions, and thereby not intensify the climate harms today’s children will experience from emissions elsewhere. In addition, cancellation of the project might show the way and facilitate similar actions by others, and thereby accelerate and multiply the reductions in emissions and harms borne by today’s children.

To correct the deficiency that comes from its failure to describe the climate-related costs its coal mine would impose on children, Telkwa Coal must provide a full assessment of the climate-related costs the Tenas Project will impose on young people – using the information described above and any other relevant information – if it is to satisfy its obligation to provide decision-makers and the public with a comprehensive understanding of the project’s external costs.

⁹ Statista. 2022. [Population Estimate of British Columbia, Canada in 2020, by Age and Sex](#).

¹⁰ Readfern, G. 2021. [Australian Government Must Protect Young People from Climate Crisis Harm, Court Declares](#).

III. FAILURE TO ASSESS EXTERNAL COSTS FROM NEGATIVE IMPACTS ON BIODIVERSITY AND ECOSYSTEM SERVICES

If implemented, the Tenas Project would generate external costs not just by intensifying the climate crisis but also by contributing to the crisis in biodiversity and ecosystems. This latter crisis has received much less attention than climate, but it is also severe and existential to human life as we know it.¹¹ This reality is being made more apparent by research conducted and compiled by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), which stands parallel to the comparable institution, the Intergovernmental Panel on Climate Change (IPCC).¹²

The biodiversity/ecosystem crisis is occurring across the globe. Concern about biodiversity and ecosystems arises from research that shows nature makes countless contributions to human well-being, but its capacity to continue providing these so-called ecosystem services is diminishing at an unprecedented rate. This decline is more than worrisome because more than one-half of the economic activity measured by conventional indicators, such as the world's gross domestic product (GDP) is dependent on ecosystem services from nature.¹³ Globally, about one-third of the world's forest area has been destroyed, more than 85 percent of wetlands have been lost, one-third of the topsoil has been degraded, freshwater species and vertebrate species have experienced population declines of 83 percent and 60 percent, respectively, since 1970. These losses and trends create risks for human society and economy through their impacts on global health, global peace, intra- and international trade, gender equity, cultural and social connections between ecosystems and indigenous communities, and economic development. A major driver of these losses and trends has been the industrial exploitation of ecosystems to produce coal and other materials. Coal mining, which has both direct and indirect impacts on ecosystems, is among the greatest contributors to the biodiversity/ecosystem crisis.

British Columbia cannot avoid the worsening biodiversity/ecosystem crisis. A 2019 scientific assessment of biodiversity in British Columbia found disturbing trends:

*“British Columbia (B.C.) has the most biodiversity of any Canadian province and also the most species assessed to be at risk. In 1996, B.C. signed on to the national Accord for the Protection of Species at Risk, supporting the position that Canada’s biodiversity offers benefits to people and should be protected [but] the province has repeatedly been criticized for prioritizing resource development over the needs of species.”*¹⁴ [citations omitted for brevity]

The scientists also made strong recommendations intended to arrest and reverse these trends. Among these, they stated:

¹¹ A just-published peer-reviewed report from a panel of 50 of the world's leading biodiversity and climate experts states: “Biodiversity loss and climate change are both driven by human economic activities and mutually reinforce each other. **Neither will be successfully resolved unless both are tackled together.**” [Bold emphasis added.]

¹² For more information about the IPBES, please see the [home page](#).

¹³ Support for the facts in this paragraph come from World Economic Forum. 2020. [Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy](#).

¹⁴ Westwood, A.R., and others. 2019. [Protecting Biodiversity in British Columbia: Recommendations for Developing Species At Risk Legislation](#).

“[P]revention is widely recognized as the best approach for conserving biodiversity, [but] additional measures are needed to recover species at risk of extirpation or extinction. ... [S]ocioeconomic considerations should not trump ecological ones in cases of imminent imperilment, [and] every environmental impact assessment or cumulative effects assessment should consider effects on endangered species, taking a precautionary approach in the case of data deficiencies.”¹⁵ [citations omitted for brevity]

Biodiversity underlies many of the benefits – sometimes called ecosystem services – that nature provides humans. Ecosystems with greater diversity typically exhibit greater biological productivity than those with lower levels of diversity, creating opportunities for nature to provide a wider range and higher levels of benefits to humans. The national government has recognized the economic importance of healthy ecosystems:

“Ecosystems play an important role in supporting society through the goods and services they provide, such as food, clean water, air purification and climate regulation. They also contribute to climate change mitigation, by sequestering carbon from the atmosphere. The services provided by ecosystems are impacted by multiple factors, including land-use change and overexploitation, which can reduce their capacity to deliver benefits in the short and long term. As the climate continues to change and ecosystems shift in response to changing environmental conditions, their capacity to provide these services will be affected. Maintaining, restoring and managing ecosystems to address climatic and non-climatic stressors are key strategies for reducing their vulnerability in the face of climate change, by enhancing their resilience to changing conditions. Considering the important connections between Indigenous communities and nature, Indigenous Knowledge is vital to understanding how climate change is affecting ecosystems and to the design and implementation of approaches for their preservation and management.”¹⁶

These observations are in line with research findings from the World Bank, which recently recognized in more detail the economic importance of avoiding further damage to biodiversity and nature’s ability to contribute to human well-being:

“A new World Bank report estimates that the collapse of select ecosystem services provided by nature – such as wild pollination, provision of food from marine fisheries and timber from native forests – could result in a decline in global GDP of \$2.7 trillion annually by 2030.”¹⁷

Telkwa Coal has not published an estimate of the economic value of the potential harms to biodiversity and ecosystem services from the Tenas Project. To correct this deficiency, it should evaluate these harms in the context of global efforts to quantify the external costs from negative impacts on biodiversity and ecosystem services. The preliminary evidence suggests that they are huge. For example, the loss of biodiversity and degradation of ecosystems can contribute to the emergence of devastating diseases, the degradation of forest wetlands can diminish their ability to retard, even arrest wildfires, and industrial modification of ecosystems can diminish soils and degrade their productivity.¹⁸

¹⁵ *Ibid.*

¹⁶ Molnar, M., Olmstead, P., Mitchell, M., Raudsepp-Hearne, C. and Anielski, M. 2021. [Ecosystem Services; Chapter 5 in Canada in a Changing Climate: National Issues Report.](#)

¹⁷ World Bank. 2021. [Protecting Nature Could Avert Global Losses of \\$2.7 Trillion Per Year.](#)

¹⁸ UN Environment Programme. 2021. [Making Peace with Nature: A Scientific Blueprint to Tackle the Climate, Biodiversity and Pollution Emergencies, Executive Summary.](#)

The global research suggests it would be prudent to expect that the external costs from the Tenas Project's negative impacts on biodiversity and ecosystem services are equal to or greater than the value of the coal produced. A recent review of global research, for example, reached these conclusions:

*"Our analysis shows that both conservation and ecological restoration bring considerable net benefits in terms of public goods and common pool resources, regardless of the habitat or type of ecosystem state change being considered. ... [O]ur findings do suggest that, within the broad habitat and geographic range present in our data, we have typically passed the point where the benefits of further change from nature towards human-modified uses exceed the costs to society."*¹⁹
[bold emphasis added]

Telkwa Coal also should evaluate the potential external costs from the Tenas Project in the context of a landmark, 2021 assessment of the economics of biodiversity, commissioned by the UK government.²⁰ It examined the performance of industries that extract materials from ecosystems around the globe and concluded that, regardless of focus or location, the rate of return from these activities generally is about only 20 percent as large as the rate of return that would result from conserving and restoring the ecosystems. It reaches this conclusion after reviewing catalogs of scientific and economic research regarding the economic consequences of the biodiversity/ecosystem crisis (described above) that arises because human actions "have degraded the biosphere to the point where the demands we make of its [ecosystem] goods and services far exceed its ability to meet them on a sustainable basis."

In other words, humans have so degraded nature that it no longer can sustain past and current levels of production of coal and other materials. This degradation comes from more than just the emission of greenhouse gases and the obliteration of biodiversity. It also includes soil degradation, the emission of toxic pollutants, modifications to stream flows, elimination of wetlands, and more. Moreover, the degradation has become a worldwide reality, so there is no opportunity for an industry to exhaust the extraction of materials in one location, then move to another that has been untouched, and enjoy transitory higher levels of productivity. This reality, thus, is a major component of the biodiversity/ecosystem crisis: as nature becomes more degraded, ecosystems provide fewer services, suppressing the productivity of mining and other extractive industries.

To correct the deficiency in its current environment report and satisfy its obligation to provide decision-makers and the public with a comprehensive assessment of the project's external costs, Telkwa Coal must provide a full assessment of the external costs that will result from the Tenas Project's potential negative impacts on biodiversity and ecosystem services. This assessment must incorporate the information described above as well as any other relevant information. In particular, the assessment must recognize that credible scientific and economic evidence strongly suggests that these external costs, borne by society as a whole, will exceed the benefits from the project that will accrue privately to the corporation and its owners.

¹⁹ Bradbury, R.B., S.H.M. Butchart, B. Fisher, and others. 2021. [The Economic Consequences of Conserving or Restoring Sites for Nature](#).

²⁰ HM Treasury. 2021. [The Economics of Biodiversity: The Dasgupta Review](#).

IV. FAILURE TO ASSESS EXTERNAL COSTS FROM AIR, WATER, NOISE, AND LIGHT POLLUTION

Telkwa Coal has acknowledged that implementation of the proposed Tenas Project would result in increased emissions of pollutants, including particulates, selenium, and other harmful materials into the air and water, as well as noise pollution and light pollution. It has not, however, identified, described, and assessed the external costs likely to result from these pollutants. As a consequence, the information Telkwa Coal has provided to the EAO is not sufficient for decision-makers and the public to make fully informed decisions about the reasonableness of the proposal.

There is no apparent reason for not helping decision-makers and the public understand these potential external costs, insofar as information regarding the external costs associated with each type of pollution is readily available. For example, the World Economic Forum, a widely respected source of economic analysis, recently summarized relevant evidence regarding the harmful impacts of light pollution and concluded:

“Its impacts are wide-ranging - with human health, the environment and nature all affected, according to studies. ... How dark the night sky is affects wildlife including bats, migratory birds and insects. Light pollution threatens the health and natural cycles of humans, as well as wastes energy and money.”

“Humans are not exempt from the effect artificial light has on animals, with studies showing that it sends the body’s biological clock off, hampering sleeping cycles. What’s worse, artificial light was found in a study to be ‘significantly correlated for all forms of cancer’ including lung, breast, colorectal and prostate cancers individually.”²¹

Extensive research also documents harms that result from exposure to noise pollution. For example, researchers recently reported that:

“Living in a noisy environment can be annoying, but it might also harm your health. People experiencing high levels of noise from cars, trains or planes were more likely to suffer a heart attack than people living in quieter areas.”²²

The researchers also recognized interactions between the harms from air pollution and noise:

“[N]oise can cause chronic stress, disturbances in sleep and emotional distress such as anxiety and depression, which could impact cardiovascular health. Chronic stress is known to cause hormonal changes linked with inflammation and changes in the blood vessels that are associated with heart disease. Living near roadways and other transportation infrastructure also means greater exposure to vehicle exhaust and other forms of particulate air pollution. Previous studies have linked particulate air pollution with cardiovascular damage and increased rates of heart disease. Air pollution and noise go hand-in-hand.”

It should not be difficult for Telkwa Coal to locate and provide EAO, decision-makers, and the public with evidence regarding the potential external costs likely to accompany the different

²¹ World Economic Forum. 2022. [3 Ways Light Pollution Harms the Planet – And What We can Do About It.](#)

²² American College of Cardiology. 2022. [Living Near Noise Pollution Tied to Greater Risk of Heart Attack.](#)

types of pollution that would accompany implementation of the Tenas Project. Straightforward Google searches will yield dozens of links to relevant reports. For example, a search for “economic cost of noise pollution” will yield a link to research that concludes:

“Environmental noise pollution increases the risk for hearing loss, stress, sleep disruption, annoyance, cardiovascular disease, and has other adverse health impacts. ... The analyses suggest that a 5 dB noise reduction scenario would reduce the prevalence of hypertension by 1.4% and coronary heart disease by 1.8%. The annual economic benefit [in the U.S.] is estimated at \$3.9 billion.”²³

Until and unless it provides credible evidence to the contrary, it is reasonable to expect that noise in Canada has similar effects and imposes similar external costs on society. It also is reasonable to expect that the noise pollution associated with the Tenas Project—from on-site operations as well as from off-site activities, such as increased train traffic—could impose significant external costs on those exposed to the noise. Accordingly, to provide decision-makers and the public with a comprehensive assessment of noise-related external costs, Telkwa Coal should fully map potential exposure to project-related noise near the mine, along the rail line, and elsewhere, and assess the potential costs resulting from the noise. Note that additional costs would result from the impacts of noise on wildlife and livestock.

The Tenas Project will generate emission of particulates and other pollutants into the air through multiple pathways. Some will be tied directly to the mine’s operation: the combustion of diesel fuel by heavy equipment at the mine and by train locomotives, for example. Others will occur indirectly, for example, from increases in the combustion of gasoline and diesel fuel by workers and families attracted to the area, and by economic activity indirectly linked to the mine. There can be no doubt that these pollutants will impose external costs:

“Epidemiological studies suggest that there exist no safe levels for many local air pollutants. Among these are fine particulate matter [citations], or PM_{2.5}, which the Environmental Protection Agency (EPA) estimates is responsible for over 90% of air pollution-related health damages [citation]. Exposure to PM_{2.5} has been linked to numerous fatal health consequences, among them ischemic heart disease, stroke, chronic obstructive pulmonary disease, and lung cancer [citation]. Therefore, despite recent reductions in the average concentration of pollution, risks remain.”²⁴

Many local residents have raised concerns about the potential costs from mine-related dust emissions. Some of these emissions will result from the operation of heavy equipment at the mine and from mine-related rail and highway traffic. It also is reasonable to anticipate that external costs will result from coal-dust emissions resulting from storing and handling coal. Recent research in the U.S., for example, reported:

“We find that a 10% increase in the coal stockpiles held by U.S. power plants results in a 0.09% increase in average PM_{2.5} concentration levels within 25 miles of these plants. Unlike most sources of variation in local air pollution, coal storage and handling impacts PM_{2.5} but not other pollutants such as SO₂ and NO₂. Consequently, using coal stockpiles as an instrument, we show that a 10% increase in PM_{2.5} causes a 1.1% (3.2%) increase in average adult (infant) mortality rates. Using a value of

²³ Swinburn, T.K., M.S. Hammer, and R.L. Neitzel. 2015. [Valuing Quiet: An Economic Assessment of US Environmental Noise As a Cardiovascular Health Hazard](#).

²⁴ Tschofen, P., I.L. Azevedo, and N.Z. Muller. 2019. [Fine Particulate Matter and Value Added in the US Economy](#).

statistical life approach, our estimates indicate that a one ton increase in coal stockpiles results in local air pollution costs of \$197.”²⁵

Insofar as many coal-fired power plants in the U.S. are located in rural areas, it is not unreasonable to anticipate that the Tenas Project would generate similar effects and costs. External costs from storing and handling coal likely would materialize not just near the mine but also near where the coal is delivered to the port and loaded onto ships. Additional costs likely would materialize from coal-dust emissions along the rail line. Research in western Washington found that “nearly all coal trains appeared to generate some degree of coal dust.”²⁶ The amount of coal dust can be astonishingly high. For example, for coal shipped to the West Coast from Wyoming, “500 pounds to a ton of coal can escape from a single loaded car.”²⁷ The amount of coal dust that would be emitted by trains carrying coal from the Tenas project has yet to be determined with certainty. Note that additional external costs would result from dust other than coal-dust, and from the impacts of dust on livestock and wildlife.

Until and unless it provides credible evidence to the contrary, Telkwa Coal should use these and other salient research findings to provide decision-makers and the public with a full description and account of the potential external costs from mine-related emissions of transportation-related, coal dust, and other air pollutants.

Similar concerns apply to potential impacts on water quality. A Google search for “economic cost of water pollution” will identify a recent report from the World Bank on the economic costs of water pollution. Titled *Quality Unknown: The Invisible Water Crisis*, it:

“[S]hows, with new data and methods, how a combination of bacteria, sewage, chemicals, and plastics can suck oxygen from water supplies and transform water into poison for people and ecosystems. To shed light on the issue, the World Bank assembled the world’s largest database on water quality gathered from monitoring stations, remote sensing technology, and machine learning. The report finds that a lack of clean water limits economic growth by one-third. It calls for immediate global, national, and local-level attention to these dangers which face both developed and developing countries. ‘Clean water is a key factor for economic growth. Deteriorating water quality is stalling ²⁸economic growth, worsening health conditions, reducing food production, and exacerbating poverty in many countries.’ Said World Bank Group President David Malpass.”²⁹

Extending the search to focus on the potential harms to indigenous communities will yield links to research that documents widespread recognition that these harms include not just risks to physical health, but much more. For example, a summary of research in Canada demonstrates the Telkwa Coal should give special emphasis to identifying, describing, and assessing the potential external costs the Tenas Project might impose on Indigenous people.:

“Clean, accessible, and sustainable drinking water is a basic necessity of life, and indispensable for meeting national and international standards of health, justice, equality, and responsibility. While much research has focused on identifying and preventing contaminants in drinking water,

²⁵ Jha, A. and N.Z. Muller. 2018. [The Local Air Pollution of Coal Storage and Handling: Evidence from U.S. Power Plants.](#)

²⁶ University of Washington, Jaffe Research Group. 2015. [Train Study.](#)

²⁷ De Place, E. 2011. [At Least the Website Is Clean: What the Railroads Don’t Want You To Know about Coal Dust.](#)

²⁸ Bharadwaj, L., and L. Bradford. [Indigenous Water Poverty: Impacts Beyond Physical Health.](#)

²⁹ World Bank. 2019. [Worsening Water Quality Reducing Economic Growth by a Third in Some Countries: World Bank.](#)

Indigenous teachings point out that water has various meanings and uses for people including its aesthetics; a symbol of fertility and purity; a home for living beings; a life-enriching cleansing agent; an element of interconnection; and a symbol of both strength and softness. Water "... is life; ...sacred; ...power; ... our first medicine; and, water connects all things" (Sanderson, 2004, p. 93). Elders also describe that when water sources are no longer usable, life suffers and cultural health is threatened. Elders stress that, "Water cannot be separated into one realm. In the same way, water is important to life, health, education, the laws that govern our lives, and the environment." (Sanderson, 2004, p. 113)

"In freshwater-rich Canada, providing safe drinking water on reserves is a pressing issue for Indigenous communities and the federal government. The ongoing effects of colonization have contributed to the erosion of Indigenous peoples' livelihood systems, culture, and resources (Adelson, 2005; Arquette, 2002; Waldram, Herring, & Young, 2006). The erosion of water resources has a negative impact on the wellbeing of communities and contributes to the current inequity in the health status of Indigenous Canadians (Waldram et al., 2006)."

In sum, extensive evidence was available to Telkwa Coal regarding the potential external costs from project-related air, water, noise, and light pollution, but it failed to incorporate this information in the materials it submitted to EAO. It must correct this deficiency to satisfy its obligation to provide decision-makers and the public with a comprehensive description and assessment of the Tenas Project's external costs.

V. FAILURE TO ASSESS NEGATIVE IMPACTS ON JOBS, WORKERS, FAMILIES, AND COMMUNITIES

The assessment report submitted to EAO by Telkwa Coal fails to provide a comprehensive, description of the project’s potential negative impacts on jobs, workers, families, and communities. Particularly important, the report fails to describe the external costs to workers, families, and communities as the initial employment boom from inauguration of the Tenas Project is followed by chronic layoffs and, eventually, a job bust. In addition, the assessment report fails to identify, describe, and assess the likelihood that implementation of the Tenas Project will preclude growth in jobs in other sectors of the economy.

The assessment report states: “During the Operation Phase, the Project would provide up to 133 direct FTEs for TCL employees, with...on average 17 FTE jobs for contractors.”³⁰ If it fills any of these jobs with workers already employed by local employers, those employers will have to incur costs to search for replacements. If they can’t readily find replacements in the local labor market, they will have to incur additional costs to attract qualified workers from elsewhere. Telkwa Coal does not describe these external costs.

But then what? History shows that coal production, for many decades, has had deep, negative impacts on workers, families, and communities. The coal mining industry has destabilized and depressed local economies by eliminating jobs and contributing to unhealthy social conditions in local communities. For example, data for surface coal mining in the U.S. shows that the labor required to produce a given amount of coal has been declining by about one percent per year.³¹ If this trend applies to the Tenas Project, then, over its planned operating lifetime, Telkwa Coal will lay off about 20 percent of its initial production workforce. Nowhere, in its discussion (Section 5.0, Chapter 2) of the project’s economic-development impacts, however, does the assessment report identify, describe, and assess the economic importance of the chronic layoffs.

And then it will lay off all remaining production workers when production ceases. Telkwa Coal asserts that this likely will happen about 25 years in the future. In others words, the company plans to impose an employment bust on workers, families, and communities about 25 years after it generates the initial boom. But it does not identify, describe, and assess the external costs that experience elsewhere indicates will accompany the boom-bust cycle.

Moreover, Telkwa Coal does not assess the likelihood that these external costs will be magnified if the coal production ceases sooner than 25 years in the future. Given the worldwide pressures to eliminate greenhouse-gas emissions from fossil fuels, it would be prudent for decision-makers and the public to anticipate that the probability of early closure is significant. The assessment report Telkwa Coal submitted to EAO doesn’t identify, describe, and assess these pressures, nor does it give decision-makers and the public information they need to understand the potential magnification of boom-bust external costs that likely would materialize if coal production ceases earlier than planned.

³⁰ Section 13, Chapter 16, p. 8.

³¹ National Mining Association. 2021. [U.S. Coal Mining Productivity Trends, 1950-2020](#).

The discussion above supports the conclusion, that implementation of the Tenas Project likely will not foster robust economic outcomes for workers, families, and communities. Instead, the production of coal will, instead, likely contribute to persistent economic and social decline.

Would the outlook be different absent the Tenas Project? Substantial evidence says, “Yes.” Research reaching back over several decades indicates that an emphasis on resource conservation and restoration likely would yield brighter future for jobs, incomes, and overall economic activity.

Some of this evidence comes from research conducted in Oregon, which found that proximity to conserved forestlands typically correlates with faster growth in community wealth. Specifically, communities within 10 miles of land protected from resource extraction “experienced higher growth in community wealth than communities more than 10 miles from...protected land.”³²

Two major factors underlie the likelihood that resource conservation and restoration would stimulate an increase in jobs and community prosperity. One is the outdoor recreation/tourism industry, which has been growing doggedly and rapidly.

The second major factor materializes as communities with attractive amenities attract workers, families, and businesses to communities. New workers often have higher levels of skill and incomes, new families typically have higher incomes to spend in local shops, and new businesses generally have the ability to grow more rapidly than long-established businesses (especially those with a resource-extraction orientation). All of these factors can contribute to a more robust and sustainable local economy. All of these factors can generate new economic opportunities for the current residents of communities near the proposed site of the Tenas mine.

This is not a new phenomenon. The most extensive examinations of it have focused on the western U.S., but research confirms a strong similarity in B.C. For example, in 1999, an economist with the USDA Economic Research Service, looked back and concluded:

“Climate, topography, and water area are highly related to rural county population change over the past 25 years. A natural amenities index, derived and discussed here, captures much of this relationship. Average 1970-96 population change in nonmetropolitan counties was 1 percent among counties low on the natural amenities index and 120 percent among counties high on the index. ... Employment change is also highly related to natural amenities.... The importance of particular amenities varies by region...people are attracted to the West for its varied topography.”³³

A more recent analysis concluded that, on average, counties with more public land protected from extractive activities enjoy increased economic performance. After statistically controlling for the influence of other factors, the researchers found that, on average, a county in the western U.S. with 10,000 additional acres of land protected from extractive activities exhibited higher average per capita income, faster growth in per capita income, and faster growth in non-labor per capita income.³⁴

³² Weber, Bruce, and Yong Chen. 2012. “Federal forest policy and community prosperity in the Pacific Northwest.” *Choices*. 27(1). <http://www.choicesmagazine.org/choices-magazine/theme-articles/rural-wealth-creation/federal-forest-policy-and-community-prosperity-in-the-pacific-northwest->

³³ McGranahan, D.A. 1999. [Natural Amenities Drive Population Change](#).

³⁴ Rasker, R., Gude P.H., and Delorey, M., 2013. [The Effect of Protected Federal Lands on Economic Prosperity in the Non-Metropolitan West](#).

An even more recently completed review of this phenomenon found that it has been transforming the economies of communities across the western U.S.:

“During the past three decades, rural communities in the American West have experienced significant economic restructuring, transitioning from extractive-based industries toward service-based economies. A major impetus for economic restructuring in the Western U.S. (hereafter, the West) has been amenity migration, a phenomenon in which people relocate to communities for physical and social amenities derived from an abundance of desired ecosystem services as opposed to simply following employment opportunities. These amenity migrants include footloose entrepreneurs, retirees, and people willing to trade income for a higher quality of life.”³⁵ [Citations omitted]

Research in northern B.C. has reached similar conclusions. For example:

“Findings indicate that good social capital networks stimulated by pleasant surroundings have promoted more sustainable patterns of local development. Effective territorially-based community governance is seen as important in enabling these settlements to acquire greater ownership of their built and natural environments.”³⁶

“Rural and small-town places in northern BC are affordable and connected places for living and doing business. With the connectivity of the ‘information age,’ these places are attractive economic and quality-of-life destinations for companies and government agencies seeking to relocate from expensive and congested metropolitan areas while at the same time staying connected to the global economy. Our northern quality of life...can be a foundation for both economic and community development.”³⁷

In sum, the evidence presented above shows that implementation of the Tenas Project likely would, both directly and indirectly, have negative impacts on jobs, workers, families, and communities. These negative impacts would offset some of the purported positive impacts throughout the project’s operation and, eventually, eliminate production jobs altogether. The assessment report Telkwa Coal submitted to EAO is deficient in that it does not provide the information necessary for decision-makers and the public to understand these negative impacts and the external costs that will accompany them. To correct this deficiency, Telkwa Coal must fully identify all of the ways in which opening, operating, and closing the mine might have negative impacts on jobs, workers, families, and communities.

³⁵ Hjerpe, E., A. Hussain, and T. Holmes. 2020. [Amenity Migration and Public Lands: Rise of the Protected Areas](#).

³⁶ Jackson, T., B. Illsley, J. Curry, and E. Rappaport. 2008. [Amenity Migration and Sustainable Development in Remote Resource-Based Communities: Lessons from Northern British Columbia](#).

³⁷ Markey, S., G. Halseth, and D. Manson. 2012. [Investing in Place: Economic Renewal in Northern British Columbia](#).

VI. FAILURE TO ASSESS EXTERNAL COSTS FROM PROJECT-RELATED RISKS

The Tenas Project will impose risks on workers, families, communities, and global society whenever it creates the possibility that they will lose something important to them. Project-related risks might entail an increase in the probability of death, injury, or illness; reduction in quality of life; or diminution in economic well-being. The preceding sections demonstrate that it is reasonable for decision-makers and the public to anticipate that implementation of the Tenas Project likely would generate multiple, serious risks from its negative impacts on climate; on biodiversity and ecosystem services; from air, water, noise, and light pollution; and on jobs, workers, families, and communities.

It is important to recognize that the Tenas Project will impose external costs on society – individuals, families, businesses, communities, future generations, society as a whole – whenever it creates risk, i.e., increases the probability that something bad will happen to those exposed to the risks. These external costs are distinct from, and in addition to, the external costs that would manifest if the bad things materialized. For example, if the project releases poisons into the air, parents likely will experience anxiety whenever they allow their children to play outside. This anxiety reduces their quality of life and, hence constitutes an external cost imposed on them. They will experience this cost, whether or not the poisons actually make their children ill

The environmental report Telkwa Coal submitted to the EAO does not identify, describe, and assess the risks and related external costs that would accompany implementation of the Tenas Project. To correct this deficiency, Telkwa Coal should identify, describe each risk that might result from implementation of the project and clearly assess the associated external costs.

Ernie Niemi, President of the consultancy, Natural Resource Economics, prepared this document in response to a request from the group, What Matters in Our Valley. The report draws from his review of information specific to the Tenas project and from more than 40 years of his earlier efforts to describe the external costs resource-extraction projects impose on workers, families, communities, and other sectors of the economy. He prepared this document without material influence from any other party, and reserves the right to change the document in response to new information that might become available in the future. Natural Resource Economics is solely responsible for the contents of this document.

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