A Technical Review of the

BC EAO EAC Application – Tenas Project
Atmospheric Environment Valued Component
Greenhouse Gas (GHG) Emissions

By
Dr. Mark Chernaik
Environmental Law Alliance Worldwide

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With respect to an environmental assessment of a proposed coal mine, judicial opinion distinguishes between ***direct*** and ***indirect*** greenhouse gas (GHG) emissions of the project. Direct GHG emissions from a proposed coal mine include:

> "… emissions from undertaking mining operations, including vegetation stripping, release of fugitive methane during open cut mining and combustion of fuels by vehicles, plant and equipment during mining operations."[1]

In contrast, indirect GHG emissions from a proposed coal mine include:

> "… emissions that are a consequence of the activities of an entity, but which arise from sources not owned or controlled by that entity. [Examples] are emissions from the extraction and production of purchased materials, transportation of purchased fuels and use of sold products and services. [These] emissions will include emissions associated with the extraction, processing and transportation of diesel and the transportation and combustion of product coals. Emissions from the combustion of product coal are 'downstream' emissions as they physically occur at the power stations or steel mills combusting product coal from the mine."[2]

For a proposed coal mine, **indirect GHG emissions exceed direct GHG emissions often by several orders of magnitude.**[3]

Judicial opinions hold that an environmental assessment for a proposed fossil fuel project, such as a coal mine, must include **both direct and indirect GHG emissions** of the proposed project.

Contrary to judicial opinions, and the commonsense understanding that "all of the direct and indirect GHG emissions of [a coal mine] will impact on the environment," Telkwa Coal Limited has excluded indirect GHG emissions from the scope of the environmental assessment of its mine application, stating in response to public comment that:

> "GHG emissions from the project area including coalbed methane as well as haul road and rail infrastructure activities will be assessed. The inquiry will be addressed in the atmospherics/GHG chapter of TCL's Environmental Assessment (EA) Application (draft Application Information Requirements section 4.1). **A GHG assessment beyond the boundary of the project area is beyond the scope of TCL's EA Application**."[4]

Accordingly, the environmental assessment for the mine application presents to stakeholders and decision-makers only these direct emissions of the proposed Tenas Project, stating:

> "Emissions of GHGs were estimated for all Project activities during Year 5 of the Operation Phase and summarized in Table 5.2-2. **Total annual GHG emissions**

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[1] *Gloucester Resources Limited v Minister for Planning* [2019] NSWLEC, at paragraph 426.
[2] Ibid., at paragraph 428.
[3] In the case of the proposed Tenas Project, indirect GHG emissions exceed direct GHG emissions by roughly 33 times, 2.26 million metric tons of CO_2eq per year versus 69,000 tons of CO_2eq per year, see below.
[4] Tenas Project Public Consultation Report.

associated with the Project are estimated to be 68,973 tonnes. The largest sources of GHG emissions are fuel combustion in mobile mine equipment and fugitive releases of coalbed methane. …"[5]

Table 5.2-2: Estimated Greenhouse Gas (GHG) Emissions

Emission Source	CO_2 (t)	CH_4 (t)	N_2O (t)	CO_2e (t)
Mine equipment	44,156	1.2	3.7	45,300
Locomotives	101	0.006	0.04	113
Haul trucks and service vehicles	388	0.01	0.02	395
Space heating	156	0.006	0.003	157
Quarry equipment	575	0.02	0.05	590
Coalbed methane	-	897	-	22,418
Total	**45,377**	**898**	**3.8**	**68,973**

Notes: t=tonnes; CO_2=carbon dioxide; CH_4=methane; N_2O=nitrous oxide; CO_2e=carbon dioxide equivalent

NOTE: The document *BC EAO EAC Application – Tenas Project Atmospheric Environment Valued Component* does not supply a basis for the expected quantity of coalbed methane emissions of 22,416 tons of CO_2eq per year. However, a report assessing core sample data in the Telkwa field indicates that the project would have expected coalbed methane emissions of **92,546 tons of CO_2eq per year**,[6] bringing total project emissions to **139,000 tons of CO_2eq per year.**

However, these direct GHG emissions of the project are *vastly exceeded* by the indirect GHG emissions, which I calculate below. To calculate the indirect GHG emissions, one needs to ascertain the rate of coal production of the project and the expected carbon content of the coal that would be produced. With respect to the rate of coal production, the feasibility study for the project states:

> "The mine production schedule for the Tenas Project is nominally 1,050,000 ROM tonnes per annum for a 22- year mine life including construction, producing on average 750,000 saleable tonnes per annum, at a strip ratio of 3.6:1 BCM/ROMt, and at a yield of 75% (at 10% moisture when loaded onto a vessel)."

With respect to carbon content of the coal produced, the feasibility study for the project states:

> "In determining a suitable price point for Telkwa semi-soft coking coal, Koornhof notes Telkwa SSCC is a closer match with the Queensland medium volatile SSCC (MV SSCC), than New South Wales high volatile SSCC (HV SSCC). The net effective carbon content of the MV SSCC, which is considerably higher than that of the HV SSCC, results in a premium of US$2-3/tonne for the MV SSCC."

Soft-coking coals and semi-soft coking coals typically have a total carbon content of 82.5%.[7]

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[5] BC EAO EAC Application – Tenas Project, Atmospheric Environment Valued Component, Greenhouse Gas (GHG) Emissions, at page 49.

[6] George Lebiadowski (October 26, 2020) "Tenas Mining Concession, Coal/Gas in Place, Telkwa, BC, Technical Discussion." At page 5.

[7] Camberwell coal project, Glennies Creek, NSW, Camberwell Coal Pty. Limited, October, 1988

Since TCL is claiming that the "*net effective carbon content of the MV SSCC, which is considerably higher than that of the HV SSCC*," then we may assume that the carbon content of the 750,000 saleable tonnes per annum of SSCC of the proposed Tenas project would have a total carbon content of at least 82.5%

TCL intends to sell 750,000 saleable tons per annum of SSCC to steelmaking facilities, where such SSCC would be combusted. Therefore, the annual CO_2 emissions of the intended purpose of the Tenas project can be calculated as follows:

750,000 tons of SSCC/year x 0.82 tons of carbon/ton of SSCC x 3.67 tons of CO_2/ton of carbon:

= 2.26 million metric tons of CO_2/year.

The failure of the environmental assessment for the mine application to include the indirect GHG emissions of the project within its scope deprives stakeholders and decision-makers of essential information for evaluating the acceptability of the project, such as the number of deaths associated with such GHG emissions.[8]

In 2021, the number of expected deaths caused by the emission of one additional metric ton of CO_2 was estimated by researchers at the Columbia University School of International and Public Affairs: They state:

> "In this study, we create an extension to DICE-2016 called DICE-EMR (Dynamic Integrated Climate-Economy Model with an Endogenous Mortality Response)….. We use DICE-EMR to produce a new metric …: the mortality cost of carbon (MCC). *The 2020 MCC is the number of expected temperature related excess deaths globally from 2020 to 2100 caused by the emission of one additional metric ton of carbon-dioxide equivalent emissions in 2020*. We find that in the DICE baseline scenario that results in 4.1 °C warming above preindustrial temperatures by 2100, the 2020 MCC is 2.26 x 10^{-4} lives per metric ton in the central estimate, which implies that adding 4,434 metric tons of carbon dioxide in 2020 … causes one excess death globally in expectation between 2020 and 2100. …
>
> "We find that optimal climate policy in DICE-EMR, however, involves large immediate emissions reductions and full decarbonization by 2050. This results in 2.4 °C warming by 2100.
>
> "If the world undertakes the optimal emissions path in DICEEMR and restrains global average temperatures to 2.4 °C, we largely avoid the temperatures where marginal increases in temperature resulting from a marginal emission today are most damaging. Therefore, the SCC and the MCC are highly sensitive to future climate policy. On the optimal emissions path the 2020 MCC drops by 53% from 2.26 × 10^{-4} lives per metric ton in the baseline emissions scenario to 1.07 × 10^{-4} lives per metric ton (see Table 1). *This implies that under DICE-EMR's optimal climate policy, adding (reducing) 9,318*

[8] As there are iron and steel manufacturing facilities in Canada, a portion of these indirect emissions would be from source in Canada.

tons of carbon dioxide … causes (reduces) one excess death globally between 2020 and 2100."[9]

This analysis allows us to calculate the mortality costs associated with annual expected indirect GHG emissions of the Tenas Project. If the world pursues the optimal emissions path and restrains global average temperatures to 2.4 °C above pre-industrial levels by 2100, then the number of such associated deaths are:

2.26 million metric tons of CO_2/year x 1 death/9318 tons CO_2 = **247 deaths**

However, if the world fails to undertake the optimal emissions path and allows global average temperatures increase to 4.1 °C above pre-industrial levels by 2100, then the number of such associated deaths are:

2.26 million metric tons of CO_2/year x 1 death/4434 tons CO_2 = **510 deaths**

Over a 22-year mine life, the deaths would total **5434** (if global average temperatures are held to 2.4 °C above pre-industrial levels by 2100) or **11,220** deaths (if global average temperatures increase to 4.1 °C above pre-industrial levels by 2100).

The mortality costs associated with annual expected **direct** GHG emissions of the Tenas Project, (as detailed in BC EAO EAC Application – Tenas Project, Atmospheric Environment Valued Component, Greenhouse Gas (GHG) Emissions, at page 49) would be fewer, but still substantial: **166 deaths** (if global average temperatures are held to 2.4 °C above pre-industrial levels by 2100) or **343 deaths** (if global average temperatures increase to 4.1 °C above pre-industrial levels by 2100).[10]

A decision to allow the Tenas Project would be associated with these impacts. If TCL is correct that its metallurgical coal would be "a vital ingredient for making steel, iron alloy, carbon, and other metals," then the absence of metallurgical coal from the Tenas Project would compel makers of steel, iron alloy, carbon and other metals to reduce output or find ways not involving metallurgical coal to manufacture these commodities.

[9] Bressler, R. D. (2021). The mortality cost of carbon. *Nature communications*, *12*(1), 1-12.

[10] Such associated deaths would be 332 deaths (if global average temperatures are held to 2.4 °C above pre-industrial levels by 2100) or 686 deaths (if global average temperatures increase to 4.1 °C above pre-industrial levels by 2100) if coalbed methane emissions were actually 92,546 tons of CO2eq per year.