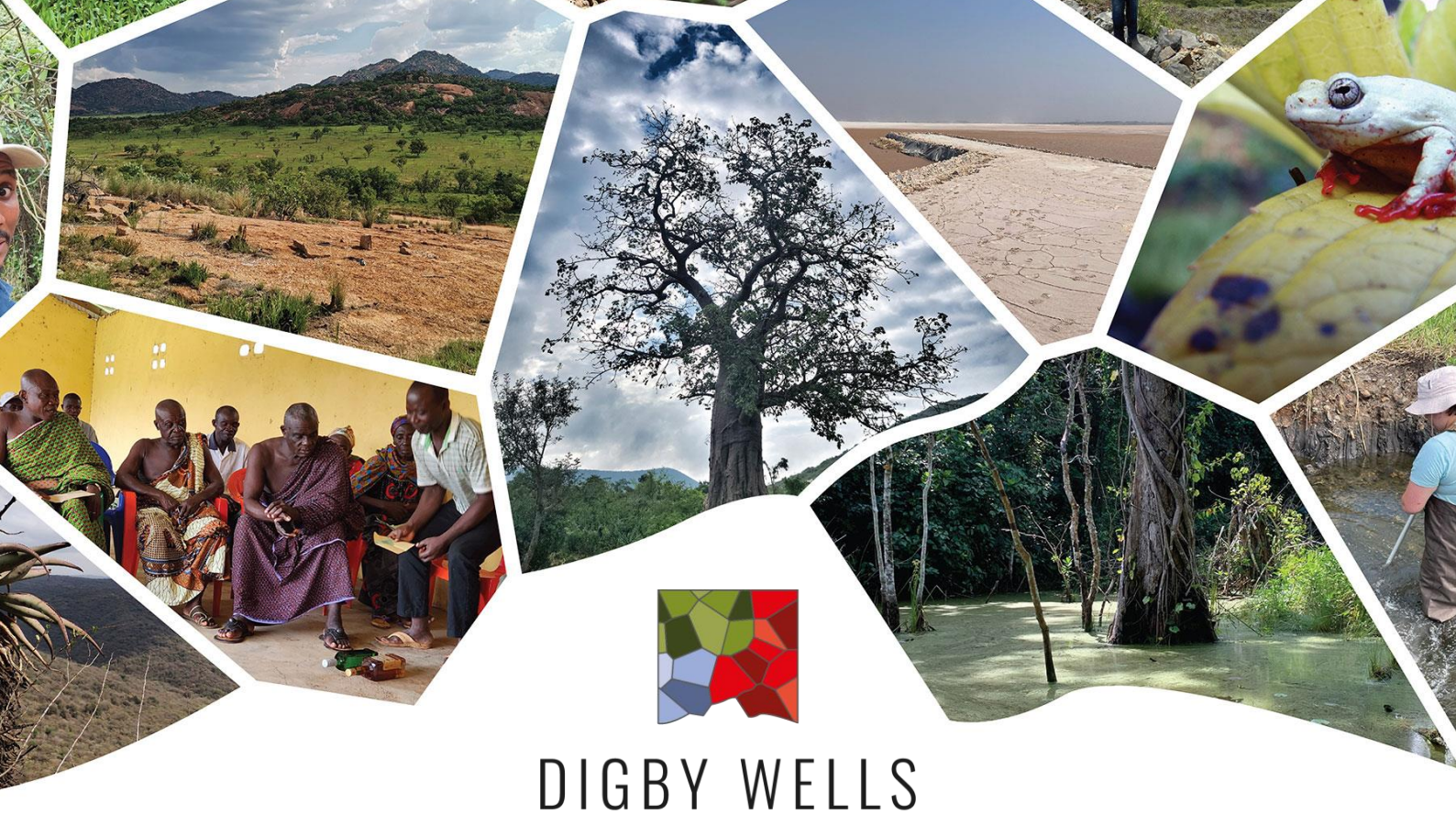


DIGBY WELLS
ENVIRONMENTAL

Climate Change Risk And Vulnerability Assessment For Blanket Mine

Climate Change Specialist Report

Prepared for:

Caledonia Mining Corporation PLC

Project Number:

CAL8564

March 2024

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Project Name:	Climate Change Risk and Vulnerability Assessment for Blanket Mine
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Executive Summary

Digby Wells Environmental (Digby Wells) was appointed by Caledonia Mining Corporation PLC (Caledonia) to conduct a Climate Change Risk and Vulnerability Assessment (CCRVA) at the Blanket Gold Mine (Blanket Mine) located in Matabeleland South Province of Zimbabwe.

The CCRVA was undertaken in terms of the local laws and international best practice guidelines such as the International Finance Corporation's Performance Standards on Environmental and Social Sustainability 2012 (referred to as the "IFC PSs").

This CCRVA considers the climate change risks that Blanket Mine is projected to be exposed to as well as Blanket Mine's contribution to climate change. The former explores the potential climate-related risks identified through a CCRVA, while the latter calculates the current Greenhouse Gases (GHG) associated with the Blanket Mine. These can be used to inform management plans and strategies for sustainable project development and implementation; and to build resilience into management of the mine.

Impact of Blanket Mine on Climate Change

The Blanket Mine's impact on climate change was assessed in the context of 2023 GHG emissions emitted. This considered Scope 1 (direct emissions) and Scope 2 (energy indirect emissions), as well as Scope 3 Category 3 emissions. The calculated Scope 1 and 2 emissions of the Blanket Mine in 2023 were 41,124 tonnes of carbon dioxide equivalents (tCO_2e), while Scope 3 Category 3 emissions were 2,113 tCO_2e. In 2023, Scope 2 emissions from purchased electricity were the largest source of emissions.

The Blanket Mine's 2023 emissions were compared to 2022 values, indicating a 16% overall reduction in GHG emissions, with the largest contribution to the decrease being a 62% reduction in stationary combustion emissions. There has been a significant reduction in the use of diesel generators to produce electricity, in part due to the newly completed onsite solar photovoltaic system.

The Blanket Mine's 2023 emissions were 43,237 tCO_2e. Zimbabwe's national emissions during 2020 were ~26 million tCO_2e. Using Zimbabwe's 2020 emissions as a baseline, the Blanket Mine's emissions account for approximately 0.17% of Zimbabwe's national emissions.

Climate Change Risks and Vulnerabilities

The Intergovernmental Panel on Climate Change (IPCC) stated in the Sixth Assessment Report (AR6) that the continuous release of GHG emissions into the atmosphere will lead to increased global temperatures that will exceed 1.5°C above pre-industrial levels well before 2100 (IPCC, 2022b).

The IPCC's SSP5-8.5[1] projections show that temperatures will continue to rise, annual temperatures in the region will increase by approximately 2.25°C over the life-of-mine (LoM),

[1] Shared Socio-economic Pathways (SSPs) represent different potential emissions scenarios in relation to different global climate change responses. SSP5-8.5 represents a 'worst-case scenario' outlook that considers a very weak global response to reducing emissions and can be used to highlight the most prominent risks from climate change.

and the number of extreme heat days will increase by threefold to ~91 days per year. At the same time, annual precipitation will increase, and precipitation events will become increasingly more intense. There will also be an increase in the length of drought periods. The frequency and severity of extreme weather events and wildfires are also projected to increase.

Mitigation and adaptation recommendations to respond to identified climate risks and improve climate change resilience include:

- Incorporating extreme weather event planning into Blanket Mine's emergency preparedness and response plans;
- Updating Health and Safety Management Systems to account for climate risks such as extreme heat;
- Ensuring that the current built infrastructure and any new designs consider flooding and extreme weather event scenarios where necessary;
- Ensuring that management plans account for climate-related risks;
- Increased monitoring and monitoring infrastructure, such as water quality and dust monitoring, after storm events and ensuring necessary repairs are made in a timely manner; and
- Updating the Rehabilitation and Closure Plan to be more resilient to climate change and the implementation of audit processes to ensure corrective measures can be put in place timeously.

Given the climate time lag[2] and uncertainty, climate projections and risks need to be continuously monitored, reviewed, and updated to ensure mitigation and adaptation measures align with changing risks. Provision also needs to be made to account for future changes in physical risk.

The implementation of the recommendations will not necessarily eliminate the identified climate risks but will reduce the impact of and bolster resilience to climate change risks and hazards. Increased climate resilience will protect employees and infrastructure, improve operational efficiencies, and promote sustainable and continuous value creation for stakeholders. Furthermore, effectively responding to identified climate risks illustrates good corporate governance. Acknowledging potential climate change impacts, when paired with proactive steps to manage risks, helps to ensure transparency and accountability.

Conclusion

There are a range of practicable steps which can be implemented over time to reduce physical climate-related risks and impacts of the Blanket Mine on the surrounding environment. It is essential that mitigation measures and adaptation recommendations, are investigated and,

[2] This lag refers to delays between the time when emissions are released into the atmosphere and when the Earth's temperature responds to those emissions (Mulhern, 2020). The climate time lag is influenced by processes that regulate the earth's temperature such as ice sheets and the movement of heat in oceans. It is important to note that due to the 'climate time lag' within the atmosphere, temperature changes over the next few decades are a result of historic emissions.

where appropriate, implemented timeously. Doing so will improve the Blanket Mine's climate resilience by protecting operations and the workforce from adverse climate-related risks, and reduce the mine's impacts on the surrounding communities and environment.

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Appendix A: Climate Projection Data

ACRONYMS, ABBREVIATIONS AND TERMS

AR6	IPCC 6th Assessment Report
CCRVA	Climate Change Risk and Vulnerability Assessment
CH_4	Methane
CMIP6	Coupled Model Inter-Comparison Project Phase 6
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
Digby Wells	Digby Wells Environmental
ENSO	El Niño Southern Oscillation
EP	Equator Principles
GHG	Greenhouse Gases
ICMM	International Council on Mining and Metals
ITCZ	Inter-Tropical Convergence Zone
LoM	Life-of-mine
MAP	Mean Annual Precipitation
MDGs	Millennium Development Goals
Mm	Millimetres
N_2O	Nitrous Oxide
NAP	National Adaptation Plan
NDC	Nationally Determined Contributions
PS	IFC Performance Standards
SDGs	Sustainable Development Goals
TCFD	Taskforce on Climate-related Financial Disclosures
tCO_2e	Tonnes of carbon dioxide equivalents
TSF	Tailings Storage Facility
UN	United Nations
UNFCCC	UN Framework Convention on Climate Change

1. Introduction

Caledonia Mining Corporation PLC (Caledonia) has appointed Digby Wells Environmental (Digby Wells) to perform climate change risk and vulnerability assessments (CCRVAs) for both the Blanket and Bilboes/Motapa mining sites, as well as calculate the Blanket Mine's Greenhouse Gas (GHG) emissions for 2023. This document contains the CCRVA for the Blanket Mine and the Blanket Mine GHG emissions calculation.

1.1. Project Objective

The overall objectives of this project were to determine:

- Current climate conditions and climate change trends and projections;
- Impacts of the Blanket Mine on climate change (GHG Assessment) through calculation of the mine's GHG footprint;
- Impacts of climate change on the Blanket Mine (CCRVA) through identification of key climate change related vulnerabilities and risks; and
- Possible adaptation and mitigation measures.

1.2. Specialist Details

Please refer to Table 1-1 for details of the specialists involved in the compilation and review of the report.

Table 1-1: Specialist Details

Name of Specialist	Role	Experience and Qualifications
Letago Kgomoeswana	Report Compilation	BSc Geography Honours 6 months' experience in climate change
Becki Woythal	Report Compilation	MSc in Climate Change 7 years' experience in sustainability and climate change
Matthias Rommelspacher	Report Compilation	MEng. In Environmental Engineering 6 years' experience in climate change
Kathryn Terblanche	Report Review	MSc in Restoration Ecology. GARP Sustainability and Climate Risk Certificate 12 years' experience in environmental science
Sarah Cooper	ExCo Review	LLB, BA (Hons) +17 years' experience in ESG, Sustainability and Responsible Investment Sector Member of World Gold Council's ESG Task Force

2. Assumptions, Limitations and Exclusions

Assumptions are made to safeguard the development of an accurate CCRVA. The assumptions made in this report and corresponding limitations are discussed in Table 2-1 below:

Table 2-1: Limitations and Corresponding Assumptions and Exclusions

Limitation	Assumption
Climate Change Baseline and Risk Assessment	
There are uncertainties related to the emissions trajectories and projections assessed because of ambiguity related to global climate change responses, variability caused by regional downscaling of data models, and climate change modelling accuracy.	IPCC emissions trajectories were utilised. The IPCC uses the Coupled Model Inter-Comparison Project Phase 6 (CMIP6) database for emission and climate change projections (IPCC, 2022). These are considered appropriate and reliable and are referenced accordingly.
Historic climatology trends and future projections in the Baseline Results and Discussion (Section 5) data were gathered via the World Bank CCKP (2021a) and The Swedish Meteorological and Hydrological Institute Climate Information Portal (SMHI,	All data gathered for the climate change baseline, including climate trends and projections, were gathered between 8-21 February 2024. Exact access dates for each variable can be found in **Error! Reference source not found.**.

Limitation	Assumption
2023). Both sources perform regular updates to their data processing and visualisation systems, therefore the trends and projections retrieved may be variable based on the date of download.	
Climate change-related projections and risks are informed by CMIP5 and CMIP6 scenarios, known as the Representative Concentration Pathways (RCPs) and the Shared Socio-economic Pathways (SSPs). The SSPs available from CMIP6 are an updated version of the RCPs available in CMIP5. CMIP data is a collection of global climate models overseen by the World Climate Research Program, making up the newest iteration of climate projections used to inform The International Panel on Climate Change (IPCC) assessment reports (The World Bank, 2021a). The pathways reviewed in this report, RCP4.5, SSP2-4.5, RCP8.5, and SSP5-8.5, represent different global responses to climate change and the subsequent emissions projected under each response. RCP4.5 and SSP2-4.5 represent a pathway like current emissions, and RCP8.5 and SSP5-8.5 represent a 'worst-case scenario' outlook that considers a very weak global response to reducing emissions, leading to more intense climate change-related risks. Climate risks are identified based on reasonable assumptions considering previous trends for an area as well as projections of future climate and are therefore not exact.	'Worst case scenarios' consider the most negative outlooks for the future, and the hazards experienced on site may be less intense than the risks identified in this report. However, climate change has a lag time, and the emissions trajectories and subsequent projected temperature changes are informed by historic emissions (i.e. temperature increases experienced now area result of actions and emissions from decades ago). This means there are only small differences between the scenarios during the life-of-mine (LoM), and the cumulative effect of the differences become more significant towards the end of the century when the mine is likely to be in closure.
Climate change projections, as well as quantitative measurements of exposure, sensitivity, and adaptive capacity are complex and subject to uncertainties.	Quantifications of risk serve as a scale to identify and prioritise various potential risks that the Blanket Mine may be exposed to, rather than a rigid scientific quantification process.
The CCRVA is a risk assessment and not an impact assessment.	Climate risks are identified based on reasonable assumptions considering previous trends for an area as well as projections of future climate and are therefore not exact.
GHG Assessment	
Scope 3 Data was limited for this assessment.	Scope 3 calculations were limited to Category 3.

Limitation	Assumption
The exact breakdown of diesel used by contractors is not recorded.	All of the diesel consumed by contractors was assumed to be mobile combustion.
Detailed emission factors for each explosive used are not published.	The emission factor for explosives published by Australian Department of Climate Change in 2008 was applied to all explosives used.

3. Relevant Legislation, Standards and Guidelines

3.1. International Best Practice

To future-proof against potential costs, reputational risks, or legal interventions related to climate change adaptation and mitigation, it is best practice for operations to be developed in alignment with the various international regulations, principles and frameworks related to climate change. Industry best practice entails considering, conforming, and adhering to these regulations and frameworks. The following table (Table 3-1) outlines international regulations and/or frameworks that consider climate change:

Table 3-1: Applicable Legislation, Regulations and Guidelines

Legislation, Regulation, Guideline or By-law	Applicability
The United Nations' (UN) Millennium Development Goals (MDGs)	The UN MDGs commit world governmental and institutional leaders to work towards combating poverty, disease, hunger, environmental degradation, illiteracy, and female discrimination. There are set targets for each of the eight MDGs and progress is tracked against 1990 baselines. MDG seven is related to ensuring environmental sustainability and has particular reference to managing ecosystems sustainably to meet environmental, economic and social needs.
The UN's Sustainable Development Goals (SDGs)	The UN SDGs replaced the MDGs and calls all governments, organisations, and individuals to promote prosperity and continuous growth while conserving the planet's finite resources.
The UN's Secretary General's Sustainable Energy for All Initiative	The Sustainable Energy for All initiative forms part of a multi-stakeholder collaboration between the private sector, governments, and civil society. The three objectives of the initiative include ensuring widespread access to modern energy services, improving global rates in energy efficiency, and doubling renewable energy in the global energy mix.
The International Energy Charter Treaty (ECT)	The International Energy Charter Treaty focusses on energy cooperation between stakeholders and is intended to promote energy security through competitive and open energy markets. The Charter Treaty respects the principles of sustainable development and management of energy resources.
UN Framework Convention on Climate Change (UNFCCC)	The UNFCCC established legal principles and frameworks for international collaboration relating to climate change considerations. The UNFCCC aims to stabilise and ultimately reduce atmospheric GHG concentrations and work towards avoidance of anthropogenic influence on the global climate system. Zimbabwe is a signatory to the UNFCCC.
Kyoto Protocol	The Kyoto Protocol, of which Zimbabwe is a signatory, originated from the UNFCCC and committed industrialised countries and economies to transition to reduce and limit GHG emissions in accordance with agreed individual targets.
Paris Agreement	The Paris Agreement is an international climate change treaty. The agreement builds on the UNFCCC and was adopted in 2015 and considers climate change adaptation, mitigation, and finance. The Paris Agreement's aim is to improve global responses to climate change threats through working to limit global warming well below 2°C above pre-industrial levels. To achieve this goal, signatory countries need to mobilise finance contributions consistent with a low emissions and climate-resilient future and support developing and vulnerable countries with their climate objectives.

Legislation, Regulation, Guideline or By-law	Applicability
	Zimbabwe is a signatory (2016) to the Paris Agreement and needs to regularly outline their climate efforts through nationally determined contributions.
Nationally Determined Contributions (NDC) Also known as National Communications (NC) to the UNFCCC.	NDCs form the main pillar of the achieving the long-term goals of the Paris Agreement. It relates to Paris Agreement signatory countries and requires climate change adaptation considerations and climate change mitigation and action plans to reduce country emissions. NDC's include regular communications (in five-year intervals) by countries on their efforts to combat climate change and improving overall climate resilience. In NDC reporting, countries need to disclose their total emissions as well as provide status updates on emission reduction implementation efforts. Zimbabwe's updated 2021 NDC pledges to achieve a 40% per capita reduction in emissions compared to a projected baseline scenario (based on 2017 emissions) by the year 2030. Notably, the emissions reduction target applies to all sectors of the economy.

3.2. Zimbabwean Legislation

Zimbabwe has several regulatory texts that address issues related to climate change and other decisions relating to United Nations Conventions. The Blanket Mine is required to comply with all obligations in terms of the provisions of national legislations, regulations, guidelines, and by-laws. The guidelines directing the CCRVA are discussed in Table 3-2.

Table 3-2: Applicable Legislation, Regulations, Guidelines and By-laws

Legislation	Applicability
Zimbabwe's Initial Adaptation Communication to the UNFCCC (2022) (Government of Zimbabwe, 2022)	The Initial Adaptation Communication serves the purpose of raising awareness and showcasing progress in integrating adaptation efforts into the national agenda. It highlights Zimbabwe's commitment to reducing the vulnerability of its socio-economic sectors (mining, manufacturing, agriculture and tourism) to the unprecedented impacts of climate change. These vulnerabilities include extreme weather events, water scarcity and energy costs. The country aims to actively participate in enhancing adaptation measures and making valuable contributions to the first Global Stocktake, demonstrating its dedication to addressing climate change challenges on a global scale.
Revised Nationally Determined Contributions (NDCs) (2021)	The revised NDCs outline a noteworthy 7% increase in emission reduction targets, raising the ambition from 33% in the initial NDC to 40%. Unlike the first NDC, which solely focused on the Energy Sector, this updated commitment represents progress towards a comprehensive, economy-wide NDC. It now encompasses additional sectors such as Waste, Industrial

Legislation	Applicability
	Processes and Product Use, as well as Agriculture, Forestry, and Other Land-Use Sectors. Furthermore, the revised NDC goes beyond mitigation efforts and incorporates adaptation actions, recognizing Zimbabwe's heightened vulnerability to the impacts of climate change. This holistic approach reflects the country's dedication to addressing both the causes and consequences of climate change, indicating a more comprehensive and integrated strategy for sustainable development.
Low Emission Development Strategy (LEDS) (2019)	The Low Emission Development Strategy (LEDS) aligns with Zimbabwe's vision of achieving an upper middle-income economy by 2030. Key strategies crucial for realizing this vision include the implementation of renewable energy and energy efficiency initiatives, adoption of climate-smart agricultural practices, establishment of low carbon transport systems, promotion of sustainable forest management, implementation of effective solid waste management, and fostering sustainable industrial development. These strategies, outlined in the LEDS, serve as integral components guiding Zimbabwe towards its economic aspirations, emphasizing a commitment to environmentally sustainable practices and the reduction of carbon emissions across various sectors.
National Adaptation Plan (NAP) (2019) (Government of Zimbabwe, 2019)	The National Adaptation Plan (NAP) is a comprehensive strategy for a country to systematically address climate change adaptation. Zimbabwe's NAP is divided into four key elements: Laying the Groundwork and Addressing Gaps; Analysing Climate Scenarios; Prioritizing Climate Change Adaptation; and Reporting, Monitoring, and Review. This structured approach suggests a commitment to not only understanding the current climate challenges but also preparing for future changes. The emphasis on capacity building, coordination, and regular review indicates a dynamic and adaptive process. Reporting and outreach activities contribute to transparency and engagement with stakeholders.
National Climate Policy (2016) (Government of Zimbabwe, 2016)	The National Climate Policy in Zimbabwe has a dual focus, primarily aiming to establish legal structures for regulating businesses in climate-related matters and facilitating the reduction of greenhouse gas emissions. This signifies a commitment to creating a regulatory framework that encourages businesses to adopt environmentally sustainable practices, contributing to the overall goal of mitigating climate change. In addition to its emphasis on businesses, the policy places a focus on adaptation measures, particularly for rural communities and the agricultural sector. This underscores the recognition of the vulnerability of these sectors to the impacts of climate change. By prioritizing adaptation in rural areas and agriculture, the policy aims to enhance resilience, promote sustainable practices, and safeguard the livelihoods of communities dependent on these

Legislation	Applicability
	sectors. This comprehensive approach aligns with the broader goal of achieving climate resilience and sustainability across various aspects of the country's socio-economic landscape.
Mines and Minerals Act (Chapter 21:05) Mining tribute agreements (Government of Zimbabwe, 2016)	Section 283 of the Act defines a tribute agreement as any arrangement where one party grants another party the right to mine a specified location. This agreement can involve the transfer of licenses, concessions, or other mining rights. The Mining Affairs Board (MAB) must approve any modifications or renewals to these agreements. In the context of a tribute agreement, the party granted mining rights is referred to as the "tributor," while the party granting those rights is called the "grantor." The term "mining location" refers to a designated area where mining rights have been acquired under the Act or previous mining laws.
National Climate Change Response Strategy (NCCRS) (2014) (Government of Zimbabwe, 2014)	Climate change poses significant threats to Zimbabwe's development, food security, and adaptive capacity. The National Climate Change Response Strategy has been a vital initiative to address these challenges by establishing specific provisions and actions. This strategy guides national measures, integrates climate change into development planning at various levels, and ensures coordinated activities. The focus is on developing adaptation strategies to mitigate diverse climate impacts and enhance community livelihoods.

3.3. Project Specific Compliance

This Climate Change Specialist Report aligns with the recommendations and guidelines set out by the IFC and Equator Principles (EP). Relevant principles related to climate change risk assessments are listed in Table 3-3.

Table 3-3: Applicable Guidelines

Guideline	Applicability
Equator Principle 4	A Climate Change Risk Assessment (CCRA) is required to be undertaken for Category A and, as appropriate, Category B projects. For these projects the CCRA is to include consideration of relevant climate-related ‘Physical Risks’. The CCRA should also consider Blanket Mine’s compatibility with the host country’s national climate commitments, as appropriate. Refer to Section 3.2.
International Council on Mining and Metals (ICMM) Climate Change Position Statement (ICMM, 2021)	The ICMM’s Climate Change Position Statement details how member companies should approach climate change through ten principles. ICMM Mining Principles related to climate change include: Principle 4 – Implementing effective risk management systems and strategies informed by science and includes stakeholder insights of relevant risks;

Guideline	Applicability
	Principle 6 – Striving for continual environmental performance improvements including climate change and energy use; Principle 7 – Contributing to biodiversity conservation and integrating approaches for sustainable land-use planning; Principle 8 – Supporting and facilitating systems for responsible and sustainable design, re-use, use, disposal, and recycling of products related to minerals and metals; and Principle 10 – Proactive and transparent stakeholder engagement on sustainable development challenges and opportunities. Reporting and independent verification of engagement progress and performance.
International Financial Reporting Standards (IFRS) S2 (aligned with the now subsumed Taskforce on Climate-related Financial Disclosures (TCFD))	Reporting in alignment with the IFRS S2 intends to provide decision useful information on climate-related risks and opportunities to enable stakeholders to adequately understand the financial risks related to changing climatic conditions. This CCRVA feeds into the IFRS S2 recommendations. The CCRVA will inform the risk management pillar. Identified risks and opportunities can be used to inform strategies which ultimately illustrates good climate-related governance.
IFC Performance Standard 1 (PS1): Assessment and Management of Environmental and Social Risks and Impacts	The risks and impacts identification process for Blanket Mine bearing in mind PS1, must consider the following: Emissions of GHGs; Risks associated with a changing climate; Transboundary effects; and Adaptation opportunities.
IFC Performance Standard 3 (PS3): Resource Efficiency and Pollution Prevention	PS3 aims to reduce GHG emissions caused by Blanket Mine. This should be undertaken through: Considering and implementing alternatives to reduce GHG emitted through the design and operational phases of Blanket Mine. This also includes measures to conserve water, energy, and raw material. Annually quantifying both direct (Scope 1) and indirect emissions associated with off-site energy production (Scope 2) (including all significant sources of GHG emissions including non-energy related sources such as methane and nitrous oxide) for projects that will produce more than 25,000 tCO_2e)/year. This should be done using estimation methodologies provided by the IPCC.
IFC Performance Standard 4 (PS4): Community Health, Safety and Security	PS4 aims to avoid adverse impacts on the affected communities. Communities are already subjected to climate change impacts. In future these impacts may be exacerbated due to Blanket Mine's activities. Projects must identify and mitigate risks and potential impacts on priority ecosystems services that may be exacerbated by climate change.

4. Methodology

4.1. Greenhouse Gas Calculations

It is important that GHG emission calculations are relevant, complete, consistent, accurate and transparent. The GHG emissions calculations are guided by the Greenhouse Gas Protocol's *A Corporate Accounting and Reporting Standard* (Greenhouse Gas Protocol, 2015). Figure 4-1 depicts the overall process for determining the Blanket Mine's GHG emissions.

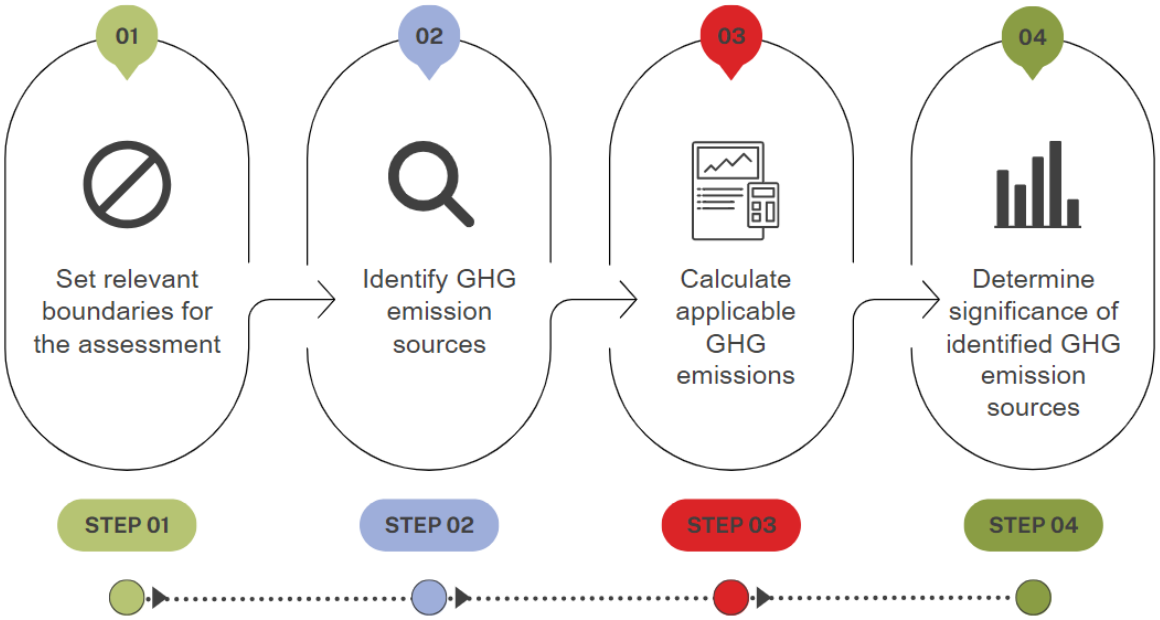


Figure 4-1: Approach to GHG Assessment

Alignment with The Greenhouse Gas Protocol requires that at least direct (scope 1) and energy indirect (scope 2) emissions be considered (Greenhouse Gas Protocol, 2015).

The generalised equation used to calculate the total GHG emissions for a source is as follows:

$$GHG\ Emissions = Activity\ data \times Emission\ Factor \times Global\ Warming\ Potential$$

- **Activity data** is the measure that describes the activity being completed by the source. For example, the amount of fuel combusted in a generator would be considered the activity data for a generator.
- **The emission factor** is a conversion factor that relates the activity data to the associated emissions. In some cases, these are calculated according to the stoichiometry of a chemical reaction, such as a combustion process. In other cases, it can be determined allometrically by measuring the amount of GHG emissions generated per unit of the activity data.
- **The global warming potential** is used to equate an amount of a given GHG to an equivalent amount of CO_2. It is specific to each GHG. It represents the amount of CO_2

that would need to be released in order to have the same warming effect on the atmosphere as the specific GHG.

Scope 1 and scope 2 emissions for 2023, as defined by the GHG Protocol (Greenhouse Gas Protocol, 2015) were calculated. Scope 3 category 3 (Fuel- and Energy-Related Activities) emissions were also calculated. The inclusion of this category of emissions requires very little extra resources whilst significantly improving the understanding of value-chain related emissions and associated potential risks.

4.2. Climate Change Baseline

Data was collected and analysed to assess the baseline climate and future climate change projections in the Blanket Mine's region. Climate baseline data was obtained using the methodology listed in Table 4-1 below.

Table 4-1: Climate Change Baseline Data Methodology

Baseline Section	Data Source and Methodology
Climate Baseline	Current climate conditions (temperature, precipitation, seasonality) were assessed for using averaged regional data from 1991-2020 accessed from the World Bank Climate Change Knowledge Portal (CCKP) (2021a). Climate forcing mechanisms were assessed via a literature review.
Historic Climate Trends	Historic trends in temperature and precipitation were assessed using regional ERA5 data and trend analysis accessed for the 1950-2020 period via the World Bank CCKP (2021a), with rates of change analysed from the period 1971-2020.
Climate Projections	Projected changes in climate were assessed using regional data provided by the Coupled Model Inter-Comparison Project (CMIP) Phases 5 and 6, accessed via the World Bank CCKP (2021a) and The Swedish Meteorological and Hydrological Institute Climate Information Portal (SMHI, 2023). Data is assessed using a historic reference period, with projections across various time horizons spanning to 2100. Change rates were assessed by comparing baseline values to each future time horizon. Data was assessed across two emissions scenarios, SSP2-4.5 and SSP5-8.5. The scenarios are described in Section 5.2.
Extreme Events	Historic statistics on extreme weather events were collected using country-wide data from 1980-2020 via the World Bank CCKP (2021a) and an additional literature review.

4.3. Climate Change Risk and Vulnerability Assessment

This CCRA was guided by the principles of the IFC *Performance Standards on Environmental and Social Sustainability* as well as the Equator Principles. This includes identifying the physical risks of the Blanket Mine.

4.3.1. Physical Risk

The IPCC considers physical climate risk and associated impacts as a function of hazards, exposure and vulnerability (comprising sensitivity and adaptive capacity) (Figure 4-2).

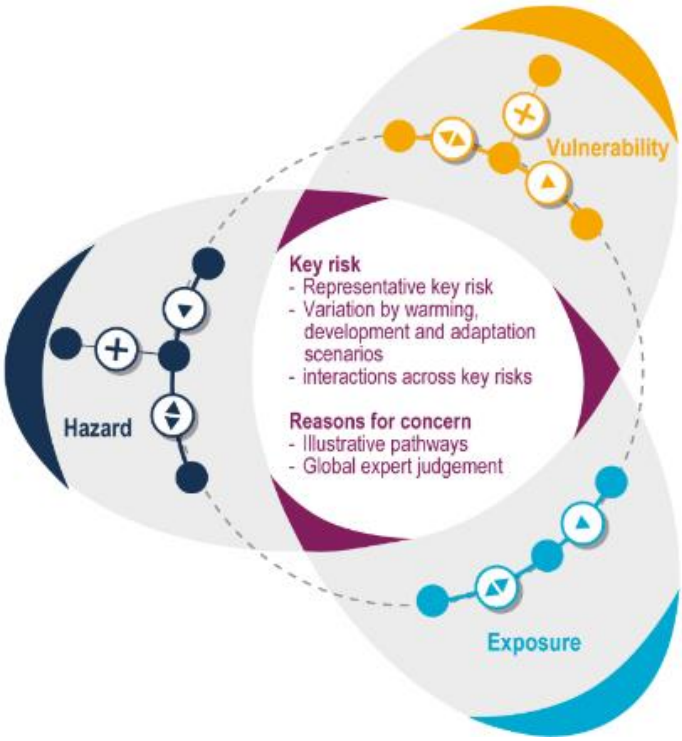


Figure 4-2: IPCCs Climate Risk Framework in AR6 (IPCC, 2022b)

Generally, *physical risk* impacts operations at the 'site level'. Global Climate Models (GCM) are used to identify projected changes in climate and therefore possible hazards (e.g., wildfires). These are then downscaled and considered in conjunction with exposure (e.g., infrastructure in an area prone to wildfires) and vulnerability information (e.g., presence of firebreaks).

The assessment utilised data from the following sources:

- **Hazards:**
  - **Climate Change Projections:** Downscaled CMIP5 and CMIP6 data was utilised for quantitative hazard analysis from the following sources:
    - The World Bank's Climate Change Knowledge Portal (2021a), which provides regionally specific CMIP6 climate projections;
    - The Swedish Meteorological and Hydrological Institute Climate Information Portal (SMHI, 2023), which provides regionally specific CMIP5 and CMIP6 climate projections.
  - **Additional Hazard Data:** Additional hazard data utilised to describe regional climate change risks in Section 7.1 and qualitative risks in Section 7.2 were extracted and reviewed using the following sources:

- Aqueduct which is an open-source tool that maps water risks (floods, droughts, water scarcity, etc.), developed by the World Resources Institute (2023);
- The Global Facility for Disaster Reduction and Recovery's Think Hazard tool (GFDRR, 2020), which assesses and maps the risks of climate hazards in countries, provinces and districts;
- The World Bank's Country Specific Climate Risk Profiles (The World Bank, 2021b), which provides national to provincial level datasets containing climate scenarios, projected climate-related risks, and vulnerabilities; and

- **Exposure, sensitivity and adaptive capacity**: These were determined based on location and design plans. Examples include, but were not limited to:
  - Topographical data;
  - Proximity to rivers;
  - Infrastructure layout maps; and
  - Various policies and procedures.

4.3.1.1. Quantitative Physical Risk Determination

Climate change and the associated projections are dynamic and complex. Due to these complexities, the challenge of assessing risks of climate change is not well bounded, they are often assessed differently and involve many uncertainties (IPCC, 2021). This quantification of risk therefore serves as a scale to identify and prioritise various risks that Blanket Mine may face, rather than a rigid scientific quantification process.

Based on industry best practice, Digby Wells used the IPCC 6th Assessment Report (AR6) risk framework, over other available risk frameworks, due to its specific focus on climate risks. The following calculation was used as a baseline for providing a quantitative physical risk score:

$$Risk = Hazard \times Exposure \times Vulnerability$$

Assessing vulnerability as a single quantitative score is a complex process, and runs the risk of oversimplifying Blanket Mine's vulnerability to risk. To best determine vulnerability scores, Digby Wells determined vulnerability indices as a product of Blanket Mine's sensitivity to risk and adaptive capacity. Therefore, the finalised calculation was used to determine quantitative physical risk scores.

$$Risk = Hazard \times Exposure \times (Sensitivity - Adaptive\ Capacity)$$

Scores were assigned to each of the components and were quantified as indicated in Table 4-3. The resultant risk sores were then categorised according to Table 4-2.

Table 4-2: Risk Scoring

Negligible	Low	Medium	High	Very High
1-2	3-4	5-6	7-8	9-10

Table 4-3: Physical Risk Quantification Methodology

Aspect	Definition (IPCC)	Scores	Methodology
Hazard	The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources.	1 - 10 1 – lowest hazard 10 – highest hazard	For hazards where quantitative scoring was possible, each score was calculated by determining the percentage change of the hazard from the baseline period to a time horizon that assumed a 40-year LoM ending in 2064. Scores were assigned using the following thresholds, a change larger than 100% was capped at 10: • 0-10% = 1 • 11-20% = 2 • 21-30% = 3 • 31-40% = 4 • 41-50% = 5 • 51-60% = 6 • 61-70% = 7 • 71-80% = 8 • 81-90% = 9 • 91-100+% = 10 The justification and source of each quantitative hazard score is listed in **Error! Reference source not found.**.
Exposure	Refers to the presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or	0 or 1 0 – not exposed 1 – exposed	This score quantifies whether the site is exposed to the identified hazard or not. Hazards that the operation will not be exposed to were screened out and excluded to ensure brevity.

Aspect	Definition (IPCC)	Scores	Methodology
	economic, social, or cultural assets in places and settings that could be adversely affected.		
Sensitivity	Refers to the level of responsiveness to changes in physical climate hazards. It involves the ability to recognise, assess and respond to identified hazards and the potential impacts of it to an organization's operations, assets, and reputation. Physical climate risk sensitivity is influenced by a company's risk appetite, the level of awareness to physical climate risks as well as risk management processes.	0, 0.5 or 1 0 – no sensitivity 0.5 – medium sensitivity 1 – high sensitivity	Operations may be exposed to particular climate hazards but may not be sensitive to them. 0 Defines sensitivities that may have a minimal/ zero effect on operations/assets/workers; 0.5 Defines sensitivities that may result in effects to cost and operational efficiencies; and 1 Defines sensitivities that may result in an incident (e.g. injuries, work stoppages).
Adaptive capacity	Refers to the ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.	0, 0.5 or 1 0 – no adaptive capacity 0.5 – medium adaptive capacity 1 – high adaptive capacity	As the vulnerability of the element under review is determined by the sensitivity and adaptive capacity, adaptive capacity can reduce the vulnerability to the climate hazard. Pre-adaptation and post-adaption scores are provided. 0 No interventions or adaptations; 0.5 Adaptive measures planned but there is room for improvement; and 1 Little to no room for improvement to feasible adaptive measures

4.3.1.2. *Qualitative Physical Risk Determination*

Adequate quantitative hazard data is not available for all hazard types. Therefore, some hazards were discussed qualitatively by assessing hazards, exposure, and vulnerability using best-available data.

5. Climate Baseline

According to the Köppen-Geiger Climate Classification, a system used to inform general climate conditions based on local vegetation, temperature patterns, and seasonal precipitation, the project region is classified as a hot semi-arid climate (BSh classification), as seen in Figure 5-1 below (The World Bank, 2021a). Hot semi-arid climates are characterised by Peel *et al.* (2007) as:

- **High temperatures:** year round high temperatures (above 18°C);
- **Low rainfall:** some to minimal precipitation throughout the year, less than 600 millimeters annually;
- **Hot, wet summer:** above-average rainfall and high levels of humidity; and
- **Cool, dry winter:** warm to cool conditions with little to no rain.

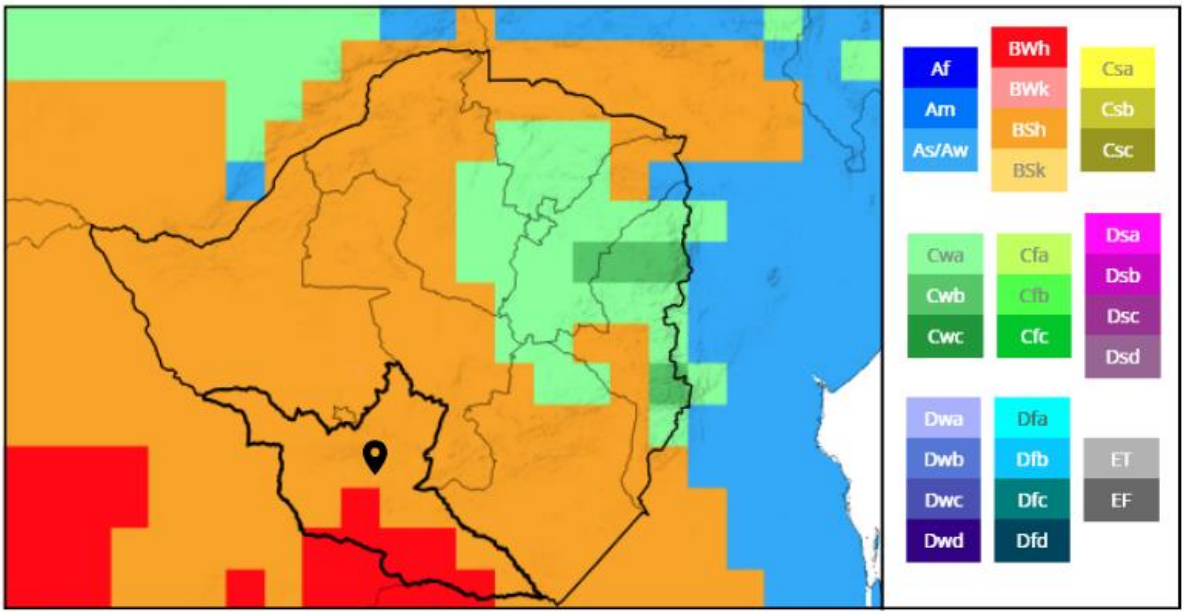


Figure 5-1: Köppen-Geiger Climate Classification at Blanket Mine, BSh Classification
Image Adapted from The World Bank (2021a)

Table 5-1 and Figure 5-2 outline the historical and observed climate baseline data from 1991 to 2020 in the Matabeleland South Province (The World Bank, 2021a).

Table 5-1: Annual Average Climatic Conditions
(The World Bank, 2021a)

Climate Variables	Annual Averages
Minimum Temperature	14.12°C
Mean Temperature	21.54°C
Max Temperature	29.02°C
Mean Annual Precipitation (MAP)	467.45mm per year

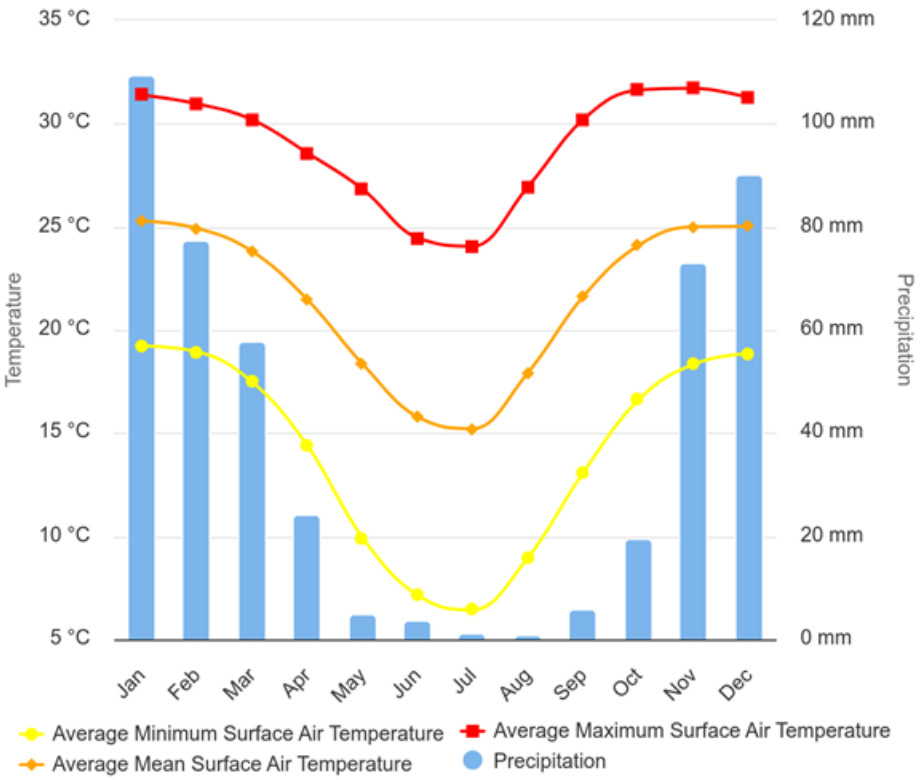


Figure 5-2: Monthly Average Temperature and Precipitation for Matabeleland South Province, Zimbabwe
(Reference Period 1991 to 2020) (The World Bank, 2021)

The Zimbabwean climate is generally controlled by a combination of climate forcing mechanisms. Precipitation cycles are influenced by the positioning of the Inter-Tropical Convergence Zone (ITCZ), El Niño Southern Oscillation (ENSO) periods, and the Indian Ocean Dipole/Zonal Mode (IODZM) (The World Bank, 2021a). These systems are discussed in more detail below:

- **ITCZ:** The ITCZ is a low-pressure belt that shifts based on the areas receiving the highest solar radiation. It is formed where the trade winds from the Northern and Southern Hemispheres converge. When the sun is overhead at the Tropic of Capricorn (Southern Hemisphere summer), the ITCZ follows, causing convergence of trade

winds, leading to heavy rain and thunderstorms. Zimbabwe receives most of its rain from the ITCZ during this period (Kunaka, 2020; The World Bank, 2021a).

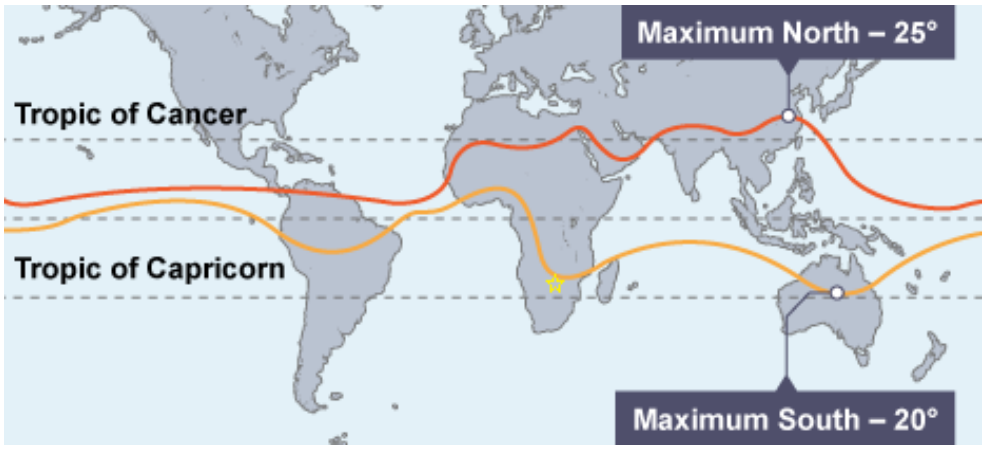


Figure 5-3: Inter-Tropical Convergence Zone Path (Star Marks Blanket Mine)
Image adapted from BBC (2023)

- **ENSO:** ENSO, which is a dominant earth climate condition that significantly impacts global energy balances, affecting climate dynamics and predictions (Lin & Qian, 2019) also impacts the annual variability of temperature and precipitation in Zimbabwe. The country's rainfall season falls between October and March; during this period, the nation typically encounters below-average rainfall in the warm phase of ENSO. Conversely, it frequently receives above-average precipitation in the cool phase of ENSO (La Niña) within the same rainy season.
- **IODZM:** There is also a notable connection between the IODZM and rainfall patterns in Zimbabwe. During the positive phase of the IODZM, Sea Surface Temperature (SST) in the Indian Ocean experience an abnormal positive gradient. The positive gradient impacts weather patterns, causing deficiencies in rainfall and drought conditions in Zimbabwe (Manatsa, Chingombe, & Matarira, 2008).

5.1. Climate Trends

Examining previous climate trends helps to improve the understanding of regional climate system dynamics and informs climate projections and potential risks. The following trends for Matabeleland South have been observed over the last five decades and are explained below (The World Bank, 2021a).

Table 5-2: Matabeleland South Climate Trends from 1971 to 2020
(The World Bank, 2021a)

Climate Variable	1971-2020 Trend	Rate of Change	Significance[3]
Mean Annual Minimum Temperature	Increased	+ 0.01°C / year	80%
Mean Annual Temperature	**Increased**	**+ 0.03°C / year**	**100 %**

[3] Using a significance threshold of 95%, values that are considered significant are designated in bold font.

Climate Variable	1971-2020 Trend	Rate of Change	Significance[3]
Mean Annual Maximum Temperature	**Increased**	**+ 0.04°C / year**	**100 %**
Mean Annual Precipitation	Decreased	- 0.28mm / year	37%
Maximum Consecutive Wet Days	Decreased	- 0.12mm / year	63%
Maximum Consecutive Dry Days	Increased	+ 0.39 days / year	81%

Significant increase in temperature: Mean annual temperatures have increased significantly at a rate of 0.03°C per year from 1971 to 2020 (Figure 5-4). Annual maximum temperatures have also increased at a significant rate of 0.04°C in the same period. Although statistically insignificant, annual minimum temperatures have also increased at a rate of 0.01°C per year in the 50-year period.

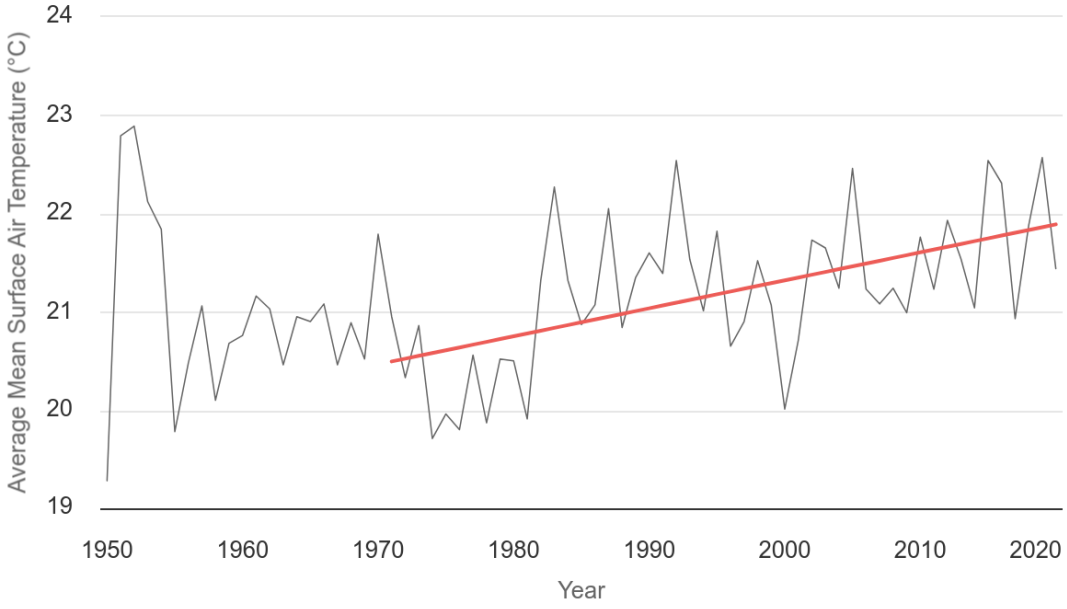


Figure 5-4: Annual Mean Temperature Trend
(Reference Period: 1971 to 2020) (The World Bank, 2021a)

Decrease in rainfall: Annual rainfall for the region decreased at a statistically insignificant rate of 0.28mm per year from 1971 to 2020. Figure 5-5 highlights the relatively flat rainfall trend which emphasises that no significant change in rainfall patterns has been observed. In this context, "flat" means that there is minimal deviation from the average or normal levels of rainfall during the 50-year period. Likewise, the number of consecutive wet days have decreased at an insignificant rate of 0.12mm per year for the same time period.

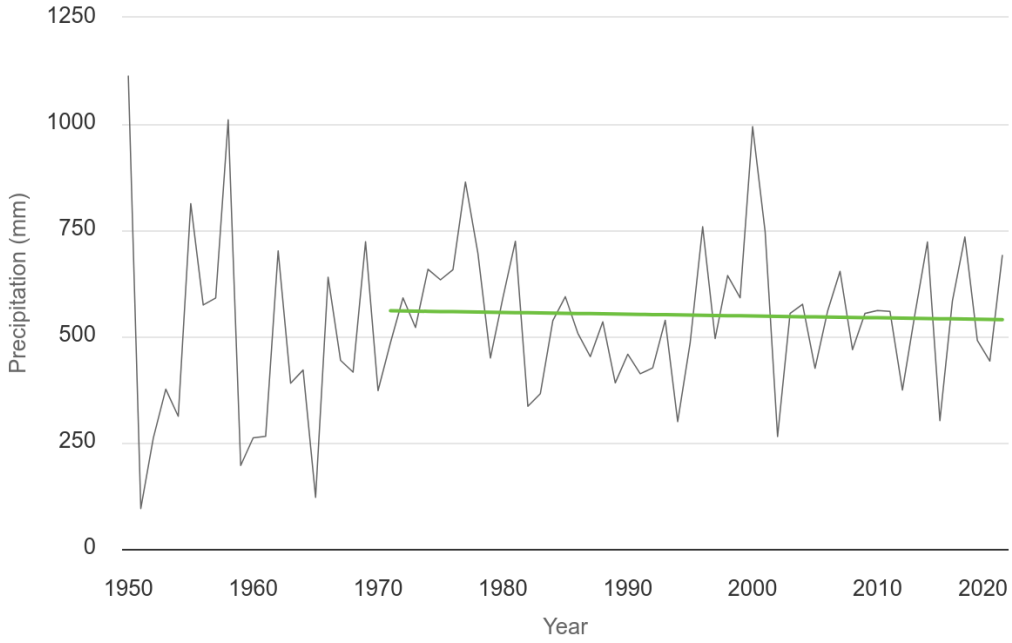


Figure 5-5: Annual Precipitation Trend
(Reference Period: 1951 to 2020) (The World Bank, 2021a)

Consecutive dry days: Annual consecutive dry days increased by a statistically insignificant rate of 0.39 days per year from 1971 to 2020 (The World Bank, 2021a). Annual consecutive dry days refers to the longest period within the region where no measurable precipitation (such as rain, snow, sleet, etc.) occurs. The slight increase in consecutive dry days can be interpreted in conjunction with the increase in temperature and decrease in precipitation observed for the area, showcasing a climate that has become increasingly hotter and drier. These factors are interconnected and often reinforce each other, creating a feedback loop that exacerbates the impacts of climate change (Hao, AghaKouchak, & Phillips, 2013).

5.2. Climate Projections

Understanding and preparing for climate risks is especially important on the African continent. According to the IPCC (2022c), most African countries will experience high temperatures sooner than higher latitude nations, and climate risks will have compounding implications to loss of labour, productivity, food production, reduced economic growth, and loss of human life.

To assess projected trends in climate and adequately assess future climate risk, it is necessary to look at global climate models such as the Coupled Model Intercomparison Project Phase 6 (CMIP6). CMIP6 is overseen by the World Climate Research Program, and informs the World Bank's (2021a) climate projections, as well as IPCC Assessment Reports. The CMIP6 dataset considers five Shared Socio-economic Pathways (SSPs), each representing different potential emissions scenarios in relation to different global climate change responses. The SSPs, with their varied development paths, mitigation efforts, and defined emission trends are detailed in Table 5-3.

Further climate analysis for the Project will be determined using SSP2-4.5 and SSP5-8.5.

Table 5-3: SSP Emissions Pathways and Temperature Increases
(IPCC, 2021)

Name	Scenario	Emissions	Projected Temperature Increase by 2050	Projected Temperature Increase by 2100
SSP1-1.9	Sustainable development resulting in radiative forcing of 1.9 Wm^{-2} by 2100.	CO_2 emissions cut to net zero by 2050 (meets Paris Agreement).	1.6	1.4
SSP1-2.6	Sustainable development resulting in radiative forcing of 2.6 Wm^{-2} by 2100.	Low emissions but not cut as fast as SSP1-1.9. CO_2 emissions cut to net zero around 2075.	1.7	1.85
SSP2-4.5	Middle-of-the-road development resulting in radiative forcing of 4.5 Wm^{-2} by 2100.	Intermediate emissions. CO_2 emissions around current levels until 2050, then falling but not reaching net zero by 2100.	2.1	2.8
SSP3-7.0	Regional rivalry resulting in radiative forcing of 7 Wm^{-2} by 2100.	High emissions. CO_2 emissions double by 2100.	2.2	3.7
SSP5-8.5	Fossil-fuel led development resulting in radiative forcing of 8.5 Wm^{-2} by 2100.	Very high emissions: CO_2 emissions triple by 2075.	2.5	4.5

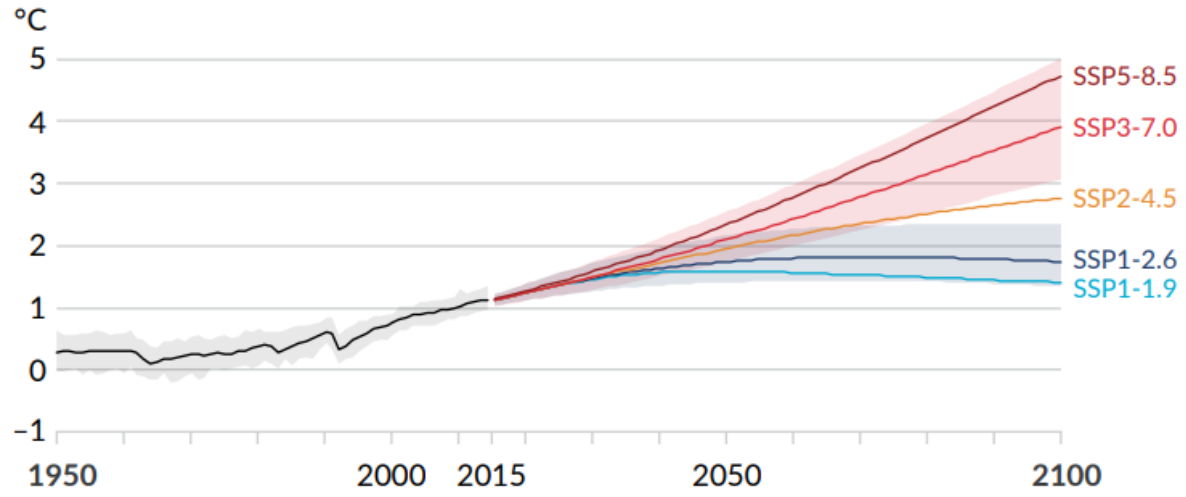


Figure 5-6: Global Surface Temperature Changes Under Different SSP Scenarios
(IPCC, 2021)

When reviewing emissions scenarios, the 'climate time lag' must be considered. This lag refers to delays between the time when emissions are released into the atmosphere and when the Earth's temperature responds to those emissions (Mulhern, 2020). The climate time lag is influenced by processes that regulate the earth's temperature such as ice sheets and the movement of heat in oceans.

It is important to note that due to the 'climate time lag' within the atmosphere, temperature changes over the next few decades are a result of historic emissions, and therefore current and future emissions associated with the five SSP scenarios only begin diverging in later decades at approximately 2050 (Figure 5-6) ((Mulhern, 2020). This delay therefore renders the difference between the scenarios during the LoM as minimal unless production continues through the second half of the century. Two scenarios were selected during this analysis to provide a scale of potential changes the Project may face. The SSP2-4.5 scenario represents a similar emissions path to what is currently taking place across the globe, while the SSP5-8.5 is based on a high emissions pathway, providing a worst-case scenario to ensure the Project is prepared for the majority of potential risks.

The following climate projections are based on CMIP6 data, as well as its predecessor CMIP5 when CMIP6 data were not available. Details on the sources, time horizons, spatial resolutions, climate models, and emissions scenarios for each variable used are presented in Appendix A.

5.2.1. Temperature Projections

Table 5-4 below compares temperature variables for Matabeleland South across two emissions scenarios, SSP2-4.5 and SSP5-8.5. When compared to a historic baseline, all temperature variables are projected to increase across each future time-period under both scenarios.

Table 5-4: Temperature Projections
(SMHI, 2023; The World Bank, 2021a)

Climate Variable	**Baseline** (1981-2010)	**Scenario**	**2011-2040**	**2041-2070**	**2071-2100**	**Trend ***
Mean Temperature	20.06°C	SSP2-4.5	+ 0.82°C	+ 1.72°C	+ 2.49°C	↗
		SSP5-8.5	+ 0.84°C	+ 2.25°C	+ 4.16°C	↗
Minimum Temperature	2.24°C	SSP2-4.5	+ 0.49°C	+ 1.53°C	+ 2.08°C	↗
		SSP5-8.5	+ 0.72°C	+ 1.78°C	+ 4.41°C	↗
Maximum Temperature	37.45°C	SSP2-4.5	+ 1.04°C	+ 2.08°C	+ 3.14°C	↗
		SSP5-8.5	+ 1.22°C	+ 2.96°C	+ 4.86°C	↗
	Baseline (1995-2014)		**2020-2039**	**2040-2059**	**2060-2079**	
Extreme Heat Days (Max Temp > 35°C)	22.34 days	SSP2-4.5	+ 15.03 days	+ 27.38 days	+ 38.70 days	↗
		SSP5-8.5	+ 15.27 days	+ 36.16 days	+ 69.13 days	↗

***Darker color indicates steeper trends.*

By 2070, mean annual temperature is projected to increase by 1.72°C under SSP2-4.5, and by 2.25°C under SSP5-8.5 (The World Bank, 2021a).Increases in maximum temperature are also projected to result in an increase in the number of hot days experienced within the region. It is anticipated that extreme heat events will increase in frequency and duration, affecting various economic activities including mining (USGCRP, 2016).

Extreme heat days, or days with maximum temperatures over 35°C, are expected to increase under both emissions scenarios. Under SS2-4.5, extreme heat days are projected to increase by ~15 days by 2039, and by ~27 days by 2059, compared to a historic baseline of ~22 days per year. Under SSP5-8.5, they are projected to increase by ~15 days by 2039, and by ~37 days by 2059. The increase in heat days will be most severe in Spring, in the months of September, October, and November.

5.2.2. Precipitation Projections

Precipitation projections are an important tool for assessing the risks associated with extreme weather events such as floods, droughts, and storms. Table 5-5 below highlights the projections of various precipitation variables for Matabeleland South under the SSP2-4.5 and

SSP-8.5 scenarios. Variables are presented as a change from the historic baseline (1981-2010) across three future time periods.

Table 5-5: Precipitation Projections
(SMHI, 2023)

Climate Variable	Baseline (1981-2010)	Scenario	2011-2040	2041-2070	2071-2100	Trend*
Mean Annual Precipitation	1.17mm/day	SSP2-4.5	- 0.45%	+ 1.88%	+ 1.39%	↗
		SSP5-8.5	+ 2.15%	+ 6.55%	+ 2.54%	↗
Longest Dry Spell[4]	232 days	SSP2-4.5	+ 1.39%	+ 7.20%	+ 9.91%	↗
		SSP5-8.5	+ 6.72%	+ 5.17%	+ 11.11%	↗
Number of Dry Spells[5]	287 days	SSP2-4.5	- 2.06%	- 8.00%	- 8.88%	↘
		SSP5-8.5	- 2.44%	- 8.67%	- 13.55%	↘
10 Year Flood[6]	27.67 m³/s	RCP4.5	+ 40.04%	+ 62.88%	+ 83.19%	↗
		RCP8.5	+ 40.09%	+ 90.49%	+ 102.41%	↗
50 Year Flood[7]	43.75 m³/s	RCP4.5	+ 46.44%	+ 64.42%	+ 88.86%	↗
		RCP8.5	+ 43.62%	+ 104.47%	+ 105.14%	↗

Darker color indicates steeper trends.

Mean annual precipitation is projected to increase by ~2% and ~7% under SSP2-4.5 and SSP5-8.5 respectively by 2070. While this increase is relatively small, it is necessary to look at single-event rainfall projections to determine the impact that increased precipitation may have on the region. Water discharge rates, which can be used as an indicator of flooding in the Project region, are projected to increase under both emissions scenarios. By 2070, 10-year flood occurrence is projected to increase by ~63% under RCP4-5 and by ~90% under RCP8.5. Similarly, 50-year flood occurrence is projected to increase by ~64% under RCP4.5 and by ~104% under RCP8.5. As seen in Figure 5-7 below, one day precipitation events in

[4] Maximum number of consecutive dry days over a 30-year period.
[5] Number of dry periods 5 days or longer over a 30-year period.
[6] 10 Year Return period of annual daily max water discharge, used to showcase 10-year flood recurrence.
[7] 50 Year Return period of annual daily max water discharge, used to showcase 50-year flood recurrence.

the Matabeleland South Region are projected to increase in severity most noticeably during the summer period in the months of January and February, and decrease during the month of October in the spring.

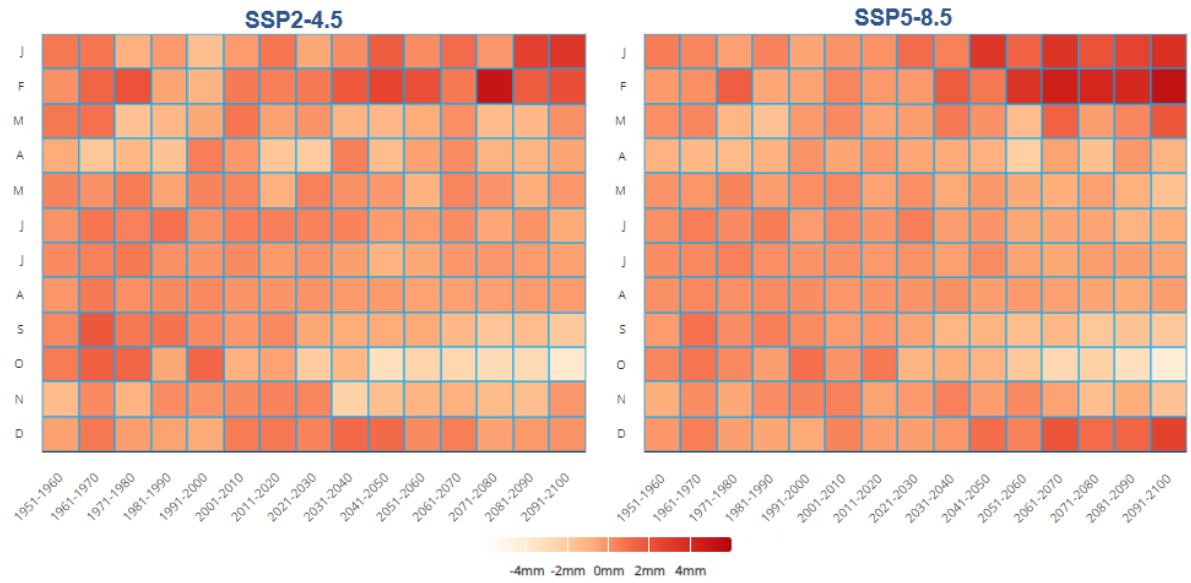


Figure 5-7: Projected Change in Largest One-Day Precipitation for Matabeleland South, Zimbabwe
(Reference Period: 2011 to 2100) (The World Bank, 2021a)

Despite projected increases in rainfall, variability of rainfall in the region means that the Project area may still experience drought periods. Longest consecutive dry periods are projected to increase in duration by 7% under SSP2-4.5 and by 5% under SSP5-8.5 by 2070 (Table 5-5). Despite a projected increase in the duration of dry spells, the quantity of dry spells is projected to decrease under both SSP scenarios. The number of dry spells for the region are expected to decrease by 8% under SSP2-4.5 and by 9% under SSP5-8.5 by 2070.

5.2.3. Extreme Events

Extreme weather events refer to unusual and severe weather occurrences that deviate from the typical patterns observed in a particular region. These events occur only when several climatic preconditions come together. In Zimbabwe, these events are projected to increase despite the uncertainty involved in predicting the exact magnitude and timing of future extreme events (USAID, 2015). For example, an extreme rainfall event can only occur when high temperatures are paired with adequate moisture and atmospheric instability (The World Bank, 2021). When one of these preconditions increases in frequency, so does the potential for extreme weather events.

As a semi-arid region, Zimbabwe's climate is characterised by hot temperatures and low rainfall. Extreme climate events in the country typically include droughts, heatwaves, and occasional floods (Ndlovu, Prinsloo, & le Roux, 2020). Figure 5-8 shows the distribution of historical hazards in the area. Between 1980 and 2020, the nation experienced an average of 8 instances of drought, 12 floods, and 6 storms each year. These extreme events have

resulted in loss of life and impacted the livelihoods of in the nation. From 1980 to 2020, droughts, floods, and storms have impacted over 26 million people, 344,000 people, and 386,000 people respectively (The World Bank, 2021a).

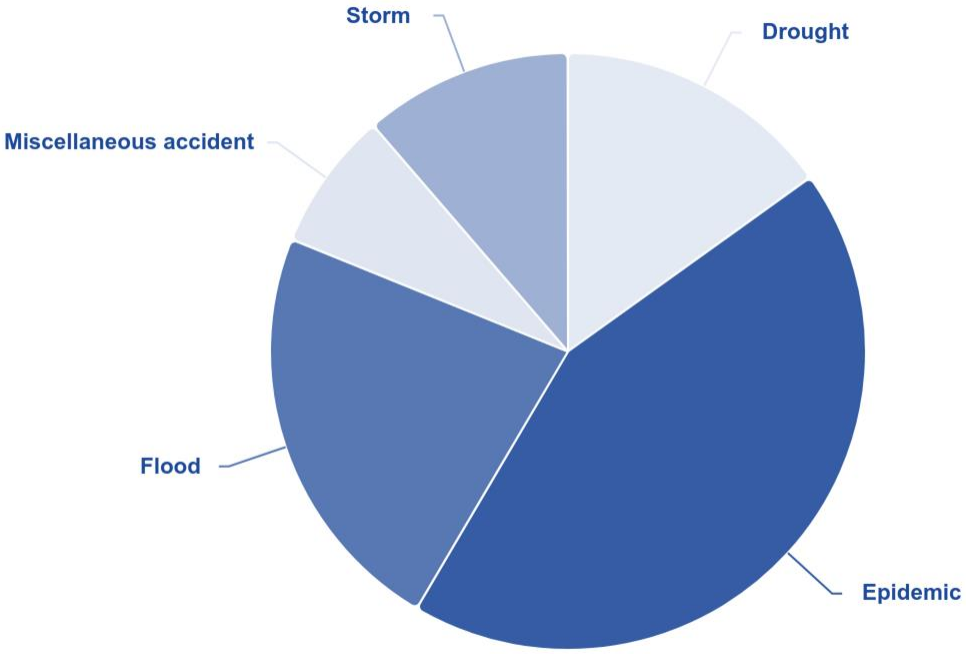


Figure 5-8: Average Annual Natural Hazard Occurrence in Zimbabwe
(Reference Period: 1980 to 2020) (The World Bank, 2021a)

In addition to increased temperatures leading to dry spells and droughts, as well as variabilities in precipitation resulting in floods, Zimbabwe is also affected by tropical cyclones. These cyclones can have varying impacts on the country's climate, depending on factors like strength and proximity. They may result in extended dry periods or heavy rainfall, leading to flooding. For instance, Cyclone Eline in February 2000 caused severe flooding, affecting numerous farmers and displacing thousands of people (Food and Agriculture Organization, 2000). Similarly, Cyclone Idai in March 2019 led to significant casualties, displacements, and widespread impacts on communities in Zimbabwe (International Federation of Red Cross, 2019).

5.2.4. Climate Baseline Summary

The following table provides a brief summary of the historic climatic trends and projections described above. Asterisks (*) are used to indicate statistically significant trends.

Table 5-6: Summary of Climate Change Trends and Projections

Historic Trends (1970 to 2020)	Future Projections (2014 to 2100)
• Increased mean annual temperature* • Decreased annual precipitation from 1970-2020, with a relatively flat rainfall trend • Increase in consecutive dry days, interpreted in conjunction with the increase in temperature and decrease in precipitation	• Increase in temperature • Increase in hot days (temp > 30°C) • Increase in intensity of one-day rain events during the months of January and February, and decrease during the month of October

6. Greenhouse Gas Assessment

The Blanket Mine's GHG emissions for 2023 were calculated according to the methodology described in Section 4.1. The activity data provided by Caledonia is summarised in Table 6-1 whilst the emission and conversion factors used are summarised in Table 6-2.

Table 6-1: Activity data supplied by Caledonia Mining

Description	Detail	Value	Unit of Measure
Mobile Combustion	Diesel – vehicles	724,359	Litres
	Diesel – contractors	464,308	Litres
	Diesel – TMM	662,461	Litres
	Petrol	45,352.0	Litres
Stationary Combustion	Diesel - generators	1,474,546	Litres
	Diesel - Smelter	16,310	Litres
Explosives	DANFO	679	tonnes
	Kubela 45	43	tonnes
	Kubela 28	447	tonnes
Electricity purchased	ZESA	84,390,017	kWh

Table 6-2: Emission and Conversion Factors

Description	Value	Unit of Measure	Source
Stationary – Diesel – CO_2	74,100	$kgCO_2/TJ$	(IPCC, 2006)
Stationary – Diesel – CH_4	3	$kgCH_4/TJ$	(IPCC, 2006)
Stationary – Diesel – N_2O	0.6	kgN_2O/TJ	(IPCC, 2006)

Description	Value	Unit of Measure	Source
Mobile – Diesel –CO_2	74,100	$kgCO_2/TJ$	(IPCC, 2006)
Mobile – Diesel –CH_4	4.15	$kgCH_4/TJ$	(IPCC, 2006)
Mobile – Diesel –N_2O	28.6	kgN_2O/TJ	(IPCC, 2006)
Mobile – Petrol –CO_2	69,300	$kgCO_2/TJ$	(IPCC, 2006)
Mobile – Petrol –CH_4	3.5	$kgCH_4/TJ$	(IPCC, 2006)
Mobile – Petrol –N_2O	5.7	kgN_2O/TJ	(IPCC, 2006)
Global Warming Potential (GWP) – CO_2	1	tCO_2e/tCO_2	(IPCC, 2022a)
GWP – CH_4	29.8	tCO_2e/tCH_4	(IPCC, 2022a)
GWP – N_2O	273	tCO_2e/tN_2O	(IPCC, 2022a)
Grid Emission Factor	0.375	tCO_2e/MWh	(Zimbabwe Energy Regulation Authority, 2023)
Explosives	0.17	tCO_2e/t	(Australian Department of Climate Change, 2008)
Well-to-tank (WTT) - Diesel	0.624	$kgCO_2e/L$	(Department of Environment, Food and Rural Affairs, 2023)
WTT - Petrol	0.607	$kgCO_2e/L$	(Department of Environment, Food and Rural Affairs, 2023)
Density – Diesel	829.9	kg/m^3	(Department of Environment, Food and Rural Affairs, 2023)
Density – Petrol	743.5	kg/m^3	(Department of Environment, Food and Rural Affairs, 2023)
Net Calorific Value (NCV) - Diesel	0.043	TJ/t	(IPCC, 2006)
Net Calorific Value (NCV) – Petrol	0.0473	TJ/t	(IPCC, 2006)

The GHG emissions calculated for 2023 are summarised in Table 6-3. This shows that scope 2 is the largest source of GHG emissions. The scope 2 GHG emissions are >330% larger than the scope 1 GHG emissions. Within scope 1, the main source of GHG emissions is from mobile combustion equipment. This is the opposite of the previous year's scope 1 GHG emissions, where the stationary combustion emissions were the largest contributor to scope 1.

Table 6-3: GHG Emissions 2023

Operation Emissions	2023 (tCO2e/y)	2022 (tCO2e/y)	Difference
Scope 1	**9,488**	**15,129**	**-37%**
Mobile	5,532	4,807	15%
Diesel	5,419	4,719	15%
Petrol	113	88	28%
Stationary	3,956	10,321	-62%
Diesel/LFO	3,956	10,321	-62%
Explosives	199	92	116%
Scope 2	**31,636**	**32,624**	**-3%**
Electricity purchased	31,636	32,624	-3%
Scope 3	**2,113**	**3,435**	**-38%**
Category 3	2,113	3,435	-38%
Diesel/LFO	2,086	3,413	-39%
Petrol	28	21	29%

The largest absolute change in GHG emissions was the 6,365 tCO_2e reduction in stationary combustion emissions. This equates to a 62% decrease in this GHG emission source. The next largest absolute change was the 988 tCO_2e reduction in scope 2 emissions. Due to the scale of the scope 2 emissions, this only represents a 3% decrease. Mobile combustion emissions increased by 15%, from 4,807 tCO_2e to 5,532 tCO_2e. The overall decrease in the consumption of fuels also decreased the scope 3 category 3 GHG emissions by 39%.

7. Climate Change Risk and Vulnerability Assessment

7.1. Regional Climate Change Risks

Table 7-1 discusses prevalent climate hazards in Zimbabwe and at the Blanket Mine location over the course of the 40-year LoM.

Table 7-1: Regional Climate Hazards

Climate Hazards	Description
Flooding	From 1980 to 2020, it is estimated that flooding events in Zimbabwe have impacted more than 344,000 people, with an annual average of 12 floods per year (The World Bank, 2021a). When looking at the Gwanda District within the Matabeleland South Province where the Blanket Mine is located, riverine and urban floods risk is currently classified as low (GFDRR, 2020; WRI, 2023).

Climate Hazards	Description
	However, under both SSP2-4.5 and SSP5-8.5, annual precipitation and the intensity of rainfall events is expected to increase, which will increase risks of flooding.
Increased temperatures	The Gwanda District is currently classified as having medium extreme heat risk, where there is more than a 25% chance that a period of prolonged exposure to extreme heat will occur in the next five years (GFDRR, 2020). Based on the SSP2-4.5 and SSP5-8.5 emissions pathways, temperatures in the region will increase, leading to an increased frequency of extreme heat days with temperatures 35°C (The World Bank, 2021b).
Wildfires	Wildfires are currently classified as the highest level of hazard in the Gwanda District. Given projected increases in temperature and variability of rainfall, there are likely to be conditions that allow for longer, more frequent, and more severe wildfires (GFDRR, 2020).
Slope Failure	While risk of landslides in the Gwanda District is currently classified as very low (GFDRR, 2020), increased intensity and frequency of heavy rainfall events can lead to a higher risk of slope failure on rehabilitated land. In addition. This intensifies flood risks and increases the risk of landslides, depending on regional topography.
Droughts and water scarcity	The Gwanda district is currently classified as having a medium drought risk (WRI, 2023; GFDRR, 2020). While future projections do not indicate a strong trend in drought occurrences, it is prudent to plan for continued drought risks.
Tropical Storms	From 1980 to 2020, it is estimated that tropical storm events in Zimbabwe have impacted more than 386,000 people, with an annual average of 6 storms per year (The World Bank, 2021a). While tropical storms and cyclones as discussed in Section 5.2.3 may have less impact on the project area, impacts to the surrounding regions may impact Blanket Mine's value chain.
Epidemic diseases	Parasitic and bacterial epidemic diseases, such as malaria or cholera, can impact people exposed to natural hazards caused by changing weather conditions. Increased air pollution and compromised water sources can increase the transmissibility of airborne diseases and the risk of infectious waterborne diseases. From 1980 to 2020, epidemic events in Zimbabwe have impacted more than 678,000 people, with an annual average of 23 epidemic incidents per year (The World Bank, 2021a). The area where Blanket Mine is situated is classified as having extremely high risk due to lack of sanitation and access to safe drinking water. This is due to over 20% of the local population collecting water from unprotected sources, and over 20% of people do not have access to sanitation services to dispose of human waste (WRI, 2023).

7.2. Project Specific Climate Change Risks

Project specific risk and the subsequent impacts on worker health and safety, operations and the value chain are outlined and discussed below in Table 7-2. Risks are scored according to the methodology outlined in Section 4.3.

The LoM is projected to be 40 years. To account for potential variation in LoM, as well as risks related to mine closure and long-standing infrastructure such as Tailings Storage Facilities (TSFs), hazard data is presented as a change from the historic baseline to a time horizon covering 2070. Additional details on the justification and source of each quantitative hazard score can be found in **Error! Reference source not found.**.

Table 7-2: Project Specific Physical Climate Change Risks

Hazards	Projected Relative Change in Hazard Level (0-10)		Exposure (0-1)	Sensitivity (0, 0.5,1)	Adaptive Capacity (0, 0.5, 1) Recommended Adaptation (0, 0.5, 1)	Risk Description	Projected Change in Risk Score	
	RCP-4.5 SSP2-4.5	RCP-8.5 SSP5-8.5					RCP-4.5 SSP2-4.5	RCP-8.5 SSP5-8.5
Heavy rainfall and flooding events	**7**	**10**	**1**	**0.5**	**0**	**Infrastructure Damage and Increased Operating Costs**	**3.5**	**5**
	50 year flood recurrence is projected to increase by ~64% under RCP4.5 and ~104% under RCP8.5 by 2070.		Exposed infrastructures are vulnerable to damage during extreme rainfall and flooding. This includes linear infrastructure such as fencing, aboveground slurry and water pipelines, power lines, and access roads. Extreme rainfall will also increase water ingress into the underground shafts and put strain on stormwater infrastructure like diversion channels.	Upstream and on-site infrastructure breakdowns and damages during extreme precipitation and flooding events are possible, but existing diversion channels have been adequate to assess historic flooding issues.	No consideration for extreme precipitation and floods.	At minimum, heavy rainfall can lead to higher operational expenses from increased pumping activities and lost production due to road closures or damage to infrastructure such as water pipelines, fence lines, and electricity transmission lines. Closed access roads can lead to delays of goods, resources, and services to and from the mine and within the mining license. Moderate impacts of extreme rainfall include damage to pumping and stormwater management infrastructure, incurring higher costs to repair damage. Complete failure of pumping equipment, diversion channels, and containment dams due to floods or an extreme precipitation event can lead to production stoppages. *Key risks: operational and maintenance costs, lost production*		
					0.5		**0**	**0**
					Extreme precipitation and flooding events considered in stormwater management, site, and infrastructure planning.			
Heavy rainfall and flooding events	**7**	**10**	**1**	**1**	**0**	**Structural Instability and Slope Failure**	**7**	**10**
	50 year flood recurrence is projected to increase by ~64% under RCP4.5 and ~104% under RCP8.5 by 2070.		Infrastructure with steep slopes such as TSF walls and other earthworks can be susceptible to erosion and slope failure.	Extreme rainfall events can lead to slope failure, placing infrastructure and workers at risk, and disrupting operations.	No infrastructure in place to reduce likelihood of slope collapse, erosion, or flooding.	Minor slope failure of historic or proposed TSFs and other earthworks from heavy rainfall or flooding could damage infrastructure and equipment, disrupting operations while repairs are made. Complete slope failures or critical structural instability could lead to production stoppages, community infrastructure damage, environmental contamination risks and fines, reputational risks, injury, or death. *Key risks: operational and maintenance costs, lost production, health and safety, environmental damage, reputational risks*		
					0.5		**3.5**	**5**
					Ensure gradient of slopes at proposed TSF site are designed with climate change in mind, ensure stormwater infrastructure can withstand large and more frequent flooding events and that rehabilitation plans are aligned with climate trends.			
Heavy rainfall and flooding events	**7**	**10**	**1**	**1**	**0**	**Contamination and Reputational Risks**	**7**	**10**
	50 year flood recurrence is projected to increase by ~64% under RCP4.5 and ~104% under RCP8.5 by 2070.		Exposed infrastructures carrying mining waste and other forms of wastewater such as slurry pipelines, TSFs, and slimes dams are vulnerable to damage during extreme rainfall and	Infrastructure damage can lead to seeps and spillage.	No consideration for extreme precipitation and floods.	Increased rainfall increases discharge of excess water into stormwater management systems, leading to environmental damage and reputational risks from sedimentation of surrounding waterways. Failure of pumping equipment and stormwater management infrastructure, including an overflow of containment and return water dams due to floods or an extreme precipitation event, can lead to seepage into the local environment.		
					0.5		**3.5**	**5**

			flooding. Stormwater infrastructure such as diversion channels and containment dams may overflow.		Extreme precipitation and flooding events considered in stormwater management, site, and infrastructure planning.	Damage to pipelines and slimes dams can also spill waste into the environment. Contamination leads to environmental risks and fines, health and safety risks, as well as reputational risks. The previous TSF is unlined, therefore additional water content in the TSF could cause any contaminants present to leach into surface and groundwater resources. *Key risks: health and safety, environmental damage, reputational risks*		
Heavy rainfall and flooding events	**7**	**9**	**1**	**0.5**	**0**	**Rehabilitation Success**	**3.5**	**4.5**
	10 year flood recurrence is projected to increase by ~62% under RCP4.5 and ~90% under RCP8.5 by 2070.		Planned rehabilitation areas exposed to extreme rainfall and flooding events.	Extreme rainfall and flooding events can adversely impact revegetation success and vegetation cover, which can expose soils and accelerate erosion, resulting in damage to rehabilitation structures, and damage to revegetated areas.	No consideration for rainfall and flooding events in rehabilitation planning. **0.5** Rehabilitation planning considers increased extreme rainfall and flooding events.	Flood affected areas can become compromised and unusable areas with reduced vegetation cover, which will lead to increased erosion and loss of topsoil nutrients. Increased erosion of existing and proposed TSF sides and tops leads to increased ingress and resulting contamination of groundwater resources. It will require significant resources to rehabilitate and restabilise the affected areas. Reduced rehabilitation success will increase operational costs and can lead to reputational risks. *Key risks: environmental damage, operational costs, reputational risks*	**0**	**0**
Extreme heat days	**10**	**10**	**1**	**0.5**	**0**	**Operational Efficiency**	**5**	**5**
	Extreme heat days will increase by ~173% under the SSP2-4.5 scenario, and by ~309% under the SSP5-8.5 scenario by 2070.		Outdoor and underground equipment will be expected to continue operating at these conditions.	During extreme heat days, ambient air pressure drops. This reduces the mass of air available for combustion in engines as well as the mass of air available for cooling systems.	No consideration for extreme heat events. **0.5** Increase operation activity during the cooler hours of the day, and increase ventilation for underground operations.	Engines and generators use air for cooling and combustion. At 40°C, the density of air reduces, leading to a 10% reduction in the mass of air available for generator cooling and combustion (Inoplex, 2022). Less air available for combustion reduces combustion efficiency: for every 3°C rise over 20°C in air intake temperature, engine power is reduced by 1% (Rakopoulos et al., 2004) Therefore, when ambient temperatures exceed 35°C, fuel consumption increases by 5% during those hot periods, leading to operational efficiency losses during construction, operations, and rehabilitation activities. This applies to both aboveground and belowground activities, as underground mine temperature is currently between 30-35°C, which is expected to increase on days with extreme temperatures. The efficiency of ventilation systems used for underground operations will also be impacted by extreme heat, increasing the cost of operation on those days. *Key risks: operational costs*	**0**	**0**
Extreme heat days	**10**	**10**	**1**	**0.5**	**0**	**Solar Derating**	**5**	**5**
	Extreme heat days will increase by ~173% under the SSP2-4.5 scenario, and by ~309% under the SSP5-8.5 scenario by 2070.		12.5 MW solar installation will continue operating on extreme heat days.	During extreme heat days, high temperatures will increase temperature of solar cells.	No mitigation feasible for existing solar installation.	Solar panels are generally developed and tested at 25°C, and experience a decrease in energy output for each 1°C increase in the temperature of the solar cells, known as their temperature coefficient. This decrease ranges between models, with some major solar panel models losing between 0.26% to 0.41% output for each 1°C increase over 25°C (Sendy, 2022). Solar cells often reach temperatures higher than the ambient air temperature. Therefore, solar output will decrease during extreme heat days, leading to increased costs from purchasing electricity through the grid or use of generators. *Key risks: operational costs*		

Extreme heat days	**10**	**10**	**1**	**1**	**0**	**Worker Health and Safety**	**10**	**10**
	Extreme heat days will increase by ~173% under the SSP2-4.5 scenario, and by ~309% under the SSP5-8.5 scenario by 2070.		Staff working outdoors and underground will be expected to continue working during extreme heat periods.	Mine workers are susceptible to heat induced stress and issues.	No consideration for extreme heat events in health and safety management.	Extreme heat days could lead to more workplace incidents such as absenteeism, fatigue, dehydration, heat stroke, respiratory and cardiovascular disorders, and increased hospital admissions if not managed responsibly. Excessive heat can also lead to increased operator error, resulting in additional safety incidents. This applies to both aboveground and belowground activities, as underground mine temperature is currently between 30-35°C, which is expected to increase on days with extreme temperatures. *Key risks: health and safety*		
					0.5		**5**	**5**
					PPE, sunscreen, aircons in cabins of vehicles, adequate underground ventilation in use, urine chart, taking regular breaks during extreme heat periods.			
Extreme heat days	**10**	**10**	**1**	**0.5**	**0**	**Rehabilitation Success**	**5**	**5**
	Extreme heat days will increase by ~173% under the SSP2-4.5 scenario, and by ~309% under the SSP5-8.5 scenario by 2070.		Revegetation will occur throughout operation and decommissioning phases of the Blanket Mine	Increased heat can result in die-off of rehabilitated vegetation.	No consideration for extreme heat events in rehabilitation planning.	Increased heat can result in die-off of rehabilitated vegetation, thereby increasing dust and erosion, and leading to increased water ingress when rain falls. Increased ingress leads to increased instances of contamination of groundwater, impacting the Blanket Mine's social license to operate. It will require significant resources to rehabilitate and restabilise the affected areas. Reduced rehabilitation success will increase operational costs and can lead to reputational risks. *Key risks: environmental damage, operational costs, reputational risks*		
					0.5		**0**	**0**
					Rehabilitation planning considers increased extreme heat events.			
Extreme heat days	**10**	**10**	**1**	**1**	**0**	**Safe Storage of Chemicals**	**10**	**10**
	Extreme heat days will increase by ~173% under the SSP2-4.5 scenario, and by ~309% under the SSP5-8.5 scenario by 2070.		Chemicals such as cyanide that may be reactive to high heats are stored on site.	Extreme heat can cause chemicals to increase in reactivity.	Large stockpile of chemicals without temperature stability considerations.	High temperatures can increase reactivity of stored chemicals like cyanide, leading to potential leaks and chemical storage failure. Chemical spills can cause health and safety risks to employees, and spills that leach into the surrounding environment will cause contamination of water resources and local habitats, leading to reputational risks and potential fines. Explosives that are currently stored in underground storage areas are also susceptible to deterioration or autoignition at high temperatures. *Key risks: health and safety, environmental damage, reputational risks*		
					0.5		**5**	**5**
					Chemical storage method ensures stability of temperature.			
Droughts	**1**	**1**	**1**	**0.5**	**0**	**Increased Operational Costs and Reputational Risks**	**0.5**	**0.5**
	The length of dry spells is projected to increase by ~7% under RCP4.5, and decrease by ~5% under RCP8.5 by 2070.		Access to water is required for activities like dust suppression, processing, and human consumption.	Without sufficient surface water, water used for dust suppression and other uses may need to be purchased.	No system in place to reduce surface water reliance.	While overall precipitation is expected to increase, the length of dry spells is also projected to increase, which may lead to more intense drought conditions. Water from the Blanket Dam is processed for potable water used in administrative buildings and the mining village, as well as used in processing and dust suppression. Process water is also obtained through dewatering activities, which may decrease in drought conditions. Decreased potable water supply may lead to increased operational costs due to the need to purchase water elsewhere. Insufficient water for processing and dust suppression can lead to potential increased operational costs and delays in the		
					0.5		**0**	**0**

				Increase water efficiency considerations, increasing the range of water sources that can be used.	up-stream value chain due to increased water prices, water shortages, or product delivery delays. *Key risks: increased operational costs, delays*		
Droughts	**1** **1**	**1**	**0.5**	**0**	**Reputational Risks**	**0.5**	**0.5**
	The length of dry spells is projected to increase by ~7% under RCP4.5, and decrease by ~5% under RCP8.5 by 2070.	Decreased rainfall impacts water availability at Blanket Dam.	Water scarcity increases competition for water resources between Blanket Mine and surrounding communities.	No system in place to reduce surface water reliance. **0.5** Water treatment facility upgraded to make use of dewatering water.	If the Blanket Mine consumes large quantities of water from Blanket Dam while the surrounding communities lack water access, local pressure to conserve water can increase, risking the Blanket Mine's social license to operate. *Key risks: reputational risks*	**0**	**0**
Droughts	**1** **1**	**1**	**0.5**	**0**	**Rehabilitation Success:**	**0.5**	**0.5**
	The length of dry spells is projected to increase by ~7% under RCP4.5, and decrease by ~5% under RCP8.5 by 2070.	Rehabilitation areas can be exposed to drought conditions.	Droughts impact revegetation success and cover, which can expose soils that are susceptible to erosion, resulting in damage to rehabilitated areas.	No consideration for drought periods. **0.5** Drought periods are considered in rehabilitation planning and implementation through irrigation and drought resistant plant species.	Drought periods compromise rehabilitation success by creating unstable areas with reduced vegetation cover, leading to increased erosion and loss of topsoil nutrients. Erosion can lead to increased water ingress when rain does fall. Increased ingress leads to increased instances of contamination of groundwater, impacting the Blanket Mine's social license to operate. It will require significant time, money, and effort to rehabilitate and restabilise drought affected areas, and failure to do so may lead to reputational risks. *Key risks: rehabilitation costs, reputational risks*	**0**	**0**
Qualitative Risk Assessments							
Wildfires	**Increasing Hazard**	**Exposed**	**High Sensitivity**	**No Adaptive Capacity**	**Infrastructure Damage and Health and Safety Risks:**	**Increased Risk**	
	At present, there is a 50% chance that a combination of changes in temperature and rainfall conditions can lead to wildfires every year (GFDRR, 2020). Increasing temperatures and variable rainfall are projected to lead to higher wildfire occurrence.	Exposed infrastructure (TSFs, fencing, pipelines, and access roads) are in a fire prone area.	Upstream and on-site infrastructure damages during wildfire events causing production stoppages and losses, as well as risks to health and worker health and safety.	No consideration for wildfire events. **Medium Adaptive Capacity** Wildfire events considered in site and infrastructure planning and firebreaks incorporated.	At minimum, wildfires may lead to operational delays due to road closures or damage to civil infrastructure (such as electricity transmission lines). Closed access roads can lead to delays of goods, resources, and services to and from the mine, indirectly impacting operational schedules for the construction and operation of the Blanket Mine. Moderate impacts of wildfires include damage to onsite infrastructure and equipment, incurring higher costs to repair damage. Severe impacts of wildfires include health and safety risks for employees and the community due to inhalation of ash, reduced visibility, and injury or death from damaged infrastructure. Heat from wildfires also increases the potential for TSF wall or pipeline damage, leading to contamination of the surrounding environment. *Key risks: operational and maintenance costs, lost production, health and safety*	**Increased Risk**	
Wildfires	**Increasing Hazard**	**Exposed**	**High Sensitivity**	**No Adaptive Capacity**	**Rehabilitation Success:**	**Increased Risk**	
	At present, there is a 50% chance that a combination of changes in temperature and rainfall conditions can	Rehabilitation areas can be exposed to wildfire conditions.	Wildfires impact revegetation success and cover, which can expose soils that are	No consideration for wildfire events.	Wildfires compromise rehabilitation success by damaging rehabilitated areas and creating unstable areas with reduced vegetation cover, leading to increased erosion and loss of topsoil nutrients. It will require significant time, money, and		

	lead to wildfires every year (GFDRR, 2020). Increasing temperatures and variable rainfall are projected to lead to higher wildfire occurrence.		susceptible to erosion, resulting in damage to rehabilitated areas.	**Medium Adaptive Capacity** Wildfire events considered in rehabilitation planning.	effort to rehabilitate and restabilise wildfire affected areas, and failure to do so may lead to reputational risks. *Key risks: rehabilitation costs, reputational risks*	**Increased Risk**

7.3. Recommendations

Climate change impacts and risks have increased significantly over recent years and will only increase in severity if projections based on emissions trajectories are accurate (IPCC, 2022b; The World Bank, 2021a). It is also important to consider that climate change impacts will also affect all ecosystem drivers and services, which means that communities that are already facing high vulnerability to climate change impacts will only become more vulnerable (IPCC, 2022b).

Table 7-3 outlines mitigation and adaptation recommendations for consideration in the construction of future phases, operation, and closure of the Blanket Mine based on the identified climate-related risks outlined in section 7.2.

Table 7-3: Mitigation and Adaptation Recommendations

Risk	Recommendations to Mitigate and Adapt to Risks

Increased Temperatures and Extreme Heat	• Integrate heat safety into health and safety management plans. Potential measures to investigate include:
	  • Training on identification of dehydration in staff – urine charts, behaviours to look out for etc;
	  • Develop extreme heat day procedures;
	  • Define temperature thresholds at which certain procedures should be implemented;
	  • Ensure sufficient availability of water stations;
	  • Provide frequent heat rest breaks on extreme heat days; and
	  • Ensure that worker PPE and clothing provides sufficient protection from heat stress.
	• Investigate temperature control of underground operations and ensure ventilation systems are continually monitored;
	• Investigate temperature control of cabins of vehicles that are used for long periods of time, for example in haul trucks, excavators, and transport trucks;
	• Develop rehabilitation plans to account for increased temperatures and potential die-off of rehabilitated vegetation; and
	• Identify and monitor temperature storage thresholds for explosives and chemicals being stored above and belowground.

Extreme rainfall and flooding	• Develop maintenance policies to ensure regular maintenance of potentially vulnerable infrastructure, stormwater and drainage channels to flooding events as well as safe water drainage and channeling;

Risk	Recommendations to Mitigate and Adapt to Risks
	• Ensure that frequent and thorough maintenance is conducted as per maintenance policies for roads, drainage channels and vulnerable areas on site to safeguard structural integrities and ensure effective water drainage and flood control; • Perform continuous monitoring, especially after extreme weather events, to ensure there is no contamination of surrounding environment from potential spills and seepage of waste and wastewater; • Develop emergency site evacuation plans. To ensure the safety of all workers on site, it is pivotal that all site evacuation and emergency response plans can be implemented effectively during flooding events and that other built infrastructure on site is designed to be resilient towards projected flood levels;; • Ensure that the operation's stormwater management plan considers and has capacity to safely manage more frequent and intense flooding events; • Ensure that site design and layout planning considers the potential for increased extreme precipitation events that could lead to soil saturation and potential compromised slope stability of rehabilitated areas; and • Ensure that the implementation of progressive rehabilitation is planned to reinforce slope stability.
Droughts and Water Scarcity	• Upgrade water treatment facility to increase the use of underground dewatering water and reduce reliance on Blanket Dam; • Any additional actions that the mine can implement to save water, to reduce consumption and improve water consumption efficiencies need to be implemented; • Install flow meters to accurately document water abstraction from water sources. During extreme drought periods, consumption needs to be carefully monitored to not compromise water availability for other users; and • Ensure vegetation planned for rehabilitation efforts is drought resistant.
Wildfires	• Develop a wildfire risk mitigation, evacuation and response plan as part of the operational emergency procedures and response plans. • It is important to ensure that activities on site do not increase wildfire risks. Site procedures and policies need to account for potential

Risk	Recommendations to Mitigate and Adapt to Risks
	wildfire ignition, especially during periods where the weather conditions are favourable for wildfires spreading; • Identify areas and infrastructure vulnerable to wildfire risks such as electricity transmission lines and pipelines; • Implement fire breaks as needed; and • Ensure that fire breaks are regularly maintained for the vulnerable areas and infrastructure.

8. Conclusion

The calculated Scope 1 and 2 emissions of the Blanket Mine in 2023 were 41,124 tCO_2e, while Scope 3 Category 3 emissions were 2,113 tCO_2e. In 2023, Scope 2 emissions from purchased electricity were the largest source of emissions.

The projected climate changes for Blanket Mine include increased flooding, extreme heat, wildfire risks, and continued drought risks. All reviewed climate models outlined the same physical climate risks for the region, with varying degrees of intensity and severity. It is therefore important to regularly inform climate risk registers with updated climate risk reviews. Updated climate risk assessments will outline which mitigation options to prioritise to improve the Project's climate resilience.

Projected climate changes at the Blanket Mine are likely to:

- Pose increased risk of damage to onsite infrastructure;
- Present health and safety risks for employees; and
- Cause delays or stoppages in production due to damaged onsite and changes in the supply chain.

To reduce climate risks, the Blanket Mine should consider incorporating extreme weather events and flood planning into the operation's emergency preparedness and response plans. Ensuring that built infrastructure designs consider extreme weather event scenarios will reduce risk exposure and ensuring that management plans account for climate-related risks is important.

Given the climate time lag and uncertainty, this needs to be constantly monitored, reviewed, and updated to ensure measures align with changing risks. Provision also needs to be made to account for future changes in risk.

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Appendix A: Climate Projection Data

Table 9-1: Climate Projection Data for Blanket Mine

Indicator and Source	Model	Spatial Resolution	Time Horizons	SSP2-4.5 / RCP4.5	SSP5-8.5 / RCP8.5	Methods / Uncertainty	Description	Justification	Date Accessed
Annual Mean Temperature Source: (SMHI, 2023)	CMIP6	.25 degrees area covering Blanket Mine (-20.87, 28.88)	1981-2010	20.06°C	20.06°C	Ensemble Median 25th and 75th percentile	Mean annual daily temperature values averaged over a 30 year period, calculated as absolute change from baseline	Representative of future changes in overall temperature conditions	08/02/2024
			2010-2040	+ 0.82°C (0.67, 0.95)	+ 0.84°C (0.61, 1.01)				
			2041-2070	+ 1.72°C (1.36, 2.11)	+ 2.25°C (1.74, 2.78)				
			2071-2100	+ 2.49°C (1.80, 3.01)	+ 4.16°C (3.55, 5.47)				
Annual Minimum Temperature Source: (SMHI, 2023)	CMIP6	.25 degrees area covering Blanket Mine (-20.87, 28.88)	1981-2010	2.24°C	2.24°C	Ensemble Median 25th and 75th percentile	Mean annual daily minimum temperature values averaged over a 30 year period, calculated as absolute change from baseline	Representative of future changes in minimum temperature conditions	08/02/2024
			2010-2040	+ 0.49°C (0.21, 0.96)	+ 0.72°C (0.45, 0.87)				
			2041-2070	+ 1.53°C (1.17, 1.95)	+ 1.78°C(1.59, 2.63)				
			2071-2100	+ 2.08°C (1.48, 2.69)	+ 4.41°C (3.21, 4.99)				
Annual Maximum Temperature Source: (SMHI, 2023)	CMIP6	.25 degrees area covering Blanket Mine (-20.87, 28.88)	1981-2010	37.45°C	37.45°C	Ensemble Median 25th and 75th percentile	Mean annual daily maximum temperature values averaged over a 30 year period, calculated as absolute change from baseline	Representative of future changes in maximum temperature conditions	08/02/2024
			2010-2040	+ 1.04°C (0.73, 1.46)	+ 1.22°C (1.00, 1.36)				
			2041-2070	+ 2.08°C (1.54, 2.59)	+ 2.96°C (2.36, 3.19)				
			2071-2100	+ 3.14°C (2.44, 3.58)	+ 4.86°C (4.53, 6.80)				
Extreme Heat Source: (The World Bank, 2021a)	CMIP6	Regionally downscaled to Matabeleland South	1995-2014	22.34 days	22.34 days	Ensemble Median 10th and 90th percentile	Annual days over 35°C, averaged over a 20 year period, calculated as an absolute change from baseline	Days over 35°C provides indication of number of days with risks of strain from extreme heat	21/02/2024
			2020-2039	+ 15.03 days (3.14, 28.34)	+ 15.27 days (2.37, 30.75)				
			2040-2059	+ 27.38 days (11.13, 49.19)	+ 36.16 days (16.5, 60.85)				
			2060-2079	+ 38.7 days (15.81, 63.45)	+ 69.13 days (33.48, 105.09)				
			2080-2099	+ 51.69 (21.93, 81.02)	+ 109.04 days (57.54, 164.23)				
Mean Annual Precipitation Source: (SMHI, 2023)	CMIP6	.25 degrees area covering Blanket Mine (-20.87, 28.88)	1981-2010	1.17 mm/day	1.17 mm/day	Ensemble Median 25th and 75th percentile	Mean annual daily precipitation values averaged over a 30 year period, calculated as relative change from baseline	Representative of future changes in overall precipitation conditions	08/02/2024
			2010-2040	- 0.45% (-8.12, 9.63)	+ 2.15% (-3.69, 11.69)				
			2041-2070	+ 1.88% (-11.30, 14.04)	+ 6.55% (-4.59, 11.29)				
			2071-2100	+ 1.39% (-2.43, 11.18)	+ 2.54% (-5.43, 15.95)				
50-year return period of annual max water discharge Source: (SMHI, 2023)	CMIP5	Results covering Blanket Mine (-20.87, 28.88), spatial resolution undefined	1981-2010	43.75m³/s	43.75m³/s	Ensemble Median 25th and 75th percentile	50 Year Return period of annual daily max water discharge, used to showcase 50 year flood recurrence	50-year water discharge most representative of extreme, highly damaging flood	08/02/2024
			2010-2040	+ 46.44% (26.71, 129.66)	+ 43.62% (-10.77, 103.47)				
			2041-2070	+ 64.42% (6.17, 168.32)	+ 104.47% (28.42, 174.05)				
			2071-2100	+ 88.86% (26.03, 136.36)	+ 105.14% (63.33, 161.26)				
10-year return period of annual max water discharge Source: (SMHI, 2023)	CMIP5	Results covering Blanket Mine (-20.87, 28.88), spatial resolution undefined	1981-2010	27.67m³/s	27.67m³/s	Ensemble Median 25th and 75th percentile	10 Year Return period of annual daily max water discharge, used to showcase 10-year flood recurrence	10-year water discharge most representative of average flooding events	08/02/2024
			2010-2040	+ 40,04% (23.27, 127.07)	+ 40.09% (-6.72, 91.53)				
			2041-2070	+ 62.88% (4.38, 150.15)	+ 90.49% (26.75, 166.37)				
			2071-2100	+ 83.19% (26.24, 107.70)	+ 102.41% (63.99, 151.42)				
Longest Dry Spell	CMIP6		1981-2010	232 days	232 days				08/02/2024

Source: (SMHI, 2023)		.25 degrees area covering Blanket Mine (-20.87, 28.88)	2010-2040	+ 1.39% (-6.80, 11.21)	+ 6.72% (-1.94, 12.96)	Ensemble Median 25^{th} and 75^{th} percentile	Maximum number of consecutive dry days where precipitation is <1mm over a 30 year period	Longest dry periods can be representative of past and future drought conditions	
			2041-2070	+ 7.20% (0.00, 16.16)	+ 5.17% (-0.43, 14.77)				
			2071-2100	+ 9.91% (0.46, 17.17)	+ 11.11% (6.40, 18.28)				
Number of dry spells Source: (SMHI, 2023)	CMIP6	.25 degrees area covering Blanket Mine (-20.87, 28.88)	1981-2010	287 days	287 days	Ensemble Median 25^{th} and 75^{th} percentile	Calculated as the number of dry periods for more than 5 days for a 30-year period	Dry periods of 5 days or more can be used to represent future periods of drought	08/02/2024
			2010-2040	- 2.06% (-6.06, 1.65)	- 2.44% (-5.62, -0.92)				
			2041-2070	- 8.00% (-13.83, -4.43)	- 8.67% (-12.03, -4.64)				
			2071-2100	- 8.88% (-13.04, -8.01)	- 13.55% (-20.96, -11.53)				