

Appendix G.5

CLIMATE CHANGE SCOPING REPORT





Sasol South Africa Limited

SECUNDA GAS TO POWER (G2P) FACILITY

Climate Change Impact Assessment - Baseline
Report





Sasol South Africa Limited

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Climate Change Impact Assessment - Baseline Report

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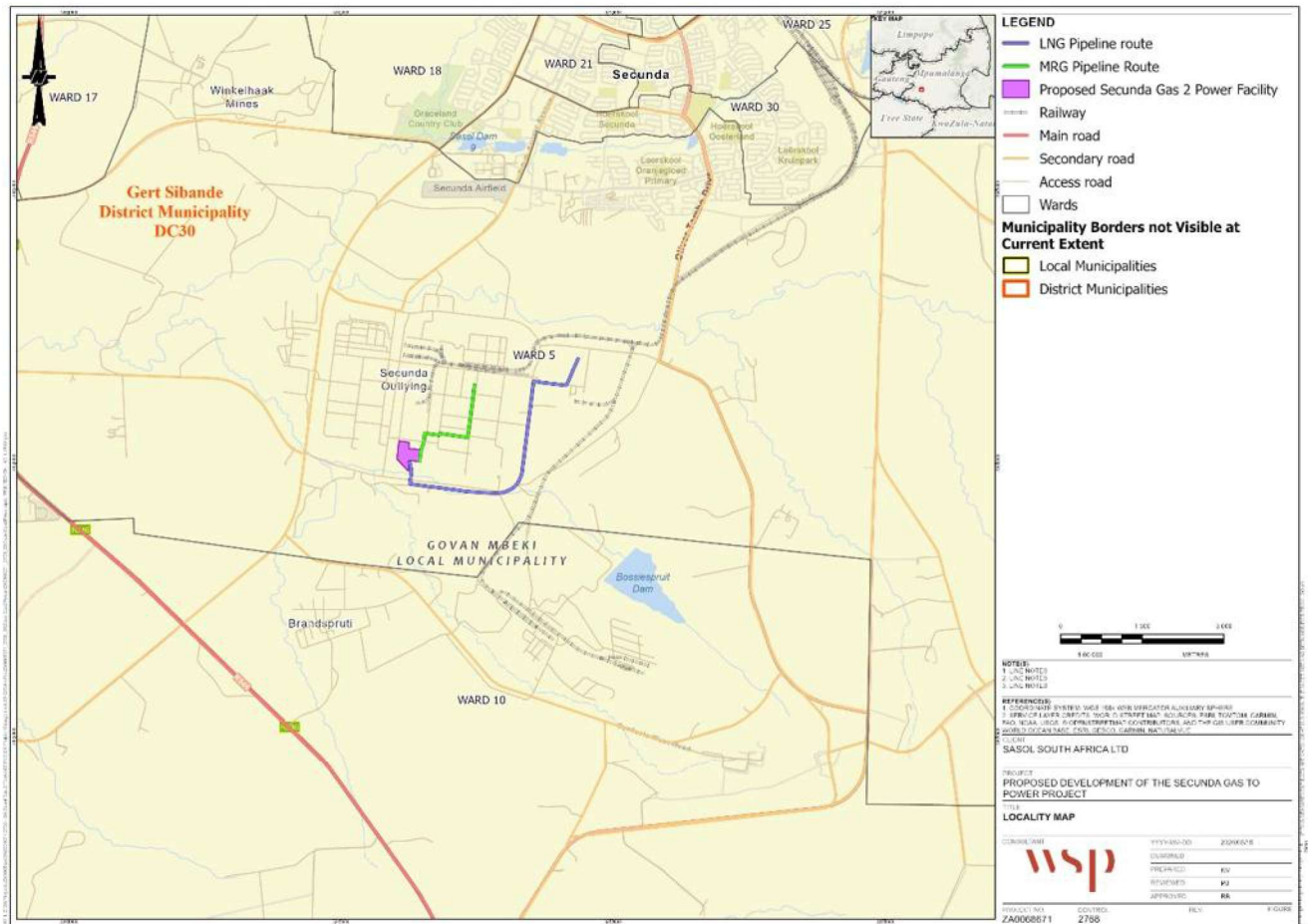


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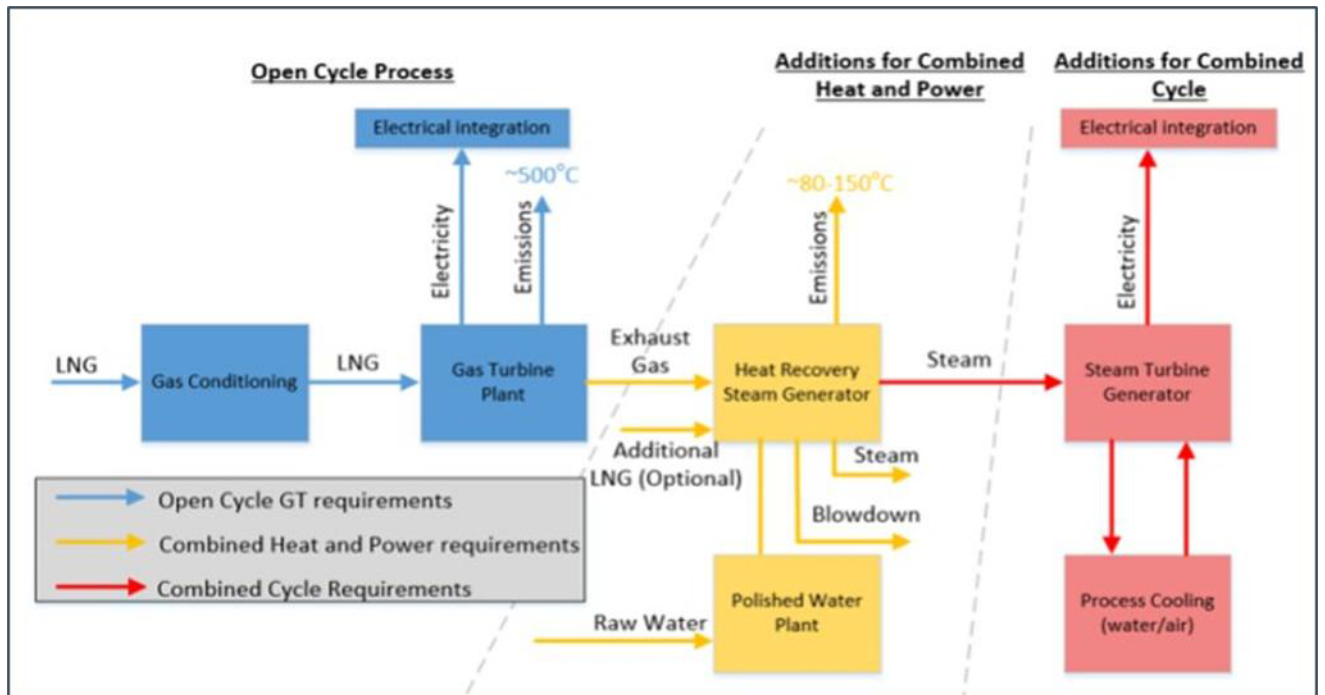


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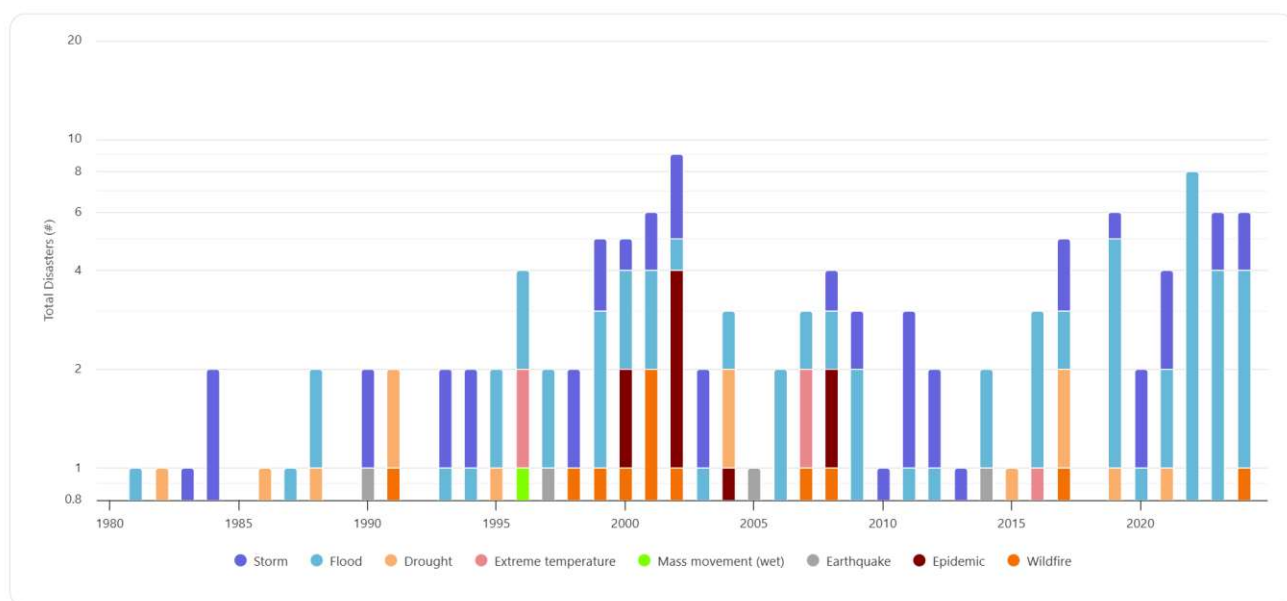


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ABBREVIATIONS AND ACRONYMS

List of Abbreviations	
AR4	Fourth Assessment Report
AR6	Sixth Assessment Report
BAU	Business-As-Usual
CCIA	Climate Change Impact Assessment
CMIP5	5th Phase of the Coupled Model Intercomparison Project
CMIP6	6th Phase of the Coupled Model Intercomparison Project
CCIA	Climate Change Impact Assessment
CCRA	Climate Change Risk Assessment
CH ₄	Methane
CO ₂	Carbon Dioxide
COP	Conference of the Parties
CSIR	Council for Scientific and Industrial Research
DARDLEA	Department of Agriculture, Rural Development, Land and Environmental Affairs
ECMWF	European Centre for Medium-Range Weather Forecasts
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EPs	Equator Principles
ENSO	El Nino Southern Oscillation
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EWRP	eMalahleni Water Reclamation Plant
GCMs	General Circulation Models
GHG	Greenhouse Gas
GHGP	Greenhouse Gas Protocol Corporate Accounting and Reporting Standard
GWP	Global Warming Potential

List of Abbreviations

GtP	Gas to Power
HFA	Hyogo Framework for Action
HFCs	Hydrofluorocarbons
ICMM	International Council on Mining and Metals
IDMC	Internal Displacement Monitoring Centre
IBL	Inside Battery Limits
IFC	International Finance Corporation
IFC: PS	International Finance Corporation: Performance Standards
IPCC	Intergovernmental Panel on Climate Change
ITCZ	Inter-Tropical Convergence Zone
LNG	Liquefied Natural Gas
MCCMS	Mpumalanga Climate Change Mitigation Strategy
MRG	Methane-Rich Gas
NCCRS	National Climate Change Response Strategy
NDCs	Nationally Determined Contributions
NDPs	National Development Plans
NMP	National Mitigation Plan
N ₂ O	Nitrous Oxide
OBL	Outside Battery Limits
PCD	Pollution Control Dam
PFCs	Perfluorocarbons
RCPs	Representative Concentration Pathways
SF ₆	Sulphur Hexafluoride
SPI	Standardised Precipitation Index
SRES	Special Report on Emissions Scenarios
SSPs	Shared Socioeconomic Pathways
TCFD	Taskforce for Climate-related Financial Disclosure



List of Abbreviations

UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WBCKP	World Bank Climate Change Knowledge Portal
WBCSD	World Business Council for Sustainable Development
WMO	World Meteorological Organisation
WRI	World Resources Institute
WSP	WSP Group Africa (Pty) Ltd



UNITS OF MEASURE

List of Units of Measure	
°C	Degrees Celsius
CO ₂ e	Carbon Dioxide equivalent
km	Kilometres
mm	Millimetres
tCO ₂ e	Metric tonnes of CO ₂ equivalent
W/m ²	Watts per square meter

1 INTRODUCTION

Sasol South Africa Limited is proposing the development of the Secunda Gas-to-Power (GtP) Facility, which aims to generate electricity for supply to the national grid and support South Africa's growing energy demand.

The components of the proposed GtP Project requiring Environmental Authorisation primarily relate to the external infrastructure associated with integration into the existing Secunda facility. This includes the installation of transmission lines and the routing of high-voltage cables, where feasible, within existing servitudes.

In addition to the electrical infrastructure, the Project will involve the installation and routing of various pipelines and supporting utility systems. These include pipelines for Liquefied Natural Gas (LNG) and Methane-Rich Gas (MRG), as well as utilities such as cooling water, raw water, firewater, instrument air, and effluent treatment systems. Water treatment infrastructure may also be required to meet operational demands.

The proposed development will be located within a Sasol-owned brownfield site of approximately 5 ha (50,000 m²), situated within the primary area of the existing Secunda complex. This report presents the climate baseline for the scoping phase of the Project, with a comprehensive Climate Change Impact Assessment (CCIA) to be undertaken at a later stage.

2 PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The proposed Secunda Gas to Power Facility is located in Secunda in the Govan Mbeki Local Municipality and Gert Sibande District Municipality, in the Mpumalanga Province of South Africa (**Figure 2-1**). The proposed Secunda Gas to Power Facility would have a project footprint area of approximately 50 000m² or 5 ha.

The details of the property associated with the proposed Secunda Gas to Power Facility, including the 21-digit Surveyor General (SG) codes for the cadastral land parcels are outlined in **Table 2-1**.

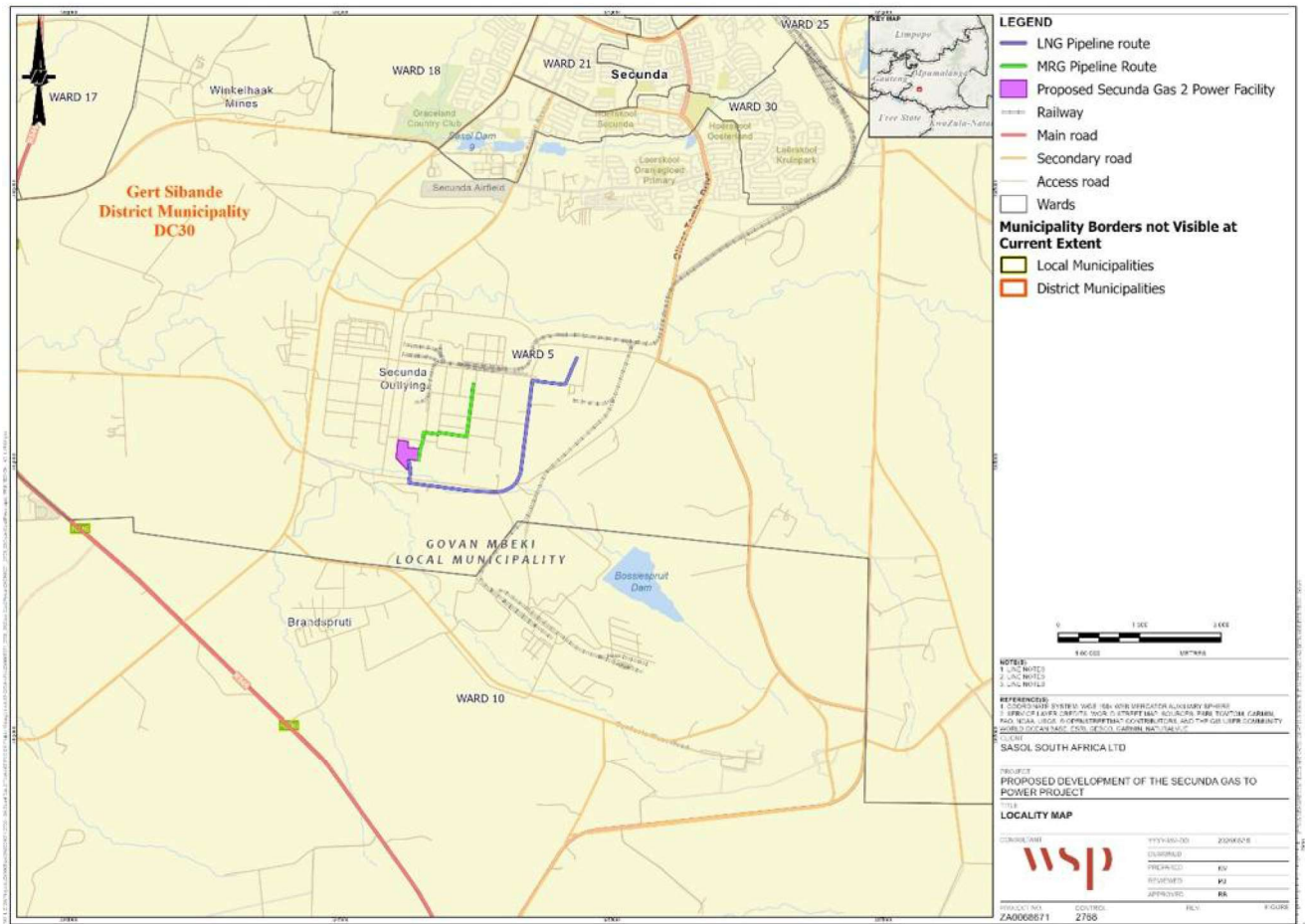


Figure 2-1 - Secunda GtP Facility Locality Map

Table 2-1 - Secunda Gas to Power Facility Affected Farm Portions

Farm Name and Number	Portion	21 Digit Surveyor General Code of Each Cadastral Land Parcel
45/290 (ERF 8488)	0	T0IS00190000848800000
8/290 (ERF 8342)	0	T0IS00190000834200000
FABRIEK 601 IS (ERF 8341)	0	T0IS00190000834100000

2.2 GAS TO POWER ELECTRICITY GENERATION PROCESS

The Secunda Gas to Power (GtP) project aims to generate electricity through Liquefied Natural Gas (LNG) (methane rich gas being considered as back-up feed), with the objective to provide power to the national grid, supporting South Africa's growing energy needs.

The Inside Battery Limit (IBL) scope includes the main equipment for generating electricity, which will be proposed by the vendor. The Outside Battery Limit (OBL) scope will focus on the external infrastructure and utilities required to support the Secunda Gas to Power project (integration into the Secunda facility). The electrical scope will cover the reconfiguration of the electrical network. The installation of transmission lines, along with the routing of high-voltage cables through existing servitudes, will also be considered.

In addition to the electrical work, the OBL scope will involve the installation and routing of various pipelines. These will include pipelines for LNG, Methane Rich Gas (MRG) and any required utilities such as cooling water, raw water, polished water, firewater, potable water, instrument air, nitrogen and any effluent depending on the IBL requirements. Raw water treatment will also be included to achieve the necessary water quality specifications.

Alternatives were considered such as OCGT (blue), CHP (blue & yellow) and CCGT (blue, yellow and red), it has been established that CCGT is the option to be taken forward (**Figure 2-2**).

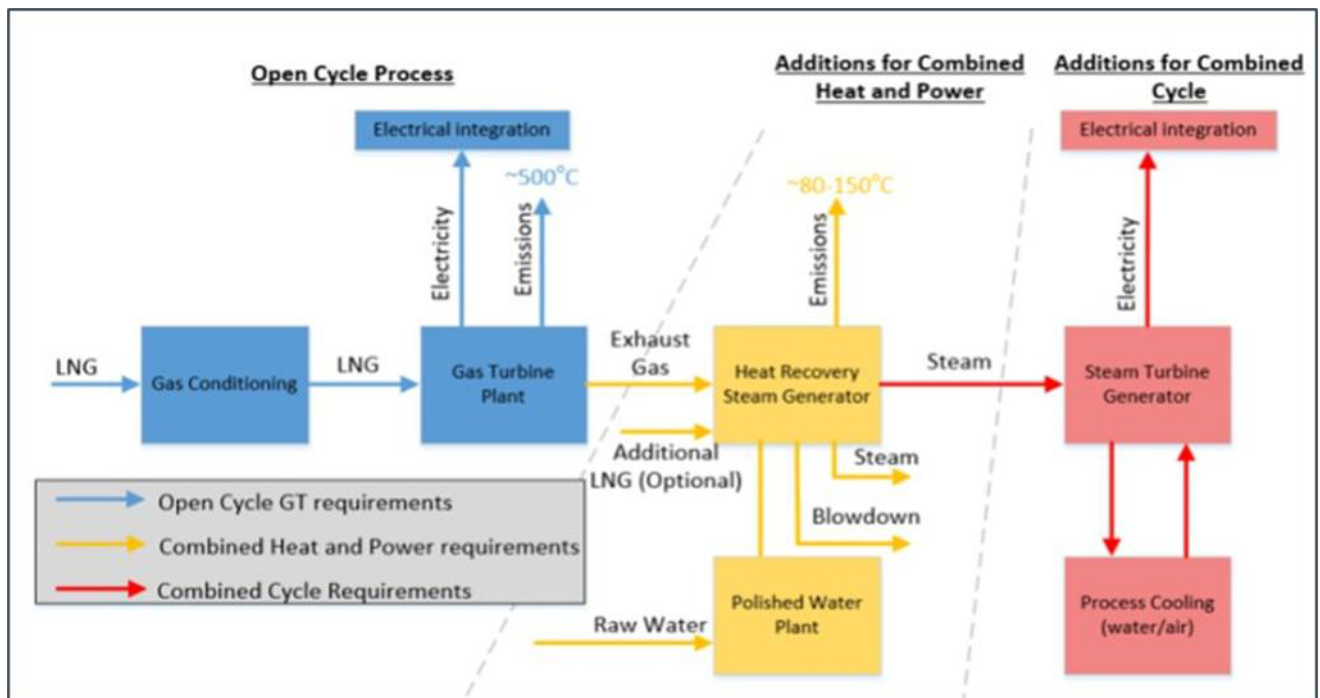


Figure 2-2 - Overview of the Gas to Power Facility (Sasol, 2026)

2.3 PROJECT INFRASTRUCTURE

The proposed Secunda Gas to Power Facility will be developed with a capacity of up to 800 megawatts (MW). The key components are outlined in **Table 2-2** below -

Table 2-2 – Proposed Project Infrastructure

Technical details of the proposed Secunda Gas to Power Facility

Farm Portions	45/290 (ERF 8488) 8/290 (ERF 8342) FABRIEK 601 IS (ERF 8341)	
Central coordinates of the site and activity location	Gas to Power Facility	Central point on the site: -26.563088, 29.161332
	MRG Pipeline	East factory: - Start point: -26.553602, 29.173919 - Central point: -26.558468, 29.171505 West factory: - Start point: -26.551528, 29.155120 - Central point: -26.558140, 29.157479
	LNG Pipeline	Route 1 (through primary area): - Start point: -26.548064, 29.189061 - Central point: -26.555818, 29.171938 Route 2 (around the factory): - Start point: -26.548064, 29.189061 - Central point: -26.568217, 29.178204
Total Site Extent	Approximately 50 000m ²	
Design Specifications		
Capacity of power plant (including all equipment and auxiliaries to enable operation)	778.6 – 800.6 MW	
Length of pipeline (LNG)	Route 1, through primary area: 5.38 km Route 2, around the south-eastern side of the factory: 5.87 km	
Pipeline specifications (LNG)	16" pipeline, C3 line class (carbon steel)	
Length of pipeline (MRG)	Total length of piping is 5.54 km (including piping from east and west factories).	
Pipeline specifications (MRG)	14" pipeline, C line class (carbon steel)	
Raw water treatment	The raw water infrastructure requirements are as follows: Two stormwater attenuation facilities (evaporation ponds/dams) with surface areas of approx. 0.5 ha and 0.3 ha, each to a depth of 1.0 m, providing a combined storage capacity of 9,000 m ³ ; Main raw water storage tanks with a total storage capacity of up to 10,000 m ³ ; Raw water storage tanks for the water treatment system used for demi-water production, with a total storage capacity of 6,000 m ³ , supplied from the main raw water tanks;	

	Demineralised water storage tanks with a total storage capacity of up to 3,000 m ³ , supplied from the raw water tanks of the water treatment system; Water storage tanks for the fire-fighting system, with a total storage capacity of up to 1,250 m ³ , supplied from the raw water tanks.		
Emissions	Number of Stacks: 1 stack per HRSG 1 stack for HRSG Bypass 2 stacks for each GT Stack Dimensions: 7 to 9 m stack diameter and 60 to 65 m stack height. Exit Velocity: 15 to 20 m/s flue gas velocity at stack exit and will be verified with project specific details		
Construction schedule	Phase	Duration	Key Outcome
	Development & Financial Close	12–24 months	Permits + funding secured
	Construction	24–36 months	Plant built and commissioned
	Operation	25–30 years	Power generation lifecycle
Traffic	Construction: Light vehicles 50 – 100p/d; Heavy trucks 50 – 100p/d Operation: Staff cars 40–60p/d		
Powerlines	117m 132 kV Line		
Access Roads	PDP Kruger Avenue Energy Road, Synfuels East Road, Road 21, Road 2D (inside Secunda Operations)		
Associated Infrastructure	Utilities and effluent streams piping between SO and power plant		

2.4 GENERAL CONSTRUCTION ACTIVITIES

The construction process will follow industry standard methods and techniques. Key activities associated with the construction phase are described in **Table 2-3** below –

Table 2-3 – Construction Activities

Activity	Description
Site preparation and establishment	Site establishment will include clearing of the footprint of the GtP Facility, for laydown area and access routes. The temporary laydown area will be constructed, including establishment of the construction camp (temporary offices, storage containers, concrete batching plant etc). Site establishment will also entail the installation and/or connection of services (sanitation, electricity, etc).

Transport of components and equipment to site	Bulk materials (aggregate, steel etc.), infrastructure components lifting and construction equipment (excavators, trucks, compaction equipment etc.) will be sourced and transported to site via suitable National and provincial routes and designated access roads.
Excavation and earthworks	Subject to the determination of founding specifications, earthworks will be required. This is likely to entail:
Establishment of ancillary infrastructure	Ancillary infrastructure will include construction site office, temporary laydown area and workshop area for contractor's equipment.
Rehabilitation	Once all construction is completed on site and all equipment and machinery has been removed from the site, the site will be rehabilitated.

2.5 ALTERNATIVES

The EIA Regulations of 2014 (as amended) require that the S&EIA process must identify and describe alternatives to the proposed activity that were considered, or motivation for not considering alternatives. Different types or categories of alternatives could be considered including different locations, technology types, and project layouts. At the scoping level the evaluation of alternatives is provided at a high level in the absence of detailed environmental comparators for each alternative; due to the two-staged nature of the S& EIA process it is more suitable to identify and describe the potential alternatives on a high-level basis within scoping, and to perform a more detailed analysis of alternatives (with environmental comparators) in the EIA phase of the project. As such, the S&EIA will holistically assess the impacts and risks of each alternative in a comparative way, as suggested by Appendix 2 of the EIA Regulations of 2014 (as amended).

2.5.1 SITE ALTERNATIVES

A brownfield site adjacent to the existing Gas Turbines within the primary area of Sasol's Secunda Operations has been identified as the preferred location for the new gas-to-power facility. This site is considered the most suitable option because it leverages an already industrialised footprint with established access to supporting infrastructure, services, and power-related interfaces, thereby reducing the extent of new civil works, utility connections, and land disturbance that would typically be required for a greenfield development. Locating the new facilities adjacent to the existing GT infrastructure also supports more efficient integration with the current operational environment, simplifies constructability and interface management, and can shorten development timelines by making use of land that is already compatible with power generation activities. The use of this brownfield site is advantageous because it limits encroachment on undeveloped land, minimises incremental ecological disturbance, and aligns with the general preference to intensify development within existing industrial areas where practical. A greenfield site has not been considered in this study.

The selection of the Secunda Gas to Power Facility site is the outcome of a feasibility assessment by the proponent, which inter alia served to identify site options that would be optimal for energy production and grid interconnection. Multiple locations were assessed, including sites within Sasol Secunda Operations (brownfield site), a greenfield site in the secondary area of Secunda Operations, and coastal locations outside Secunda (e.g., Richards Bay). The evaluation concluded

that the brownfield site within Secunda Operations area offered the most benefits. The Secunda Gas to Power Facility site was selected because it is strategically located due to the following factors:

- Proximity to the electrical infrastructure to enable evacuation of generated power to the grid, along with access to the utilities that can be supplied by Sasol Secunda Operations (SO) to support the power plant, and proximity to the existing gas supply line to SO, thereby maximising the use of existing infrastructure.
- Land Availability and Landownership – adequate land is available within Sasol Secunda Operations (SO) to accommodate the power plant footprint.
- Strategic Approach – South Africa's gas demand is predominantly inland (~70%) and ~30% coastal. Integrating this demand with a Secunda (inland) based GtP project can underpin import infrastructure and supply agreements of LNG, while absence of an anchor demand risks stranding a significant portion of inland demand given the anticipated natural gas shortfall.
- Road and labour pool accessibility – existing access roads are available to support project construction and operations.
- Topography – refer to the summary section above
- Competition – the selected brownfield site within SO provides a competitive advantage over a greenfield location in Secunda or other areas due to its proximity to existing electrical and utilities infrastructure, thereby reducing integration scope.

The site is considered suitable for these reasons and the investigation of an alternative site is not currently proposed within this Scoping Report.

2.5.2 ALTERNATIVE TECHNOLOGY

Gas-to-Power (GtP) will play a critical role in South Africa's energy transition by bridging the gap between coal-fired generation and non-dispatchable renewable energy. This need is reflected in the Integrated Resource Plan (IRP) and reinforced by the Department of Electricity and Energy's (DEE) GASIPPPP RFP, which targets the procurement of up to 3,000 MW of new GtP capacity.

Among available technologies, GtP remains one of the most competitive sources of dispatchable electricity, offering proven reliability compared to energy storage solutions such as batteries and thermal storage. While alternative technologies are rapidly improving in cost and performance, GtP continues to provide an effective and flexible solution for meeting dispatchable power requirements in a grid with increasing renewable energy penetration.

The following technologies were considered in this project:

- Open Cycle Gas Turbine (OCGT) – alternatively referred to as a peak load facility,
- Combined Heat and Power (CHP), and a
- Combined Cycle Gas Turbine (CCGT) – alternatively referred to as a base load facility

The project will not aim to generate steam for utilisation within the existing facility, the steam that is produced as part of base load facility option will be used for electricity production via a steam turbine. Thus, the Combined Heat and Power (CHP) option was not pursued further. Given its higher efficiency and subsequent lower cost per unit of electricity generated, only the CCGT technology will be further developed.

For the proposed 780 MW power plant at the Sasol Secunda site, gas is the preferred fuel option because it provides the most practical combination of large-scale dispatchable generation, site integration, operational flexibility, and comparatively lower environmental impact relative to the most

credible alternatives. By contrast, wind and solar PV are inherently variable and non-dispatchable, and would therefore be unable to provide equivalent firm capacity without substantial overbuild and large-scale energy storage, which would materially increase land requirements, system complexity, and cost. Diesel-fired generation, while dispatchable, is not considered suitable for sustained operation at this scale because of its significantly higher fuel cost, higher emissions profile, and the logistics burden associated with continuous bulk fuel supply. Relative to liquid fuels and coal-based alternatives, gas-fired generation also offers lower specific CO₂ emissions per unit of electricity generated, with materially lower particulate, sulphur oxide, and nitrogen oxide emissions when modern combustion systems are applied, which is particularly relevant in the Secunda area given the existing regional air quality and decarbonisation pressures.

Gas is also strongly aligned with the site's existing industrial energy infrastructure and Sasol's demonstrated gas-to-power capability, including the presence of existing gas turbine operations, established power-generation interfaces, and the strategic role of Secunda in the emerging gas market and future LNG transition. In addition, gas-fired generation can be deployed in high-efficiency combined-cycle form at this plant size, making it substantially more efficient and more suitable for sustained mid-merit to baseload duty than simple-cycle or reciprocating engine alternatives at equivalent capacity.

For a plant of around 780 MW, a combined cycle gas turbine (CCGT) configuration is technically superior because it maximises fuel utilisation at large scale by recovering the high-grade exhaust heat from the gas turbine in a heat recovery steam generator to drive a steam turbine, achieving net efficiencies typically in the ~55-62% range, compared with ~35-40% for an open cycle gas turbine (OCGT) where exhaust heat is wasted, and lower overall plant efficiency for gas engine installations when scaled to this size. At ~780 MW, an OCGT would require multiple large simple-cycle units with significantly higher specific fuel consumption, higher CO₂ emissions per MWh, and poorer economics for baseload or mid-merit operation, as OCGTs are optimised for peaking and fast start rather than sustained high load factors. Gas engines, while efficient and flexible at smaller capacities, become impractical and less competitive at hundreds of megawatts due to the very large number of units required.

F-class machines (GE 9F.06 and SGT5-4000F) were evaluated in a 2x2x1 configuration. Under the site-specific power plant conditions, the SGT5-4000F delivers a higher net power output than the GE 9F.06, while both models achieve the same efficiency. For the purposes of this study, the 2x2x1 SGT5-4000F configuration will be used. However, a detailed technology selection will have to be conducted during the feasibility stage.

2.5.3 LAYOUT ALTERNATIVES

Motivation for proposed layout alternatives

2.5.3.1 Pipeline Routing

Two alternative pipeline routing options have been identified for the LNG pipeline from the Pressure Protection Station (PPS) to the brownfield plot where the Secunda Gas to Power plant will be located. A route passing through the primary area (LNG alt 1) and an alternative route passing through the secondary area (LNG alt 2) along the south-eastern side of the factory. The final LNG pipeline routing will be selected as the project design develops and following consideration of



environmental sensitivities and technical inputs obtained during the EIA phase. This routing is illustrated in **Figure 2-3**.

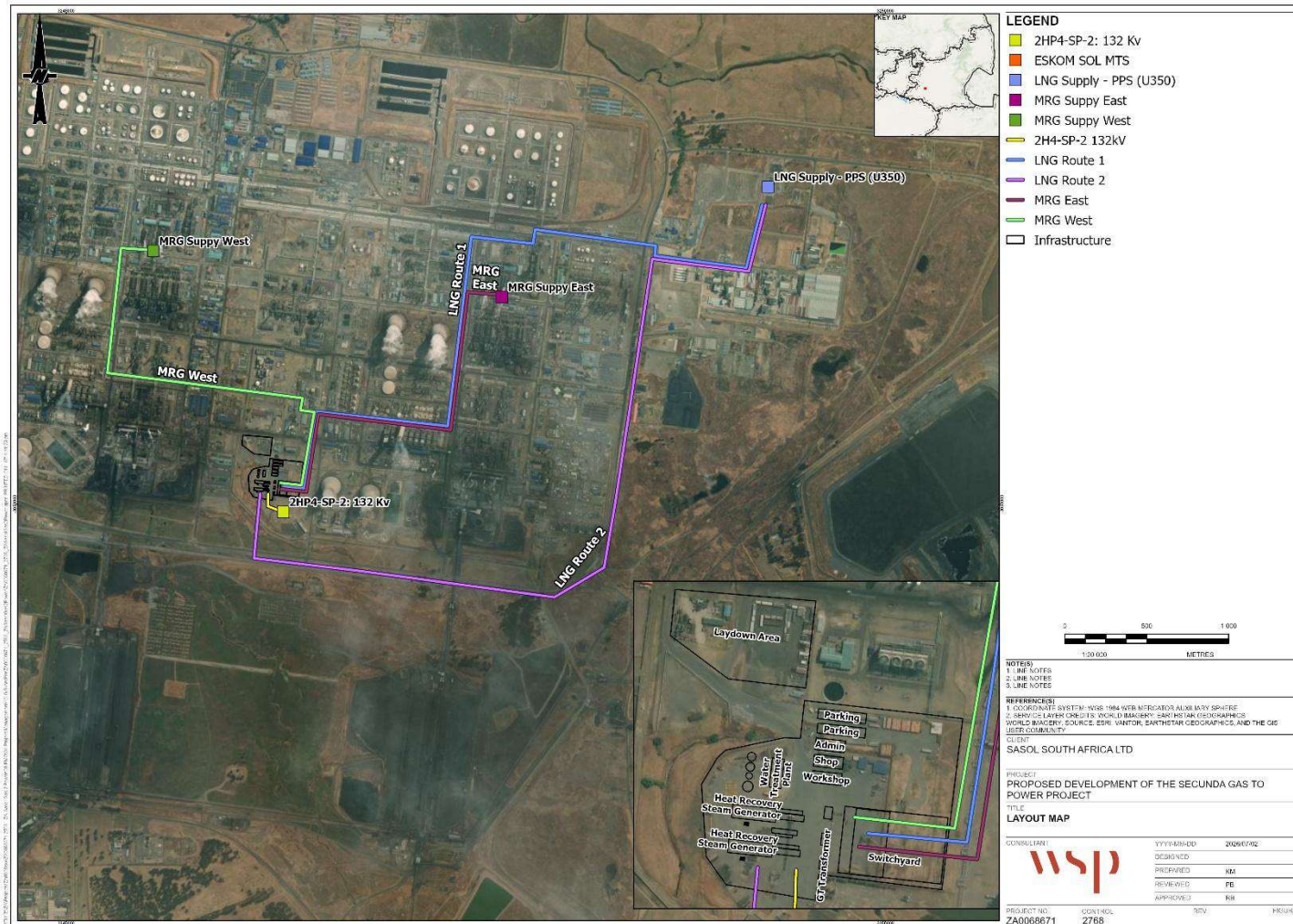


Figure 2-3 - Proposed P2G layout

Furthermore, the preliminary MRG pipeline routings for both the eastern and western options, identified during the screening activities, extend from Gas Circuit to the brownfield site through the primary area. These MRG pipeline routings remain preliminary and may be refined should alternative alignments be identified as the project progresses and the specialists undertake their site sensitivity verification processes. Both the eastern and western MRG pipeline routings are still subject to confirmation during the EIA phase.

2.5.3.2 Water Supply

Two water supply cases are being considered for the proposed CCGT system. In the first case, raw water would be treated in a water treatment plant to produce polished water for the CCGT system, using a combination of ultrafiltration, reverse osmosis and mixed-bed ion exchange technologies, with air cooling assumed for the system's cooling requirements. Under this case, the estimated raw water make-up requirement would be approximately 20–40 m³/h, supplied from the existing Bosjesspruit Dam (through existing pipelines) that provides raw water to the Secunda facility with a demand expected to remain within Sasol's permitted raw water abstraction limit. Buffer storage for raw water feed, effluent and polished water would also be required as part of the water treatment plant, and certain dosing chemicals for the water treatment facility may need to be stored on site.

In the second case, raw water would be required as feed to the cooling water system to generate the necessary cooling water for the CCGT process using a mechanical draft cooling tower system. In this instance, the estimated make-up requirement would be approximately 780 m³/h, also supplied from the existing Bosjesspruit Dam (through existing pipelines). This abstraction would remain within Sasol's permitted abstraction limit. The intention would be to use blowdown from the cooling water system as feed to the water treatment plant to produce the polished water required for the CCGT system. As with the first case, buffer storage for feed water, effluent and polished water would be required, and dosing chemicals for both the cooling tower system and the water treatment facility may need to be stored on site.

No further licencing would be required for these two potential effluent streams as their capacities and throughputs would not exceed their current licencing limits.

3 CLIMATE CHANGE IMPACT ASSESSMENT METHODOLOGY

This section outlines the methodology to be applied in the Climate Change Impact Assessment (CCIA) to evaluate both the potential impacts of climate change on the Project and the Project's contribution to GHG emissions. The methodology is prepared in line with internationally recognised frameworks, including the International Finance Corporation's (IFC) Performance Standard 3 (PS3). The approach integrates climate scenario analysis, physical risk assessment and GHG emissions quantification to ensure the evaluation of climate-related vulnerabilities and mitigation opportunities. Notably, transitional risks will not be assessed for this Project as it is out of scope.

3.1 IMPACT OF CLIMATE CHANGE ON THE PROJECT

Assessing the potential impacts of climate change on the Project requires consideration of both historical climate conditions and future climate projections. This process begins with the establishment of a climate baseline through the analysis of historical climate data, including long-term trends in temperature, precipitation variability, and the frequency and intensity of extreme weather events relevant to the Project area. Historical climate information will be sourced from reputable international datasets, including the World Bank Climate Change Knowledge Portal (WBCCKP). Building on this baseline, the assessment examines how observed and projected climate conditions may affect the Project and comprises the following key tasks:

- Description of the current climate baseline of the region.
- Desktop review of potential physical climate change impacts to which key Project components are most vulnerable.
- High-level review of potential adaptation measures, taking into account existing adaptation strategies currently in place.

This scope is designed to be qualitative in nature to identify key risk areas for further studies as part of the detailed design (for future, planned activities).

3.2 IMPACT OF THE PROJECT ON THE CLIMATE

In addition to evaluating how climate change may impact the Project, this methodology also assesses how the Project contributes to GHG emissions. This involves the development of an emissions inventory that estimates the Project's Scope 1 and 2 emissions, following the guidelines set by the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (GHGP). Scope 1 emissions include direct emissions from fuel combustion for construction and operational activities, while Scope 2 emissions account for indirect emissions associated with purchased electricity consumed by the company. This component evaluates the Project's contribution to GHG emissions and comprises the following tasks:

- Desktop review of the relevant legislation for the Project.
- Review of the organisational and operational boundaries associated with the Project.
- Compilation of a GHG inventory based on data provided by the Project team, supplemented where necessary with publicly available literature-based data. The inventory will cover Scope 1 and Scope 2 emissions only (Scope 3 excluded); and



- Evaluation of annual GHG emissions for the Project as carbon dioxide equivalent (CO₂e) and comparison with the South Africa's National Determined Contribution (NDC) targets.

4 APPLICABLE POLICIES, LEGISLATION, GUIDELINES AND STANDARDS

This section provides the context within which GHG emissions and climate change considerations are assessed for the Project. It outlines the relevant policies, legislation, guidelines and standards that inform the broader regulatory and governance landscape related to climate adaptation measures, emissions management and environmental sustainability. While these frameworks establish national and international approaches to climate risk, adaptation and mitigation, they do not prescribe specific alignment requirements for this Project. Instead, they serve as a reference point for understanding the broader climate governance environment within which the Project is being developed. This section helps to contextualise key regulatory drivers, best practices and evolving expectations related to climate change and emissions management. **Table 4-1** summarises the key policies and their alignment with the Project.

Table 4-1 - Applicable Policies, Legislation, Guidelines and Standards

Policy, legislation, guideline or standard	Relevance to the Project
International Policy	
The Intergovernmental Panel on Climate Change (IPCC)	<p>The IPCC is a panel established in 1988 by the World Meteorological Organisation (WMO) and the United Nations Environment Programme (UNEP) to provide independent scientific advice on climate change. The First Assessment Report (AR1) of the IPCC served as the basis for negotiating the United Nations Framework Convention on Climate Change (UNFCCC). The main role of the policy is to provide policymakers with regular assessments of the scientific basis of climate change, its impacts and possible adaptation and mitigation strategies. The Project should align with the IPCC assessments to mitigate climate risks and ensure compliance with environmental regulations. Additionally, the IPCC data aids in risk assessment and long-term planning, informing decisions on infrastructure design and Project sustainability. Therefore, the Project's integration of IPCC policies support climate change adaptability and aligns with global climate goals.</p> <p>The most recent IPCC AR6, released in March 2023, will be used for this assessment.</p>
The Paris Agreement (2015)	<p>The Paris Agreement, which was adopted in December 2015, is an international accord within the UNFCCC. Its main objective is to limit global warming to well below 2°C above pre-industrial levels, with efforts to limit it to 1.5°C. To achieve this, the agreement aims to enhance the global response to climate change by strengthening countries' abilities to deal with the impacts of climate change and reducing GHG emissions. does not single out specific industries, rather it sets a framework for parties to develop and submit their own Nationally Determined Contributions (NDCs). These NDCs are country-specific climate action plans that outline the measures and targets each country will undertake to contribute to the global effort in combating climate change. The Paris Agreement also emphasises transparency and accountability and requires parties to regularly report on their GHG emissions and progress towards their NDCs.</p>

	The current assessment supports the objective of the Paris Agreement by identifying material emissions and subsequent mitigation measures.
Sustainable Development Goals (SDGs)	<p>These are urgent actions for all countries, developed and developing. They recognise that ending poverty and other deprivations must go together with strategies that improve health and education, reduce inequality and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.</p> <p>The core focus of the CCIA directly advances SDG 13 (Climate Action) by identifying climate risks, recommending adaptation strategies and assessing mitigation potential through GHG emissions analysis. The Project also supports SDG 15 (Life on Land) through planned rehabilitation to maintain biodiversity and ecosystems Embedding the SDGs into the Project planning and execution not only enhances its long-term sustainability but also aligns it with national development priorities and global climate commitments.</p>
Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (GHGP)	The GHGP, a joint initiative of World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD), arose out of the need to assist countries and companies account for, report and mitigate emissions. Moreover, this international best practice standard is based on a report that identified an action agenda to address climate change through a standardised quantification methodology and quantification of GHG emissions. The GHGP provides accounting and reporting standards, sector guidance, calculation tools and trainings for businesses as well as local and national governments. It has created a comprehensive, global, standardised framework for measuring and managing emissions from private and public sector operations, value chains, products, cities and policies to enable GHG reductions across the board. The GHGP will be used in quantifying the GHG emissions for the proposed Project.
South Africa's National Climate Change Response Policy White Paper (NCCRP) (2011)	<p>The NCCRP is a comprehensive strategy to address both mitigation and adaptations in the short, medium and long term (up to 2050). Strategies are specified for the following areas:</p> <ul style="list-style-type: none"> ■ Carbon Pricing. ■ Water Agriculture and commercial forestry. ■ Health. ■ Biodiversity and ecosystems. ■ Human settlements. ■ Disaster risk reduction and management. <p>The policy has two main objectives: first, to manage inevitable climate change impacts through interventions that build and sustain social, economic and environmental adaptation measures and emergency response capacity. Secondly, to make a fair contribution to the global effort to stabilise GHG concentrations in the atmosphere.</p> <p>The climate change study aligns with the NCCRP white paper as the proposed mitigation measures for the GHG emission sources will be outlined to indicate how the Project can minimise its impact or contribution to climate change.</p>
National Climate Change Adaptation Strategy (NCCAS) (2020)	The NCCAS provides a common vision of climate change adaptation for South Africa and outlines priority areas for achieving this vision. It draws on South Africa's NCCRP (DEA 2011), the National Development Plan (NDP; National Planning Commission (NPC), 2011), the adaptation commitments

	<p>included in its NDC, sector adaptation plans, provincial adaptation plans and local government adaptation plans.</p> <p>The main objective of the strategy is to provide guidance across all levels of government, sectors and stakeholders affected by climate variability and change. It should also serve as the country's National Adaptation Plan (NAP) and fulfils the commitment to its international obligations under the Paris Agreement. The NCCAS is relevant to the Sasol G2P Project in highlighting the importance of integrating climate resilience into infrastructure planning and design. Specifically, the Project's climate risk assessment considers exposure to extreme weather events (e.g. storms, flooding, and temperature extremes) and informs the incorporation of appropriate adaptation measures to enhance operational resilience and safeguard infrastructure over its design life.</p>
South Africa's Nationally Determined Contribution (NDC) (2021)	<p>South Africa submitted its updated NDC in September 2021, in line with its obligation under Article 4.9 of the Paris Agreement, which requires countries to communicate or update their NDCs every five years. The updated NDC reflects enhanced ambition, considering recent developments, policy shifts and the need for a just transition. The revised targets cover two implementation periods: 2021–2025 and 2026–2030.</p> <ul style="list-style-type: none"> ■ For 2025, the emissions target range is 398 to 510 MtCO₂e. ■ For 2030, the emissions target range is 350 to 420 MtCO₂e. <p>These figures represent a significant improvement over South Africa's 2015 submission and the updated NDC is considered more aligned with limiting global temperature rise to below 2°C, though still not fully aligned with 1.5°C according to the Climate Action Tracker.</p> <p>The updated NDC supports national policies aimed at enabling low-carbon infrastructure investment, accessing international climate finance and ensuring a just transition for vulnerable sectors and communities. The CCIA is undertaken within this national context, with a view to assessing the Project's contribution to GHG emissions and alignment with South Africa's 2030 mitigation targets.</p>
South Africa's National Environmental Management: Air Quality Act (NEM:AQA - 2004)	<p>The National Environmental Management: Air Quality Act (NEM:AQA), 39 of 2004, as amended by Government Notice 710 of 2017 (Government Gazette 40996), establishes the legislative framework for the management and protection of air quality in South Africa, with the primary objective of safeguarding the environment and human health. The Act requires that Atmospheric Emission Licences (AELs), including provisional licences, specify monitoring, measurement and reporting requirements for emissions, including GHGs where applicable. In the context of the Sasol G2P Project, the climate change assessment will align with these requirements by applying an appropriate and transparent methodology for the quantification of Scope 1 and Scope 2 GHG emissions and documenting the approach to GHG estimation and reporting within the CCIA. This supports compliance with potential AEL obligations.</p> <p>In parallel, a dedicated Air Quality Impact Assessment (AQIA) is being undertaken for the Project, which will evaluate criteria pollutant emissions, dispersion characteristics, potential exceedances of ambient air quality standards, and overall compliance with applicable national regulatory thresholds.</p>
South African National Greenhouse Gas Emission	<p>The Reporting Regulations adheres to the NEM: AQA and its purpose is to introduce a single national reporting system for the transparent reporting of GHG emissions, which will be used to maintain a National GHG Inventory,</p>

<p>Reporting Regulations (NGERs; 2016)</p>	<p>allow South Africa to meet its UNFCCC reporting obligations and to inform the formulation and implementation of legislation and policy.</p> <p>The emission sources and data providers who are covered by the Regulations are set out in Annexure 1 and Regulation 4. The Regulations also set out the reporting requirements, calculation methodology, verification procedure (to be carried out by the National Inventory Unit) and penalties (which include fines and imprisonment).</p> <p>The NGERs will be considered in calculating the GHG emissions associated with the proposed Project.</p>
<p>Declaration of Priority and Pollution Prevention Plans (2018)</p>	<p>Under Section 29 of the NEM: AQA, the following GHGs have been declared as priority pollutants.</p> <ul style="list-style-type: none"> ■ Carbon Dioxide (CO₂). ■ Methane (CH₄). ■ Nitrous oxide (N₂O). ■ Hydrofluorocarbons (HFCs). ■ Perfluorocarbons (PFCs). ■ Sulphur hexafluoride (SF₆). <p>Further, persons falling within the list of production processes, specified in Annexure A, details that GHG emissions above 0.1 Mt annually are required to prepare and submit pollution prevention plans for approval in line with NEM: AQA, Government Notice 712 of 2017 (Government gazette 40996) to the Minister. Secondly, any person conducting a production process set out in Annexure A as a primary activity is required to submit a pollution prevention plan.</p> <p>The first pollution prevention plan must cover a period from the date of promulgation of these Regulations up to 31 December 2020 and the subsequent pollution prevention plans must cover periods of five calendar years each. For the proposed Project, this regulation implies that any operation involving significant emissions of declared priority pollutants may be subject to pollution prevention planning and reporting obligations, particularly during the operational phase if thresholds are exceeded.</p>
<p>South African Carbon Tax Act (2019)</p>	<p>The Carbon Tax Act, No. 15 of 2019, was signed into law on 22 May 2019 and came into effect on 1 June 2019, as part of South Africa's strategy to reduce GHG emissions in line with its commitments under the Paris Agreement. The Act introduces a price on carbon emissions to incentivise cleaner energy production and efficiency, while supporting the transition to a low-carbon economy.</p> <p>The carbon tax applies to entities that conduct activities resulting in direct (Scope 1) GHG emissions, as listed in Schedule 2 of the Act. These sectors include electricity production, petroleum refining, iron and steel, cement, mining and waste. A liable entity is considered a taxpayer if it (a) carries out a listed activity and (b) exceeds the prescribed threshold for that activity, as set out in the NGERs.</p> <p>The initial carbon tax rate was set at R120 per tonne of carbon dioxide equivalent (tCO₂e), with annual increases of Consumer Price Inflation (CPI) + 2% until 2022 and CPI thereafter. Entities may benefit from allowances of up to 95% in Phase 1 (2019–2022, extended to 31 December 2025), depending on factors such as trade exposure, performance, and offsetting activities. This means that the effective tax rate during Phase 1 is significantly lower than the headline rate. Phase 2 of the Carbon Tax, commencing from 2026, is expected to introduce a reduced allowance structure, higher effective tax rates, and closer alignment with South</p>

	<p>Africa's Nationally Determined Contribution (NDC) targets, placing greater financial responsibility on high-emitting entities.</p> <p>By accounting for GHG emissions, organisations can determine their emissions profile and assess whether the polluter pays principle applies, as high-emitting companies will increasingly be held accountable for their contributions to climate change. The Act is therefore relevant to the proposed Project, as future operational activities that generate direct emissions—such as fuel combustion or electricity consumption—may be subject to carbon tax liabilities, underscoring the importance of implementing energy-efficient systems and low-carbon design measures.</p>
Climate Change Act 22 of 2024	<p>The Climate Change Bill was signed into law on 18 July 2024 and published as Climate Change Act 22 on 23 July 2024. However, as per section 35 of the Act, it will only come into operation on a fixed date by the President proclamation in the Government Gazette. The Act provides a comprehensive South African legal framework for regulating the climate change impacts with the goal of achieving net-zero by 2050, with which the proposed Project should align.</p> <p>The Act aims to enable effective development of climate change responses through a long-term transition to a climate-resilient and low-carbon society and economy while considering sustainable development. The Act aims to contribute fairly to global GHG stabilisation and conforms to South African international climate change obligations and commitments to protect and preserve our planet for current and future generations. The Act provides two main mechanisms to reduce the country's GHG emissions:</p> <ul style="list-style-type: none"> ■ Section 24 (under Chapter 5) of the Act obliges the Minister to determine a national GHG emissions trajectory. This trajectory must be set in consultation with the Cabinet. The trajectory must specify a national GHG emission reduction objective. This objective must be informed by South Africa's current and Projected GHG emissions and be consistent with South Africa's international obligations. ■ Section 25 (under Chapter 5) of the Act deals with sectoral emissions targets. According to section 25, the Minister must identify GHG-emitting sectors and sub-sectors that should be subject to sectoral emissions targets. The Minister must then set sectoral emissions targets for each sector, in consultation with the relevant Minister responsible for that sector. These targets must align with the national GHG emissions trajectory. The Minister responsible for each sector must then implement each sectoral target through a range of planning instruments, policies, measures and programmes.
Draft Sectoral Emissions Targets (SETs) 2025 to 2030	<p>SETs "are greenhouse gas emissions reduction targets, either qualitative or quantitative, applicable to sectors or sub-sectors over a period" and implemented at the level of national government. SETs are allocated for various sectors such as agriculture, industry, energy, mining, human settlements, transport and environment. The Draft SET Report (April 2024) is out for public comment.</p> <p>The SETs have two purposes. First to identify the key policies that are linked to key GHG mitigation levers across the economy, that if implemented as stated, the country can achieve the 2025 and 2030 NDC targets submitted. Secondly, the SETs establish the foundation for progressing toward a low GHG emission economy. In the context of the Sasol G2P Project, the SETs are relevant in that they may introduce binding or indicative emissions reduction expectations for the energy sector. The Project's GHG assessment and proposed mitigation measures are</p>

	therefore aligned to support compliance with emerging sectoral targets over its operational lifecycle.
National Greenhouse Gas Inventory Report (NIR) (2025)	<p>The 9th NIR was published by the Department of Forestry, Fisheries and the Environment (DFFE) for the period 2000-2022 in 2025. The purpose of this report is to provide current emission levels and trends, forming part of the First Biennial Transparency Report to the UNFCCC. South Africa is required, by the UNFCCC, to report its national inventory, estimates of anthropogenic emissions of CO₂, CH₄ and N₂O. The development of an accurate, complete and updated GHG emissions inventory is crucial for effective climate change mitigation, adaptation, monitoring and evaluation responses. The first national GHG inventory was reported in 1998.</p> <p>The inventory indicates that the energy sector remains the dominant contributor to national emissions, accounting for the majority of total emissions in 2022. In the context of the Sasol G2P Project, the NIR provides an important national baseline against which project-related emissions can be contextualised. Emissions associated with both the construction and operational phases of the Project will contribute to national totals, particularly within the energy sector, reinforcing the importance of robust GHG accounting and the identification and implementation of appropriate mitigation measures.</p>
Draft National Guideline for the Consideration of Climate Change Implications in Applications for Atmospheric Emission Licences and Water Use Licences (2021)	<p>This draft guideline, issued by DFFE in 2021, aims to ensure that climate change considerations are systematically integrated into applications for Atmospheric Emission Licences (AELs) and Water Use Licences (WULs).</p> <p>It outlines the importance of assessing both how climate change may affect the proposed Project (e.g. exposure to flooding, drought, or sea level variability) and how the Project may contribute to climate change (e.g. through GHG emissions or increased water use) and the sustainability of the proposed Project in the context of climate change Projections. The guideline supports climate-resilient and low-carbon decision-making in licensing processes. This guideline is relevant as it requires the Project to assess and address climate risks and emissions as part of its licensing processes, particularly regarding water use and potential contributions to increased GHG emissions.</p>
Provincial Strategies and Regulations	
Mpumalanga Climate Change Adaptation Strategy (2016)	<p>The Mpumalanga Climate Change Adaptation Strategy highlights the province's elevated vulnerability to climate change impacts, including projected increases in temperatures and associated risks to key economic sectors. The Strategy identifies priority sectors based on vulnerability assessments and stakeholder engagement processes and outlines a suite of adaptation measures informed by a review of existing initiatives, international best practice, and consultation with provincial authorities and sector experts.</p> <p>In the context of the Sasol G2P Project, this Strategy provides a relevant provincial framework for understanding climate risks and informing adaptation planning. The adaptation measures and sectoral insights support the identification and evaluation of climate-related risks to the Project (e.g. extreme temperatures, water availability and severe weather events) and guide the development of appropriate resilience measures within the CCIA to enhance the Project's long-term operational robustness under future climate conditions.</p>

<p>Mpumalanga Climate Change Mitigation Strategy (MCCMS) and Implementation Plan (2022)</p>	<p>The Mpumalanga Climate Change Mitigation Strategy (MCCMS), developed under the leadership of the Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA), serves as a provincial framework aimed at mitigating the impacts of climate change through sustainable, integrated, and equitable solutions. The Strategy promotes a holistic approach that supports green economic growth, social equity, and environmental protection. Importantly, it recognises the province's reliance on the coal mining sector and its associated greenhouse gas (GHG) emissions. Given the sector's current contribution to Mpumalanga's economy, the MCCMS emphasises the need for proactive measures to support a just transition for communities as the province moves toward a lower-carbon future.</p> <p>The Strategy identifies the following key goals and objectives:</p> <ul style="list-style-type: none"> ■ Green the energy mix; ■ Improve energy efficiency; ■ Reduce emissions from mines and waste; ■ Increase carbon sequestration and reduce emissions from agriculture; and ■ Build capacity for a sustainable low carbon economy. <p>This Strategy is particularly relevant to the Project, as it supports the identification and evaluation of GHG emissions associated with the Project and guides the development of appropriate mitigation measures, including opportunities to improve energy efficiency and reduce emissions intensity. This alignment contributes to ensuring that the Project is consistent with provincial objectives for transitioning to a lower-carbon and more sustainable energy system over its operational lifecycle.</p>
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5 CLIMATE CHANGE IMPACTS ON THE PROJECT

CLIMATE CHANGE IMPACTS ON THE PROJECT

Understanding the potential impacts of climate change on the Project requires an assessment of both historical climate trends and future Projections. Climate baselines, calculated over a 30-year period, provide a reference for temperature, rainfall and seasonal patterns in the region. Climate normals, typically calculated over the most recent 30-year period, serve as a long-term benchmark that characterise a region's average climate conditions. Future climate Projections, estimate how these conditions may change due to GHG emissions, helping to identify potential risks and adaptation needs for the plant.

The purpose of this section in the baseline report is to establish a clear understanding of the current climate conditions for the region where the Project is located. The findings provide a foundation for assessing potential climate-related risks to the development and operation of the gas-to-power facility, supporting informed decision-making on risk mitigation and adaptation planning across the short, medium, and long term.

5.1 CLIMATE BASELINE

To establish a comprehensive understanding of historical and future climate conditions, a provincial climate baseline for temperature and precipitation in Mpumalanga was developed using the ERA5 climatology dataset produced by the European Centre for Medium-Range Weather Forecasts (ECMWF) and accessed via the World Bank Climate Change Knowledge Portal (WBCCKP). ERA5 is a gridded reanalysis product that integrates diverse observational data, including surface meteorological stations, radiosondes, aircraft observations, and satellite measurements within a consistent modelling framework. This approach provides spatially coherent baseline climate conditions at approximately 0.25° resolution, representing regional-scale patterns rather than conditions at a single weather station.

The baseline reflects modelled climatological conditions for the standard 30-year period (1991–2020) derived from ERA5. Climate data was extracted at a sub-national level (Mpumalanga Province) and presented as a regional reference for this assessment. While ERA5 accounts for geographic position and elevation, the baseline does not constitute a site-specific climate profile for the Sasol GtP site, nor is it a simple average of observed station records. Mpumalanga spans both Highveld and Lowveld climatic zones; however, the baseline values align with Highveld conditions typical of the eMalahleni/Witbank area rather than the warmer Lowveld regions.

It is important to note that observed climate trends are recorded at individual meteorological stations, whereas ERA5 represents a modelled climatology generated through assimilation of multiple datasets. The reanalysis does not disclose the number or distribution of stations informing each grid cell; outputs should therefore be interpreted as regional-scale representations rather than direct observations. Despite these limitations, the ERA5 climatological baseline provides a robust and widely accepted reference for assessing potential climate change trends and project-related climate risks at a strategic level.

The modelled climate baseline from 1991-2020 is shown in **Table 5-1** below –

Table 5-1 - Climate Baseline – ERA5 Climatology, Mpumalanga (1991-2020)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg Min Temperature (°C)	16.63	16.64	15.37	12.45	8.91	5.99	5.64	8.10	11.29	13.22	14.63	16.08
Avg Mean Temperature (°C)	21.09	21.04	19.89	17.36	14.58	11.98	11.76	14.36	17.58	18.83	19.76	20.78
Avg Max Temperature (°C)	26.58	26.69	25.79	23.82	22.24	20.15	19.88	22.30	25.13	25.42	25.74	26.41
Precipitation (mm)	140.53	111.00	92.79	46.74	16.97	8.23	8.63	14.28	27.70	78.15	116.7	147.82

Seasonal baseline climate conditions are as follows:

- Average monthly temperatures range from 19.76°C to 21.09°C in summer (November through to February) and from 11.76°C to 14.36°C in winter (June - August).
- Higher temperatures occur in the summer months (December – February) and lower temperatures occur in winter months (June-August).
- Rainfall patterns follow a similar trend where the largest rainfall occurred in peak summer months, between November and February.

5.2 TEMPERATURE

Figure 5-1 presents a modelled time series of annual mean surface air temperatures for the Mpumalanga province spanning the period 1950 to 2024. The time series provides valuable insight

into long-term regional temperature trends and supports an understanding of how climatic conditions in the province have evolved over time.

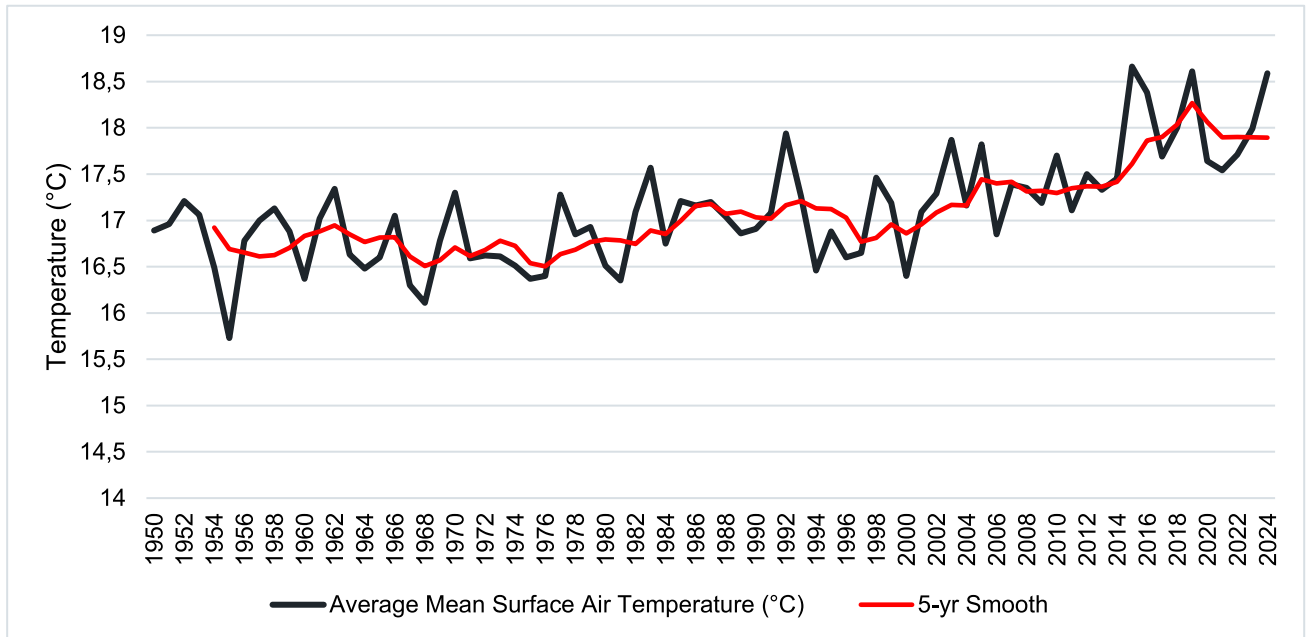


Figure 5-1 - Observed Annual Mean Temperature, Mpumalanga (1950-2024)

The baseline dataset shows a transition from relatively stable mid-20th-century temperature conditions to a clear and sustained warming trend in the late 20th and early 21st centuries. The inclusion of a 5-year smoothing curve highlights the underlying long-term signal, distinguishing it from year-to-year variability and providing clear evidence of progressive warming over time.

- Annual mean surface air temperatures between the early 1950s and late 1970s generally fluctuate within a narrow range of approximately 16.5°C to 17.2°C. While interannual variability is evident (most notably a brief cooler period in the mid-1950s) the smoothed trend indicates broadly stable conditions during this period.
- From the late 1970s onwards, the dataset reflects a gradual upward shift in mean temperatures. By the 1980s and early 1990s, annual averages are consistently higher than those recorded in earlier decades, with an observable increase in both peak temperatures and the smoothed trend. The early 1990s include several notably warm years relative to the mid-20th-century baseline.
- Warming becomes more pronounced from the early 2000s, with both the annual values and the 5-year smooth demonstrating a sustained upward trajectory. Temperatures during the 2010s and early 2020s are consistently higher than those observed in the mid to late 20th century, despite ongoing interannual fluctuations.

Overall, the data shows a clear long-term warming trend, with recent temperatures representing a marked shift from historical conditions, consistent with broader regional and global climate trends.

In addition, variables such as Max of Max Temp, Min of Min Temp, Number of Hot Days ($T > 35^{\circ}\text{C}$) and Number of Frost Days ($T < 0^{\circ}\text{C}$) were analysed for the 1991-2024 modelled baseline period. The results are displayed in **Figure 5-2** below-

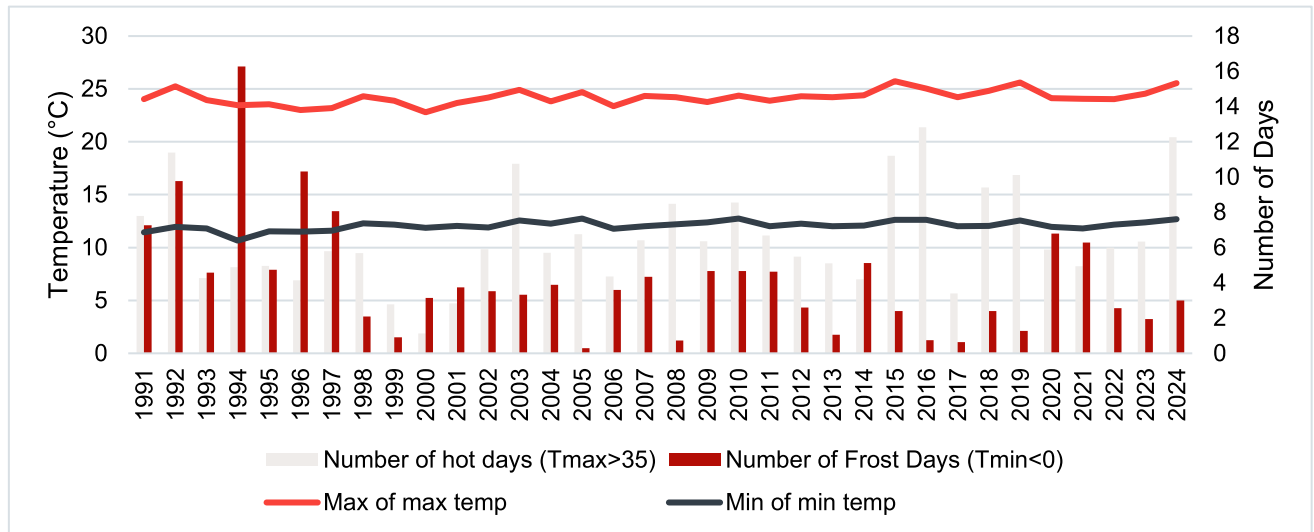


Figure 5-2 - Analysis of Climate Variables

The graph illustrates interannual variability and longer-term changes in temperature extremes between 1991 and 2024, combining annual maximum and minimum temperatures with the frequency of hot days ($T_{\text{max}} > 35^{\circ}\text{C}$) and frost days ($T_{\text{min}} < 0^{\circ}\text{C}$). Annual maximum temperatures are relatively stable during the 1990s and early 2000s but show a gradual upward shift from the mid-2000s onwards, with several of the highest values occurring during the 2010s and early 2020s.

Annual minimum temperatures exhibit smaller variability but indicate a subtle upward trend over the period of record. This increase in minimum temperatures is reflected in the corresponding decline in frost days in more recent years, despite occasional year-to-year fluctuations earlier in the dataset. Together, these observations suggest a reduction in the persistence and severity of cold extremes over time.

The frequency of hot days ($T_{\text{max}} > 35^{\circ}\text{C}$) shows pronounced interannual variability, with episodic peaks throughout the record and a clustering of higher values in recent decades. While not indicating a strictly linear trend, the combined occurrence of higher maximum temperatures, increased hot-days, and fewer frost days in the later part of the record points to a shift toward warmer conditions and an increased likelihood of heat extremes over the assessment period.

5.3 PRECIPITATION

Similar to the assessment of regional temperature patterns derived from the ERA5 reanalysis-based modelled baseline, the following analysis presents regional precipitation trends generated using the same approach, which integrates observational data with model outputs to provide a spatially consistent representation of baseline conditions across Mpumalanga.

Figure 5-3 presents a modelled time series of precipitation levels for the Mpumalanga province spanning the period 1950 to 2024. This dataset provides valuable insight into long-term rainfall patterns and supports an understanding of how regional precipitation dynamics have changed over time.

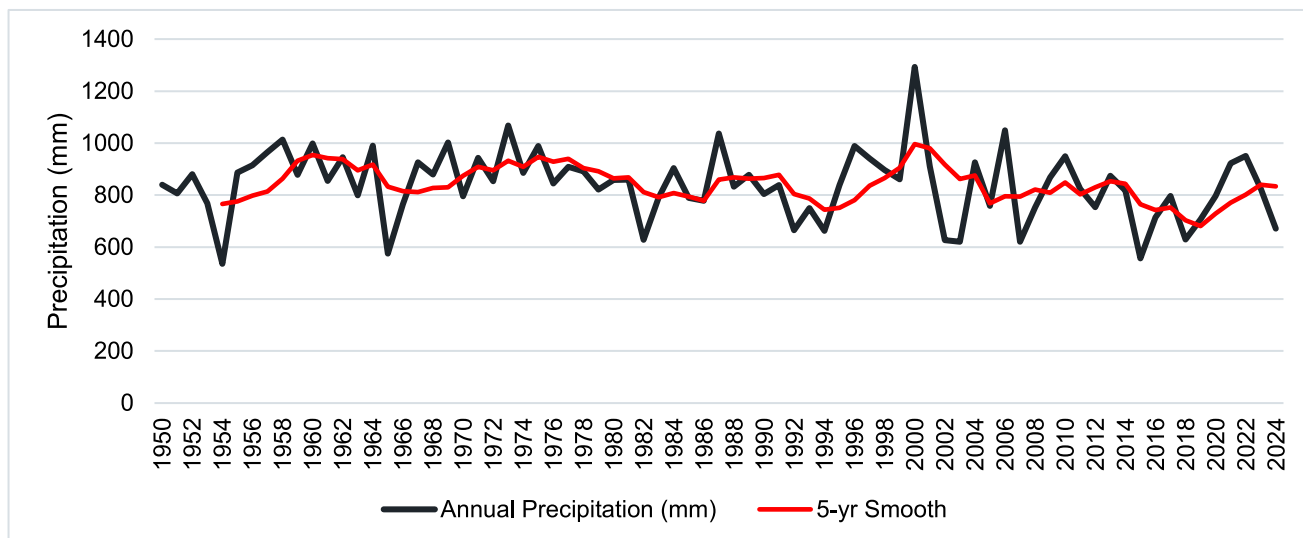


Figure 5-3 - Observed Precipitation Levels, Mpumalanga (1950-2024)

Baseline precipitation conditions for Mpumalanga over the period 1950 to 2024 indicate that annual rainfall has remained relatively stable over the long term, with no clear directional trend toward either wetter or drier conditions. The 5-year smoothed trend highlights modest multi-decadal variability, but overall rainfall levels oscillate around a broadly consistent long-term average.

Despite this long-term stability, the dataset exhibits pronounced interannual and decadal variability. Individual years show substantial departures from the mean, including notably drier years such as the mid-1950s and wetter periods, most prominent around 2000. These fluctuations reflect the naturally variable nature of precipitation in the region, with alternating sequences of above-average and below-average rainfall occurring throughout the record.

Overall, the observed variability underscores the inherent unpredictability of precipitation patterns in Mpumalanga. While long-term average rainfall has remained relatively stable, the magnitude of year-to-year and decadal fluctuations highlights the importance of accounting for short-term extremes, in addition to long-term trends when assessing water availability, flood and drought risk and planning climate-sensitive activities. The subsequent analysis of rainfall intensity and threshold exceedance, presented in **Figure 5-4**, provides further insight into changes in rainfall characteristics beyond annual totals.

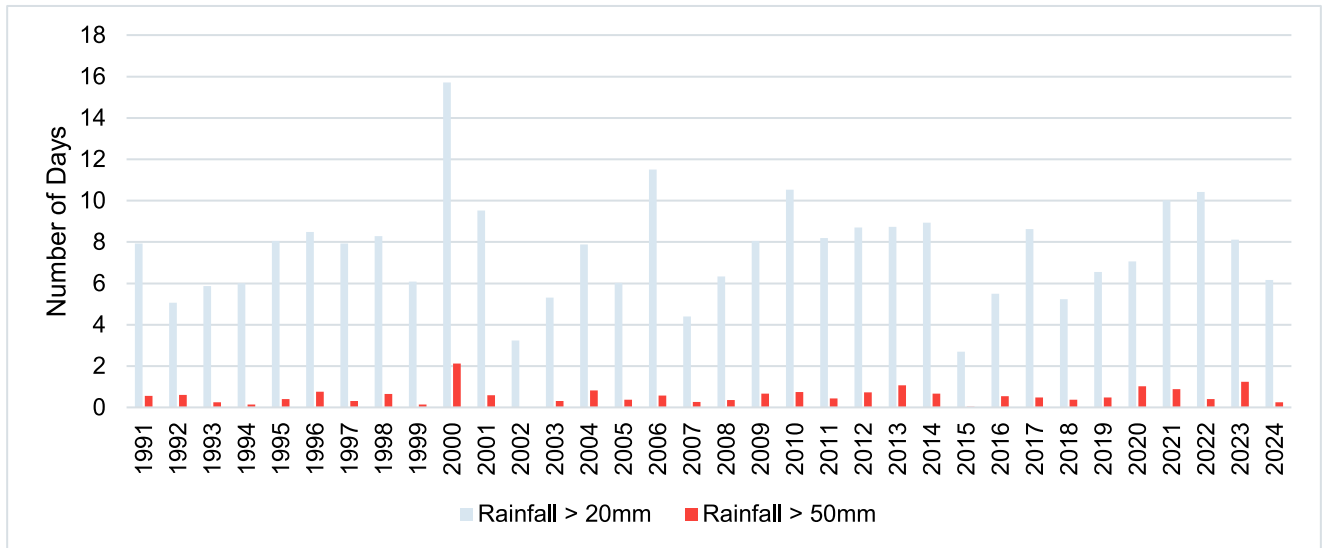


Figure 5-4 - Rainfall Days, Mpumalanga (1991-2024)

As per the Figure above, modelled baseline conditions indicate that most years experienced between 0 to 2 days of heavy rainfall exceeding 50mm. In addition, every year recorded at least some moderate rainfall events above 20mm, ranging from as few as 2.7 days in 2015 to a peak of approximately 15.7 days in the year 2000. This variation in the frequency of moderate and heavy rainfall events further illustrates the pronounced year-to-year variability in precipitation patterns across the region.

Building on the observed variability in the frequency of moderate and heavy rainfall days, **Figure 5-5** below illustrates annual extremes in short-duration and multi-day rainfall, providing further insight into the intensity of precipitation events over time.

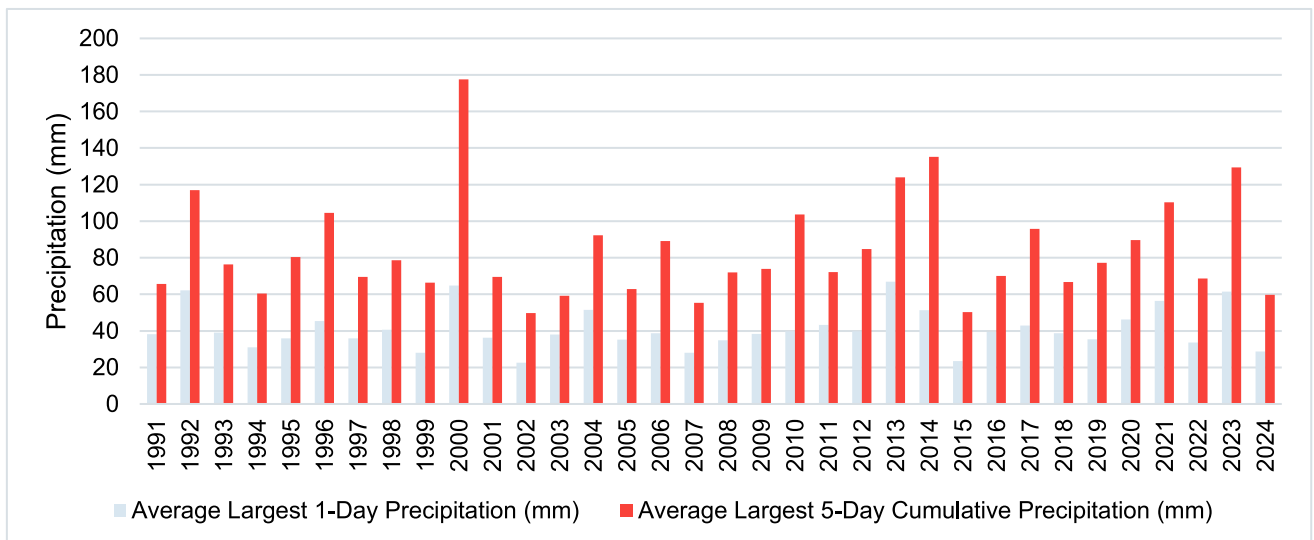


Figure 5-5 - Annual Extreme Rainfall Indicators (Largest 1-Day and 5-Day Events), 1991–2024

The graph shows substantial interannual variability in extreme rainfall intensity between 1991 and 2024, based on the annual largest 1-day precipitation and largest 5-day cumulative precipitation. While no clear long-term increasing or decreasing trend is evident, several isolated years record notably high multi-day rainfall totals, particularly around 2000 and during parts of the 2010s and early

2020s. The larger variability observed in the 5-day cumulative precipitation compared to the 1-day maxima suggests that periods of sustained rainfall, rather than short, isolated events account for the most pronounced extremes, underscoring the relevance of multi-day rainfall events for flood risk and water management planning.

5.4 SUMMARY

ERA5 climatological conditions for the Mpumalanga region demonstrate a clear long-term warming trend over the modelled baseline period, with a gradual rise in average temperatures. Warmer conditions are occurring with increasing frequency, reinforcing the need to incorporate climate change considerations into plant development planning.

In contrast, precipitation does not exhibit a consistent long-term increase or decrease. Instead, rainfall is characterised by pronounced year-to-year variability, with wetter periods often followed by notably drier years. The frequency of moderate and heavy rainfall events also varies substantially between years, underscoring the inherent variability of regional precipitation patterns. Similarly, the largest 1-day and 5-day rainfall totals fluctuate markedly over the period of record, with occasional extreme multi-day rainfall events occurring in certain years. This variability highlights the importance of accounting for a wide range of plausible climatic conditions in the Project's design and planning phases.

6 PROJECTED CLIMATE METHODOLOGY

Future climate conditions for the Project area are estimated using Global Climate Models (GCMs) from the Coupled Model Intercomparison Project Phase 6 (CMIP6), which represents the most advanced climate modelling framework currently available. These models simulate the Earth's climate system and its response to GHG emissions, offering improved accuracy and refinement compared to previous iterations such as CMIP5 (Raju & Kumar, 2020). CMIP6 incorporates updated physical and socioeconomic datasets to project potential changes in temperature, precipitation, and extreme weather events.

The CMIP6 framework uses Shared Socioeconomic Pathways (SSPs) to project future climate outcomes under different global development and emission trajectories. For this study, two key scenarios will be applied. SSP2-4.5 represents a “middle-of-the-road” pathway, assuming moderate global mitigation efforts and resulting in an estimated global temperature increase of approximately 2.1°C to 3.5°C by 2100. In contrast, SSP5-8.5 reflects a high-emissions future driven by continued fossil fuel dependence and limited mitigation, with projected warming of 3.5°C to 5.7°C by 2100 and severe climate impacts such as extreme heatwaves and flooding. These scenarios align with RCP4.5 and RCP8.5 respectively, linking socioeconomic trajectories with the level of radiative forcing expected from GHG concentrations.

These SSPs are selected to ensure that both plausible and extreme climate futures are assessed, with SSP2-4.5 providing a balanced, realistic pathway and SSP5-8.5 used to stress-test the Project against worst-case outcomes. Climate projections will be regionally downscaled to the Mpumalanga area to ensure local relevance for decision-making. CMIP6 represents an advancement over CMIP5, offering higher climate sensitivity and updated feedback mechanisms, enabling more robust projections of temperature, precipitation and extreme events. These outputs will inform the assessment of climate risks and the development of targeted adaptation and mitigation strategies for the Project area.

Table 6-1 presents the various SSP scenarios outlined in AR6 and where possible, the analogous pathway of the Special Report on Emissions Scenarios (SRES) from the IPCC AR4 are highlighted for each SSP.

Table 6-1 - Characterisation of Shared Socioeconomic Pathways in IPCC Sixth Assessment Report

SSP	RCP(s) analogous to SSP(s)	Radiative Forcing in 2100 ¹	Challenges	Global Temperature Change	Characterisation
SSP1	RCP 1.9 RCP 2.6	1.9 W/m ² 2.6 W/m ²	Sustainability –	1.0 °C – 2.4 °C	Sustainable development proceeds at a reasonably high

¹ Radiative forcing is measured in Watts per square meter (W/m²)

			Low for mitigation and adaptation		pace. Analogous to SRES B1 and A1T scenarios.
SSP2	RCP 4.5	4.5 W/m ²	Middle of the road – Medium for mitigation and adaptation	2.1 °C – 3.5 °C	An intermediate case between SSP and SSP 3. Analogous to RCP 4.5 scenario.
SSP3	RCP 7.0	7.0 W/m ²	Regional Rivalry – High for mitigation and adaptation	2.8 °C – 4.6 °C	Unmitigated emissions are high due to moderate economic growth. Analogous to SRES A2 scenario.
SSP4	RCP 3.4	3.4 W/m ² 6.0 W/m ²	Inequality – High for adaptation, low for mitigation	-	A mixed world, with relatively rapid technological development in low carbon energy sources in key emitting regions, leading to relatively large mitigative capacity in places where it mattered most to global emissions.
SSP5	RCP 8.5	8.5 W/m ²	Fossil-fuelled Development – Low for mitigation, high for adaptation	3.3 °C – 5.7 °C	In the absence of climate policies, energy demand is high and most of this demand is met with carbon-based fuels. Analogous to SRES A1T scenario. Analogous to RCP8.5 scenario.

6.1 PROJECTED CLIMATE

The projected climate variables considered in this report include monthly mean temperature, precipitation, extreme precipitation days (>20mm) and the frequency of extreme hot days ($T_{\max} > 35^{\circ}\text{C}$). The colour gradients in the projection tables provide a relative indication of the highest (red) and lowest (blue) values, with transitional colours representing intermediate values. It is important to note that these colour scales are relative to each table and cannot be compared directly between tables. The following subsections present detailed trends of historical and projected changes based on SSP2-4.5 and SSP5-8.5 future scenarios. The projections span two timeframes coinciding with the Project lifespan: near-term (2020–2039) and medium-term (2040–2059).

6.2 PROJECTED TEMPERATURE

Table 6-2 shows a comprehensive insight into historical temperature trends for the Mpumalanga Province. A consistent warming trend is observed with the lowest projected temperature increase at $+0.6^{\circ}\text{C}$ (SSP2-4.5) and the highest at $+2.4^{\circ}\text{C}$ (SSP5-8.5). These projections underscore the significant impact of climate change on temperature trends in the region, especially when temperatures are forecasted to increase by over $+2.4^{\circ}\text{C}$ by the end of 2059 under SSP5-8.5. The variations between emissions scenarios emphasise the crucial role of emissions mitigation in shaping the region's climate future. These projected rises in temperatures could affect the gas-to-power facility by increasing cooling and ventilation requirements, elevating heat-related safety risks for personnel, and reducing the efficiency and reliability of temperature-sensitive equipment and control systems.

Table 6-2 - Monthly Mean Temperature Anomalies, Mpumalanga Province

Months	1995-2014	2020-2039		2040-2059	
	Historic (°C)	SSP2-4.5 (°C)	SSP5-8.5 (°C)	SSP2-4.5 (°C)	SSP5-8.5 (°C)
Jan	21.8	+0.8	+0.8	+1.4	+1.8
Feb	21.5	+0.8	+0.9	+1.3	+1.6
Mar	20.7	+0.7	+0.9	+1.5	+1.9
Apr	18.3	+0.8	+0.8	+1.4	+2.1
May	15.5	+0.8	+0.8	+1.4	+1.8
Jun	12.8	+0.8	+0.9	+1.6	+1.8
Jul	12.7	+0.8	+0.9	+1.5	+2.0
Aug	15.0	+0.8	+0.8	+1.3	+2.0
Sep	18.1	+0.7	+1.0	+1.7	+2.1
Oct	19.3	+1.1	+1.2	+1.8	+2.4
Nov	20.0	+0.9	+0.9	+1.6	+2.1
Dec	21.1	+0.6	+0.8	+1.3	+1.9
Annual Average	18.1	+0.8	+0.9	+1.5	+2.0

Key observations are highlighted below:

- **Historical (1995-2014):** The average annual temperature was 18.1°C, with December (21.1°C), January (21.8°C) and February (21.5°C) observed as the hottest months. Conversely, the coldest months were June (12.8°C) and July (12.7°C).
- **Projected Temperature Changes (2020-2039):** Under both emissions scenarios, temperatures are projected to increase across all months. Mean monthly temperatures are expected to increase by a minimum of +0.7°C between March and September and a maximum of +1.1°C between February and October (SSP2-4.5). Similarly, temperatures are expected to increase by +0.9°C in June and +1.2°C in October (SSP5-8.5).
- **Projected Temperature Changes (2040-2059):** Significant increases are expected during this period. The most substantial increases are expected from September - November (+1.8°C; SSP2-4.5) and October (+2.4°C; SSP5-8.5).

6.3 PROJECTED PRECIPITATION

Table 6-3 provides an overview of projected average monthly precipitation patterns for Mpumalanga Province. Baseline precipitation shows high variability influenced by typical seasonal cycles. Future projections indicate a strengthening of these seasonal extremes, with wetter conditions expected in the summer months and more pronounced decreases in precipitation during winter.

Table 6-3 - Monthly Precipitation Anomalies, Mpumalanga

Months	1995-2014	2020-2039		2040-2059	
	Historic (mm)	SSP2-4.5 (mm)	SSP5-8.5 (mm)	SSP2-4.5 (mm)	SSP5-8.5 (mm)
Jan	142.6	+4.1	+7.6	+9.5	+7.5
Feb	116.3	+2.3	-0.8	+1.9	+5.4

Mar	88.9	+1.5	-3.9	-4.0	-2.8
Apr	52.1	-2.2	+1.4	-1.5	-4.6
May	20.5	-0.0	+1.9	-0.5	-0.4
Jun	10.6	-1.2	+1.3	+0.1	+0.6
Jul	8.6	-1.3	-1.6	-1.0	+0.3
Aug	14.6	-1.0	-0.5	-1.1	-2.9
Sep	31.5	-0.8	-4.1	-5.9	-8.1
Oct	81.1	-3.9	-4.1	-4.7	-10.6
Nov	126.4	-0.4	+0.9	-3.5	+4.3
Dec	148.1	+0.0	+4.8	+6.0	+3.1
Annual Average	70.1	-0.2	+0.2	-0.4	-0.7

Key observations are highlighted below:

- **Historical (1995-2014):** The months with the highest mean monthly precipitation were November (126.4mm), December (148.1mm), and January (142.6mm). In contrast, the driest months were June (10.6mm), July (8.6mm), and August (14.6mm). The annual average precipitation during this period was 70.1mm.
- **Projected Precipitation Changes (2020-2039):** Under the SSP2-4.5 scenario, seasonal trends in climate seem to intensify with notable increases from January to March and decreases observed from April to November. Under the SSP5-8.5 scenario, there are also more pronounced increases/decreases in precipitation levels, however more monthly variability is predicted during the winter months.
- **Projected Precipitation Changes (2040-2059):** Under both SSP2-4.5 and SSP5-8.5 scenarios, seasonal precipitation trends are expected to intensify. Drier conditions are expected from March to November and increases in precipitation levels are predicted for the summer months from December through to February.

6.4 PROJECTED NUMBER OF HOT DAYS

Table 6-4 below shows a definitive increase in the number of hot days ($T_{\max} > 35^{\circ}\text{C}$) predicted for the Mpumalanga Province. Compared to the historic baseline (1995–2014), all future scenarios indicate an increase in the frequency of hot days, with changes concentrated primarily in the summer and early spring months. The magnitude of increase intensifies over time and is consistently higher under the high-emissions SSP5-8.5 pathway, particularly during January, October, November, and December. Although hot days remain absent during winter months, the projections indicate a clear upward trend in extreme heat occurrence during the warm season, signalling heightened heat-related risks for infrastructure, ecosystems, and communities in the province.

Table 6-4 - Hot Day Trends, Mpumalanga

Months	1995-2014	2020-2039		2040-2059	
	Historic (days)	SSP2-4.5 (days)	SSP5-8.5 (days)	SSP2-4.5 (days)	SSP5-8.5 (days)
Jan	0.8	+0.5	+0.5	+1.0	+1.2
Feb	0.6	+0.4	+0.4	+0.7	+0.9
Mar	0.4	+0.3	+0.4	+0.6	+0.9
Apr	0.1	+0.1	+0.2	+0.3	+0.5
May	0.0	+0.0	+0.0	+0.1	+0.1
Jun	0.0	0.0	0.0	0.0	+0.0
Jul	0.0	0.0	0.0	0.0	+0.0
Aug	0.0	+0.1	+0.1	+0.1	+0.2
Sep	0.4	+0.3	+0.4	+0.6	+1.0
Oct	0.8	+0.6	+0.6	+1.0	+1.8
Nov	0.7	+0.5	+0.5	+1.0	+1.3
Dec	0.7	+0.3	+0.4	+0.8	+1.2
Annual Average	0.4	+0.3	+0.3	+0.5	+0.8

Key observations are highlighted below –

- **Historical (1995-2014):** The number of hot days is generally low, with zero days recorded between May and August. All other months record at least some occurrences of temperatures exceeding 35°C with the highest frequency observed in January and October (0.8 days), followed by November and December (0.7 days each).
- **Projected Monthly Hot Days (2020-2039):** Increases in the number of hot days are predicted for January (+0.5 days, SSP2-4.5; +0.5 days, SSP5-8.5), February (+0.4 days, SSP2-4.5; +0.4, SSP5-8.5) and October (+0.6 days; SSP2-4.5; +0.6days, SSP5-8.5). Zero hot days are projected from May – July under both scenarios.

Projected Monthly Hot Days (2040-2059): More substantial increases in the number of hot days are projected during this period. October is projected to experience the highest number of hot days (+1.0 days under SSP2-4.5 and +1.8 days under SSP5-8.5). November also shows notable increases under both scenarios (+1.0 days under SSP2-4.5 and +1.3 days under SSP5-8.5). No hot days are projected for June and July under either scenario, indicating that extreme heat remains strongly seasonal despite overall increases.

6.5 PROJECTED EXTREME PRECIPITATION DAYS

Table 6-5 outlines projected changes in the number of extreme precipitation days (>20 mm) for Mpumalanga Province compared with the historic baseline (1995–2014). Historically, extreme rainfall events are relatively infrequent, occurring mainly during the summer months, with January and December recording the highest values (1 day and 0.9 days). Future projections under both SSP2-4.5 and SSP5-8.5 show only minor changes, with slight increases in some early summer months

(January, February, and December) and negligible or no change across the remainder of the year. Overall, the annual average remains relatively stable across all scenarios, indicating that while rainfall intensity may shift in other ways, the frequency of days exceeding 20 mm shows minimal change over the projection periods.

Table 6-5 - Extreme Precipitation Day Anomalies, Mpumalanga

Months	1995-2014	2020-2039		2040-2059	
	Historic (days)	SSP2-4.5 (days)	SSP5-8.5 (days)	SSP2-4.5 (days)	SSP5-8.5 (days)
Jan	1.0	+0.1	+0.2	+0.3	+0.3
Feb	0.8	+0.0	+0.0	+0.2	+0.1
Mar	0.4	0.0	0.0	-0.1	+0.0
Apr	0.2	-0.1	+0.0	0.0	-0.0
May	0.1	0.0	+0.0	0.0	+0.0
Jun	0.0	0.0	0.0	0.0	0.0
Jul	0.0	0.0	-0.0	0.0	0.0
Aug	0.0	+0.0	+0.0	0.0	-0.0
Sep	0.2	0.0	-0.0	-0.1	-0.1
Oct	0.5	0.0	-0.0	-0.1	-0.1
Nov	0.8	-0.0	+0.1	+0.1	+0.0
Dec	0.9	+0.1	+0.1	+0.1	+0.1
Annual Average	0.4	+0.0	+0.0	+0.0	+0.0

Key observations are highlighted below –

- **Historical (1995-2014):** The number of extreme precipitation days are relatively low, with 0.0 days recorded between June and August and a peak of 1 day in January.
- **Projected Extreme Precipitation Days (2020-2039):** Slight changes in the number of extreme precipitation days are predicted under both scenarios with increases (+0.1, SSP2-4.5; +0.2, SSP5-8.5) projected for summer months from November to February.
- **Projected Extreme Precipitation Days (2040-2059):** Slight increases of +0.3 days are predicted for January under both emission scenarios. Zero days are projected from April to August (SSP2-4.5) and from March to August (SSP5-8.5).

6.6 AVERAGE LARGEST 1-DAY PRECIPITATION

Table 6-6 presents projected changes in the average largest 1-day precipitation events for Mpumalanga Province relative to the historical baseline period (1995–2014). Historically, extreme single-day rainfall events are infrequent and largely confined to the summer rainfall season. Future projections under the SSP2-4.5 and SSP5-8.5 scenarios indicate modest changes, with increases primarily concentrated in early and mid-summer months and limited changes during the winter period. Overall, the results suggest that while year-to-year variability remains pronounced, projected changes in the magnitude of the largest 1-day rainfall events are generally moderate, indicating a gradual shift in short-duration rainfall intensity rather than a uniform increase across all months.

Table 6-6 – Average Largest 1-Day Precipitation Anomalies, Mpumalanga

Months	1995-2014	2020-2039		2040-2059	
	Historic (mm)	SSP2-4.5 (mm)	SSP5-8.5 (mm)	SSP2-4.5 (mm)	SSP5-8.5 (mm)
Jan	23.8	+0.1	+0.6	+2.6	+2.5
Feb	21.3	+0.8	+0.1	+2.0	+1.5
Mar	16.7	+0.1	+0.3	+0.5	-0.1
Apr	12.7	-0.5	-0.2	+0.3	-0.3
May	7.1	+0.1	+0.8	-0.2	+0.2
Jun	4.4	-0.7	+0.1	0.0	-0.1
Jul	3.9	-0.2	-0.5	-0.2	-0.2
Aug	5.4	-0.3	-0.0	-0.2	-1.3
Sep	10.4	-0.3	-1.3	-2.0	-2.4
Oct	17.9	-0.7	-1.0	-1.8	-1.7
Nov	21.4	+0.9	+0.9	+0.7	+1.1
Dec	22.4	+0.7	+1.1	+0.6	+1.5
Annual Average	13.9	+0.0	+0.1	+0.2	+0.1

Key observations are highlighted below –

- **Historical (1995–2014):** The largest 1-day precipitation events are concentrated in the summer months, with January and December recording the highest baseline values (23.8mm and 22.4mm), while winter months (June to August) experience comparatively low extremes.
- **Projected Largest 1-Day Precipitation (2020–2039):** Both SSP2-4.5 and SSP5-8.5 scenarios indicate modest increases in short-duration rainfall intensity, particularly during early and mid-summer months (January, February, November and December), with little to no change projected during the winter period.
- **Projected Largest 1-Day Precipitation (2040–2059):** Larger increases are projected for peak summer months, notably January and February (+2.6 mm, SSP2-4.5; +2.5 mm, SSP5-8.5), under both scenarios, while autumn and winter months continue to show minimal change or slight decreases. Overall, projections suggest a gradual intensification of extreme single-day rainfall events during the summer rainfall season rather than a uniform increase throughout the year.

6.7 AVERAGE LARGEST 5-DAY CUMULATIVE PRECIPITATION

Table 6-7 presents projected changes in the average largest 5-day cumulative precipitation totals for Mpumalanga Province relative to the historical baseline period (1995–2014). Historically, prolonged multi-day rainfall extremes are concentrated in the summer rainfall season, with highest values observed between November and February. Projections under the SSP2-4.5 and SSP5-8.5 scenarios indicate modest increases in peak summer months, alongside decreases during winter and early spring. Overall, the results suggest a continued seasonal concentration of multi-day rainfall extremes, with potential intensification during summer periods rather than a uniform increase throughout the year.

Table 6-7 - Average Largest 5-Day Cumulative Precipitation

Months	1995-2014	2020-2039	2040-2059
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	Historic (mm)	SSP2-4.5 (mm)	SSP5-8.5 (mm)	SSP2-4.5 (mm)	SSP5-8.5 (mm)
Jan	58.2	+1.4	+3.9	+5.8	+4.1
Feb	52.2	+2.1	+0.8	+3.4	+4.3
Mar	39.6	-1.0	-0.2	-0.8	+0.3
Apr	27.8	-1.9	-0.1	-1.1	-1.9
May	13.8	-0.2	+0.6	-0.5	+0.5
Jun	7.7	-1.2	+0.5	+0.3	+0.5
Jul	6.7	-0.7	-1.1	-0.5	-0.2
Aug	10.8	-1.0	-0.2	-1.2	-2.2
Sep	20.4	-1.5	-1.5	-3.4	-4.4
Oct	38.9	-1.7	-1.3	-3.6	-4.7
Nov	49.5	+0.2	+3.3	+1.6	+1.3
Dec	56.0	+1.3	+2.7	+2.0	+1.6
Annual Average	31.8	-0.3	+0.6	+0.2	-0.1

Key observations are highlighted below –

- **Historical (1995–2014):** Largest 5-day cumulative rainfall events are strongly seasonal, with the highest values occurring during the core summer months, particularly January (58.2mm), December (56.0mm), and February (52.2mm). Winter months (June–August) exhibit substantially lower multi-day rainfall extremes.
- **Projected Largest 5-Day Precipitation (2020–2039):** Under both SSP2-4.5 and SSP5-8.5 scenarios, modest increases in multi-day rainfall extremes are projected for summer months, notably January, February, November, and December. In contrast, decreases are projected for several autumn and early spring months, indicating continued seasonal concentration of intense multi-day rainfall.
- **Projected Largest 5-Day Precipitation (2040–2059):** Larger increases in 5-day cumulative rainfall are projected for peak summer months, particularly January and February, under both emission scenarios. More pronounced decreases are projected for late winter and spring months (August to October), especially under SSP5-8.5. Overall, projections suggest an intensification of prolonged rainfall events during the summer rainfall season, while no consistent increase is evident outside this period.

6.8 SUMMARY

Analysis of historical and projected climate conditions for Mpumalanga Province indicates a clear long-term warming trend, with rising average temperatures and a notable increase in the frequency of hot days ($T_{max} > 35^{\circ}\text{C}$), particularly during summer and early spring. Precipitation trends show increasing seasonal intensification rather than changes in overall totals, with minimal change in the number of extreme rainfall days but more pronounced short-duration and multi-day rainfall extremes during the summer rainfall season. Both average largest 1-day and 5-day cumulative precipitation metrics point to greater rainfall intensity concentrated over fewer events, while winter conditions remain relatively unchanged.



For the development and operation of a GtP facility in Secunda, these patterns indicate increasing thermal stress and more episodic rainfall risks over the Project lifecycle. Rising temperatures and more frequent hot days may affect plant efficiency, cooling requirements, and workforce health and safety, while intensified summer rainfall events have implications for stormwater management, drainage capacity, and site access during construction and operations. Overall, the findings emphasise the importance of climate-responsive design and operational planning that accounts for heat extremes and short-duration, high-intensity rainfall, rather than changes in average precipitation conditions.

7 CLIMATE HAZARDS

This section builds on the baseline and projected climatic conditions by examining potential climate-related hazards that could affect the Project region under changing climate conditions. A climate hazard refers to a potentially damaging physical event or phenomenon arising from climate variability or change, such as extreme rainfall, drought, heatwaves, and severe storms. These hazards can trigger secondary impacts like flooding, wildfires, and water stress, which pose risks to infrastructure, ecosystems, and human systems. As climate conditions shift, the frequency, magnitude, and spatial extent of these hazards may increase, reinforcing the need for proactive planning and adaptation measures.

Table 7-1 below provides a summary of climate hazards that have resulted in extreme weather events recorded in recent years across the Mpumalanga Province. Understanding these historical patterns offers valuable insight into the region's prevailing climate trends and helps identify the key hazards that should be considered in future planning and risk assessments.

Table 7-1 - Extreme Weather Events in the Mpumalanga Province between 2019 and 2024

Climate Hazard	Year	Intensity/Severity/Effects	References
Extreme Rainfall/Flooding	November 2019	Intense rainfall in the region caused road flooding and temporary service disruption. At least 20 fatalities were reported. Widespread damage to infrastructure and disruption in essential services.	(Co-Operative Governance and Traditional Affairs, 2019)
Tropical Cyclone-Linked Rainfall	February 2021	Heavy rainfall resulting from the Tropical Storm Eloise that led to local flooding and stormwater infrastructure strain. At least 10 fatalities, missing persons. Roads and bridges washed away in Mbombela, Bushbuckridge and Nkomazi, among other areas.	(Davies, 2021)
Severe Thunderstorms	February 2023	Severe thunderstorms brought on by the La Nina global weather phenomenon caused flash floods affecting roads and drainage systems. Two fatalities reported. Damage to local residential and municipal infrastructure. Crop and livestock losses.	(Co-operative Governance Traditional Affairs, 2023)
Extreme Heat & Drought Conditions	October 2020	High temperatures and dry conditions triggered widespread fires. Widespread destruction of grazing land. Property damage (fences, barns, small farm structures). Livestock losses reported.	(Marshall, 2024)
Dry Winter Conditions	July 2022	Dry winter conditions caused multiple veld fires. Livestock deaths and grazing land destruction. Threats to communities in mountainous and rural areas. Some properties damaged; full fatalities not publicly recorded.	(Parliament of the Republic of South Africa, 2022)

Extreme Heat & Water Stress	September 2024	Record high temperatures across Mpumalanga. Significant drop in dam levels: e.g., Lowveld dams reduced from 35% to 29.9%. Water shortages led to warnings from provincial authorities. Potential impacts on agriculture, livestock, and domestic water supply. No confirmed fatalities reported, but extensive water stress and risk of crop loss.	(South African Government News Agency, 2024)
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To add context and illustrate the increasing frequency of climate-related hazards, analysis of historical disaster data from 1980 to 2024, (**Figure 7-1**) indicates a clear upward trend in the occurrence of such events. While storms, floods, and droughts were relatively infrequent before the mid-1990s, the graph shows a marked increase from the early 2000s onward, with multiple years recording more than five distinct hazard events. Notably, the period between 2000 and 2024 reflects recurring clusters of extreme rainfall, storms, and heat-related events, alongside more frequent wildfires and drought conditions. This escalation suggests that climate hazards are becoming more common and diverse, reinforcing the need for adaptive planning to address heightened risks under future climate scenarios.

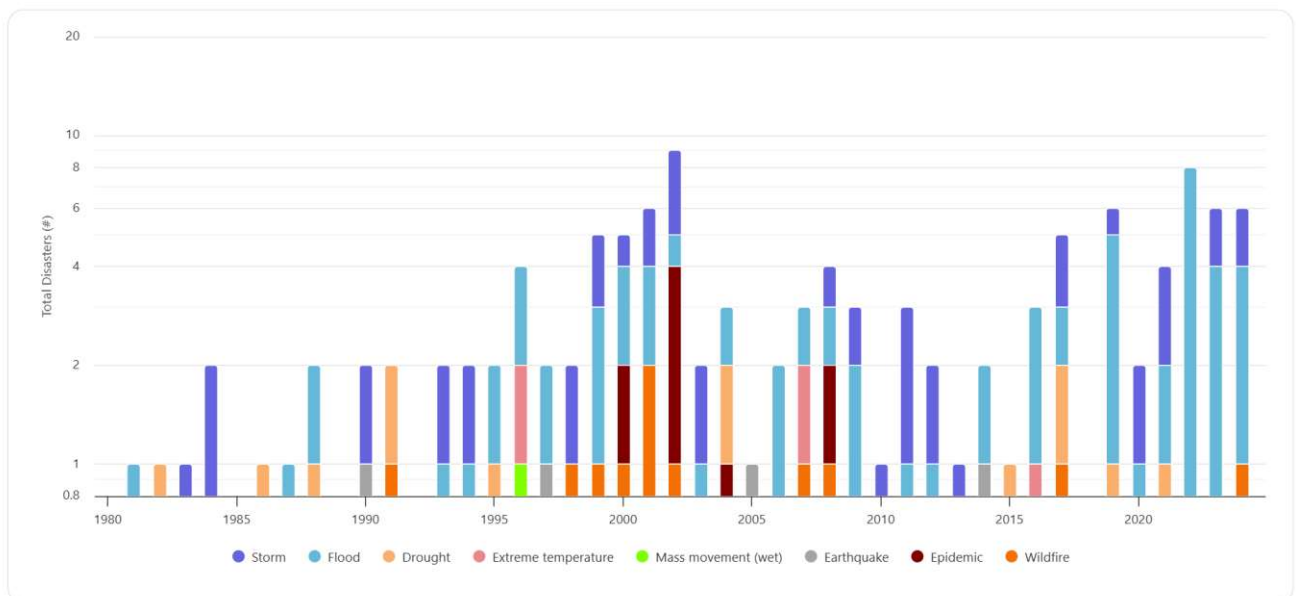


Figure 7-1 - Timeseries of Natural Disaster Statistics, 1980-2024²

² WBCCKP

7.1 FIRE DAYS

Fire days refer to days with conditions that significantly increase the risk of wildfires, as determined by the McArthur Fire Danger Index. A fire day is classified as any day with an index value exceeding 24, reflecting heightened temperatures, low humidity and strong winds conducive to fire spread. As climate change progresses, the frequency and intensity of fire danger days are expected to increase, posing significant risks to ecosystems, infrastructure and communities.

Figure 7-2 illustrates the projected number of fire danger days and the potential increase in wildfire exposure under the RCP 8.5 (low mitigation) scenario by 2050. The left map shows the distribution of fire danger days across the region, with areas predicted to experience between 0 and 60 days of fire risk (**Figure 7-2**). The map on the right indicates settlements with varying levels of wildfire exposure — from low to high — based on projected future fire danger conditions. While the increase in wildfire risk in Secunda is anticipated to be moderate, it warrants proactive consideration due to its potential impacts. These may include disruptions to regional transportation routes, reduced air quality affecting worker health and site operations, and possible supply chain interruptions, particularly where critical inputs or logistics routes pass through fire-prone areas.

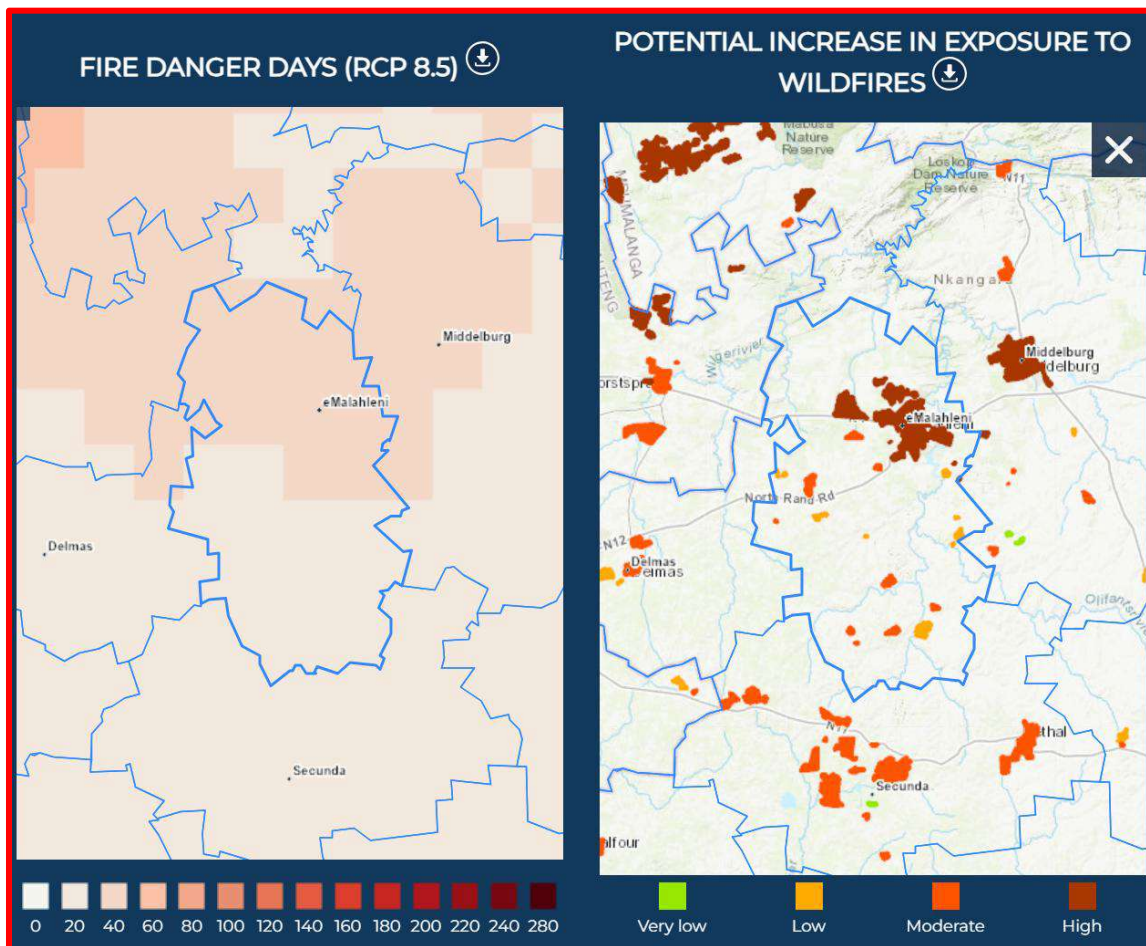


Figure 7-2 - Increase in Exposure to Wildfires

7.2 HEATWAVES

Heat extremes refer to prolonged periods of unusually high temperatures that exceed the normal range for a region, often associated with heatwaves. These events are projected to increase in frequency, intensity and duration due to climate change, posing significant risks to public health, ecosystems and infrastructure. **Figure 7-3** presents the potential increase in heat exposure under RCP8.5 (low mitigation scenario) for the Secunda Local municipality for 2050. While some settlements are projected to experience low to medium increases in heat exposure and others show no exposure, the Project area is classified as having medium exposure to heat extremes. Consequently, the risk of heat stress warrants careful consideration, given its potential to reduce physical work capacity and increase the likelihood of dehydration and other occupational health impacts.

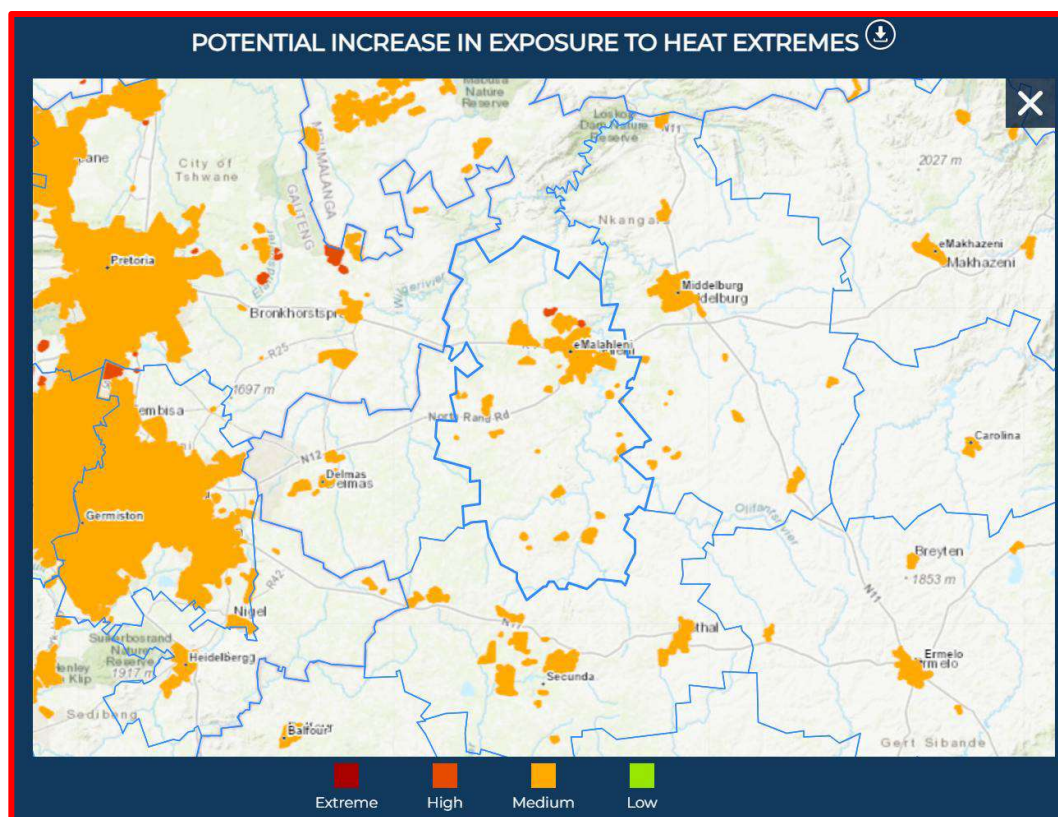


Figure 7-3 - Potential Increase in Exposure to Heat Extremes

7.3 FLOODING

Flooding refers to the overflow of water onto land that is normally dry, caused by extreme rainfall events, rising water levels, or insufficient drainage systems. Climate change is projected to increase the frequency and intensity of extreme rainfall events, heightening the risk of urban and flash flooding, which can significantly impact infrastructure, ecosystems and communities. **Figure 7-4** depicts the projected change in extreme rainfall days (left) and potential increase in exposure to urban flooding for the year 2050 under the RCP 8.5 low mitigation (worst-case) scenario (right). Extreme rainfall days

were calculated by assessing and comparing the degree of change of future rainfall extremes (e.g. 95th percentile of daily rainfall) and the current rainfall. A value of more than 1 indicates an increase in extreme daily rainfalls. An extreme rainfall event (including severe thunderstorms and lightning) is defined as an instance in which 20mm of rain occurs within 24 hours over 8 x 8 km grid point (CSIR, 2019). Across the Secunda Local Municipality, projected changes in extreme rainfall days range from 'slight decreases' to 'moderate increases'. Areas in the vicinity of the Project are predominantly classified as experiencing low to moderate increases in extreme rainfall days. While projected flood exposure across the municipality ranges from very low to high, areas surrounding the Project location are generally characterised by moderate flood exposure, with some nearby areas projected to experience only low increases in flooding. Notwithstanding these projections, flooding remains a relevant hazard given the historical occurrence of flooding in Mpumalanga Province and the sensitivity of local drainage and urban systems to intense rainfall events.

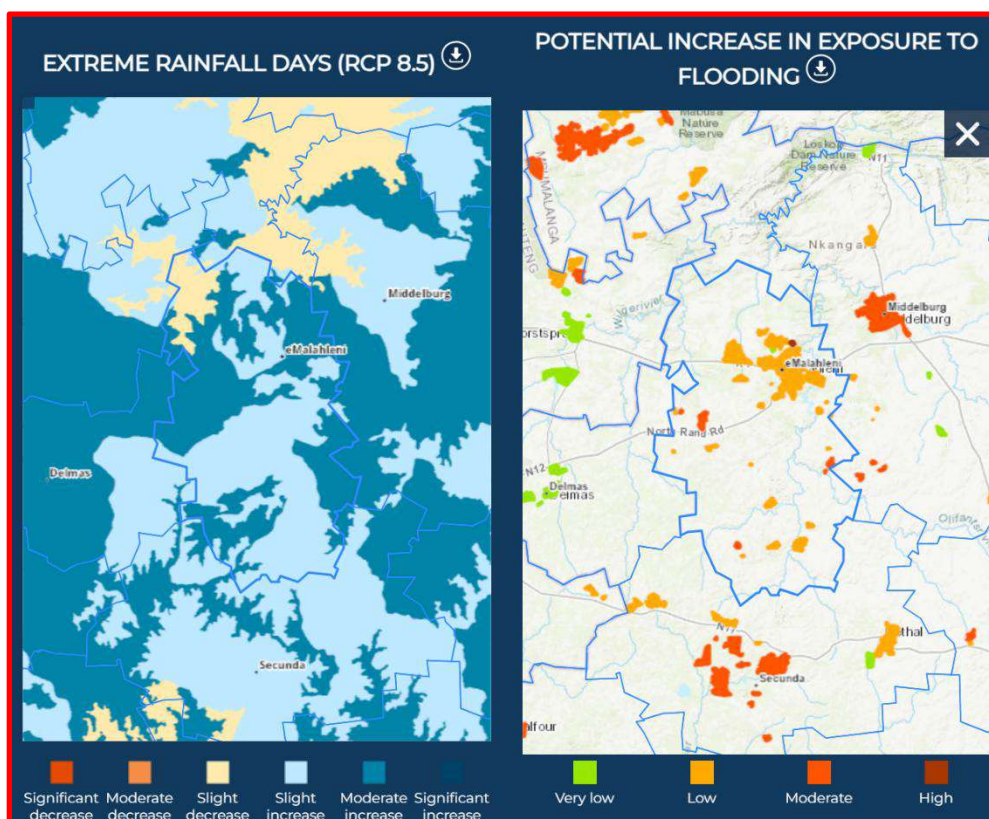


Figure 7-4 - Extreme Rainfall Days and Potential Increase in Exposure to Flooding

7.4 DROUGHT

Drought refers to prolonged periods of significantly reduced precipitation, often leading to water shortages, environmental stress and adverse socioeconomic impacts. It is a critical climate hazard, particularly for regions heavily reliant on water resources for agriculture, industry and municipal needs. **Figure 7-5** presents the drought Standardised Precipitation Index (SPI) index (left) and the potential increase in exposure of drought (right). The Projected change in drought tendencies (i.e. the number of cases exceedingly near normal per decade) is under the low mitigation scenario (RCP 8.5). The

SPI index values produced for the Secunda Local Municipality are negative numbers, ranging from -0 to <-1.2 (**Figure 7-5**), indicative of an increase in drought tendencies per 10 years (more frequent than baseline). The potential increase in exposure to drought ranges from 'very low' to 'low' in some settlements in the local municipality, whilst others may not experience these conditions. The Project region is Projected to experience an SPI index value of -0.4, increasing the likelihood of drought conditions, although the potential exposure to drought at the Project location is categorised as 'low'.

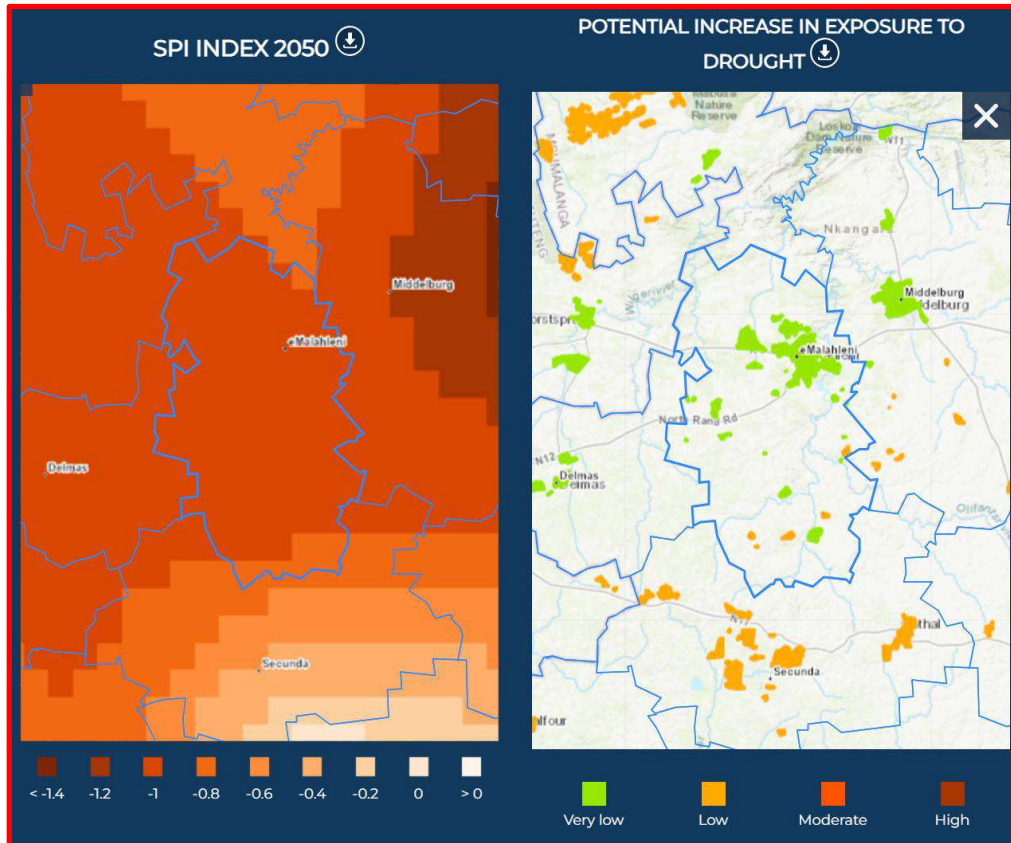


Figure 7-5 - SPI Index (left) and Potential Increase in Exposure to Drought (right)

8 IMPACT ASSESSMENT

The Project's climate change impact assessment comprises two components: (i) the potential impacts of climate change on the Project, and (ii) the Project's contribution to climate change. This scoping report includes a review of baseline climate conditions, projected climate change trends and key hazards relevant to the Project area, however, a detailed impact and risk assessment will be undertaken as part of the full CCIA. In addition, the Project's contribution to climate change will be quantitatively assessed through the development of a comprehensive GHG inventory in the CCIA.

8.1 IMPACT OF CLIMATE CHANGE ON THE PROJECT

The baseline and projected climate information indicates that increasing temperatures, extreme heat, intense rainfall, flooding, drought and wildfire may affect the Project. At this stage, these impacts have been identified through a desktop review of regional climate information and are considered preliminary. Their significance will be assessed further during the impact assessment phase once the available Project design information and relevant specialist findings can be considered.

The preliminary impacts identified are summarised in Table 8-1. The indicative significance presented does not represent a final impact rating and is based only on the climate information currently available.

Table 8-1 – Preliminary climate-related impacts

Climate Hazard	Preliminary potential impact	Preliminary indication of significance
Increasing temperature and extreme heat	Increased cooling and ventilation requirements; reduced efficiency or reliability of temperature-sensitive equipment and increased heat-related risks to workers.	Potentially moderate. Temperatures and the number of hot days are projected to increase and the Project area is identified as having a medium exposure to heat extremes.
Intense rainfall and flooding	Flooding or waterlogging of Project areas; pressure on stormwater and drainage systems and temporary disruption to site access during construction or operation.	Potentially moderate. The Project area is generally associated with moderate flood exposure and summer rainfall intensity may increase.
Drought and reduced rainfall	Increased pressure on water availability for Project activities, particularly during prolonged dry periods.	Potentially low. Drought tendencies may increase but exposure at the Project location is currently classified as low.
Wildfire conditions	Temporary disruption to access or supply routes, reduced air quality and potential risks to workers and infrastructure.	Potentially low to moderate. Wildfire risk in the wider Secunda area is expected to increase moderately, although the Project

		is located within an existing industrial area.
Severe weather events	Temporary disruption to construction activities, operations, infrastructure or access.	Significance not yet determined. The available information identifies severe weather as a relevant consideration, but is insufficient to assign a preliminary significance rating.

The preliminary findings indicate that extreme heat and flooding are likely to require the greatest consideration during the impact assessment phase. However, the final significance of each impact will depend on the sensitivity of the relevant Project components and the effectiveness of existing or proposed design and management measures. The impacts will therefore be assessed using the significance criteria presented in **Table 8-2**.

Table 8-2 - Impact Assessment Criterion and Scoring System

Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without intervention		Recoverable: Recovery with intervention		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-2 years	Medium term: 2-12 years	Long term: 12 years+	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				

Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
Impact Significance Rating					
Total Score	4 to 15	16 to 30	31 to 60	61 to 80	81 to 100
Environmental Significance Rating (Negative (-))	Very low	Low	Moderate	High	Very High
Environmental Significance Rating (Positive (+))	Very low	Low	Moderate	High	Very High

8.2 PLAN OF STUDY FOR THE IMPACT ASSESSMENT PHASE

The impact assessment phase will build on the baseline and projected climate information presented in this report. The assessment will primarily comprise a desktop study and will include:

- review of the identified climate hazards and projected changes relevant to the Project;
- consideration of the potential effects of these hazards during construction, operation and decommissioning;
- review of available Project design information to identify potentially sensitive infrastructure and activities;
- consideration of relevant information from other Project specialists, where available;
- assessment of the significance of identified impacts using the prescribed impact-assessment methodology;
- identification of existing and proposed adaptation measures; and
- recommendation of additional mitigation or adaptation measures where required.

No separate climate-specific fieldwork is proposed at this stage. The assessment will use available climate datasets, Project information and relevant specialist inputs. Where the available information is insufficient to assess a potentially material impact, this will be identified as a limitation or recommendation for further investigation.

9 IMPACT OF THE PROJECT ON CLIMATE CHANGE

This section provides a preliminary, qualitative overview of the likely GHG emissions associated with the development and operations of the GtP plant. As this is a baseline report, detailed quantification of emissions and finalisation of emission sources has not yet been undertaken. A full emissions inventory and corresponding mitigation measures will be developed in the detailed CCIA to follow.

9.1 OVERVIEW OF GHG SCOPES

GHG emissions are categorised in accordance with the GHGP:

- Scope 1 (Direct emissions): Emissions from sources owned or controlled by the Project, including fuel combustion in construction equipment and onsite vehicles, natural gas combustion within the GtP facility during operation, fuel use in auxiliary equipment (e.g. generators), and any fugitive emissions associated with gas handling and processing.
- Scope 2 (Indirect energy emissions): Emissions from the generation of purchased electricity consumed onsite to power Project infrastructure and supporting facilities during construction and operation, such as buildings, lighting, control systems and auxiliary equipment.
- This baseline report focuses only on Scope 1 and 2 emissions, consistent with the current level of Project design detail. Scope 3 emissions are not included in this Project but may be considered separately in the future.

9.2 INDICATIVE EMISSIONS ACROSS THE PROJECT LIFECYCLE

The intensity of emissions will vary depending on design choices, energy sources, equipment types and operating profiles. While construction-phase emissions are temporary, they may be significant due to high energy demand and fuel-intensive activities. Operational emissions will be ongoing and are expected to be primarily associated with natural gas combustion, auxiliary fuel use, fugitive emissions and purchased electricity. **Table 9-1** provides a high-level overview of potential emission sources, which will be confirmed during the full CCIA and GHG assessment.

Table 9-1 - Key GHG Emission Sources for the Proposed Phases of the Sasol GtP Facility

Scope		Sources
Construction Phase	Scope 1	<ul style="list-style-type: none"> ■ Diesel combustion from construction equipment and vehicles used for IBL and OBL works, including earthworks, foundations, structural works, and equipment installation (e.g. excavators, cranes, trucks). ■ Diesel use associated with construction of external infrastructure, including pipelines (LNG, methane-rich gas, utilities), electrical works, and transmission line installation. ■ Operation of diesel-powered generators for temporary power supply during construction and commissioning.

	Scope 2	<ul style="list-style-type: none"> Grid-supplied electricity consumed at temporary site offices, construction camps, laydown areas, lighting, and auxiliary construction services.
Operational Phase	Scope 1	<ul style="list-style-type: none"> Combustion of natural gas (LNG and/or MRG) in gas turbines for electricity generation (primary operational emission source). Fuel combustion associated with start-up, shutdown, and commissioning activities, including auxiliary burners and purge systems. Fuel use in auxiliary and standby equipment such as emergency diesel generators, compressors, and heaters. Fugitive emissions from natural gas handling infrastructure, including pipelines, valves, flanges, metering stations, and pressure regulation systems within the IBL and OBL.
	Scope 2	<ul style="list-style-type: none"> Purchased electricity imported from the national grid for balance-of-plant loads, including control systems, cooling systems (if applicable), water treatment systems, workshops, offices, lighting, and site utilities.
Decommissioning Phase	Scope 1	<ul style="list-style-type: none"> Diesel combustion from demolition and dismantling activities involving heavy equipment and vehicles. Fuel use associated with pipeline decommissioning, waste handling, material transport, and site remediation activities.
	Scope 2	<ul style="list-style-type: none"> Electricity consumption for decommissioning activities, including temporary power for site offices, lighting, water management systems, and rehabilitation works.

10 CONCLUSION

The baseline report establishes the foundation for climate impact assessment related to the development and operations of the Sasol GtP facility. The analysis of historical and projected climatic conditions informs key risks including heat extremes and intensified rainfall leading to flooding. These hazards pose potential threats to infrastructure, operations and supply chain continuity. The projections indicate that by 2059, heat extremes ($T_{\max} > 35^{\circ}\text{C}$) could increase by up to 1.8 days per year, precipitation by 7.5mm, and temperature by 2.4°C , under the higher emissions scenario. These shifts underscore the need for proactive adaptation measures, including stormwater management improvements, infrastructure adaptation planning and operational adjustments to extreme weather conditions.

10.1 NEXT STEPS

These baseline findings will inform the next phase of the CCIA, which will undertake a detailed evaluation of climate-related risks and associated adaptation measures for the Sasol GtP facility. The subsequent assessment will focus on:

- Evaluating the potential impacts of future climate conditions on facility design, operations, and performance.
- Identifying and assessing existing and planned adaptation measures to address key climate risks, including flooding, extreme heat, and other relevant hazards.
- Quantifying anticipated GHG emissions associated with the facility, limited to Scope 1 and Scope 2 emissions.
- Identifying and evaluating feasible GHG mitigation measures to support emissions management and improved operational efficiency.

10.2 GAPS AND LIMITATIONS

- This assessment focuses on the Sasol GtP facility and associated on-site infrastructure and does not extend to broader industrial operations, upstream gas supply, or downstream energy distribution systems beyond the Project boundary. As a result, Scope 3 emissions (including upstream fuel production and downstream use of generated electricity) are excluded from this assessment and may result in an underrepresentation of the Project's full lifecycle GHG footprint. Additionally, transitional climate risks, such as potential future regulatory changes, carbon pricing developments, market shifts, and evolving stakeholder expectations, are not assessed at this stage and may be considered in the full CCIA, where relevant.
- Climate projections are derived from regional-scale models, which introduce inherent uncertainties due to differences in spatial resolution, emissions scenarios, and modelling approaches. Variability in climate datasets may influence the interpretation of projected trends, and results should therefore be considered indicative of potential future conditions rather than precise, site-specific forecasts.

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