

Climate Management Plan

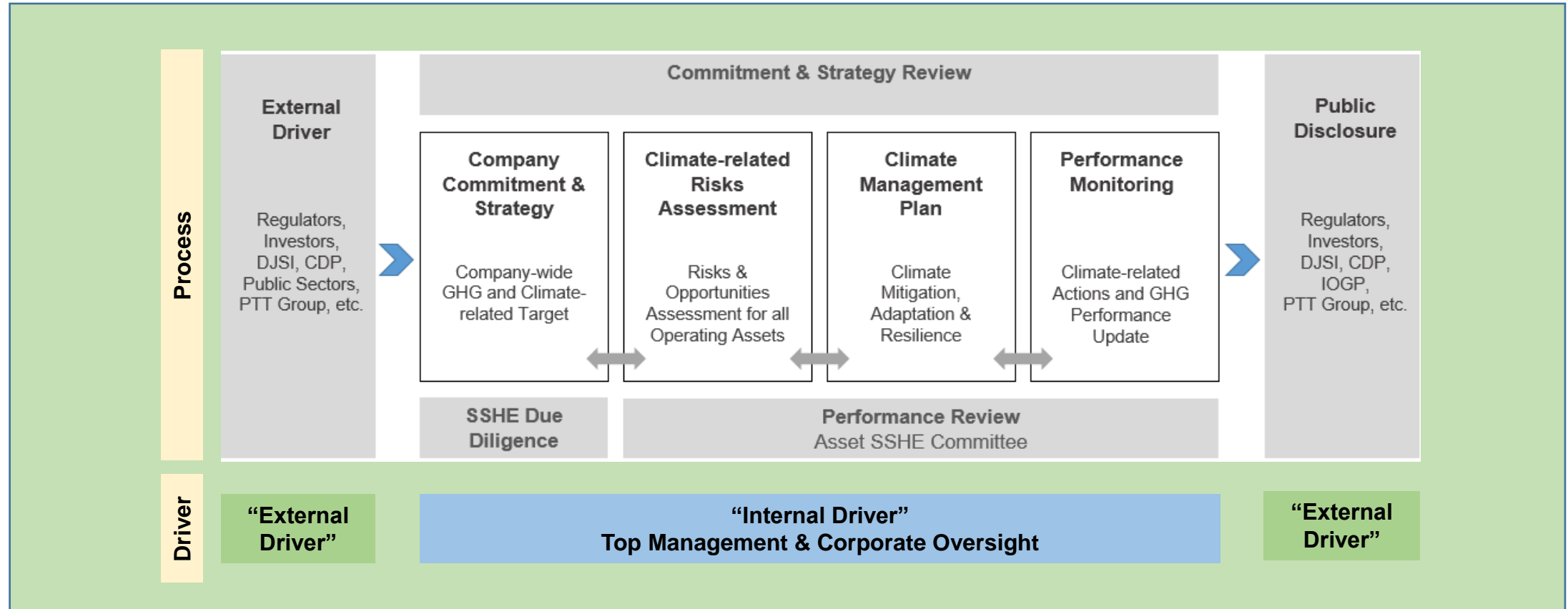




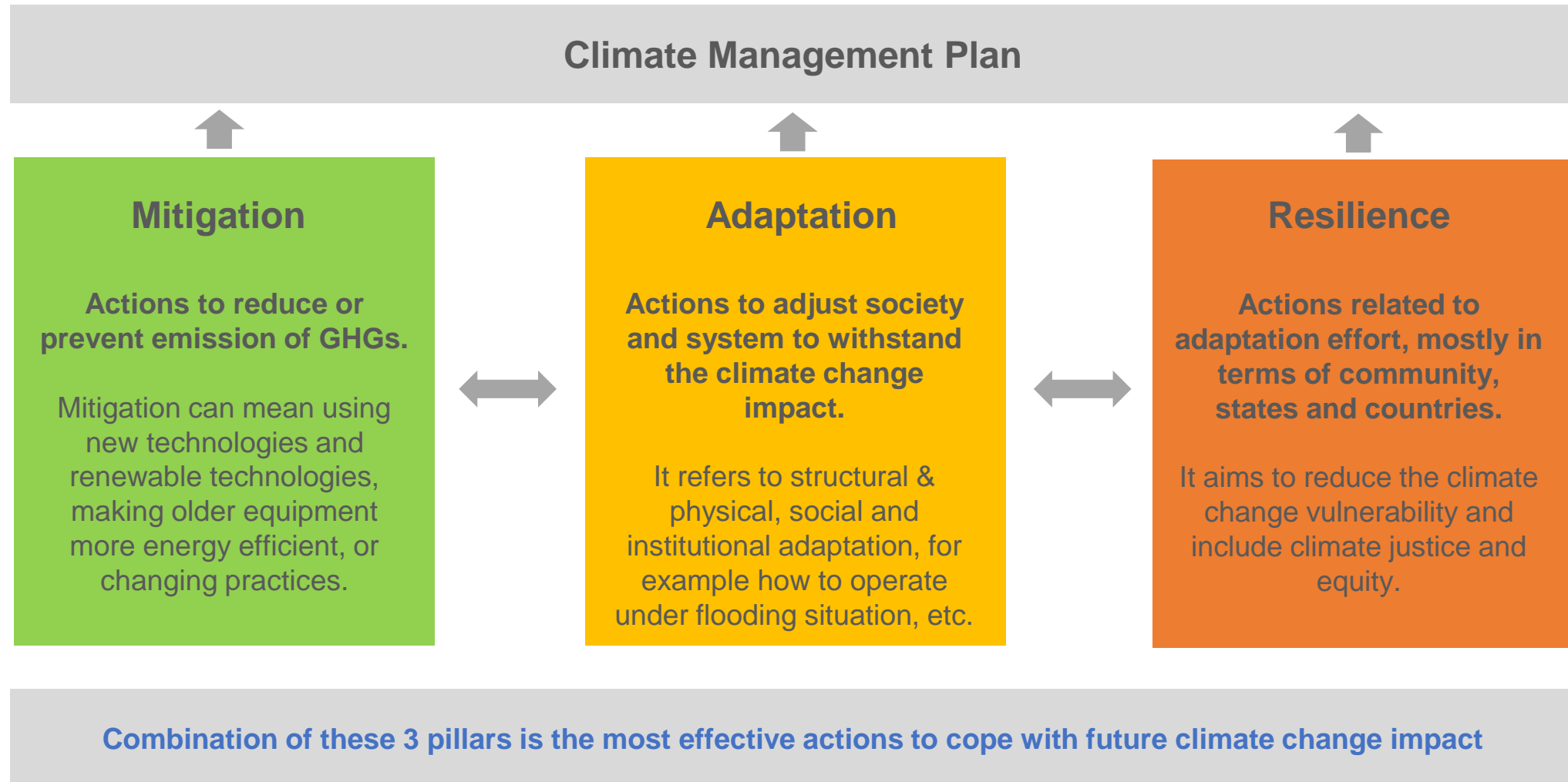
Climate Management Process

PTTEP Climate Change Management Process

“all E&P phases, existing & new operations under PTTEP operational control shall implement this process”



Climate Management Plan



Climate-Related Risks



Physical Risks

What are Physical Risks?

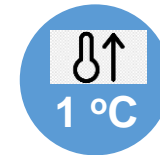
“Physical risks” = risks arising from the impacts of a changing climate on corporations due to changes in the probability and intensity of (extreme) weather.

The physical hazards assessed under this assessment covered the short, medium, and long-term and included risk categories below:



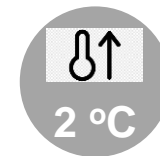
Scenario Analysis

** RCP = Representative Concentration Pathway



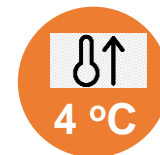
RCP 2.6

an ‘aggressive’ mitigation that may lead to temperature increased approx. 1 °C in 2100



RCP 4.5

a strong mitigation and that may lead to temperature increased approx. 2 °C in 2100



RCP 8.5

a business-as-usual (BaU) scenario with a continuation of the current path of increasing GHG concentrations that may lead to temperature increased approx. 4 °C in 2100

Physical risk scenarios and assumptions

Overview

Hazard	Heavy precipitation	Droughts	Heatwaves	Tropical cyclones		Water risks
Methodology	Trend and scenario analysis			Hotspot – frequency analysis	Hotspot – intensity analysis	Scenario analysis
Scenarios	Intergovernmental Panel on Climate Change (IPCC) scenarios: RCP2.6, RCP 4.5, RCP8.5			RCP4.5	RCP8.5	RCP 4.5, RCP 8.5
Metrics	Rx5day [mm]	CDD [days]	WSDI [days]	Number of storms per year (#/year)	Potential relative damage based on 65 year event (%)	Difference between freshwater supply and demand
Input data	Reanalysis data (ERA-Interim), global climate model ensemble (CMIP5), facility locations			Historical cyclone tracks, scientific literature review, facility locations		Aqueduct, facility locations

General approach

A four-step approach was used to assess the physical climate risks.

Baseline assessment

- Baseline **exposure** and **vulnerability** assessment for five physical risks
- Describing how **climate risks** emerge from weather hazards

Short term assessment

- A **trends-analysis** of historical ERA-Interim data using a Theil-Sen regression estimator
- Assessing near-term risks from climate change

Scenario analysis

- Based on global climate model ensemble (CMIP5)
- **Three scenarios:** RCP 2.6, RCP 4.5, RCP 8.5
- **Two time frames:** 2035 and 2050

Financial impact assessment

Combining “*hazard * vulnerability * exposure*” framework with PTTEP’s risk matrix

Physical Risks in Conclusion by Assets

Risk Type	Asset Impacted	Risk Level
Physical Risk		
Heatwaves	2026-2035 GBN, GBS, ART, S1& L22/43, SPH, ZOC, Sarawak 2035-2050 GBN, GBS, ART, S1& L22/43, SPH, ZOC, Sarawak	Medium Medium
Heavy Precipitation	2026-2035 PSB, RSB, S1& L22/43, Thakita, ZOC, Sarawak, BORF & Bintulu 2036-2050 PSB, RSB, S1& L22/43, Thakita, ZOC, Sarawak, BORF & Bintulu	Medium Medium
Tropical Cyclones	2026-2035 GBN, GBS, ART, PSB, RSB, SPH, Thakita, ZPQ, Sabah 2036-2050 (No data for likelihood score)	Medium -
Drought	2026-2035 ZOC, 2036-2050 ZOC,	Medium Medium
Water Risk	2026-2035 SPH 2036-2050 SPH	Medium Medium

Transition Risks

What are Transition Risks?

“Transition risks” = those risks resulting from a transition to a 2°C economy. According to the Task Force on Climate-related Financial Disclosures (TCFD): “transitioning to a lower-carbon economy may entail extensive policy, legal, technology, and market changes”.

The transition risks included in this assessment covered the short, medium, and long-term and included risk categories below:



Scenario Analysis



IPCC

Intergovernmental Panel on Climate Change

- database of hundreds of scenarios on how keeping global temperature below a 1.5°C increase
- shows a wide range of possible carbon prices based on policy measures, available technologies, and model methodologies



SDS

International Energy Agency (IEA) Sustainable Development Scenario

- major transformation of the global energy system from O&G to renewable energy
- fully aligned with the Paris agreement Scenario



SPS

IEA Stated Policies Scenario

- reflects the impact of existing policy frameworks and today’s announced policy intentions
- shifts from oil to natural gas and (to a lesser extent) renewable energy

Transition scenarios and assumptions

Hazard	Policy risks	Legal risks	Technology risks	Market risks	Reputation risks
Methodology	Scenario analysis and literature review	Literature review and data analysis	Scenario analysis	Scenario analysis	Data analysis
Scenarios	IEA Sustainable Development Scenario (SDS) and IPCC 1.5°C scenarios	Not scenario specific	IEA SDS and Stated Policies Scenario (SPS)	IEA SDS	Not scenario specific
Metrics	Carbon cost (USD), compliance cost	# of cases, % of total greenhouse gas (GHG) emissions	Change in demand of O&G products	Stranded assets	Share price loss from reputational damage
Assumptions	<ul style="list-style-type: none"> Carbon price based on IEA SDS O&G prices based on US EIA projections 	Attribution science (i.e. total of GHG emissions from the fossil fuel industry) is used to determine the “fair share” of PTTEP	<ul style="list-style-type: none"> Change in O&G demand is computed by the difference between SDS and SPS scenarios O&G prices based on US EIA projections 	<ul style="list-style-type: none"> Assets are considered stranded when their continued production is inconsistent with IEA SDS O&G prices based on US EIA projections 	Estimated based on the impact of reputational incidents on peer O&G companies' share prices

Transition Risks in Conclusion by Countries

Risk Type	Country Impacted	Risk Level
Transition Risk		
Policy	2020-2025 - 2026-2035 Malaysia 2036-2050 Myanmar	- Medium Medium
Legal/Litigation	2020-2025 Thailand, Malaysia 2026-2035 Malaysia 2036-2050 Myanmar	Medium Medium Medium
Technology	2020-2025 - 2026-2035 - 2036-2050 Myanmar	- - Medium
Market	2020-2025 Malaysia, 2026-2035 Malaysia, 2036-2050 -	Medium Medium -
Reputation	2020-2025 Thailand, Malaysia, Myanmar 2036-2035 Malaysia, Myanmar 2036-2050 Myanmar	Medium Medium Medium

Note: “-” no asset impacted



Climate Management Plan

Adaptation Plan for **Physical Risks** to be implemented since 2026 onward

Risk Code & Description	Mitigation/Adaptation/Resilience Plan
Heat Waves	
<ul style="list-style-type: none"> High temperatures leading to heat strokes and unsafe working conditions. 	<ol style="list-style-type: none"> 1. Reduce the number of working hours during heatwaves 2. Postpone scheduled maintenance 3. If possible, wear lightweight loose-fitting clothing 4. Introduce obligatory drinking breaks 5. Introduce wearable devices for detecting heat strokes, such as smartwatches (detecting body temperature)
<ul style="list-style-type: none"> Reduced AC system performance and cooling demand resulting in increased energy consumption and maintenance costs. 	<ol style="list-style-type: none"> 1. Increase in maintenance (ensure filters are clean, heat exchanger surfaces are clean, etc., to ensure equipment runs at the highest efficiency possible)
<ul style="list-style-type: none"> Increased ambient temp. Increase gas turbine heat rate and reduce turbine output. More gas needs to be combusted to maintain the same power output resulting in less gas available for sale, and consequently, less revenues. 	<ol style="list-style-type: none"> 1. Increase in maintenance program frequency for turbines and accelerate change out of turbines (Industrial gas turbines lose around 0.7% power output per 1°C ambient temp rise. Cooler and more dense air will increase efficiency and output. Contact OEM or GT specialist to assess the feasibility of implementing such a solution to compensate for increase air temp)

Adaptation Plan for **Physical Risks** to be implemented since 2026 onward



Risk Code & Description	Mitigation/Adaptation/Resilience Plan
Heat Waves (cont.)	
<ul style="list-style-type: none"> Lowered performance / premature failure of electrical motors due to overheating resulting in increased maintenance/repair cost. 	<ol style="list-style-type: none"> 1. Identify critical motors 2. Engage motor manufacturer/supplier to design a monitoring programme to track motor performance during extended periods of extreme heat 3. Assess potential impact on remaining motor life and feasibility of upgrading motor cooling systems 4. Assess whether motors specs need to be revised to ensure new motor purchases are better prepared to withstand extended periods of peak temperature 5. Revise motors management programme to reflect the findings in 1-4
<ul style="list-style-type: none"> Glycol cooling (TEG) system performance is reduced to the extent that cooling requirements can no longer be met with the existing aerial cooling capacity. Production has to be cut back as a result. 	<ol style="list-style-type: none"> 1. Investigate options to reduce exchanger inlet temperature 2. Reassess maintenance frequency to reduce fouling 3. Engage air cooler manufacturer to explore retrofitting options to improve efficiency including fogging solutions

Adaptation Plan for **Physical Risks** to be implemented since 2026 onward



Risk Code & Description	Mitigation/Adaptation/Resilience Plan
Heat Waves (cont.)	
<ul style="list-style-type: none"> Heatwaves impacting the percentage of LPG recovery. Resulting in a decreased amount of LPG, and revenue losses 	<ol style="list-style-type: none"> 1. Installation of vapour recovery compression system to reduce loss of product to flare 2. Upgrade of storage bullets and refrigerant chillers
<ul style="list-style-type: none"> Gas compressors trip due to higher ambient temperatures, thus interrupting production. 	<ol style="list-style-type: none"> 1. Monitor heat transfer efficiency and ensure heat transfer surfaces fouling is kept under check 2. Assess options to reduce compressor inlet temperatures 3. Engage OEM to assess potential retrofitting options to prevent compressor trip during periods of extreme temperature 4. Evaluate options to cool down air temp with fogging systems 5. Install new gas compressors capable of handling higher temperatures if the above fail
<ul style="list-style-type: none"> Heatwaves reducing workers productivity reducing output 	<ol style="list-style-type: none"> 1. Reduce the number of working hours 2. Postpone scheduled maintenance during heatwaves 3. If possible, wear lightweight loose-fitting clothing 4. Introduce obligatory drinking breaks

Adaptation Plan for **Physical Risks** to be implemented since 2026 onward



Risk Code & Description	Mitigation/Adaptation/Resilience Plan
Tropical Cyclones	
<ul style="list-style-type: none"> Tropical cyclones causing production interruption 	<ol style="list-style-type: none"> 1. Implement monitoring to include cyclone early detection. 2. Monitor swell height reaching or exceeding platform height 3. Structural reinforcement of the flare booms and communication towers
<ul style="list-style-type: none"> Tropical cyclones causing direct damages to PTTEP's E&P facilities, such as flare boom, antenna, etc which may disrupt production 	<ol style="list-style-type: none"> 1. Implement monitoring to include cyclone early detection. 2. Monitor swell height reaching or exceeding platform height 3. Structural reinforcement of the flare booms and communication towers
<ul style="list-style-type: none"> Floating Storage and Offloading (FSO) operational disruption resulting in costs. 	<ol style="list-style-type: none"> 1. Implement monitoring to include cyclone early detection. 2. Develop/update/strategy and protocol to manage storage tank capacity and offloading to minimize disruption to production to reflect cyclone events 3. Seek contractual arrangements to reduce shuttle tanker demurrage liability further in the event of cyclones
<ul style="list-style-type: none"> Tropical cyclones cause damage to oil transport lines resulting in oil spill and incurring in reputational damages 	<ol style="list-style-type: none"> 1. Identify and prioritize potential areas where a tropical cyclone could damage infrastructure and result in an oil spill 2. Inspect site condition (pipes, lines, valves, etc.), increase inspection frequency 3. Identify options to prevent/reduce the magnitude of the spill 4. Revise spill prevention, control, and countermeasure plan

Adaptation Plan for **Physical Risks** to be implemented since 2026 onward



Risk Code & Description	Mitigation/Adaptation/Resilience Plan
Heavy Precipitation	
<ul style="list-style-type: none"> Heavy precipitation during the raining season leads to disruptions in the general power grid, leading to possible production interruptions 	<ol style="list-style-type: none"> Equip with a diesel generator
<ul style="list-style-type: none"> Heavy precipitation leading to exceedance of contaminated water ponds onshore assets, resulting in the loss of oily water, which could pollute neighboring areas, resulting in fines and reputational damage 	<ol style="list-style-type: none"> Increase the capacity of the water pond
<ul style="list-style-type: none"> Floods leading to direct damages to production assets and resulting in maintenance and repair costs 	<ol style="list-style-type: none"> Implement monitoring to include (extreme) precipitation early detection Increase flood protection Inspect site conditions, increase inspection frequency
<ul style="list-style-type: none"> Floods leading to production disruption 	<ol style="list-style-type: none"> Increase flood protection Development operating and shutdown systems for remote control and supervision

Adaptation Plan for **Physical Risks** to be implemented since 2026 onward



Risk Code & Description	Mitigation/Adaptation/Resilience Plan
Droughts	
<ul style="list-style-type: none"> Drought leading to bushfires affecting the facility by potentially causing damages and potential production disruption 	<ol style="list-style-type: none"> 1. Monitor the bushfires 2. Develop an emergency plan for if the bushfire intensity increases 3. Provide funding to municipalities and government for firefighting equipment and personnel 4. Install firefighting equipment at the facility
<ul style="list-style-type: none"> Lack of water impacting production 	<ol style="list-style-type: none"> 1. Monitor water stress 2. Develop a water reduction strategy that (reduced) production can take place when water shortage is pressing 3. Increase the volume of the water storage
Water Related	
W2- Water shortage leading to unsafe situations	<ol style="list-style-type: none"> 1. Make two distinct water storages: one for firewater, the other for services 2. Increase the water storage for firewater 3. Investigate what the necessary amount of water in case of fires would need to be.

Management Plan for **Transition Risks** to be implemented 2020 onward



Risk Code & Description	Mitigation/Adaptation/Resilience Plan
L1- Future costs of climate litigation in court of country of question	1. Monitor the development of climate litigation in operating countries. In addition, preemptively monitor the development of legal standing in other jurisdiction, i.e. the likelihood of being brought to court e.g. in the US (which has currently not occurred)
M1- Stranded asset risk (forgone revenue from assets due to no longer being in use)	1. Reduce emissions through adoption of an Internal Carbon Price. The revenue from the internal carbon price should be used to implement further emission reduction projects within PTTEP.
R1- Risk of reputational damage from climate litigation	1. Maintain a high ESG performance and continuously monitors media sentiment as it will continue to evolve under the framework of the Paris Agreement and domestic policies, which in turn co-determine financial impact.
R2- Risk of reputational damage from major industry accident	
R3- Risk of reputational damage from minor industry accident	
R4- Risk of reputational damage from large civil action	
R5- Risk of reputational damage from governance scandal	

Management Plan for **Transition Risks** to be implemented 2026 onward



Risk Code & Description	Mitigation/Adaptation/Resilience Plan
P1- Emergence of carbon pricing regulations (increased pricing of GHG emissions)	1. The revenue from the internal carbon price should be used to implement further emission reduction projects within PTTEP.
P2- Enhanced emissions reporting obligations	1. Further alignment with sustainability reporting initiatives will allow PTTEP to stay ahead of mandatory reporting requirements and manage sustainability branding. It is assumed that consistent engagement with sustainability reporting initiatives will reduce the likelihood and impact by one level since governmental reporting obligations are unlikely to be more stringent than what is already disclosed under the auspices of existing reporting initiatives.
P3- Mandates on and regulation of existing products and services	1. Monitor announced mandates and upcoming regulations

Management Plan for **Transition Risks** to be implemented 2036 onward



Risk Code & Description	Mitigation/Adaptation/Resilience Plan
T1- Risk of renewable and energy efficiency technologies reducing PTTEP's products demand	1. Dedicate ■ percentage of PTTEP's revenue to invest in technology opportunities.
T2- Risk of low-carbon transportation reducing PTTEP's products demand	