STRATEGY

Climate-related Risks and Opportunities

TelkomGroup not only provides services across all regions of Indonesia but also extends its presence globally. Therefore, it is important for TelkomGroup to ensure readiness for strategies and operational sustainability amidst climate challenges. As part of efforts to enhance TelkomGroup's resilience through climate risk management, we proactively identifies, assesses, and manages climate-related risks and opportunities that may impact the business.

Telkom has identified climate-related risks and opportunities that potentially impact TelkomGroup in the short term (next 5 years), medium term (5-15 years), and long term (more than 15 years). This timeframe aligns with the lifespan of TelkomGroup's equipment and infrastructure, also considers that the climate change may have significant impacts in the medium and long term. The identified climate-related risks and opportunities are then grouped into two categories: physical and transition.

List of Climate-related Risks and Opportunities

Risk [R]/ Opportunity [O]

Climate Risks and Opportunities	
Physical	
Acute Due to extreme weather	• Extreme rainfall/flood [R] • Cyclone [R] • Wildfire [R] • Heatwave [R]
Chronic Due to long-term changes in climate patterns	• Temperature rise [R] • Increase rainfall [R] • Rising sea levels [R] • Water stress (due to drought) [R]
Transition	
Policy and legal Due to regulatory changes for emission reduction	• Carbon price increase [R/O] • Changes in energy costs due to energy regulation [R]
Technology Due to technology adoption and innovation that supports emissions reductions	• Renewable energy [O] • Low-carbon/green ICT technology [O]
Market Due to changes in market prices and demand for high-emission commodities, low-carbon services, and products	• Changes in the price of raw materials [R/O] • Changes in consumer preferences [R/O]
Reputation Due to shifts in stakeholders' perceptions and expectations regarding climate action	• Reputation impact in accordance with stakeholder expectations fulfillment [R/O]

To better understand how these risks and opportunities can evolve and affect the Company, Telkom selected several risks and opportunities to be further analyzed in the climate scenario analysis for the 2023 reporting period. This considers the relevance of issues with current policy conditions that have or could potentially impact Telkom's business, as well as the availability of data and readiness of internal processes to accommodate the analysis.

Physical	
Increased Intensity and Frequency of Extreme Rainfall causing Flood	
Timeframe	Short to long term
Potentially affected areas	Operational Damage to network assets and infrastructure, operational disruptions, including power grid outages and vendor delays, decreased employee productivity due to transportation disruptions or access issues during floods, and threats to field employees' safety. Rain can also cause a decline in service quality that affects customer satisfaction levels. Financial • Increased operational costs due to asset and infrastructure repairs, rising insurance premiums, and other operational losses. • Increased capital or investment costs for asset and infrastructure replacement.
Initiatives to respond to risks/ opportunities	Flood vulnerability factors have been considered in the installation of network infrastructure and the construction of new buildings. Several infrastructures have been upgraded to enhance resilience against floods, such as elevating buildings. Telkom conducts routine flood risk assessments every year as a precautionary and flood risk mitigation measure, especially for critical assets like Sentral Telepon Otomat (STO) networks and outdoor equipment. Telkom has established Business Continuity Management procedures and disaster management guidelines, which include flood management, as well as a Crisis Management Team. Additionally, Telkom has established flood incident documentation procedures that include the financial impacts to facilitate the monitoring process.
Rising Temperatures can Result in Asset Damage, Infrastructure Issues, and Reduced Productivity among Field Workers.	
Timeframe	Medium to long term
Potentially affected areas	Operational Increased energy demand for cooling (AC), equipment damage, and decreased efficiency due to overheating. High energy demand can also lead to energy shortages when the power grid is overloaded. Extreme heat temperatures also pose a risk of heat stress for employees, which can impact productivity. Financial • Increased energy costs for cooling and operational costs for asset repairs. • Increased capital costs for asset replacement.
Initiatives to respond to risks/ opportunities	Finance & Asset Operation (FAO) unit is responsible for ensuring that building conditions have optimal cooling to mitigate the risk of overheating and damage due to high temperatures on equipment.

Transition	
Increased Carbon Prices Driven by Increasingly Stringent Carbon Tax Regulations to Support Decarbonization	
Timeframe	Medium to long term
Potentially affected areas	Operational Potential imposition of carbon taxes from GHG emissions, but also opportunities to earn carbon credits from carbon offset efforts. Carbon pricing regulations also drive decarbonization efforts, including through the use of low-carbon technologies and energy savings in products and services. Financial • Increased operational costs from direct carbon taxes or rising material prices (embodied carbon price), revenue from carbon credits, cost savings from energy-efficient technologies and automation. • Increased capital costs for technology investments.
Initiatives to respond to risks/ opportunities	Telkom has set initiatives to reduce GHG emissions that can lower carbon tax risk exposure in the medium term, while preparing to optimize opportunities in the carbon market. The carbon offset program, as part of TelkomGroup's ESG strategy, is realized through reforestation and conservation efforts, the utilization of renewable energy, as well as energy efficiency measures.
Utilization of Renewable Energy to Reduce Emissions and Optimize Operational Costs	
Timeframe	Medium to long term
Potentially affected areas	Operational Innovation and development in renewable energy provide various technology options at competitive prices. Renewable energy also serves as an alternative off-grid energy source (such as solar panels, solar fuel cells, etc.), especially for network provision in hard-to-reach areas. Financial • Increased operational costs for maintenance and installation of renewable energy, as well as energy cost savings. • Increased capital costs or investments in research and development (R&D) and installation of renewable energy
Initiatives to respond to risks/ opportunities	Installation of renewable energy has been conducted to support the emission reduction targets set in TelkomGroup's ESG strategy. For example, green base transceiver stations (BTS) utilize solar panels and solar fuel cells. Alternative energy source innovation is one of the focuses of the Telkom Data Ekosistem in supporting green data centers
Increased Energy and Electricity Costs Due to Supply Chain Energy Tariff Hikes	
Timeframe	Medium to long term
Potentially affected areas	Financial Increase/decrease in operational costs due to changes in energy costs and electricity tariffs driven by the adoption of renewable energy or fuel price volatility due to energy transition agendas.
Initiatives to respond to risks/ opportunities	Telkom has set targets and energy efficiency programs through the Gerakan Peduli Efisiensi Energi (GePEE) implemented in all office buildings and Plasas, as well as energy efficiency efforts supporting green data centers. This initiative can also reduce exposure to risks associated with changes in energy and electricity costs

Transition	
Reputational Impact Based on the Success or Failure to Meet Stakeholders' Expectations Regarding the Company's Climate Actions	
Timeframe	Medium to long term
Potentially affected areas	Operational Enhanced company image and employee retention due to climate performance meeting the expectations of the public, investors, and other stakeholders concerned about climate issues – including resilience to climate-related disasters. Conversely, the inability to demonstrate a realistic and credible climate strategy can lead to stakeholder dissatisfaction resulting in negative media coverage. Financial • Increase/decrease in service usage, increased labor costs as employees prefer businesses with superior sustainability targets. • Opportunities to access funding, including innovative financing that uses climate performance as an assessment factor. Limitations in capital access or increased capital costs due to the inability to demonstrate good climate performance.
Initiatives to respond to risks/ opportunities	Communicating initiatives and ESG performance to stakeholders periodically and collaborating with ESG rating agencies helps Telkom improve the quality of ESG reporting, specifically climate reporting.

Climate-related risks and opportunities can have financial implications such as:

- Increased budget allocation for climate resilience and decarbonization efforts – such as R&D and renewable energy installations.
- Adjustment of insurance costs due to the addition of physical climate risk profiles to TelkomGroup's asset risk profile.
- Monitoring losses caused by climate, especially those not currently identified such as temperature rises.
- Changes in asset values, depreciation, and asset life estimates influenced by climate change – physical or transition.

Telkom will conduct further analysis to identify financial implications of climate-related risks and opportunities and explore how these implications are translated into financial reporting and accounting treatment.

Climate Scenario Analysis

Telkom conducts climate scenario analysis to understand the potential risks and opportunities in the future influenced by the impacts of climate change and climate actions at varying degrees. This analysis encompasses both physical and transition risks.

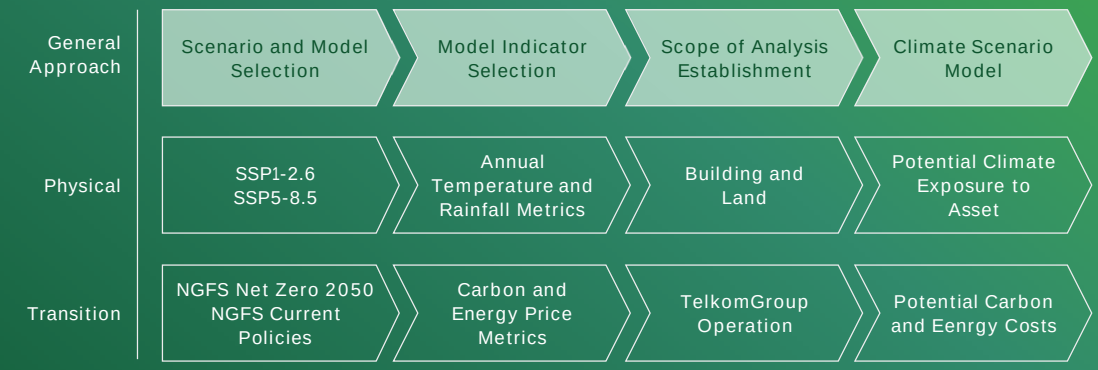
Physical climate scenario analysis provides estimates of the likelihood of climate events (such as rainfall and temperature increases) and climate change trends. Meanwhile, transition scenario modeling offers an overview of regulatory trends and market changes based on decarbonization ambition levels.

This process assists Telkom to manage climate-related risks with a deeper understanding and more comprehensive approach.

In this analysis, Telkom utilizes scenario models developed by reputable global institutions and openly accessible. These models enable users to compare how different organizations manage climate risks. The scenarios are condensed into three narratives, reflecting various temperature increase rates and decarbonization ambitions. Further explanations regarding the assumptions and methodologies of the climate model are provided in Appendix 1.

Our Methodology

Approach on the Climate Scenario Analysis



SSP = Shared Socio-economic Pathways

NGFS = Network of Central Banks and Supervisors for Greening the Financial System (NGFS)

Climate Scenario

1.5°C Aggressive Climate Action	2°C Existing Policies and Targets	4°C Limited Climate Action
Aggressive emission reduction towards Net Zero before 2050, characterized by more stringent policy measures and technological innovations.	Moderate climate ambition leads to slow emission reduction. Emissions are curbed by current policies and commitments, such as Nationally Determined Contributions (NDC).	The baseline indicates how global emissions would evolve if governments and markets did not enact any policy or investment changes to support low-carbon development.
1.5 to 1.7°C **Domination of transition risks and opportunities**	2 to 3°C Insufficient decarbonization	Greater than 4°C Domination of physical risk
Physical: SSP1-2.6 **Transition:** NGFS Net Zero 2050	Transition: NGFS Current Policies	Physical: SSP5-8.5

Physical Risk Analysis

Telkom use Shared Socio-economic Pathways (SSP) scenario which describes the future pattern of global socio-economic development in the context of various challenges related to mitigating and adapting to climate change. These scenarios complement the Representative Forcing Pathways (RCP) scenarios, which project greenhouse gas emissions and temperature rise. Telkom utilizes the SSP1 - Sustainable Development (SSP1-2.6) and SSP5 - Fossil-fueled Development (SSP5-8.5) scenarios to assess the climate change outcomes under different scenarios: one where the global community achieves the targets set in the Paris Agreement, and another where climate action is limited.

An initial analysis was conducted on 795,858 assets located across Indonesia, with a concentration of assets in Java, Sumatra, and Sulawesi – indicating areas of physical risk concentration. These assets include terrestrial and satellite transmission facilities (including aerial and underground cables, and fiber optic networks), communication network devices, buildings, and land.

Climate modeling compares historical climate models (1995-2014) with projections for 2030 (average for 2020-2039) and 2050 (2040-2059).

Assessed Physical Hazards and Climate Metrics

Extreme rainfall and flood

The changes in the intensity and frequency of extreme rainfall, which serve as proxies for floods, and the long-term trends in annual rainfall patterns.

- Intensity of extreme rainfall: rainfall on the wettest day of the year.
- Frequency of extreme rainfall: number of days in a year with a rainfall > 20mm.

Temperature rise

The changes of long-term trend for annual average temperature

- Average temperature: annual average temperature

Climate scenario narration based on SSP[1]

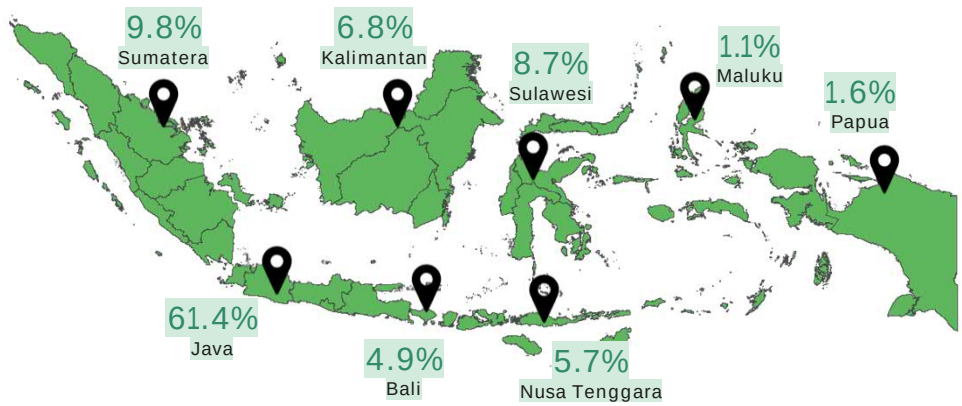
Physical climate scenario	Scenario narration	Economic growth	Technology development	Energy system
SSP1-2.6 Temperature rises by 1.5°C	Low barriers to climate mitigation and adaptation, as the world transitions toward sustainable development is gradual, but widely adopted and supported by global collaboration since 2020.	Emphasis on the concept of wellbeing beyond the narrow understanding of economic growth	Technology development which supports decarbonization acceleration	Increase in adoption of renewable and environmentally - friendly energy
SSP5-8.5 Temperature rises by +4°C	Low barriers to adaptation, but significant barriers to mitigation, as the world adopts lifestyles involving intensive resource and energy use due to low environmental awareness. Global collaboration towards a new transition is taking place in the 2020-2040 range.	Highest economic growth driven by production and consumption rates	Technology development focused on fossil fuel-based energy	Increase of energy demand and GHG emission

[1]Riahi, K. et al., 2017: The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview. Global Environmental Change. Volume 42. Pages 153-168, ISSN 0959-3780. https://doi.org/10.1016/j.gloenvcha.2016.05.009

Potential Climate Exposure based on Asset Distribution

Number of assets distribution (figure in the map) compared to Indonesia's climate change trend based on SSP5-8.5

	Sumatera		Kalimantan		Sulawesi		Maluku	
	2030	2050	2030	2050	2030	2050	2030	2050
mm/day	29.3–46.0	30.6–47.8	25.1-40.2	26.4–43.7	27.2–48.5	28.1–49.7	22.8–77.9	24.2–77.0
day	5–35	6–36	3-39	3–43	5–30	5–31	2–41	2–41
°C	19.2–29.1	24.8–29.9	21.3–28.9	23.9–29.8	18.1–27.8	22.1–28.6	21.5–28.1	22.3–28.8



	Java		Bali		Nusa Tenggara		Papua	
	2030	2050	2030	2050	2030	2050	2030	2050
mm/day	32.5–50.5	33.5–51.9	43.5–49.7	46.0–51.9	34.6–60.1	36.7– 62.3	31.1–61.2	31.2–65.0
day	8–37	9–38	18–28	19–29	9–37	9–37	8–98	9–99
°C	20.5–28.9	25.2–29.7	23.3–27.7	24.0–28.4	21.5–27.5	22.9–28.3	13.8–29.7	16.0–30.5

Rainfall intensity Rainfall frequency Temperature rise

Minimum and maximum values of SSP5-8.5 for 2030/2050 which are averaged from provinces in each island.

SSP 1-2.6 and SSP5-8.5 produce diverse climate projections, particularly for 2050, as the effects of global warming are estimated to materialize in the long term. In general, SSP5-8.5 indicates increasingly intense climate conditions, including heavier and longer-lasting rainfall in 2050 across nearly all regions of Indonesia. Temperature rises are also expected to climb, potentially reaching up to 1.7°C by 2050.

This preliminary analysis focuses on average climate change trends per island. There are limitations to this initial analysis, given that detailed changes can only be understood through more detailed analysis. Therefore, Telkom conducts analyses at the asset level to determine potential risk exposure at specific asset locations. This specific analysis serves as a pilot conducted on the building and land asset group.

Pilot analysis for building and land

10,258 buildings

1,934 lands

A total of 12,192 buildings and lands were assessed to explore the potential risk exposure at the asset level.

Combining the projections of baseline condition changes for 2030 and 2050 with Telkom's asset data yields a model that indicates changes in extreme rainfall conditions and average temperatures at asset locations. These changes are categorized into five levels of exposure, with level five indicating the most significant changes that could occur according to the SSP5-8.5 (high emission) scenario in the long term.

Category of physical risks exposure

	1 Very low	2 Low	3 Medium	4 High	5 Very high
Rainfall on the wettest day of the year (mm)	<30	30-35	35-40	40-50	>50
Days in a year with rainfall > 20mm (day/year)	<5	5-10	10-20	20-30	>30
Annual average temperature (°C)	<25	25-27	27-28	28-29	>29
				Aggregated to produce risk exposure value	

In general, building and land locations are projected to experience annual average temperatures exceeding 28°C by 2050. Additionally, most regions of Indonesia are likely to experience heavy rainfall exceeding 40 mm/day in 2050 – exposing 45% of total buildings and land. The frequency of extreme rainfall may increase to more than 20 days in Sumatra, Kalimantan, Java, Sulawesi, and Papua by 2050.

The provinces with the most assets exposed to an increase in annual average temperatures exceeding 28°C by 2050 are East Java (1,005 assets), DKI Jakarta (962), and West Java (747). East Java has the highest number of assets at risk of extreme rainfall in 2050, with 1,325 assets potentially experiencing an increase in the intensity of extreme rainfall, while 911 assets may see an increase in the frequency of extreme rainfall.

41-45%
buildings and land exposed to rainfall intensity of more than 40mm/year

35-38%
buildings and land exposed to rainfall frequency of more than 20 days/year

51-65%
assets exposed to temperature more than 28°C

Current risk exposure values help Telkom identify areas of concern in the context of climate adaptation and future asset planning.

Estimating losses from climate hazards is something Telkom can explore in the future as further analysis to inform climate risk assessment processes. Telkom will enhance data management implementation to improve the quality of analysis and information for climate risk management.

Overview of exposure by province with the highest number of buildings and land

For assets exposed in categories 4 & 5 (refer to page 22) based on SSP1-2.6 and SSP5-8.5 for 2050 compared to the baseline (1995-2014). The range represents the minimum and maximum values from both scenarios; ± indicates values that are similar.

		Rainfall intensity (>40 mm/day)	Rainfall frequency (>20 days/year)	Temperature rise (>28°C)
West Java		5-6%	±5%	5-6%
		4.2 – 57.8	22 – 43	28.1 – 29.4
		40.1 – 57.4	21 – 43	28.0 – 29.8
East Java		9-11%	6-7%	±8%
		40.0 – 67.9	21 – 62	28.0 – 29.9
		40.0 – 67.4	21 – 63	28.0 – 30.3
Central Java		±7%	±6%	4-5%
		40.0 – 66.9	21 – 67	28.0 – 29.9
		40.1 – 67.6	21 – 68	28.0 – 30.1
DKI Jakarta		<1%	<1%	±8%
		±47.8	±48	28.3 – 29.3
		±50.1	±47	29.4 – 29.8
North Sumatera		±2%	±2%	3-4%
		40.0 – 60.0	21 – 60	28.0 – 29.6
		40.0 – 60.1	21 – 58	28.1 – 29.9

The percentage of assets exposed in categories level 4 & 5 out of the total 12,192 assets. SSP1-2.6 SSP5-8.5

Location of the Provinces and Overview of Historical Impact

Extreme rain and flooding

In early 2023, several extreme weather incidents affected a number of Telkom's areas, one of them is STO Sukaresmi, Sukabumi which caused damage to fiber optic poles and cables. Telkom's disaster anticipation and response strategy managed to minimize the impact of the incident. Responding to the potential of intensifying extreme weather risks, the exposure analysis helps Telkom identify areas of concern and provides a basis for further impact analysis to improve disaster mitigation capacity. Telkom's adaptation steps are further outlined in the Resilience Strategy.

Transition Risk Analysis

Telkom utilized the Network for Greening the Financial Systems (NGFS) scenarios, developed by the Potsdam Institute for Climate Impact Research and the International Institute for Applied System Analysis (IIASA), to analyze transition risks and opportunities. These scenarios examine how the economy and financial system might evolve in response to climate impacts, policy changes, technological advancements, and shifts in market preferences aimed at addressing climate change.

Telkom selected the NGFS Current Policies (CP) and NGFS Net Zero 2050 (NZ) scenarios to compare future climate policies. The CP scenario represents the continuation of current policies, while the NZ scenario envisions more stringent policies aimed at limiting the temperature increase to 1.5°C by 2050. This analysis covers the years 2030 and 2050.

The NGFS scenarios offer models with interconnected transition themes. For instance, policies that drive market changes and spur technological innovations. Telkom's approach involves analyzing each theme separately. For example, the market theme uses energy variables, while the analysis of policies and legal aspects focuses on carbon prices without linking the two. The policy and legal, technology, and market themes are analyzed both quantitatively and qualitatively, whereas the reputation theme is examined solely qualitatively. Transition variables and metrics from the NGFS are then combined with Telkom's energy consumption and GHG emission data (metrics available on page 25). More detailed methodology and assumptions can be found in Appendix 1.

Electricity and fuel oil are critical components supporting Telkom's operations, including network infrastructure, off-grid area transmission, backup power, and operational vehicles. Currently, Telkom relies on power plants that use non-renewable energy sources, exposing all our business units to transition risks related to energy consumption and GHG emissions.

Telkom is committed to enhancing climate action by improving energy efficiency and increasing the use of renewable energy sources as part of Company's efforts to mitigate transition risks and support sustainable services.

Climate scenario narration based on NGFS

Transition Climate Scenario	Scenario narration	Policy Response	Technology Development	CO_2 Removal Usage	Variation of Regional Policies
 NGFS Net Zero 2050 Temperature rising by 1.6°C	Dominant transition risks, driven by global efforts to limit global warming to 1.5°C through stricter climate policies and innovations to achieve global net zero CO_2 emissions by 2050.	Implemented immediately and gradually	Rapid technology changes	Moderate to high usage	Moderate variation
 NGFS Current Policies Temperature rising by 2.9°C	Lower transition risks. Continued enactment of current policies at the same level, which could lead to a future dominance of physical risks.	No policy changes	Slow technology development	Low usage	Low variation

[1]Network for Greening the Financial System, 2023: NGFS Scenarios for central banks and supervisors.

The analyzed transition variables and metrics

Policy and Legal

Changes in carbon prices set to achieve greenhouse gas emission reductions to a certain level, such as Net Zero.

- Total emission: The amount of emission generated in a year
- Carbon price: The cost to reduce 1 ton of carbon emission

Technology

Changes in capital expenditure for renewable energy.

- Renewable energy capital expenditure: The cost of renewable energy installment per kWh (for example: solar PV)

Market

Changes in energy production and consumption volumes, as well as energy prices, due to regulations and national agendas driving the transition towards renewable energy.

- Energy production and consumption: Estimates of energy needs and production from economic activities.
- Energy prices: The cost required to produce energy per kWh.

Reputation

Changes in stakeholder expectations (investors, the public, and customers) regarding climate risk management, emission profiles, and emission reduction commitments.

No metrics are projected based on climate scenarios. The analysis is conducted qualitatively, considering the perspectives of key stakeholders.

Policy and Legal

The implementation of carbon pricing policies is one of climate risk that impacts operational costs through carbon tax mechanisms that are started to be applied in Indonesia. The NGFS Current Policies (CP) and NGFS Net Zero 2050 (NZ) scenarios model carbon price growth representing ambitions to limit greenhouse gas emissions.

Telkom's Scope 1 and 2 greenhouse gas emissions are used to explore carbon costs based on prices from NGFS scenarios. The exposure value is estimated by assuming a 100% carbon price imposition on greenhouse gas emissions (without emission caps) and does not yet consider decarbonization initiatives. The implementation of carbon pricing in the analysis is assumed to commence from 2025.

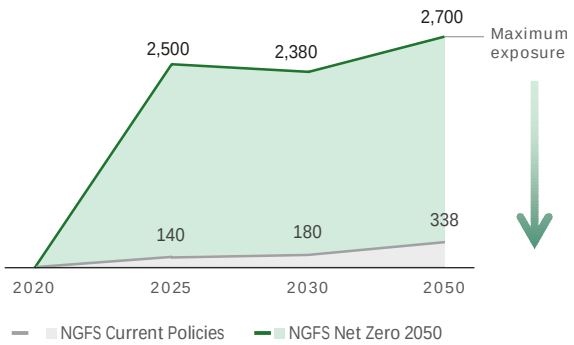
The global ambition to achieve the Paris Agreement is marked by the implementation of high carbon prices to limit emissions. According to NGFS NZ, carbon prices could rise by up to 750% by 2050, potentially exposing Telkom to carbon costs of around Rp 2.7 trillion in 2050.

NGFS CP models a lower growth in carbon prices, approximately 17% by 2050, indicating a low policy drive to reduce greenhouse gas emissions. This exposes Telkom to around Rp 338 billion in 2050.

These potential costs represent the exposure value that could be realized by various carbon pricing initiatives, such as carbon taxes. Although the telecommunications sector is not currently a target for the initial implementation of carbon taxes in Indonesia, this analysis helps Telkom anticipate the potential financial impacts of policies related to greenhouse gas emissions.

This analysis also helps Telkom to understand the internal carbon pricing context to help decision-making regarding business investments and emission reduction initiatives investments. The exposure value can be reduced through decarbonization efforts that currently being undertaken by Telkom, as further detailed in the Resilience Strategy.

Potential Carbon Cost Exposure Based on NGFS Current Policies and NGFS Net Zero 2050 Scenarios
(in billion IDR)



Telkom can reduce the potential risk of carbon costs through decarbonization efforts outlined in greenhouse gas emissions reduction target by up to 20% by 2030 and achieve Scope 1 and 2 Net Zero emissions by 2060.

Technology

Technology plays a pivotal role in achieving net zero emissions. The utilization of renewable energy, such as solar panels, has emerged as a significant trend in reducing greenhouse gas emissions from electricity use. In Telkom's decarbonization strategy, the deployment of solar panels and fuel cells stands as one of the key initiatives. Analysis indicates that these initiatives can be further optimized in the future with increasing global adoption and innovation in technology, potentially enhancing cost savings in solar panel investments.

The NGFS Net Zero 2050 (NZ) scenario indicates a decrease in solar panel investment costs per kilowatt, reaching a -8% CAGR from 2022 to 2030, and further declining to -2.4% from 2030 to 2050. Similarly, the NGFS Current Policies (CP) scenario shows a -6.5% rate from 2022 to 2030 and -2.4% from 2030 to 2050.

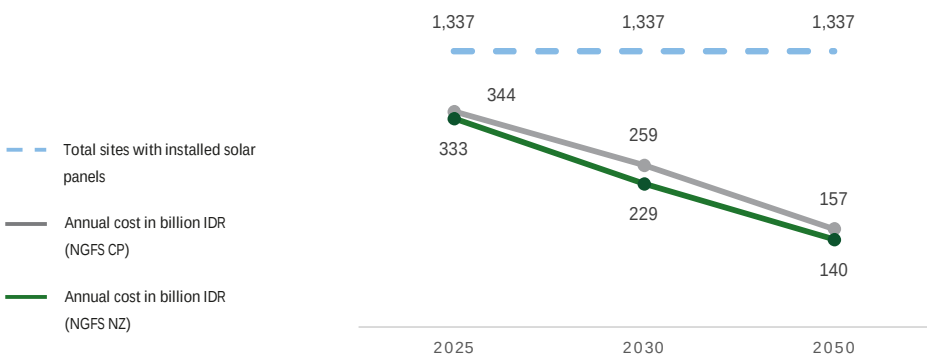
For a more detailed analysis, the pilot study examined the deployment of solar panels at Mitratel, the subsidiary with the most extensive solar panel installations in the group. The analysis is using the installed capacity of solar panels data in the year of 2023 across 623 sites as the baseline. The number of sites with installed solar panels is then projected evenly until 2050, reaching 100% installation at all Mitratel's location, amounting of 36,719 sites. Subsequently, the values are indexed to the NGFS trend, following the scenario of changes in solar panel costs in Indonesia as per the NGFS scenario.

Based on the aforementioned assumptions, the added solar panel installation reaches 1,337 sites every year. Investment costs needed to install the added solar panel in 2030 is around IDR 229 billion (NGFS NZ) – IDR 259 billion (NGFS CP). By 2050, the investment costs decrease to IDR 140 billion (NGFS NZ) – IDR 157 billion (NGFS CP).

One of the reasons for the lower investment costs in the aggressive scenario (NGFS NZ) is due to the extensive installation of solar panels, which drives down investment costs. This analysis is also conducted by global organizations such as the International Renewable Energy Agency (IRENA) and the International Energy Agency (IEA) and is part of the global energy scenarios.

Further, Telkom will use this simulation to optimize the use of solar panels as part of the emission reduction strategies at a group level.

The Potential Exposure to the Investment Costs of Solar Panels by Mitratel
Based on the NGFS Current Policies and NGFS Net Zero 2050 Scenarios



This model is developed using baseline data on solar panel capacity per site based on Mitratel's 2023 data across 623 sites.

Market

The energy transition agenda primarily impacts energy-intensive sectors, such as power generation, which can affect electricity prices. Telkom, relying on electricity and fuel oil (BBM) for its operational sustainability, may be exposed to the risk of these price changes.

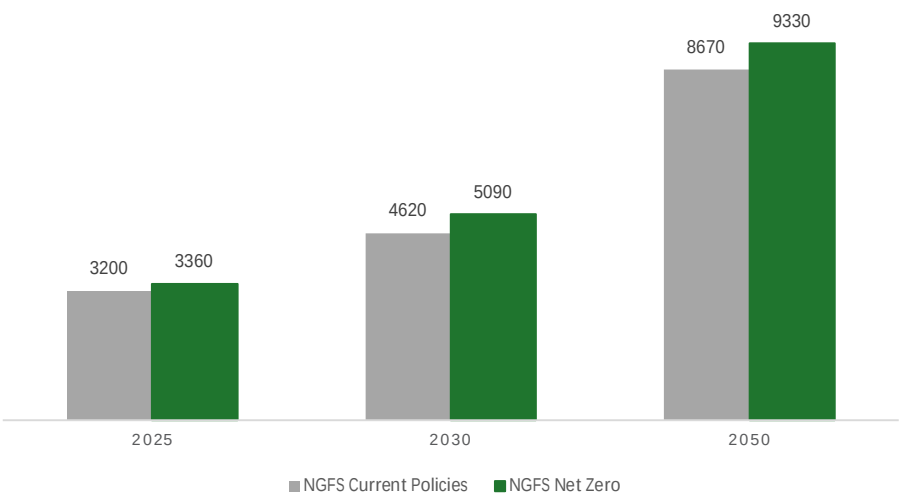
Under the NGFS Net Zero 2050 (NZ) scenario, the decrease in electricity prices reaches 16%, and the increase in fuel oil prices is up to 201% by 2050. Meanwhile, under the NGFS Current Policies (CP) scenario, there is a decrease in electricity prices by 9% and an increase in fuel oil prices by 55% by 2050.

Considering Telkom's energy consumption, energy costs (electricity and fuel oil) may experience a growth of around 4.4 - 4.5% CAGR from 2022 to 2050 based on the NGFS NZ scenario. Based on the NGFS CP scenario, energy costs may increase up to 4.1 - 4.2% CAGR from 2022 to 2050. The higher increase in fuel oil costs in the NGFS NZ scenario indicates a higher ambition for emission reduction through reducing and limiting fuel oil consumption and imposing carbon taxes on fuel oil.

The modeling results indicate the potential risk of increased operational costs due to rising energy prices. Telkom's initiatives to enhance energy efficiency across the company's operational activities can help mitigate this risk and result in operational cost savings.

The Potential Exposure to Annual Energy Costs based on the NGFS Current Policies and NGFS Net Zero 2050 scenarios

(in billion IDR)



Reputation

Telkom recognizes that meeting stakeholders' expectations on climate action can impact the Company's reputation, especially as there is increased demand from investors, financial institutions, insurers, and other stakeholders for climate-related financial information to support decision-making. Telkom's response to these stakeholders' expectations can ultimately affect the Company's financial condition.

Telkom assesses reputation risks and opportunities focusing on issues that concerned the key stakeholders, including ESG ratings agencies, domestic and foreign investors, and regulators. Generally, there is a growing trend in investment that considers climate performance, including setting targets and roadmaps for net-zero emissions, where climate disclosure serves as a source of information for assessing performance. Stakeholder concerns to climate issues may further increase due to the intensifying impacts of climate change in the future, driving the need for accelerated climate action and increased corporate resilience to address these issues.

Telkom sees this as an opportunity that can be optimized by setting a clear ESG target and strategy, including climate-related one, as a demonstration of commitment to stakeholders. Moreover, Telkom regularly communicates its ESG initiatives and performance to stakeholders to understand their aspirations, including those related to climate. Telkom's efforts to improve its ESG and climate performance also demonstrate its commitment to support sustainable State-Owned Enterprises (BUMN).

Key Stakeholder's Expectations

Rating Agency

An increasing number of global rating agencies that are now assessing climate performance with a range of issues, such as climate risk management to decarbonization targets and initiatives. This trend is driven by the need for investors to evaluate climate performance using standardized ratings.

Investor

Both international and domestic investors are increasingly concerned about the impact of climate on businesses. Moreover, support for decarbonization efforts is reflected in the increased investment in sustainable businesses and the adoption of renewable energy, such as the urge for data center operators to provide low-carbon services.

The Indonesia Stock Exchange (IDX) specifically developed the IDX ESG Leader index to accommodate investor demand for sustainable investments.

Regulator

Regulators are increasingly focusing on ESG performance, including climate issues. The United States Securities and Exchange Commission (US SEC) has finalized regulations mandating climate disclosures in early March 2024. More countries are mandating or in process for formalizing climate-related disclosures to respond to investor needs.

The Indonesian government is also increasing its efforts to promote corporate decarbonization, including through the establishment of the Carbon Exchange (IDXCarbon) and ESG performance assessments for State-Owned Enterprises (BUMN).

Telkom's Climate Resilience Strategies: Adaptation and Mitigation

Telkom is committed to providing business operations that are able to adapt to the dynamics of climate change. The results of the climate scenario analysis show the need for adaptation and mitigation steps for GHG emissions. Adaptation measures are directed to prepare the Company to face physical risks and accommodate stakeholder requests, including government policies. Mitigation actions help to actualize the Company's low-emission business.

The strategy related to improving Telkom's resilience is integrated into Telkom's ESG strategy 2024 – 2030, which is part of a sub-initiative of 10 corporate strategies, namely Link Up Group Strategic Planning & Implementation and Enhance Risk Management & Compliance.

Adaptation Action

Telkom is committed to improving the Company's climate resilience by proactively taking steps to reduce the physical impact of climate change from extreme weather events on assets such as buildings, data centers, network infrastructure, transmission, and other assets. Telkom ensures that preventive efforts, mitigation and disaster management are carried out properly in order to serve customer communication needs.

Telkom's flood anticipation and mitigation measures to ensure smooth service has been affected by physical climate hazards throughout 2023, especially due to extreme rain.

Flood

Affected locations:
13 STO locations, Plasa, Witel/Datel buildings in Sumatra, Java, Bali, Kalimantan, Sulawesi and Papua

Impact:
Office operational disruption

Heavy rain was identified as the main cause of river and drainage overflow, where for coastal locations these conditions are combined with high tides. 6 locations are in Kalimantan and 2 locations in Sulawesi. The flood height varied from 10 cm - 1.5 m.

Heavy rain and strong winds

Affected locations:
3 STO locations and Witel buildings and assets in Banten and Kendari

Impact:
Damage to roofs, poles and cables, and power outages from the grid

Heavy rain accompanied by strong winds caused trees to fall and collapse electricity poles which caused damage to Telkom's poles and cables. However, the network was not disrupted and was still active.

Landslide

Affected locations:
5 STO locations and Witel/Datel buildings in Java

Impact:
Damage to poles and cables, and power outages from the grid

Landslides caused by heavy rain buried assets and damaged Telkom poles and cables. This also caused area power outages for up to 18 hours.

Telkom has provided guidelines for flood disaster management and Business Continuity Management that apply to all levels of the Company's organization as well as a Crisis Management Team tasked with ensuring emergency responses are carried out, and also performing monitoring to prevent the impact of follow-up incidents.

Flood anticipation is carried out by providing flood management equipment and facilities such as flood pumps, especially for areas identified as flood-prone. This step has succeeded in minimizing the impact of floods that had occurred in Telkom locations where production equipment and network equipment were successfully secured and there were no casualties from the disaster.

When flood causes network power outages, the affected telecommunications networks can continue to operate with generator sets activated. The results of the climate scenario analysis assist the Company in preparing the organization, strengthening infrastructure, and emergency response measures to face the potential risk of extreme rain and flood events that may increase in the future.

Regarding the temperature increase, incidents caused by high temperatures have not been identified. The impact experienced by the Company was the increase in cooling costs when drought hit most parts of Indonesia in mid-2023 triggered by El Niño. As Telkom's effort to mitigate GHG emissions, energy efficiency initiatives also help the Company's adaptation to potential future temperature increases as projected by climate models.

Mitigation Action

In 2023, Telkom has undertaken several key initiatives to reduce greenhouse gas emissions as part of our climate transition risk mitigation strategy. These efforts are integral to our decarbonization strategy, aiming for a Net Zero target by 2060. Other climate initiatives can be found in the 2023 Telkom Indonesia Sustainability Report. The results of the climate scenario analysis will be used to bolster existing mitigation efforts, preparing us for the potentially accelerating transition towards a low-carbon economy.

Telkom's Program and Key Initiatives

Renewable Energy Utilization

Telkom has installed solar PV in 830 sites with a total capacity of 7,332.65 GJ. As for the fuel cells, they have been installed at 25 sites with a total capacity reaching 39.7 GJ. This step is part of the Company's efforts to increase the energy mix derived from renewable sources, in anticipation of carbon tax implementation.

Energy Efficiency

Telkom has performed various energy efficiency initiatives under the Energy Efficiency Movement (GePEE). Collectively, these initiatives has resulted in a reduction in the company's electricity costs. Telkom will enhance existing initiatives to improve the company's resilience to potential risks of future transitions.

Telkom's Program and Key Initiatives

Carbon offset opportunity

Telkom has implemented reforestation and conservation initiatives, as well as supported the installation of power plants that use renewable energy sources, as part of our climate risk mitigation strategy, aimed at both reducing our environmental impact and benefiting the community. These will be further optimized for carbon offset opportunities.

In 2023, Telkom has planted 45,500 mangrove trees across 45 hectares of land and conducted reef rehabilitation for 3,920 coral reefs at three locations. Additionally, Telkom has planted 62,150 trees. This initiative involves collaboration with 83 community groups, local residents living near conservation areas, nature enthusiasts, environmental organizations, and employee representatives.

Furthermore, the company also supports the installation of micro-hydro power plant for the community with a total capacity of 4.2 kWh and beneficiaries of to 23 households.

In the future, Telkom will incorporate the results of the carbon offset program into the company's greenhouse gas emission calculations, in accordance with applicable standards and regulations. Telkom will continue to optimize the carbon offset opportunities, including to pursue certification process.

Green data center

Telkom has undertaken energy and resource efficiency initiatives in the data centers by using innovative cooling technologies, employing artificial intelligence (AI) for energy management, and implementing green building designs. These steps not only boost energy efficiency but also reduce operational costs. This initiative reflects Telkom's commitment to create a green data center in response to stakeholder aspirations, especially those of investors and customers, aligning with the growing trend of energy transition.

Energy Efficiency Movement

In 2023, Telkom launched the Energy Efficiency Movement (GePEE) with the aim of increasing contribution and environmental awareness as well as reducing operational costs. This program entails research activities encompassing data collection on electricity consumption, analysis of electricity usage patterns, formulation of recommendations, and implementation of IoT systems to boost the company's energy efficiency.

This program combines energy-saving initiatives (such as turning off unused lights and AC), IoT utilization (such as smart office implementation), and renewable energy (such as solar panel usage). Through this program, the company successfully reduced electricity costs by IDR 25.7 billion (4.33%) in 2023 (yoy). The company plans to continue the GePEE program in 2024 and has prepared a roadmap for its implementation.