

# Sustainable Transformation Towards Excellence

2023 CLIMATE RISK  
REPORT



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# ABOUT THIS REPORT



The Climate Risk Report represents TelkomGroup's inaugural effort to communicate our initiatives in identifying and managing climate-related risks and opportunities throughout 2023. This report is structured into four key sections: governance, risk management, strategy, and climate-related metrics and targets, with reference to the International Financial Reporting Standards (IFRS) S2 which was built on the Task Force on Climate-related Financial Disclosure (TCFD) recommendations.

We recommend that readers review this report alongside the 2023 Telkom Indonesia Sustainability Report which outlines our commitments and approaches to manage sustainability issues that are significant to Telkom's operations.

## Forward-looking statement disclaimer

This report also contains Telkom's forward-looking statements, such as targets, expectations, estimates, or future projections. Although it has been carefully considered, Telkom is aware of the risk of uncertainty over these forward-looking views. Therefore, in line with the implementation of good governance, Telkom reminds the readers that there is no guarantee that this will fully meet the views.

The quantification of our greenhouse gas emissions, as presented in this report, is based on the National Greenhouse Gas Inventory by the Ministry of Environment and Forestry (KLHK), along with other relevant national guidelines. The calculations are based on assumptions and limitations outlined in Appendix 1.

Moreover, disparities in the methodologies utilized by third parties to calculate or report greenhouse gas emissions may preclude direct comparisons with the data presented in this report. Information related to greenhouse gas emissions, along with other climate data, will be refined as data accuracy improves.

Readers should interpret the forward-looking statements in this report with caution and are solely responsible for any actions taken in response to the information presented.

## Other information

All references to currency values are in Indonesian Rupiah (IDR), unless stated otherwise. "TelkomGroup" in this report refers to Telkom and its subsidiaries. However, the term "Telkom" in this report may refer to the context of Telkom in its business scope, not only as an organizational entity.

# INTRODUCTION

Climate change represents one of the most pressing global challenges of our time. The year 2023 was documented as the hottest on record since global temperature recordings began. Data trends from the past year indicate that the global average temperature has risen to 1.5°C. The global warming has contributed to an increase in the frequency and intensity of extreme weather events, which potentially impacting the Information and Communication Technology (ICT) industry as one of the largest consumers of electricity. As the demand for digital services continues to grow, it is important to monitor the growth in electricity consumption and its sources.

As a leading player in Indonesia's telecommunications industry, Telkom recognizes the growing significance of climate-related risks and opportunities that can impact our entire business spectrum. We have observed various disaster events, including floods, extreme rainfall, and high temperatures, affecting operations at several of Telkom's asset locations. In response, Telkom has undertaken several crucial initiatives in 2023.

Telkom has embarked on the process of identifying climate-related risks and opportunities, initiating pilot initiatives to conduct climate scenario analyses for two key categories of company assets—land and buildings—across Indonesia. This effort underpins TelkomGroup's commitment to enhancing climate risk and opportunity management.

Telkom is committed to enhancing our climate mitigation and adaptation actions, while also maximizing climate-related opportunities through our service and innovation, to deliver sustainable value for all our stakeholders.

Telkom also understands the importance of transparency regarding climate-related risks and opportunities in maintaining stakeholder trust. Given the increasing scrutiny on climate risk and its potential financial impacts, we have issued our inaugural Climate Risk Report for 2023. This report systematically outlines TelkomGroup's approach to identifying, assessing, and managing climate-related risks and opportunities.

Telkom envisions this report, which follows the IFRS S2 standard, as a key medium for our stakeholders to gain a deeper understanding of our climate governance practices and the potential impacts of climate change on the TelkomGroup's business. By disclosing our climate risks, we aim to foster meaningful discussions with stakeholders to enhance Telkom's resilience.

# TOWARD CLIMATE RESILIENCY

The Purpose of Telkom is to contribute to a prosperous and competitive nation while delivering the best value for stakeholders. We are committed to sustainable business practices by creating positive social and environmental impacts through innovative solutions and services. Telkom has developed a sustainability strategy that includes an environmental pillar with a focus on climate change.

Telkom has set climate mitigation targets aligned with the Indonesian government's commitment to achieve Net Zero by 2060. To support this target, Telkom has established a roadmap for emission reduction as a reference to reach Net Zero. Furthermore, these targets will be cascaded down to our subsidiaries, considering the alignment with their respective business operations.

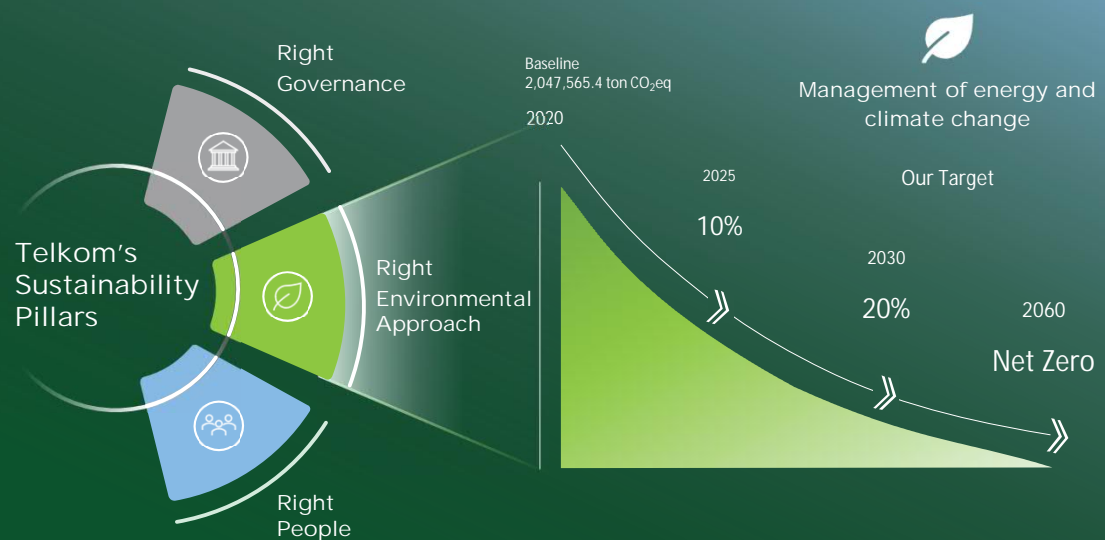
To support our climate mitigation targets, Telkom has implemented various decarbonization initiatives, including the utilization of renewable energy, energy efficiency measures, the development of green data centers through

efficient energy management, as well as reforestation and conservation efforts that potentially serve as carbon offsets.

These emission reduction initiatives are not only implemented by Telkom but also involve our subsidiaries. Detailed information about the implementation of these initiatives can be found in 2023 Telkom Indonesia Sustainability Report.

Telkom is committed to strengthening its climate change strategy, focusing on managing risks and optimizing climate opportunities to ensure a resilient business and sustainable value creation.

## Telkom's Sustainability Strategy



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# GOVERNANCE

## Role of the Board of Directors

In general, Board of Directors hold full responsibility for the entire company's operations. The member of Director who specifically responsible for sustainability (ESG) matters, including climate change topic within the environmental aspect, is the Director of Finance and Risk Management.

The Board of Commissioners currently does not yet have specific duties and responsibilities related to climate risk management. However, the Risk Evaluation Planning Monitoring Committee which comprised of the Board of Commissioners and independent members have the responsibility to monitor the implementation of comprehensive company risk management.

Telkom has included climate risks – such as flooding – as operational disruption risks in the company's risk profile. The committee and management receive updates on this risk profile every three months.

Furthermore, Telkom also determines the training and competency development needs based on the skills required to implement the risk mitigation strategies identified in the risk profile.

Currently, Telkom has several Key Performance Indicators (KPIs) for the collegial director related to ESG which derived from Shareholders' Aspirations, but it does not yet include the environmental pillar, specifically climate programs. In the future, Telkom is considering developing this aspect in line with evolving dynamics.

### Director of Finance and Risk Management

Serves as responsible parties for the formulation of directional strategy, portfolio strategy, and parenting strategy for ESG aspects, including climate management programs. Furthermore, the Director of Finance and Risk Management also report the implementation of these programs to the Board of Directors and Commissioners



# Role of Management

Telkom underwent organizational restructuring in 2023, where the management of sustainability, including climate aspects, falls under the Director of Finance and Risk Management, within the Risk Management and Sustainability Department. This restructuring is stipulated in Board Regulation No. PD.202.47/r.08/HK200/COP-A2000000/2023 regarding the Director of Finance and Risk Management Organization.

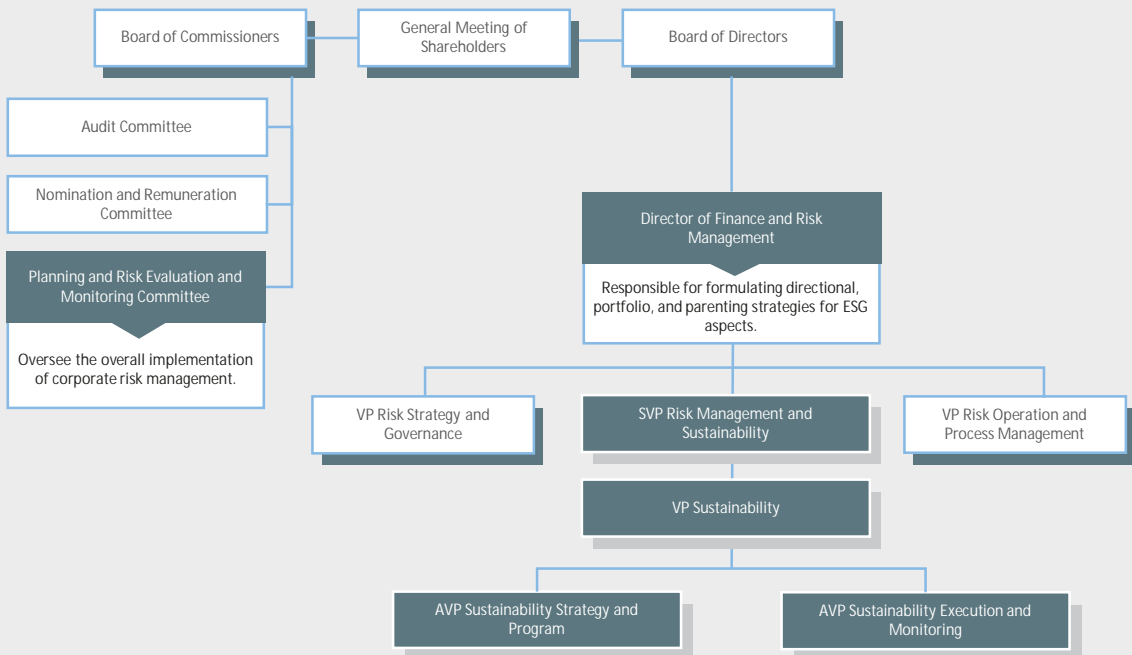
The monitoring and management process of climate-related risks and opportunities are coordinated by the Sustainability subdepartment. The subdepartment then collaborates with other relevant units within TelkomGroup, such as corporate risk management manager, climate-related programs owner, as well as units responsible for designing performance monitoring dashboards for program execution and disclosure. Telkom has also established a specific task forces to support the company's readiness in implementing disclosure according to both IFRS sustainability (S1) and climate (S2).

## Sustainability Subdepartment

Telkom has established a new subdepartment, Sustainability Subdepartment, which responsible for the management of governance, strategy, and implementation of sustainability – including climate aspects – and acts as the orchestrator of sustainability implementation governance within the TelkomGroup.

Telkom plans to merge the Social and Environmental Responsibility Committee (TJSL), which is currently responsible for TJSL initiatives, into the Sustainability Committee, which will then coordinate the implementation of ESG programs, including climate actions. Further information on this matter can be referred to [2023 Telkom Indonesia Sustainability Report](#).

Telkom's Sustainability Governance Structure





## Capacity Building on Climate Change

Telkom continuously strives to enhance and develop the competencies of personnel, including the Board of Commissioners, Board of Directors, and employees, through various certifications, trainings, and webinars related to ESG, including climate-related topics.

Directorate of Finance and Risk Management specifically organize webinars on sustainability and climate disclosure standards to enhance internal awareness and capacity in managing climate-related risks and opportunities. Other capacity-building topics include ESG governance, energy and environmental management, risk management, as well as Health, Safety, and Environment (HSE) management.

Every year, Telkom business unit develop a People Development Plan (PDP) which contains a list of training/certifications needs. From this PDP, Telkom has

also planned specific climate-related training aimed to provide basic knowledge and understanding of climate change in general, its associated risks, and increasing climate awareness, targeted at senior to middle management levels.

The demand for training related to ESG and climate change from business units has also increased. This has prompted Telkom to consider developing of specialized curricula related to ESG, including climate-related aspects, internally.



Telkom ESG Day serves as a platform to announce Telkom's ESG commitments to the public. It includes a session aimed at enhancing understanding of ESG, focusing on integrating ESG issues such as climate change into the company's risk management.

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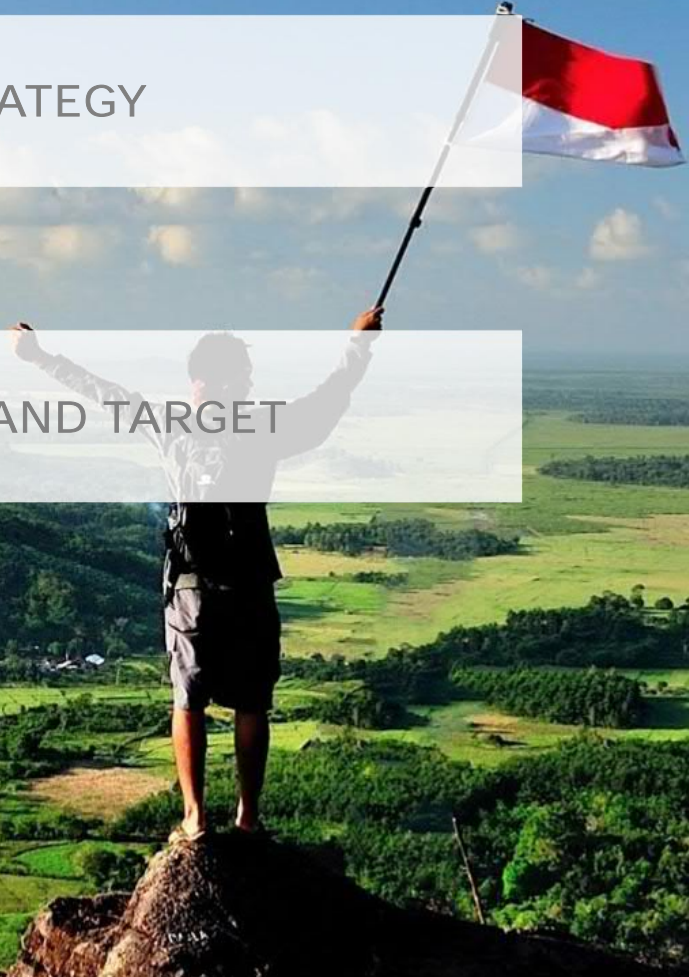
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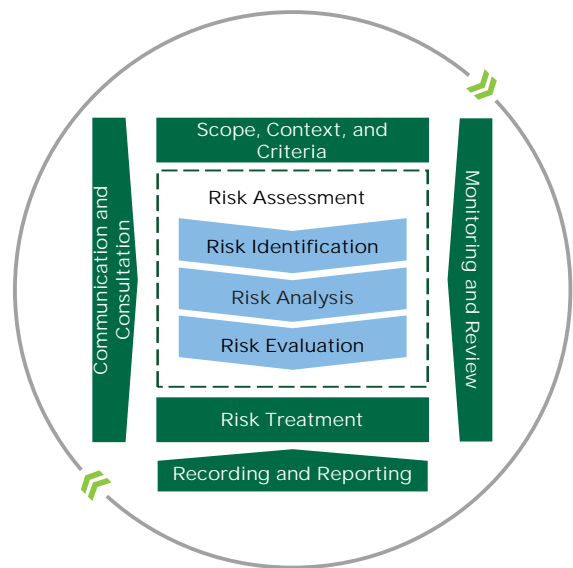
# RISK MANAGEMENT

## Enterprise Risk Management Framework

The risk management approach within the Telkom Enterprise Risk Management includes general enterprise risks, also ESG and climate risks. The risk management process is aligned with national regulations and adheres to the ISO 31000:2018 Risk Management - Principles and Guidelines.

Telkom has established Group-level Risk Management Implementation Guidelines that govern the principles, framework, and processes of risk management, as detailed in the 2023 Telkom Indonesia Annual Report. This serves as the foundation for Telkom to develop and implement climate-related risk and opportunity management processes.

Telkom's Risk Management Process



## Risk Assessment: Identification, Analysis, and Evaluation of Climate-related Risks

In the 2023 risk profile, flooding has been identified as a key driver of an operational risk related to disruptions in infrastructure and IT systems. Telkom initiated an in-depth identification of climate-related risks and opportunities at the group level in 2023. This process considers both internal and external factors of the Company that impact climate-related risks and opportunities.

### Factors in the Risk Identification Process

#### Internal

- Company's operational activities

#### External

- Climate trend, such as temperature and sea-level rise, and extreme weather.
- Industry trends, such as climate management practices by peer companies, technology, and market forecast.
- National regulation and global standard, such as emission reduction target and carbon price.
- Aspiration of stakeholder groups, such customer's preference changes, investor, and ESG rating agencies.

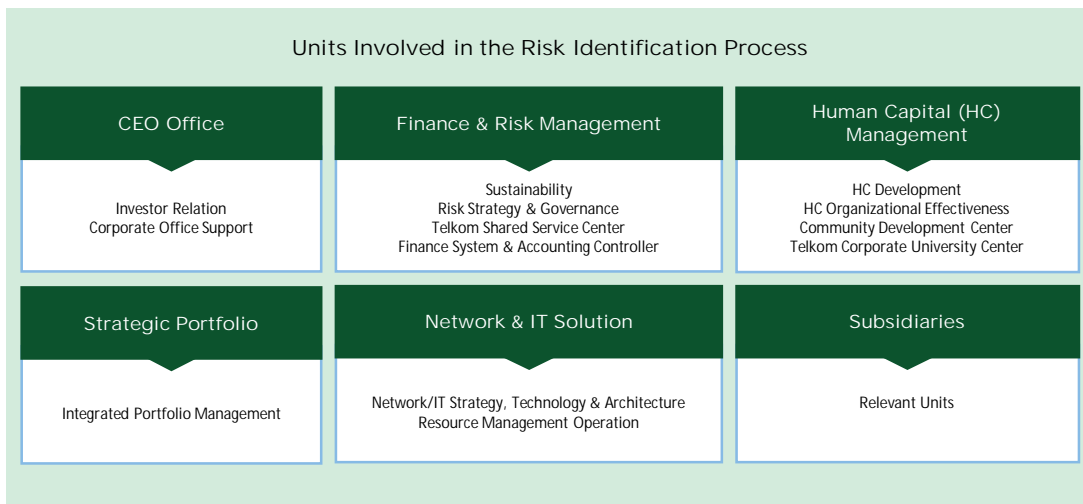


Telkom combined both top-down and bottom-up approaches in undertaking the climate-related risks and opportunities identification process, namely through document review and workshop involving cross-departments in Telkom.

The results of the risk and opportunity identification are then categorized into categories of physical and transition risks or opportunities. The initial analysis involves using climate scenario analysis methods to delve deeper into priority risks. The climate scenario analysis process is further detailed in the Strategy section. This entire process is coordinated by the sub-department of Sustainability.

Additionally, a risk monitoring process is implemented to monitor the development of risk levels and the progress of mitigation efforts. This process also aims to assess the potential emergence of new risks. The outcomes of the risk monitoring primarily contribute to improving the effectiveness of risk management.

Telkom is working to formalize an approach for each business unit to identify, assess, and monitor climate-related risks within our risk universe. This includes determining risk management plans, integrating them into our annual business planning and budgeting processes. Telkom already has procedures for disaster-related risks that can serve as a foundation for developing climate risk management processes, such as broadening our perspective on infrastructure damage from wildfires and floods.



## Climate Risk Management

Telkom implements risk treatments to reduce the impact of risks, which may involve accepting, avoiding, mitigating, or transferring them. These risk treatment plans are integrated into the Company's management plan and processes following consultation with relevant stakeholders. Details regarding strategies for addressing climate-related risks and opportunities are presented in the Strategy section.

Telkom has established a Business Continuity Plan (BCP) that governs the handling of high-risk natural disasters such as flash floods, droughts, and extreme weather events, using Business Impact Analysis to Disaster Recovery. The BCP serves as a guide for strategy, planning, and testing of potential disaster risks

In terms of Occupational Health and Safety (OHS), we have implemented an integrated Occupational Health and Safety Management System (OHSMS) aligned with the Company's Management System. The implementation of the OHSMS is governed by Board Decision No. 37 of 2010 on the Company's Security and Safety Management Policy dated October 26, 2010, and the Collective Labour Agreement VIII article 51 which specifies that, "Telkom is required to conduct a work safety and health program in accordance with prevailing regulations". This serves as the foundation for Telkom to identify and manage climate-related risks associated with OHS aspects, in alignment with our commitment in the OHS Policy to ensure a safe, comfortable, and conducive work environment.

We acknowledge that managing climate-related risks entails broader policies, including energy, asset, and technology management. Therefore, Telkom is actively working to ensure that identified and assessed climate-related risks are managed with appropriate and integrated systems. This is pivotal in enhancing the resilience of company assets against physical risks and mitigating the impacts of transitioning to a low-carbon economy.

The initial synchronization of Telkom's climate risk management will evolve from existing processes within the company, such as BCP and OHSMS. This specifically includes classifying aspects related to climate risks, such as through risk tagging, and enriching the risk universe to incorporate steps for addressing the risks. These steps consider climate scenario analysis as an input for risk analysis and evaluation. For instance, establishment of alternative risk treatments based on changes in likelihood and impact due to climate change.

## Integration of Climate Risks into Enterprise Risk Management

As a next step, Telkom will reassess, enhance, and drive the integration of climate-related risks into the company's overall risk management process. This includes incorporating climate-related risks into monitoring, documentation, and reporting processes, as well as communicating and consulting on these risks with relevant stakeholders. We recognize the dynamic nature of climate-related risks, particularly due to evolving regulations, which require thorough management.

Telkom is committed to continuously improving its climate risk management processes in accordance with evolving regulations and standards.

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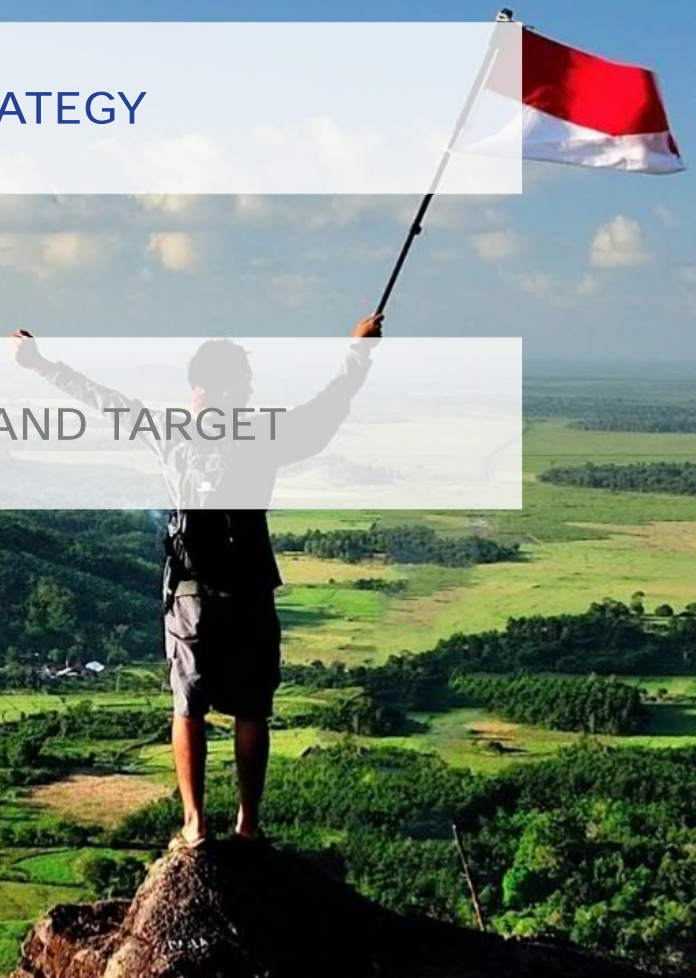
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# STRATEGY







## 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   |   |
|  <p><b>Acute</b><br/>Due to extreme weather</p>  | <ul style="list-style-type: none"> <li>• Extreme rainfall/flood [R]</li> <li>• Cyclone [R]</li> <li>• Wildfire [R]</li> <li>• Heatwave [R]</li> </ul>                                   |
|  <p><b>Chronic</b><br/>Due to long-term changes in climate patterns</p>   | <ul style="list-style-type: none"> <li>• Temperature rise [R]</li> <li>• Increase rainfall [R]</li> <li>• Rising sea levels [R]</li> <li>• Water stress (due to drought) [R]</li> </ul> |
| Transition   |   |
|  <p><b>Policy and legal</b><br/>Due to regulatory changes for emission reduction</p>  | <ul style="list-style-type: none"> <li>• Carbon price increase [R/O]</li> <li>• Changes in energy costs due to energy regulation [R]</li> </ul>   |
|  <p><b>Technology</b><br/>Due to technology adoption and innovation that supports emissions reductions</p>                            | <ul style="list-style-type: none"> <li>• Renewable energy [O]</li> <li>• Low-carbon/green ICT technology [O]</li> </ul>   |
|  <p><b>Market</b><br/>Due to changes in market prices and demand for high-emission commodities, low-carbon services, and products</p> | <ul style="list-style-type: none"> <li>• Changes in the price of raw materials [R/O]</li> <li>• Changes in consumer preferences [R/O]</li> </ul>  |
|  <p><b>Reputation</b><br/>Due to shifts in stakeholders' perceptions and expectations regarding climate action</p>                    | <ul style="list-style-type: none"> <li>• Reputation impact in accordance with stakeholder expectations fulfillment [R/O]</li> </ul>   |

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   | <p><b>Operational</b><br/>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.</p> <p><b>Financial</b></p> <ul style="list-style-type: none"> <li>• Increased operational costs due to asset and infrastructure repairs, rising insurance premiums, and other operational losses.</li> <li>• Increased capital or investment costs for asset and infrastructure replacement.</li> </ul>   |
| 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   | <p><b>Operational</b><br/>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.</p> <p><b>Financial</b></p> <ul style="list-style-type: none"> <li>• Increased energy costs for cooling and operational costs for asset repairs.</li> <li>• Increased capital costs for asset replacement.</li> </ul>   |
| 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   | <p>Operational</p> <p>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.</p> <p>Financial</p> <ul style="list-style-type: none"> <li>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.</li> <li>Increased capital costs for technology investments.</li> </ul> |
| 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   | <p>Operational</p> <p>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.</p> <p>Financial</p> <ul style="list-style-type: none"> <li>Increased operational costs for maintenance and installation of renewable energy, as well as energy cost savings.</li> <li>Increased capital costs or investments in research and development (R&amp;D) and installation of renewable energy</li> </ul>                                  |
| 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   | <p>Financial</p> <p>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.</p>  |
| 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  |  |
|---|--|
|  <b>Reputational Impact Based on the Success or Failure to Meet Stakeholders' Expectations Regarding the Company's Climate Actions</b> |  |
| Timeframe   | Medium to long term  |
| Potentially affected areas  | <p><b>Operational</b></p> <p>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.</p> <p><b>Financial</b></p> <ul style="list-style-type: none"> <li>• Increase/decrease in service usage, increased labor costs as employees prefer businesses with superior sustainability targets.</li> <li>• 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.</li> </ul> |
| 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.

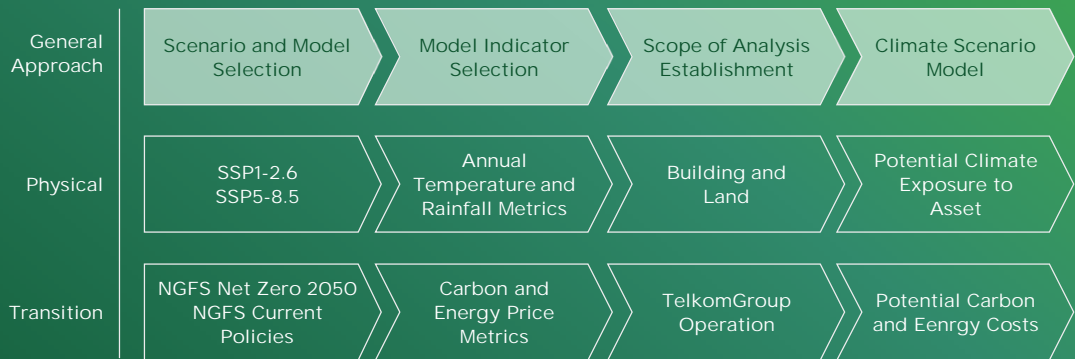
Physical climate scenario analysis provides estimates of the likelihood of climate events (such as rainfall and temperature increases) and climate change trends. Meanwhile, transition scenario modeling offers an overview of regulatory trends and market changes based on decarbonization ambition levels.

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

|    |    |    |
|---|---|---|
| <b>1.5°C Aggressive Climate Action</b><br>Aggressive emission reduction towards Net Zero before 2050, characterized by more stringent policy measures and technological innovations.<br>1.5 to 1.7°C<br><b>Domination of transition risks and opportunities</b><br>Physical: SSP1-2.6<br>Transition: NGFS Net Zero 2050 | <b>2°C Existing Policies and Targets</b><br>Moderate climate ambition leads to slow emission reduction. Emissions are curbed by current policies and commitments, such as Nationally Determined Contributions (NDC).<br>2 to 3°C<br>Insufficient decarbonization<br>Transition: NGFS Current Policies | <b>4°C Limited Climate Action</b><br>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.<br>Greater than 4°C<br>Domination of physical risk<br>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<sup>1</sup>

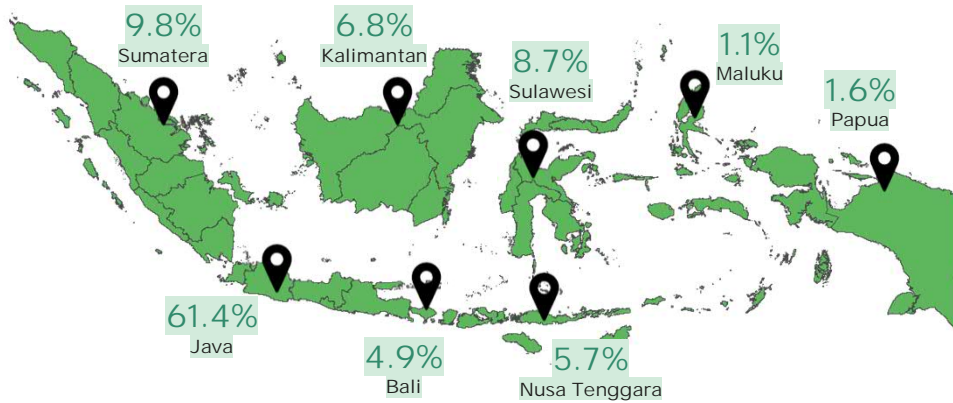
| Physical climate scenario  | Scenario narration   | Economic growth   | Technology development   | Energy system   |
|--|--|---|--|---|
|  <p>SSP1-2.6<br/>Temperature rises by 1.5°C</p> | Low barriers to climate mitigation and adaptation, as the world transitions toward sustainable development is gradual, 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 |
|  <p>SSP5-8.5<br/>Temperature rises by +4°C</p>  | 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                              |

<sup>1</sup>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<br>Very low | 2<br>Low | 3<br>Medium | 4<br>High                                 | 5<br>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.

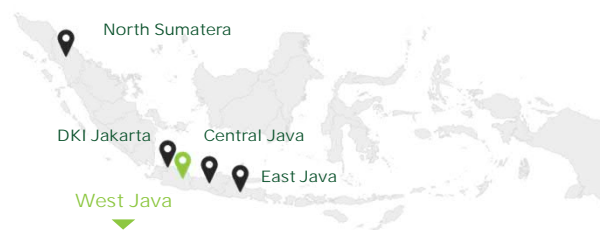
### Overview of exposure by province with the highest number of buildings and land

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 <sub>2</sub> Removal Usage | Variation of Regional Policies |
|--|--|---------------------------------------|-----------------------------|-------------------------------|--------------------------------|
|  <p>NGFS Net Zero 2050<br/>Temperature rising by 1.6°C</p>    | 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 <sub>2</sub> emissions by 2050. | Implemented immediately and gradually | Rapid technology changes    | Moderate to high usage        | Moderate variation             |
|  <p>NGFS Current Policies<br/>Temperature rising by 2.9°C</p> | 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                  |

<sup>1</sup>Network for Greening the Financial System, 2023: NGFS Scenarios for central banks and supervisors.





### 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.

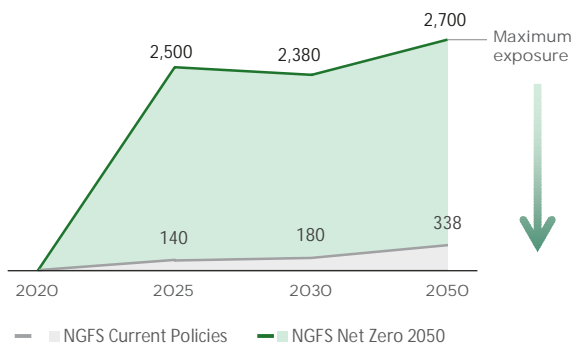
The global ambition to achieve the Paris Agreement is marked by the implementation of high carbon prices to limit emissions. According to NGFS NZ, carbon prices could rise by up to 750% by 2050, potentially exposing Telkom to carbon costs of around Rp 2.7 trillion in 2050.

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

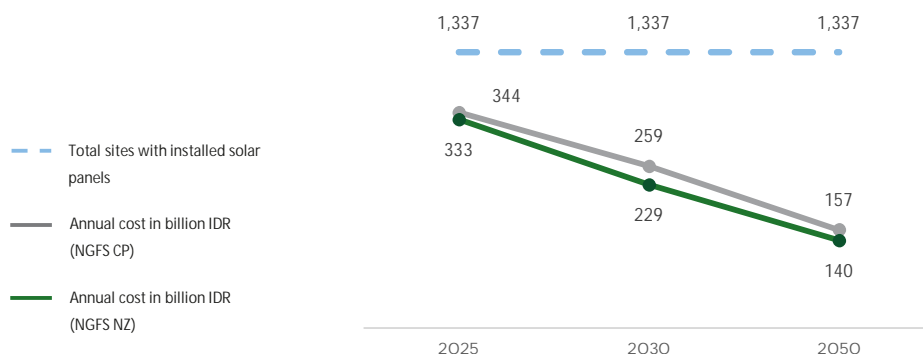
all Mitratel's location, amounting of 36,719 sites. Subsequently, the values are indexed to the NGFS trend, following the scenario of changes in solar panel costs in Indonesia as per the NGFS scenario.

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 CP) – IDR 259 billion (NGFS NZ). 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

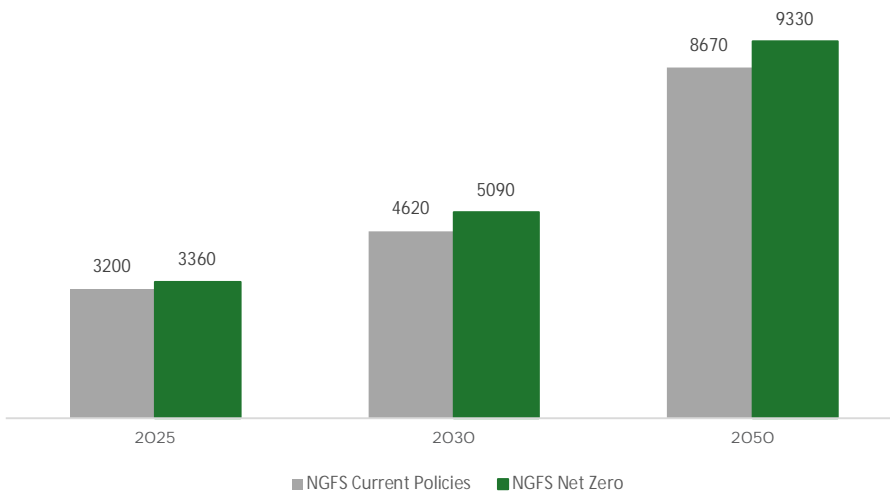
The energy transition agenda primarily impacts energy-intensive sectors, such as power generation, which can affect electricity prices. Telkom, relying on electricity and fuel oil (BBM) for its operational sustainability, may be exposed to the risk of these price changes.

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  | Heavy rain and strong winds  | Landslide   |
|--|--|---|
| <p><b>Affected locations:</b><br/>13 STO locations, Plasa, Witel/Datel buildings in Sumatra, Java, Bali, Kalimantan, Sulawesi and Papua</p> <p><b>Impact:</b><br/>Office operational disruption</p> <p>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.</p> | <p><b>Affected locations:</b><br/>3 STO locations and Witel buildings and assets in Banten and Kendari</p> <p><b>Impact:</b><br/>Damage to roofs, poles and cables, and power outages from the grid</p> <p>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.</p> | <p><b>Affected locations:</b><br/>5 STO locations and Witel/Datel buildings in Java</p> <p><b>Impact:</b><br/>Damage to poles and cables, and power outages from the grid</p> <p>Landslides caused by heavy rain buried assets and damaged Telkom poles and cables. This also caused area power outages for up to 18 hours.</p> |

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.

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### 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.



01

GOVERNANCE

02

RISK MANAGEMENT

03

STRATEGY

04

METRICS AND TARGET

# METRICS AND TARGET

Telkom has set several metrics and targets for climate risk management as part of its efforts to measure and monitor climate targets. These climate metrics and targets are expected to provide stakeholders of the company's efforts and processes in managing climate risks and opportunities. They will be periodically reviewed to ensure all relevant indicators remain integrated.

Currently, Telkom has identified greenhouse gas emissions (GHG) as the fundamental metric related to climate. This metric will continue to be measured and monitored alongside the strengthening of climate risk and opportunity management internally. Telkom will also enrich other climate-related metrics as recommended by applicable standards.

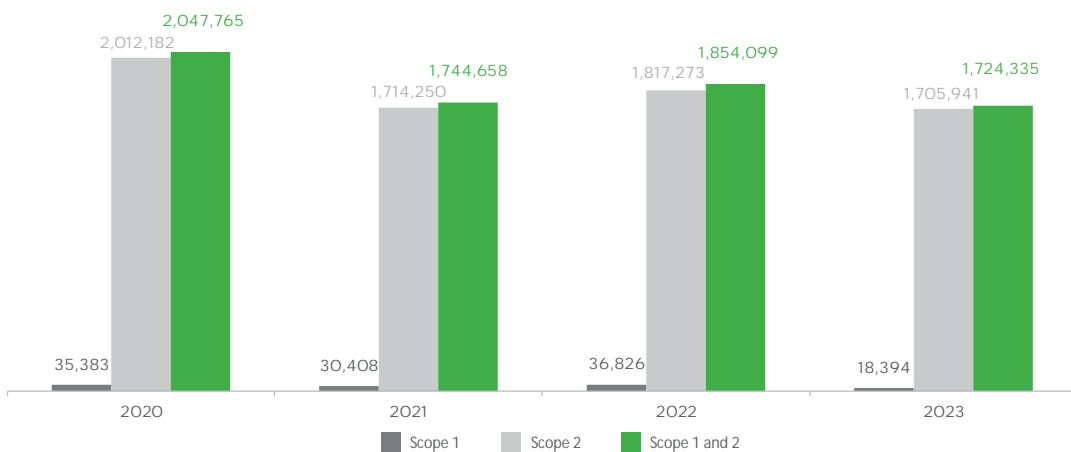
For climate target, Telkom has committed to reduce carbon emissions from Scope 1 and 2 by 20% by 2030 compared to the 2020 baseline as a group, and to achieve Net-Zero Emissions by 2060.

## Performance in 2023



Telkom has reduced GHG emissions amounting of 129,764 tons CO<sub>2</sub>eq or equivalent to 7% compared to the 2022 data.

Greenhouse Gas Emission Profile of TelkomGroup\*  
(in ton CO<sub>2</sub>eq)



\*Information related to greenhouse gas emissions may change with the refinement of calculation methodologies.

# APPENDIX



# Appendix 1. Assumptions and Limitations

## Climate Scenario Analysis – Physical Risk

|                |   |
|----------------|---|
| Asset          | <p><b>Methodology</b><br/>Asset selection is based on data completeness and the relevance of asset types to potential climate-related impacts. Buildings are further classified as buildings designated for accommodation, administration, network resources, network equipment containers, site preparation/access sites, support, and other buildings with specific functions.</p> <p><b>Assumption</b><br/>Climate risks are assumed to impact the entirety of asset components. This analysis represents a stress test approach to assess the maximum exposure to climate risks for assets considered as a worst-case scenario.</p> <p><b>Limitation</b><br/>Current analysis conducted depends on asset locations and does not consider infrastructure, geological, or geographical conditions of asset locations.</p>   |
| Climate model  | <p><b>Methodology</b><br/>The analysis utilizes the NASA Earth Exchange Global Daily Downscaled Projections (NEX-GDDP-CMIP6) dataset, which contains climate scenarios with detailed resolution for Indonesia through statistical downscaling and is based on the Sixth Phase of the Coupled Model Intercomparison Project (CMIP6), underlying the IPCC AR6. The NEX-GDDP-CMIP6 data has a resolution of 0.25° (approximately 25 km x 25 km) globally.</p> <p>This analysis combines 18 models for each climate metric to generate more comprehensive climate projections in accordance with good scientific practice.</p> <p><b>Assumption</b><br/>A 20-year average for each time period (2030 and 2050) is used to provide long-term climate trends and indications of climate risk, reducing variability between years.</p> <p><b>Limitation</b><br/>The analysis utilizes climate models from the publicly available NEX-GDDP-CMIP6 dataset and does not involve the development of independent models. Climate projections are based on assumptions about future greenhouse gas emissions associated with human activities and policy choices according to narratives in climate scenarios. The integrated climate scenarios into the model projections are not predictions or forecast the timing of meteorological events such as rainfall, temperature increases, or floods.</p>   |
| Climate metric | <p><b>Methodology</b><br/>The climate metrics adopt descriptions and thresholds defined by international standards from the World Meteorological Organization (WMO).</p> <p><b>Assumption</b><br/>The intensity and frequency of rainfall (exceeding 20 mm/day) are used as proxies for extreme rainfall and floods. The increase in average temperature is assumed to impact building energy costs and increase the risk of heat stress on employees, especially field workers. Generally, chronic temperature increases (occurring gradually) can affect all aspects of Telkom's operations and personnel, particularly in the medium and long term, considering the radiative forcing effects of greenhouse gas emissions persisting in the atmosphere in the long term.</p> <p><b>Limitation</b><br/>The climate metric standards used may differ from nationally applicable metric standards or define different situations than local practices. There are other factors influencing flood risk, such as soil drought, erosion, geological conditions, regional infrastructure, and the resilience of infrastructure and asset materials themselves. Chronic temperature increases may drive acute changes (such as heatwaves, wildfire risks). The current analysis does not consider flood risk factors or acute events from temperature increases due to data limitations. The current analysis process helps Telkom identify data needs for more in-depth analysis.</p> |

## Climate Scenario Analysis – Physical Risk

|               |   |
|---------------|---|
| Risk Exposure | <p><b>Methodology</b></p> <p>Risk exposure values are estimated from the number of assets located in areas with historical value differences to 2030/2050 categorized as exposure levels 4 and 5. Exposure categories are determined by calculating future change values, then divided into five category levels with names consistent with the Telkom Risk Management Framework. Categories are developed into simple and consistent ranges. The threshold for each exposure category is based on historical and future values of the 20-year average for each climate metric.</p> <p><b>Assumption</b></p> <p>The risk exposure value does not represent the financial impact or loss due to climate hazards but rather provides an overview of assets located in areas potentially experiencing certain climate conditions. The results of the current analysis are useful for identifying areas and assets that highly potential to experience climate conditions that serve as proxies for climate hazards, which can then be further analyzed to determine the potential loss per asset.</p> <p><b>Limitation</b></p> <p>Risk exposure values may have a high level of uncertainty. This estimation should be considered as a proxy for comparing the potential damages and materiality of climate risks to each other.</p> |
|---------------|---|

## Climate Scenario Analysis – Transition Risk

|                         |   |
|-------------------------|---|
| <p>Policy and legal</p> | <p><b>Methodology</b><br/>This scenario analysis is built based on a carbon pricing model applied to company emissions. The method for calculating company emissions is outlined in another section.</p> <p><b>Assumption</b><br/>This model uses the company's GHG emissions as the baseline emission reference. The growth of emission values and carbon prices is formed based on the trajectory of the model used.</p> <p>The NGFS model used as the basis for modeling carbon prices in Indonesia is formed based on various parameters beyond explicit carbon prices that can be used as proxies for government policies, technological changes, and market dynamics. In theory, the financial impact of carbon pricing is channeled through instruments such as taxes and carbon trading.</p> <p><b>Limitation</b><br/>The changes in GHG emission values built based on the model may differ from the actual company GHG emission values. This analysis is highly dependent on the basic assumptions of carbon pricing, and its values will be much lower under less aggressive policies. Considering the uncertainty and materiality of the carbon pricing assumptions, the results of this analysis would be more informative if used to review the differences between scenario outcomes rather than interpreting absolute figures as estimates or potential outcomes.</p> |
| <p>Technology</p>       | <p><b>Methodology</b><br/>This scenario analysis built based on solar panel growth model, where the addition in solar panel capacity per year used as basis in the amount of additional capacity invested using the price of solar panel in the corresponding year.</p> <p><b>Assumption</b><br/>The growth of solar panel capacity is built based on the trajectory of the model used. The NGFS model utilizes as basis of technology development and solar panel implementation modelling in Indonesia. The initial reference value of solar panel capacity uses the solar panel capacity installed in Mitratel. Aspects related to government policy that impacts the socioeconomic condition and low-carbon economy target are also considered.</p> <p><b>Limitation</b><br/>The planning of the actual solar panel capacity addition of the company in the corresponding year may differ from solar panel capacity addition in the model. This analysis does not include consideration of solar panel growth caused by administrative policies unrelated to socioeconomic conditions or initiatives towards a low-carbon economy.</p>  |
| <p>Market</p>           | <p><b>Methodology</b><br/>This scenario analysis is built based on the fuel consumption model of both electricity and fuel oil which is used as the quantity of energy consumption of the company that needs to be paid as energy costs.</p> <p><b>Assumption</b><br/>The company's current energy consumption is used as a preliminary reference for energy consumption in this model. The growth of energy consumption is formed based on the trajectory of the model used. The NGFS model is utilized as a basis for modeling electricity and fuel prices in Indonesia as a result of changes in the mix of electrical energy and fuel which have implications for price increases due to investment in the construction of new energy plants, closure of high-emission energy plants, and carbon taxes.</p> <p><b>Limitation</b><br/>Telkom's actual electrical energy and fuel consumption in the coming year may differ from the electricity and fuel consumption projected in the model. The analysis does not include future government energy cost caps if the policy is not based on socioeconomic conditions or initiatives towards a low-carbon economy.</p>  |

## Greenhouse Gas Emission Calculation

|  |   |
|--|---|
| <p>Scope 1 – Fuel consumption</p>        | <p><b>Methodology</b><br/>Emission calculation and emission factors refer to the National GHG Emission Inventory – Ministry of Environment and Forestry and other national guidances, such as those issued by Ministry of Energy and Mineral Resources as a local context that contains emission values from usage of car fuel.</p> <p><b>Assumption</b><br/>Fuel energy consumption calculations utilizes data obtained from the amount of fuel consumption in the group operational vehicles and generator.</p> <p><b>Limitation</b><br/>Emission factors refer to particular type of fuel which is the significant fuel in TelkomGroup operational. GHG Scope 1 emissions include fuel consumption in fixed networks (STO), cellular networks (BTS), operational vehicles managed by Telkom Property, Telkom Data Ekosistem data centers, and data centers in Telin Timor Leste.</p>   |
| <p>Scope 2 – Electricity consumption</p> | <p><b>Methodology</b><br/>The emissions calculation refers to National GHG Emission Inventory – Ministry of Environment and Forestry and other national guidances, such as those issued by Ministry of Energy and Mineral Resources, which contains emission values due to fuel combustion to generate electricity supplied for Telkom's electricity needs. The emission factors used refer to Ministerial Regulation No. 163/2021.</p> <p><b>Assumption</b><br/>The calculation of electricity consumption uses the spending-based method from electricity payment data billed by PLN.</p> <p><b>Limitation</b><br/>The electricity cost per kWh used to calculate emissions is a fixed value obtained from PLN data. The emission factors used in the calculation refer to emission factor value that is most significant. Scope 2 GHG emissions include electricity usage in fixed networks (STO), cellular networks (BTS), Building Operations managed by Telkom Property, Telkom Data Ekosistem data centers, and data centers in Telin Hong Kong and Timor Leste.</p> |

## Appendix 2. Glossary

| Glossary | Description  |
|----------|--|
| CAGR     | Compound Annual Growth Rate (CAGR) is the annual growth rate of an investment over a long-term period or a specific period.  |
| ERM      | Enterprise Risk Management (ERM) is an approach to identifying, assessing, and managing risks at the corporate level.  |
| ESG      | Environmental, Social, and Governance is a set of operational standards that refer to three main criterias (environmental, social, and governance) in measuring the sustainability and impact of an investment in a company.   |
| GHG      | Greenhouse gases (GHGs) are atmospheric gases that trap heat from the sun, including carbon dioxide (CO <sub>2</sub> ), nitrous oxide (N <sub>2</sub> O), methane (CH <sub>4</sub> ), and fluorinated gases (SF <sub>6</sub> , HFCs, and PFCs).  |
| IFRS S1  | IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information consists of a series of disclosure requirements designed to enable companies to communicate the sustainability-related risks and opportunities they face in the short, medium, and long term to investors. |
| IFRS S2  | IFRS S2 Climate-related Disclosures sets out disclosure requirements related to climate change that fully integrate the TCFD recommendations.  |
| IPCC     | The Intergovernmental Panel on Climate Change (IPCC) is a United Nations (UN) body that assesses climate science and publishes Assessment Reports (AR) on the knowledge of climate change, its causes, potential impacts, and options for mitigation and adaptation.                                   |
| ISSB     | The International Sustainability Standards Board is a board established by the International Financial Reporting Standards (IFRS) Foundation to develop sustainability reporting standards that support better economic and investment decision-making.  |
| NDC      | Nationally Determined Contributions (NDCs) are commitments made by a country to reduce greenhouse gas emissions as part of climate change mitigation.  |
| NGFS     | The Network for Greening the Financial System is a network of central banks and financial supervisors aimed at accelerating the expansion of environmentally friendly green finance and developing recommendations for the role of central banks in climate change.                                    |
| SASB     | Sustainability Accounting Standards Board (SASB) provides sustainability accounting standards for use by publicly listed corporations in the U.S. in disclosing material sustainability issues for the benefit of investors and the public.  |
| SSP      | Shared Socio-economic Pathways are scenarios of climate change based on projections of global socio-economic changes up to the year 2100.  |
| STO      | Automatic Telephone Central (Sentral Telepon Otomat) is a collection of devices in a facility that connects customer telephone communications with public telecommunications service providers.  |
| TCFD     | The Task Force on Climate-related Financial Disclosures provides recommendations for a climate disclosure framework consisting of four pillars: governance, strategy, risk management, and metrics and targets.  |
| Witel    | Telecommunication area of Telkom (Wilayah Telekomunikasi) is responsible for business aspect in the managed area   |
| WMO      | The World Meteorological Organization (WMO) is a specialized agency of the United Nations responsible for international cooperation in meteorology, climatology, hydrology, and related geophysical sciences.  |



# 2023 CLIMATE RISK REPORT



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