Climate Risk Assessment study : DSNG's Climate Approach, Methods, Impacts, Risks & Opportunities

Annex to the DSN Group's climate disclosure in line with recommendations of the Task Force for Climate-Related Financial Disclosures (TCFD)

March 2022

Physical Risks Assessment

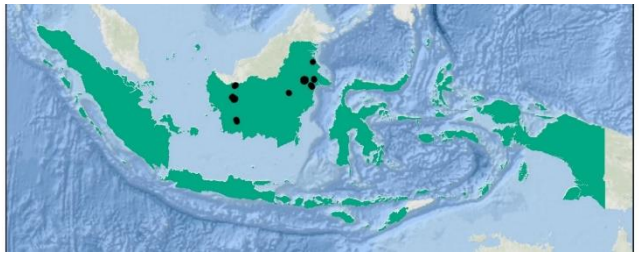
Methodology, data sources, scenarios and results

Assessment Approach

Physical Climate Risks

- **Screening-level physical climate risk assessment** for DSN Group (DSNG) operations in Indonesia.
- The assessment was conducted for baseline and climate change for:
  - Two climate change scenarios (**RCP 4.5** and **RCP 8.5**),
  - Two timeframes - **2030** (mid-term) and **2050** (long-term), and
  - **Five climate natural hazards** relevant to DSNG's business and Indonesia: water availability, riverine flood, extreme heat, landslides and cyclones/winds.
- DSNG's assets considered as part of this assessment fall under the following categories:
  - Plantations (37 assets);
  - Oil Mills (10 assets); and
  - Wood Mills (2 assets).

DSNG Project Footprint in Indonesia



Step 1

- Review and identification of **regional and country level climate-related physical risks**.

Step 2

- **Evaluation** of climate-related physical risk (sub-national level).

Step 3

- Identification of **high-level business implications and recommendations**.

Assessment Methodology

The physical climate risks analysis compared baseline data for climate-related natural hazards at assets' locations with future scenarios (RCP 4.5 and RCP 8.5 of IPCC) by 2030 and 2050.

Geospatial Data

Geospatial Information

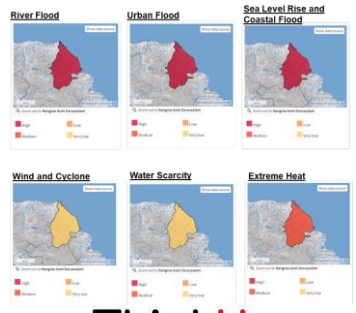
Climate Change Projections

- Climate Data CMIP-5 for RCP 4.5 and 8.5 IPCC scenarios (2030 or 2050)
- Data for Key Climate Indices
- Qualitative Risk Rating

Baseline Natural Hazards

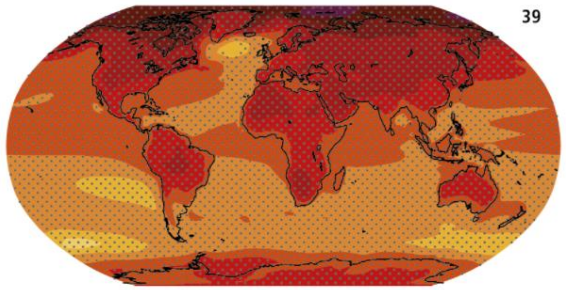
- ThinkHazard
- Key Natural Hazards

Baseline Hazard Data



ThinkHazard!

Climate Change Projections



WORLD BANK GROUP
Climate Change Knowledge Portal
For Development Practitioners and Policy Makers

Qualitative Physical Risk (Hazard) Matrix

Regency	Water Scarcity	Inland Floods	Coastal Floods	Extreme Heat	Cyclone and Wind
Regency 1					
Regency 2					
Regency 3					
Regency 4					
Regency 5					
Regency 6					

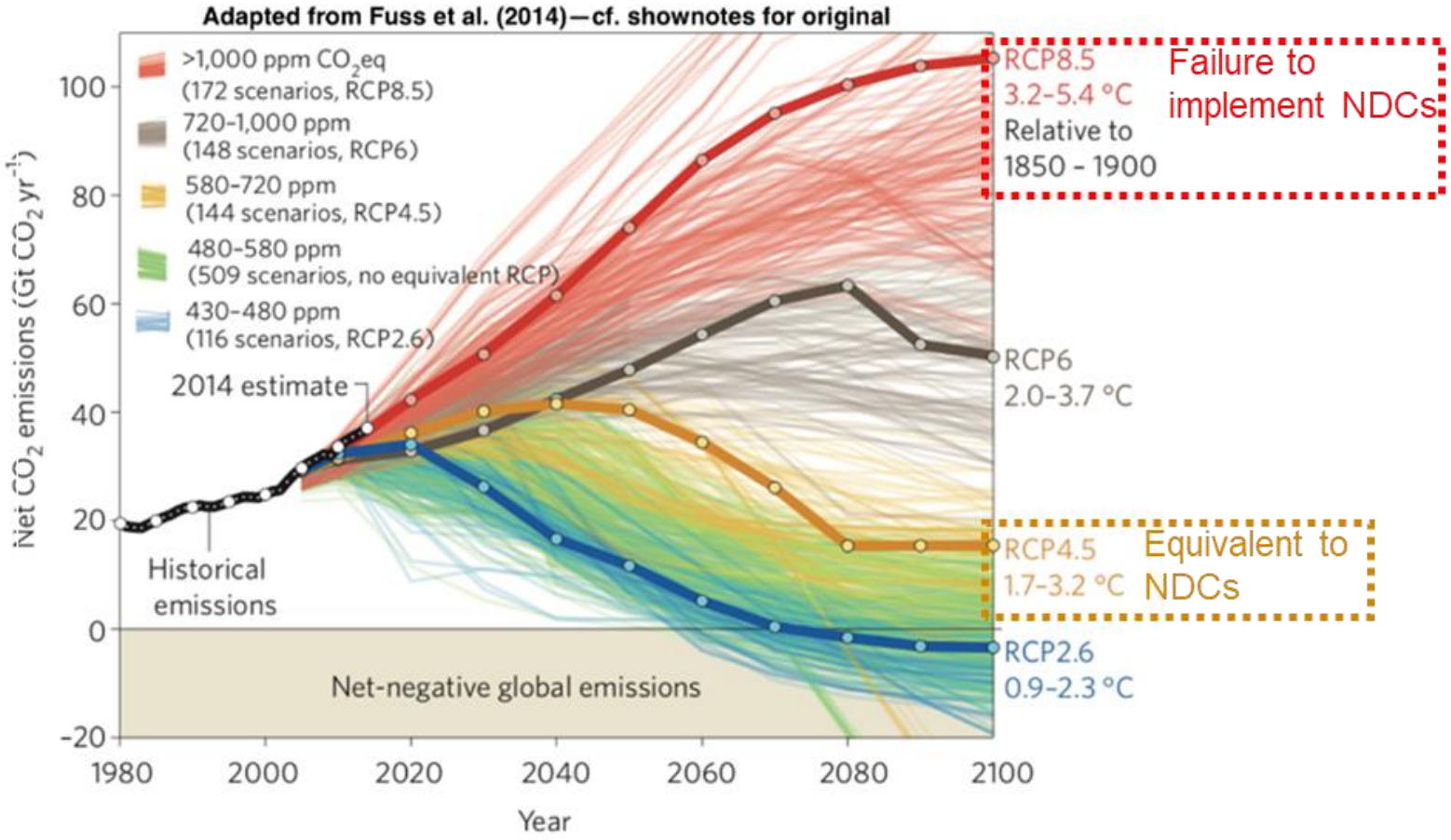
Note: since IPCC's Sixth Assessment Report (AR6) has just been released at the time of the assessment, it does not have the necessary and required datasets yet to access this climate data.

Scenarios for Physical Climate Risks

Selection of scenarios for physical climate risks assessment

Two **Representative Concentration Pathway (RCP) scenarios** of the Intergovernmental Panel on Climate Change (IPCC) have been used for our physical climate risk assessment for DSN Group, including:

- **RCP 8.5** is a high emission scenario with no policy for emission reduction, hence the projections for RCP 8.5 in 2080 can be considered the 'worst case' physical risks scenario.
- **RCP 4.5** considers the relatively ambitious GHG emissions reduction to keep global temperature increase within **2°C**. At the same time, it envisages stronger changes in the climate system and hence higher physical impacts than the RCP 2.6 scenario (corresponding to the 1.5°C future), and thus has been prioritised for the DSN Group physical risk assessment.



Source: Sabine Fuss, et al., "Betting on negative emissions," Nature Climate Change 4 (10), September 2014, pp. 850–853.

Note: NDC = Nationally Determined Contribution

Physical Climate Risks Assessment Results

Relative hazard level in the baseline and future climate scenarios by 2030 and 2050 for DSNG's asset locations.

Climate change projections indicate higher maximum temperature and longer warm spell duration in future.

No significant change in extreme rainfall is projected under climate change scenario.
However, any changes in land use pattern (e.g. clearing-off of forest cover, or deep cutting for development) may exacerbate land slides in future

Regency	Water Availability					Riverine Flood					Extreme Heat					Landslides					Wind and Cyclones				
	Baseline	RCP 4.5		RCP 8.5		Base-line	RCP 4.5		RCP 8.5		Base-line	RCP 4.5		RCP 8.5		Base-line	RCP 4.5		RCP 8.5		Base-line	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050		2030	2050	2030	2050		2030	2050	2030	2050		2030	2050	2030	2050		2030	2050	2030	2050
Kutai Timur	1	1	1	1	1	3	3	3	3	3	2	3	3	3	3	2	2	2	2	2	1	1	1	1	1
Kutai Barat	1	1	1	1	1	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	1	1	1	1	1
Bulungan	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	2	2	2	2	2	1	1	1	1	1
Lamandau	1	1	1	1	1	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	1	1	1	1	1
Sintang	1	1	1	1	1	3	3	3	3	3	2	3	3	3	3	2	2	2	2	2	1	1	1	1	1
Sekadau	1	1	1	1	1	3	3	3	3	3	2	3	3	3	3	1	1	1	1	1	1	1	1	1	1
Temanggung	2	2	2	2	2	1	1	3	1	2	1	3	3	3	3	2	2	3	2	2	1	1	1	1	1

Although climate change projections indicated an increase in annual rainfall, availability of water at local level (e.g. at Site) may get affected by water usage pattern in and around the Site area. Therefore, detailed water risk assessment may be required to evaluate water risks with respect to availability, infrastructure, and governance.

No significant change in extreme rainfall is projected under climate change scenarios. However, the increase rainfall may lead to localised inundation and water logging in low lying areas.

Considering the locations of the assets, no significant change in cyclone hazard is expected. However, it should be noted that in recent years an increasing number of cyclones have been reported to affect some parts of Indonesia.

Legend: - No Hazard | 1 - Low Hazard | 2 - Medium Hazard | 3 - High Hazard

Climate Change Implications and Risk Management

Impact Evaluation for Plantations

Hazard Type	Key Implications	Risk Management Techniques Considered
Water Availability	• Impact on operations • Impact on water availability for irrigation • Water stress may impact growth of plants • Impact on domestic water requirement • Reputational risk during water stressed periods	• Conduct **water risk assessment** • Explore opportunities for **rainwater harvesting** at **site and catchment level** • Adopt **water efficiency/saving technology** to reduce water usage • Explore opportunities to **reuse or recycle wastewater within the plant or from nearby communities** • Construction of water embankments and water reservoirs in the field • Developing strategic water reservoirs for summer/dry seasons • Preparing water reserves for DSNG field staff
Flooding	• Damage to infrastructure, tools and equipment • Temporary disruption of access due to waterlogging of access roads • Safety of employees • Erosion of top soil • Degradation of soil quality due to water logging • Nutrient deficiency and death of immature plants • Increased insurance costs • Impact on operations • Impact on staff, local communities, and biodiversity	• **Flood risk assessment** may be conducted to identify areas prone to flooding for all key assets • Design and **implement suitable mitigation measures,** such as increasing the capacity of storm water drainage or pumping system, construction of flood barrier, etc. • Consider flood hazards in the **emergency response plan** • Evaluate existing spill management plans/storm water management plans • Prepare an emergency response that takes the safety of DSNG field staff into account • Provide security equipment to mitigate impacts of flooding
Extreme Heat	• Increased irrigation water demand due to high evapotranspiration • Impact on crop yield (an increase of 1-4°C may result in 10-40% decline in yield) • Potential discomfort due to heat stress • Reduced working efficiency of employees • Overheating, reduced efficiency and breakdown of equipment	• Consider extreme heat conditions in the **emergency response plan** • Provide **training to employees** to identify symptoms of heat stress and provide first aid • Evaluate existing **operational temperature ranges** of tools and equipment against projected extreme temperatures
Landslides	• Damage to infrastructure, tools and equipment • Temporary disruption of access along roads • Safety of employees • Increased cost for replacement or repair of damaged assets • Potential risk of damage to plantations located at foothills	• Identify areas prone to landslides • Avoid deep/steep cuttings • Implement landslide mitigation measures as appropriate
Wind and Cyclone	• Damage to buildings and infrastructure • Safety of employees • Loss of revenue due to disruption of operations • Cost of replacement and repair of damaged infrastructure • Increased insurance costs	• Comply with **national or international best practices** for wind load for design and construction of all structures • Implement/follow **monitoring** mechanisms with the national or regional meteorological agencies for the early warning system • Develop a response mechanism to plan operations and take **preventive steps** (e.g. planned shut down before cyclone) to reduce impacts • Include cyclone and wind as one of the hazards in site level **emergency response plans**

Climate Change Implications and risk Management

Impact Evaluation for Oil Mills, Wood Mills, and Renewable Energy Plants

Hazard Type	Key Implications	Risk Management Techniques Considered
Water Availability	• Reduced availability of water may impact the production capacity • Impact on domestic water requirement • Reputational risk during water stressed periods • Impact on oil mill location selection • Impact on processes for boilers • Risk of fire for wood products	• Conduct **water risk assessment** • Explore opportunities for **rainwater harvesting** at **site and catchment level** • Adopt **water efficiency/saving technology** to reduce water usage • Explore opportunities to **reuse or recycle waste water within the plant or from nearby communities**
Flooding	• Damage to infrastructure, tools and equipment • Temporary disruption of access due to waterlogging of access roads • Safety of employees and local communities • Increased cost for replacement or repair of damaged assets • Increased insurance costs • Migration of hazardous material/waste to the off-site areas • Impact on oil mill location selection • Risk to supply chain and logistics from forests and hills	• **Flood risk assessment** may be conducted to identify areas prone to flooding for all key assets • Design and **implement suitable mitigation measures,** such as increasing the capacity of storm water drainage or pumping system, construction of flood barrier, etc. • Consider flood hazards in the **emergency response plan** • Evaluate existing spill management plans/storm water management plans
Extreme Heat	• Potential discomfort due to heat stress • Reduced working efficiency of employees • Overheating and breakdown of equipment • Reduced efficiency of equipment • Impact on the drying process for wood products	• Consider extreme heat conditions in the **emergency response plan** • Provide **training to employees** to identify symptoms of heat stress and provide first aid • Evaluate existing **operational temperature ranges** of tools and equipment against projected extreme temperatures
Landslides	• Damage to infrastructure, tools and equipment • Safety of employees • Increased cost for replacement or repair of damaged assets • Risk to supply chain and logistics from forests and hills • Impact on the delivery of bulk stock as it passes through cliff areas	• Identify areas prone to landslides • Avoid deep/steep cuttings • Implement landslide mitigation measures as appropriate • Anticipate handling landslides in areas behind boilers
Wind and Cyclone	• Damage to buildings and infrastructure • Safety of employees • Disruption of supply chain, e.g. power supply grid, down stream supply chain • Loss of revenue due to disruption of operations • Cost of replacement and repair of damaged infrastructure • Increased insurance costs	• Comply with **national or international best practices** for wind load for design and construction of all structures • Implement/follow **monitoring** mechanisms with the national or regional meteorological agencies for the early warning system • Develop a response mechanism to plan operations and take **preventive steps** (e.g. planned shut down before cyclone) to reduce impacts • Include cyclone and wind as one of the hazards in site level **emergency response plans**

Baseline Data Sources: Subnational Level

Baseline Natural hazards and Climate Change Projections

Hazard and Description	Primary Data Source	Underlying Data Sources
Water Scarcity Hazard is classified using a Water Stress Index, which reflects the availability of water per person per year – a measure of water stress based on hydrological drought and water use.	Think Hazard (World Bank Group, 2017) https://thinkhazard.org/en/	Global Dataset of Water Crowding Index (WCI) (Veldkamp et al. 2015).
Riverine Floods River flood and urban flood hazards are classified using a threshold of area flooded to damaging intensity of 0.5 m. The area threshold is 1% of the Administrative (ADM) unit for river flood, and 4% of the ADM unit for urban flood.	Think Hazard (World Bank Group, 2017) https://thinkhazard.org/en/	SSBN Ltd 90 m global flood hazard maps
Extreme Heat Extreme heat hazard classification is based on a daily maximum Wet Bulb Globe Temperature, provided as frequency-severity data in raster format.	Think Hazard (World Bank Group, 2017) https://thinkhazard.org/en/	Wet Bulb Globe Temperature (WBGT) extreme heat dataset developed by VITO
Landslides Landslide hazard classification is based on the annual frequency of landslides per square kilometre.	Think Hazard (World Bank Group, 2017) https://thinkhazard.org/en/	
Cyclone Tropical cyclone is classified using wind speed, provided as frequency-severity data. The damaging intensity threshold is 80 km/h.	Think Hazard (World Bank Group, 2017) https://thinkhazard.org/en/	UNISDR Global Assessment Report 2015 (GAR15)
Baseline and Climate Change Projections Data (Precipitation, temperature)	ERM's in-house Climate Change Risk Assessment Tool	Couple Model Intercomparison Project (CMIP)
Baseline and Climate Change Projections Data	Knuston et. al. (2020). Tropical Cyclones and Climate Change Assessment: Part II: Projected Response to Anthropogenic Warming https://journals.ametsoc.org/view/journals/bams/101/3/bams-d-18-0194.1.xml	

Transition Risks and Opportunities

Methodology, drivers, scenarios and results

Assessment Approach

Transition Risks and Opportunities

- **Qualitative transition climate risk and opportunity assessment** for DSN Group (DSNG) operations in Indonesia and along the company's value chain.
- The assessment was conducted for:
  - Two climate change scenarios (APS – Announced Pledges Scenario and SDS - low carbon scenario of the International Energy Agency),
  - Two timeframes – mid-term (**2030**) and long-term (**2050**), and
  - **Twelve transition drivers** representing policy and regulatory, market, technology, and reputational risk, in line with TCFD.
- **DSNG's three strategic business units (SBUs)** were considered:
  - Palm oil;
  - Wood products; and
  - Renewable energy.

Step 1

- Identify **relevant transition drivers** and assess their potential impact on DSNG SBUs.

Step 2

- **Scenario analysis** and (qualitative) assessment of future transition risks and opportunities for DSNG SBUs.

Step 3

- Identification of potential **risk mitigation measures** and recommendations for **business strategy**.

Summary of Key Drivers and Their Impact

Policy and Regulatory Drivers

Scenario Indicator	Palm Oil		Wood Products		Renewable Energy		Financial Driver
	Weight	Rationales	Weight	Rationales	Weight	Rationales	
Land Use Restriction		Likely to happen and increases the production cost as the technology needs to improve to keep the yield high while the amount of land stays the same		May increase the raw material price due to domestic land restriction		The restriction may reduce the input of raw material to generate electricity	CAPEX, OPEX
Carbon Tax		Increases the OPEX significantly. Cost benefit analysis is required to find the balance between improving the sustainability and managing the carbon price		Will impact the cost but is less significant as wood production emits less emissions		Opportunity for DSNG to reduce its carbon footprint and potentially generate carbon credits	CAPEX, OPEX, REVENUE
Foreign Trade Restrictions		Already happened and reduces the market coverage. Increasing the certification standard may partially mitigate this risk		Not really significantly relevant unless the higher standard/certification is required later		N/A due to nature of the product (electricity generated for domestic use)	REVENUE
Mandatory Biofuel Utilization		Already happened and demand for fuel should increase over time		N/A		Already aligned with government direction	REVENUE
International Standard		Increasing the OPEX and CAPEX to fulfill the standard. However, the product might reach new market with better value		Increasing the OPEX and CAPEX to fulfill the standard. However, the product might reach a new market with better value		N/A	OPEX, REVENUE

- **Likelihood, impact and risks/ opportunities** **+**

High Low N/A Low High

Summary of Key Drivers and Their Impact

Market and Technology

Scenario Indicator	Palm Oil		Wood Products		Renewable Energy		Financial Driver
	Weight	Rationales	Weight	Rationales	Weight	Rationales	
Customer Sustainability Concerns		The scenario has already happened and is more likely to increase in the future as more countries need to adapt		The scenario has already happened and is more likely to increase in the future as more countries need to adapt		Electricity from renewables can improve the customer's perspective of the company's sustainability	REVENUE
Niche Market		The effort to become more sustainably can help capture a niche market		The effort to become more sustainably can help capture a niche market.		The effort to become more sustainably can help capture a niche market.	REVENUE
Sustainability-Linked & Green Loans		The palm oil industry needs to prove themselves able to comply with several stands and diversify their business, similar to what DSNG is currently doing		There are various opportunities to pursue green loans		Can act as a leverage point when the palm oil business is requesting a loan	CAPEX
More Efficient Technologies		An opportunity to meet target yields when more land restrictions for palm oil plantations are implemented		N/A		Have larger inputs that can be matched with an expansion plan	REVENUE
Renewable and Methane Capture Costs		Increasing demand to produce electricity with renewable energy, as well as implement the methane capture technology		N/A		The technology will cost less and improve the electricity production and company expansion	CAPEX

Reputational

Scenario Indicator	Palm Oil		Wood Products		Renewable Energy		Financial Driver
	Weight	Rationales	Weight	Rationales	Weight	Rationales	
Shareholders' Sentiments		Already happened and risks significantly impacted investments. Many investors are increasingly concerned about the sustainability of palm oil companies		For DSNG aspects, several improvements could open new green investment opportunities		Could be added value for DSNG to open investment opportunities	CAPEX
NGOs' and Other Stakeholders' Role		More likely to happen, increasing the CAPEX and OPEX to meet the stakeholders' expectations		Less likely to happen even though some improvements are required to meet expectations		Can be the solution for meeting stakeholders' expectations	CAPEX, OPEX

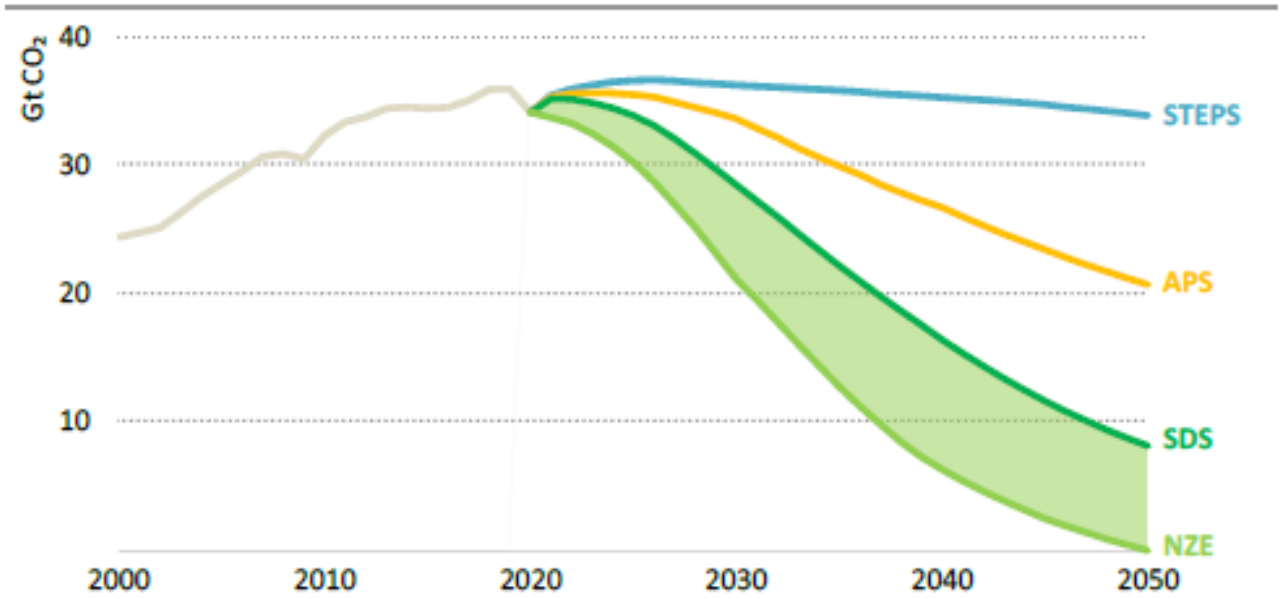
- **Likelihood, impact and risks/ opportunities** **+**

High Low N/A Low High

Scenarios for Transition Risks and Opportunities

APS and SDS are selected due to latest update, availability of data, and DSNG journey

International Energy Agency (IEA) World Energy Outlook Scenarios



Source: IEA (2021), World Energy Outlook 2020, IEA, Paris https://www.iea.org/reports/world-energy-outlook-2021

STEPS - Base case scenario: A pathway that takes account of announced climate-related policies (such as the current Paris Agreement 'Nationally Determined Contributions'), however does not forcefully pursue decarbonisation. The implied global climate warming associated with the base case scenario is between 2.5°C and 3.3°C.

APS – Announced Pledges Scenario: Enhanced STEPS with net zero pledges from more than 50 countries which just recently announced in the run-up to COP26.

SDS - Low carbon scenario: A pathway towards reducing global CO_2 emissions and achieving other, non-climate, sustainable development goals. Global demand for fossil fuels declines in this scenario, and the world embraces clean technology as an alternative. Consumers make informed choices about their carbon footprints, such as impacting frequency of travel. Implied climate warming is 1.65°C to 'just above' 2°C.

NZE - Net Zero Emissions by 2050 Scenario: A narrow but achievable roadmap to 1.5°C stabilisation in rising global temperatures and the achievement of other energy-related SDGs

Note: since IEA's Net Zero Emissions scenario has just been released recently, it does not have the necessary and required datasets yet to access fully impacts of transition drivers identified for DSNG.

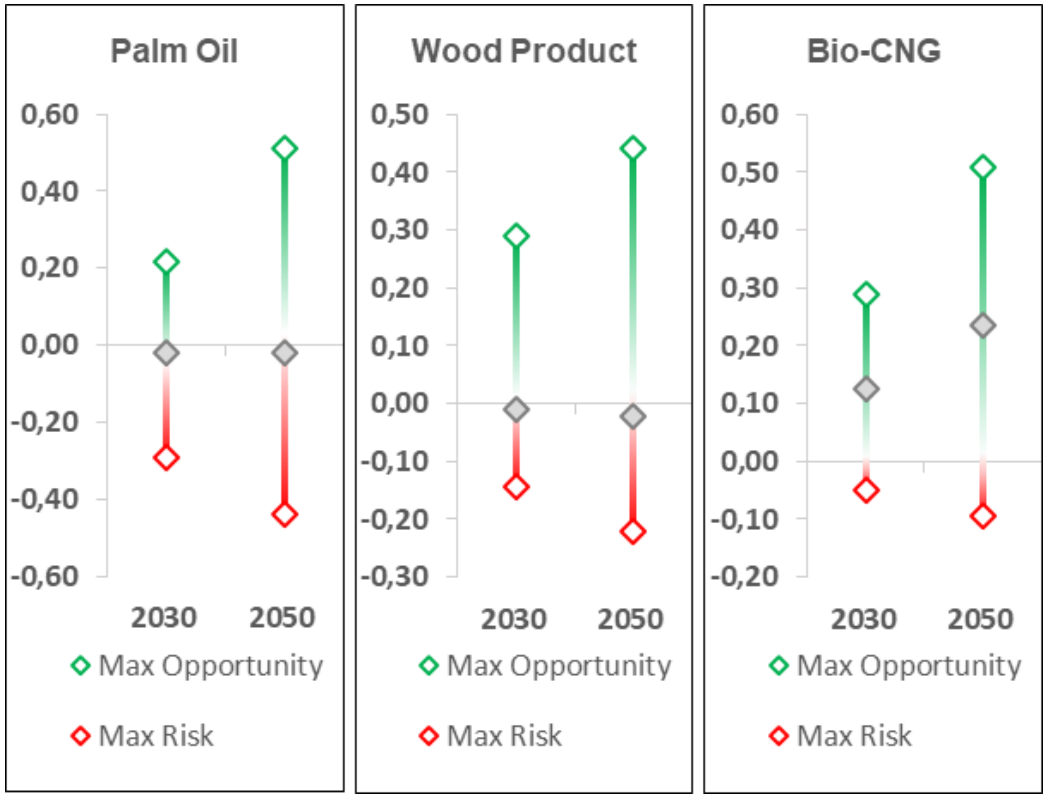
Transition Risks and Opportunities for DSNG

Heatmap

Risk score colour key						
High Opp.	Mod. Opp.	Low Opp.	Neutral	Low Risk	Mod. Risk	High Risk

Identified Transition Risk and Opportunity	Heatmap of Potential Transition Risks and Opportunities for DSNG					
	Palm Oil		Wood Products		Renewable Energy	
	2030	2050	2030	2050	2030	2050
Policy & Legal						
Land-use restrictions						
Carbon tax						
Foreign trade restrictions						
Mandatory biofuel utilization						
International standards						
Market						
Sustainability-related customer concerns						
Niche market						
Sustainability-linked & green loans						
Technology						
Increased technology efficiency						
Renewable and methane capture cost						
Reputation						
Shareholders' concerns						
Role of NGOs and other stakeholders						

Key Transition Risks and Opportunities



Policy & Legal:

- **Carbon Tax** brings significant risks on palm oil and wood products since it will increase the cost burden while for the Bio-CNG, it will present an opportunity
- **Foreign trade restriction** affects heavily palm oil and wood products businesses

Market & Technology

- **Technology Advancement** is the opportunity that could be captured by every SBU to increase the yield and reduce the cost
- **Renewable Energy** production will be a great solution that could bring more efficient production, less emission and positive stakeholder sentiments

Reputation

- For the reputation side, both of the drivers bring modest risks and opportunities for each SBU.

Transition Risks Response Measures / Strategic Priorities

	Climate Drivers	Implication for DSNG Business	Risk Mitigation Teqniques Considered
Policy & Regulation	**Carbon Tax**	▪ Increasing cost in production for Wood Product and Palm Oil ▪ Leverage point for BioCNG	▪ Calculating internal carbon price based on the current regulation in Indonesia and other target market countries. ▪ Finding opportunities for BioCNG to utilize their renewable electricity generation
	Foreign trade restriction	▪ Limiting international market for DSNG ▪ Need put more effort to level up the sustainability level of the product to pass the import ban	▪ Establishing clear climate strategy to address this issue ▪ Mapping market expansion and assessing the requirements
Technology & Market	**Technology Advancement**	▪ Increasing the yield and efficiency for each SBUs	▪ Detailed assessment for the technology and how it will fit with current and future DSNG operation
	Renewable Energy & Methane Capture	▪ Market will be more concerned related to the lowering cost of green technology	▪ Finding investment for the green technology that will be utilized by DSNG
Reputational	**Shareholder and Stakeholder Sentiment**	▪ Reputation on stake that could be affected DSNG position in the market and funding access	▪ Disclosing DSNG sustainability journey through credible framework such as TCFD