

# *Bangchak Climate Strategy*

Task Force on Climate-Related Financial Disclosures (TCFD)

Report 2023

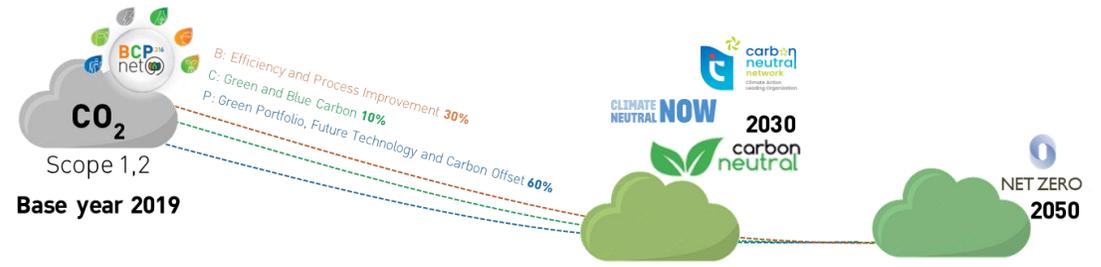
# Introduction



Bangchak Corporation Public Company Limited has **5 Business Group** which comprises of Refinery and Oil Trading Business, Marketing Business, Power Business, Bio Based Products and Natural Resources and New Business Group. In calendar year 2021, the company became TCFD supporter as climate change is one of the crisis confronting humanity. In 2022, the company pledged its commitment targeting to become **carbon neutrality by 2030** and **Net Zero GHG emission by 2050** compared to **base year 2019**. Bangchak also has been certificated as “Climate Action Leading Organization” by Thailand Carbon Neutral Network Committee. Hence, we put an effort to work toward implementation to **align with TCFD framework and integrate Sustainable Development Goals 13** (Climate Action) into the corporate strategy and business operations aiming to demonstrate the commitment towards the SDGs. We assigned our governance body to oversee the climate-related risk and opportunity. The main aim of scenario analysis is to evaluate potential impacts from future physical risk and low carbon economy transition impacts, as well as finding an opportunity. These evaluations will be **incorporated into our strategic planning and Enterprise Risk Management framework** to assist us improve our resilience and adaptability.



For more information on Bangchak Corporation please see:  
[Resource Center | Bangchak Corporation](#)  
[Bangchak and Sustainability | Bangchak Corporation](#)



As per our vision “Crafting a Sustainable World with Evolving Greenovation”, we commit to accelerate sustainable energy transition, while balancing energy security and be energizing lives through greenovative solution and promoting ESG for all. Bangchak has been ready to drive low carbon society and try to built environment decarbonization through “**BCP 316 NET**” **Strategy** which comprise of **Breakthrough** performance (efficiency and process improvement), **Conserving** nature and society (green and blue carbon), **Proactive** business growth and transition (green portfolio, future technology and carbon offset) and **NET** zero ecosystem creation.

The **data disclosed in this TCFD report is for the year 2022** and covered GHG emission performance boundary of 1) Refinery business 2) Marketing business; Bangchak Green Net Co., Ltd which operates Bangchak’s service stations and Bangchak Retail Co., Ltd. which operates retail and Inthanin coffee shops and 3) Office buildings covering M-Tower office building and 3 Regional offices in the North, Northeast and South of Thailand.

This report has been prepared in line with the TCFD’s 2021 “Annex: Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures”  
[https://assets.bbhub.io/company/sites/60/2021/07/2021-TCFD-Implementing\\_Guidance.pdf](https://assets.bbhub.io/company/sites/60/2021/07/2021-TCFD-Implementing_Guidance.pdf)

# Content

## Governance

Describe the **Board's Oversight** of Climate-related Risk and Opportunities

Describe **Management's role** in assessing and managing climate-related risks and opportunities

## Strategy

**Climate related risks and opportunities** have identified over the **short, medium, and long term**

**Impact** of climate-related risks and opportunities

**Resilience** of the company's strategy, taking into consideration different climate-related scenarios

## Risk Management

**Processes for identifying** and assessing climate-related risks

**Processes for managing** climate-related risks

**Processes are integrated** into the Bangchak's overall risk management.

## Metrics and Target

**Metrics used** to assess climate-related risks and opportunities **in line with its strategy and risk management process**

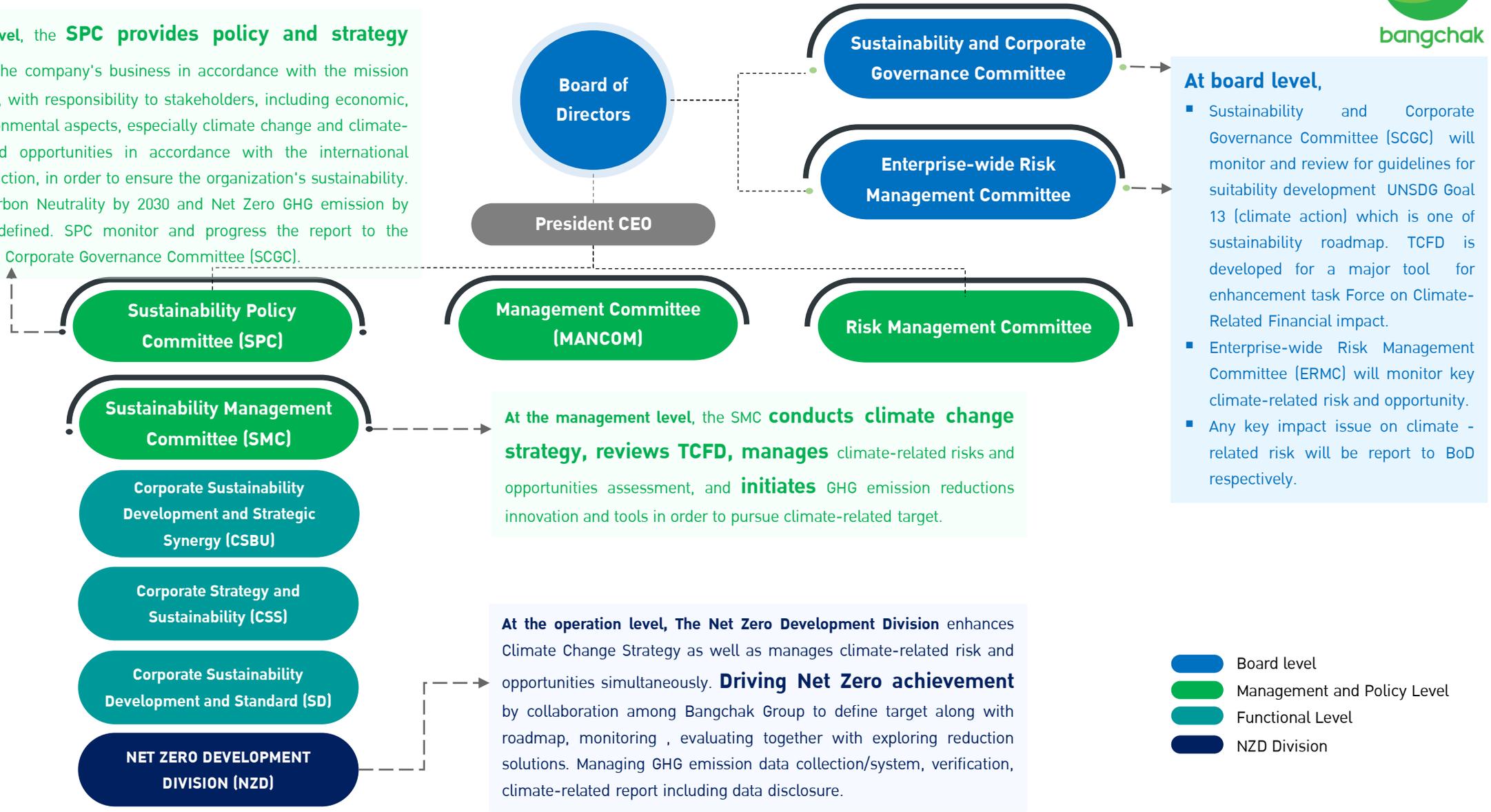
**Disclose Scope 1, Scope 2, and Scope 3** greenhouse gas (GHG) emissions

**Describe the Targets used** to manage climate-related risks and opportunities and performance against targets

# Governance

# Governance

At the policy level, the **SPC provides policy and strategy direction** for the company's business in accordance with the mission corporate culture, with responsibility to stakeholders, including economic, social, and environmental aspects, especially climate change and climate-related risks and opportunities in accordance with the international sustainability direction, in order to ensure the organization's sustainability. The target of Carbon Neutrality by 2030 and Net Zero GHG emission by 2050 has been defined. SPC monitor and progress the report to the Sustainability and Corporate Governance Committee (SCGC).



# Governance

## Board's Oversight of Climate-related Risk and Opportunities

Body	Roles and Responsibilities	Meeting Frequency
Sustainability and Corporate Governance Committee (SCGC)	<ol style="list-style-type: none"> <li>1. <b>Propose</b> corporate governance and sustainability development practices, including <b>climate change related issues</b> to the Board of Directors.</li> <li>2. Supervise the performance of the Board of Directors and the management in accordance with good corporate governance and sustainability development principles.</li> <li>3. Review good corporate governance and sustainability development practices. By comparing with international standards and making recommendations to the Board of Directors for continuous improvement and response to stakeholders' needs and expectation.</li> <li>4. <b>Assign</b> good corporate governance and sustainability development policy, including <b>climate change guideline using TCFD for enhancement task Force on Climate-Related Financial impact</b>.</li> <li>5. Perform duties as assigned by the Board of Directors.</li> </ol>	<b>Twice per year at minimum</b>
Enterprise-wide Risk Management Committee (ERMC)	<ol style="list-style-type: none"> <li>1. <b>Propose</b> policy, strategy and goals for <b>risk management including climate-related risk</b>.</li> <li>2. Develop an organization-wide risk management system for continuous efficiency.</li> <li>3. Promote cooperation in risk management at all levels of the organization.</li> <li>4. Supervise the company to have appropriate and effective risk management.</li> <li>5. The Chairman of the Enterprise-wide Risk Management Committee reports the results of the next meeting to the Board of Directors.</li> <li>6. Perform duties as assigned by the Board of Directors.</li> </ol>	<b>Quarterly</b>

# Governance

## Management's role in assessing and managing climate-related risks and opportunities

Body	Roles and Responsibilities	Meeting Frequency
Sustainability Policy Committee (SPC)	<ol style="list-style-type: none"> <li><b>Provide policy and strategy direction</b> for the company's business in accordance with the mission corporate culture, with responsibility to stakeholders, including economic, social, and environmental aspects <b>especially climate change and climate-related risks and opportunities</b> in accordance with the international sustainability direction, in order to ensure the organization's sustainability. <b>The target of Carbon Neutrality by 2030 and Net Zero GHG emission by 2050 has been defined.</b></li> <li>Progress the report to the Sustainability and Corporate Governance Committee (SCGC)</li> </ol>	<b>Minimum half year</b>
Sustainability Management Committee (SMC)	<ol style="list-style-type: none"> <li><b>Conduct the work plans and manage work</b> according to the responsibilities towards various groups of stakeholders according to the direction and framework specified by the Corporate Sustainability Policy Committee to bring innovation and GHG management tools to use within the Bangchak Corporation in order <b>to achieve Carbon Neutrality in 2030 and Net Zero in 2050</b></li> <li><b>Prepare climate strategy and manage opportunities and risks arising from climate change.</b></li> <li>Encourage work processes and development plans or events to <b>increase awareness, knowledge, and understanding of sustainability including climate change.</b> Participating in operations with Bangchak Corporation stakeholders by submitting a report to the working committee or reviewing in order to promote collaboration among affiliated companies in Strategic Corporate Governance Planning (CPG Task Force)</li> <li>Progress the report to the Sustainability and Corporate Governance Committee (SCGC)</li> </ol>	<b>Minimum half year</b>

# Governance



To ensure focused implementation of climate change strategy, **GHG reduction** target-related Key Performance Indicator (KPI) **are set as corporate KPI in 2022** for the all-executive levels and relevant business unit including Group Chief Executive Officer and Presidents.



# Strategy

# Strategy: Growth Balanced

## 4S

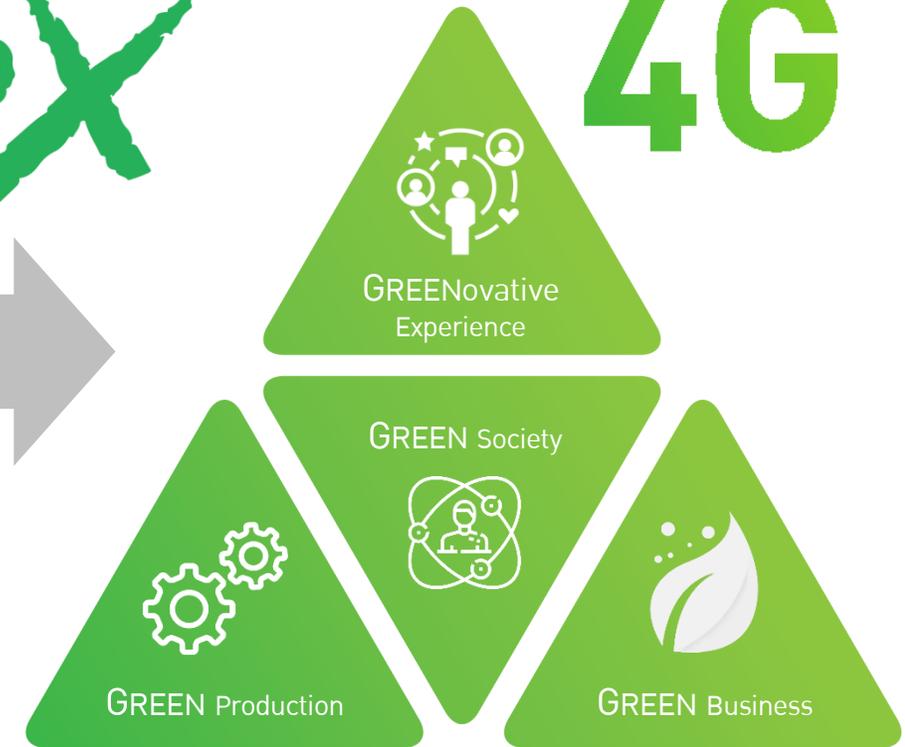


**BUSINESS STRATEGY**

## Bangchak 100X



## 4G



**SUSTAINABILITY STRATEGY**

# Strategy: BCP 316 NET



## The Challenge of Balancing Energy Supply Security and Reducing GHG Emissions to Support Thailand's Net Zero GHG Emission Target 2065

Thailand has ratified the Paris Agreement to response limit global warming to well below 2°C in pre-industrial levels and pursuing efforts to limit warming to 1.5°C.

Thailand has announced the ambition of climate mitigation to reduce 40% emission by 2030 in order to achieve the 2050 carbon neutrality and 2065 Net Zero GHG emission targets. Bangchak's vision is to accelerate sustainable energy transition, while balancing energy supply security and be energizing lives. From enormous energy consumption, energy transition cannot occur overnight, and therefore fossil fuels will continue to play a critical role for decades to come. **Bangchak prioritizes Balancing the Energy Trilemma**, specifically, Energy Security, Energy Affordability, and Environmental Sustainability. Thus, the clean energy transition requires considerable time and capital investment, as well as the appropriate technology to help build a new ecosystem, albeit clear energy, carbon sequestration, low-carbon fuels, synthetic biology, and future fuels like hydrogen. It requires collective support and investment to build the ecosystem that will enable us to stay with fossil fuels for the energy security, as well as the environmental sustainability.

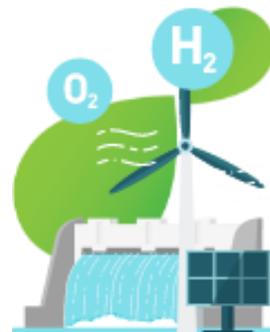
Bangchak measures its emission by applying Thailand Greenhouse Gas Management Organization (TGO) methodology (Carbon Footprint for Organization, CFO). We initiated "**BCP 316 NET**" Strategy to support energy transition and accelerating climate action for the Low-Carbon Society, while balancing energy supply security. The Strategy comprises of **B**reakthrough performance (efficiency and process improvement) to reduce GHG emission 30%, **C**onserving nature and society (green and blue carbon) to reduce GHG emission 10%, **P**roactive business growth and transition (green portfolio, future technology and carbon offset) to reduce GHG emission 60% and **NET** is zero ecosystem creation.



# Strategy: Physical and Transition Risks Driver

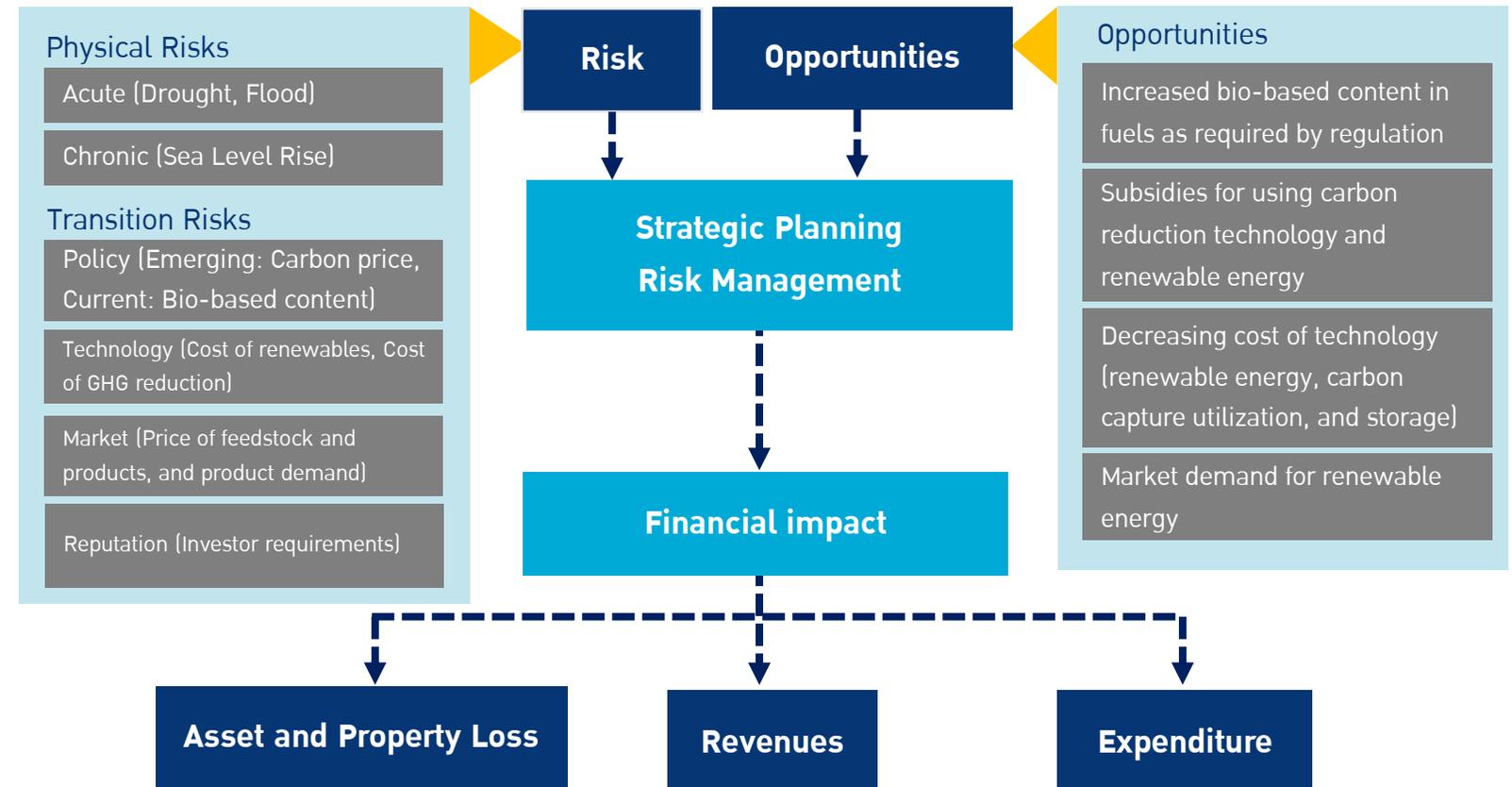
## Potential Impacts of Climate-Related Risks and Opportunities on the Bangchak's Businesses

Bangchak pay attention to climate-related risks and opportunities by **integrating climate drivers into environmental scanning and identifying factors** having potential impact. We have **evaluated climate-related risks in time horizon:** short-(**0-2 years**), medium-(**2-10 years**) and long term (**more than 10 years**) and incorporated in TCFD report. We have **applied RCP and IEA's scenarios including the goal of limiting the global temperature increase to no more than 2°C** by reducing greenhouse gas emissions. We apply climate-related risks in existing and new operations.



## Physical and Transition risks

We include stakeholder's potential impacts in our consideration. Enterprise Risk Management has included climate-related risks. Drivers of physical risks, transitional risks and opportunity are shown below.

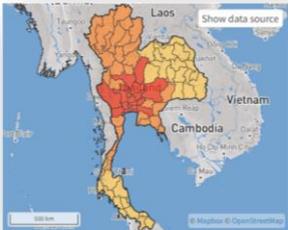


# Strategy: Physical Risk Baseline

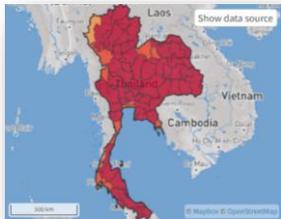
## Physical Risk Assessment

Physical risk assessment cover **Refinery and Oil Trading Business** which is Complex refinery located in Phra kanong, Bangkok, Thailand, with capacity of 120 KBD and **Marketing Business** which has distribution channels through industrial & retail channels 1,343 service stations nationwide (Standard service 724 stations and Community 619 stations). We **used ThinkHazard** (qualitative assessment methodology) to **categorize hazard baseline and used CCKP** (Climate Change Knowledge Portal by World Bank) to **project change under RCP 2.6 and RCP 8.5 scenarios in 2030, 2040, and 2050 timeframes**. From historical data, Bangchak had faced with acute risks of Drought and Flood. ThinkHazard show that Thailand has potential to occur Drought situations around 20% in the next 10 years and has potential to occur Flood situations at least once in next 10 years, respectively. Hence, Drought and Flood are our focusing.

### ThinkHazard!



Drought (Medium)



Flood (High)

Province	Think Hazard evaluator									
	River flood	Water scarcity	Urban flood	Coastal flood	Earthquake	Landslide	Tsunami	Cyclone	Extreme heat	Wildfire
Bangkok	Medium	Medium	Medium	High	Low	Very low	N/A	High	High	High
Chaburi	Medium	Very low	High	High	Low	Low	Medium	High	Medium	Medium
Kanchanaburi	High	Medium	High	N/A	Low	High	N/A	High	High	High
Kalasin	High	Very low	High	N/A	Low	Very low	N/A	Low	High	High
Kumphueng Phet	Low	Low	Low	N/A	Very low	Very low	N/A	Low	High	High
Khon Kaen	High	Very low	High	N/A	Low	Low	N/A	Very low	Medium	High
Chanthaburi	High	Low	High	High	Low	Medium	Low	High	Medium	High
Chachoengsao	High	Medium	High	High	Low	Low	Low	High	High	High
Chonburi	High	Low	High	High	Low	Medium	Low	High	Medium	High
Chai Nat	High	Low	High	N/A	Very low	Very low	N/A	Low	High	High
Chaiyaphum	High	Very low	High	N/A	Low	Medium	N/A	Low	Medium	High
Chumphon	High	Low	High	High	Low	High	Low	High	Medium	High
Chiang Rai	High	Low	High	N/A	Medium	High	N/A	High	Medium	High
Chiang Mai	High	Low	High	N/A	Medium	High	N/A	Low	Medium	High
Trang	High	Very low	High	High	Low	Low	Medium	High	Medium	Medium
Trat	Medium	Low	High	High	Low	High	Low	High	Medium	High
Tak	Medium	Low	High	N/A	Low	High	N/A	Medium	High	High
Nakhon Nayok	High	Medium	High	N/A	Low	Medium	N/A	Medium	High	High
Nakhon Pathom	High	Medium	High	N/A	Low	Very low	N/A	High	High	High
Nakhon Phanom	High	Very low	High	N/A	Low	Low	N/A	High	Medium	High
Nakhon Ratchasima	High	Medium	High	N/A	Low	Medium	N/A	Low	Medium	High
Nakhon Si Thammarat	High	Very low	High	High	Low	High	Low	High	Medium	Medium
Nakhon Sawan	High	Medium	High	N/A	Low	Medium	N/A	Low	High	High
Nonthaburi	High	Medium	High	N/A	Low	Very low	N/A	Medium	High	High
Narathiwat	High	Very low	High	Low	Low	High	Low	High	Medium	Medium
Nan	High	Low	High	N/A	Low	Medium	N/A	High	Medium	High
Bueng Kan	High	Very low	High	N/A	Low	Very low	N/A	High	Medium	High
Buriram	High	Low	High	N/A	Low	Very low	N/A	Low	Medium	High
Pathum Thani	High	Medium	High	N/A	Low	Very low	N/A	Medium	High	High
Prachuap Khiri Khan	Medium	Low	High	High	Low	Medium	Low	High	Medium	High
Prachinburi	High	Low	High	N/A	Low	Very low	N/A	Low	High	High
Pattani	High	Very low	High	High	Low	High	Low	High	Medium	Medium
Phra Nakhon Si Ayutthaya	High	Medium	High	N/A	Low	Very low	N/A	Medium	High	High
Phayao	High	Low	High	N/A	Low	Low	N/A	High	Medium	High
Phang Nga	Medium	Very low	High	High	Low	High	Medium	High	Medium	Medium
Phatthalung	High	Very low	High	N/A	Low	Low	N/A	High	Medium	Medium
Pichit	High	Low	High	N/A	Very low	Very low	N/A	Low	High	High
Phisanulok	High	Low	High	N/A	Very low	Medium	N/A	Low	High	High
Phetchaburi	High	Low	High	High	Low	Medium	Low	High	High	High
Phetchabun	High	Medium	Medium	N/A	Low	Medium	N/A	Low	High	High

Province	Think Hazard evaluator									
	River flood	Water scarcity	Urban flood	Coastal flood	Earthquake	Landslide	Tsunami	Cyclone	Extreme heat	Wildfire
Phrae	High	Low	High	N/A	Low	Medium	N/A	Low	High	High
Phuket	Low	N/A	High	High	Low	High	Medium	High	Medium	Medium
Maha Sarakham	High	Very low	Medium	N/A	Low	Very low	N/A	Very low	High	High
Mukdahan	High	Very low	High	N/A	Low	Low	N/A	Medium	Medium	High
Mueang Mae Hong Son	Low	Low	High	N/A	Medium	High	N/A	Low	Medium	High
Yasothon	High	Very low	Medium	N/A	Low	Very low	N/A	Medium	Medium	High
Yala	High	Very low	High	N/A	Low	High	N/A	High	Medium	Medium
Roi Et	High	Very low	High	N/A	Low	Very low	N/A	High	High	High
Rayong	High	Low	High	High	Low	Medium	Low	High	Medium	High
Ratchaburi	High	Medium	High	N/A	Low	Medium	N/A	High	High	High
Loeburi	High	Medium	High	N/A	Low	Medium	N/A	Low	High	High
Lampang	High	Low	High	N/A	Low	Medium	N/A	Low	Medium	High
Lamphun	High	Low	High	N/A	Low	Medium	N/A	Low	Medium	High
Loei	Medium	Very low	High	N/A	Low	Medium	N/A	Very low	Medium	High
Sisaket	High	Very low	Medium	N/A	Low	Very low	N/A	Low	Medium	High
Sakon Nakhon	High	Very low	High	N/A	Low	Low	N/A	Medium	Medium	High
Songkhla	High	Very low	High	High	N/A	High	Medium	High	Medium	N/A
Satun	High	Very low	High	High	Low	Medium	Medium	High	Medium	High
Samut Prakan	Medium	Medium	Low	High	Low	Very low	Low	High	High	High
Samut Songkhram	Medium	Medium	N/A	High	Low	Very low	Low	High	High	High
Samut Sakhon	Medium	Medium	Medium	High	Low	Very low	Low	High	High	High
Sa Kaeo	High	Low	High	N/A	Low	Low	N/A	Medium	Medium	High
Saraburi	High	Medium	High	N/A	Low	High	N/A	Medium	High	High
Sing Buri	High	Medium	High	N/A	Very low	Very low	N/A	Low	High	High
Sukhothai	High	Low	High	N/A	Low	Medium	N/A	Low	High	High
Suphan Buri	High	Medium	High	N/A	Low	Medium	N/A	Medium	High	High
Surat Thani	High	Very low	High	High	Low	High	Low	High	Medium	Medium
Surin	High	Very low	High	N/A	Low	Very low	N/A	Low	Medium	High
Nong Khai	High	Very low	High	N/A	Low	Low	N/A	High	Medium	High
Nongbua Lamphu	Medium	Very low	High	N/A	Low	Very low	N/A	Very low	Medium	High
Ang Thong	High	Medium	High	N/A	Low	Very low	N/A	Low	High	High
Armat Charoen	High	Very low	Medium	N/A	Low	Very low	N/A	Medium	Medium	High
Udon Thani	High	Very low	High	N/A	Low	Low	N/A	Low	Medium	High
Uttaradit	High	Low	High	N/A	Low	Medium	N/A	Low	High	High
Uthai Thani	High	Low	High	N/A	Low	Medium	N/A	Low	High	High
Ubon Ratchathani	High	Very low	High	N/A	Low	Low	N/A	High	Medium	High

# Strategy: Physical Risk Projection

## Physical Risk Projection Trends for Thailand

Project change under RCP 2.6 and RCP 8.5 scenarios in 2030, 2040, and 2050 timeframes (project from year 2022)



Climate Change Knowledge Portal  
For Development Practitioners and Policy Makers

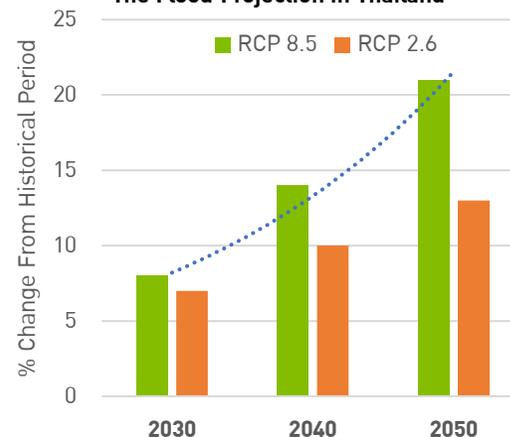
Hazard	Indicator	RCP 2.6			RCP 8.5		
		2030	2040	2050	2030	2040	2050
Drought	Change in water stress (Drought Index)	-0.08	-0.005	0.07	-0.01	0.095	0.2
Flood	Change in day maximum rainfall (%)	7%	10%	13%	8%	14%	21%

### Legend and Hazard Score for RCP 2.6 and RCP 8.5 scenarios

Category	Drought (Change in annual drought probability)	Flood (Change in 5 day maximum rainfall)
Significant increase	<-1	>10%
Moderate increase	<-0.5	>5%
Slight increase	<0	>0%
No change	0	0%
Slight Decrease	>0	<0%
Moderate Decrease	>0.5	<-5%
Significant Decrease	>1	<-10%

Categorization criteria considers all climate indicator values across scenarios and time horizons. The climate indicator went through a normalization process which involves comparing the minimum and maximum value across all time horizons and scenarios. Process depends on the indicator, some may be normalized by climate zone whereas some are done globally

### The Flood Projection in Thailand



#### Scenario

**RCP 8.5 scenario:** A pathway delivers a temperature increase of about 4.3°C by 2100, relative to pre-industrial temperatures.

**RCP 2.6 scenario:** Stringent mitigation scenario. A pathway which is representative of a scenario that aims to keep global warming likely 1.5°C and above pre-industrial temperatures by 2100.

**Flood:** In 2030 and 2050 timeframes, the climate projection data indicated there is **significant increase change** to occur both RCP 2.6 and RCP 8.5 scenarios. Flood situation has affected to our logistics and may be operation. Hence, flood has been selected as one driver of Refinery and Marketing Business.

**Drought:** In 2030 timeframes, the climate projection data indicated there is a **slightly increase change** to occur both RCP 2.6 and RCP 8.5 scenarios. Water shortage from water supply has impact to our refining process. Therefore, drought has been selected as another driver of concerned risks.

# Strategy: Physical Risk Assessment in Time Horizon



## Bangchak's Physical Risk Assessment in Time Horizon

The climate related issue in 2030, 2040 and 2050 timeframes are cover  
Bangchak's assessment in Time Horizon has identified over the short, medium,  
and long term, respectively.

Risk levels High Medium Low Very Low

Risk Type	Risk Driver	Impact in time horizon		
		Short term (0-2 years)	Medium term (2-10 years)	Long term (>10 years)
Acute	<b>Drought</b>			
	<b>Flood</b>			
Chronic	<b>Sea Level Rise</b>			

**Flood:** flooding in the operation area, can affect total production. Bangchak assessed this situation into **High-Level Risk all-time horizon:** short, medium, and long term.

**Sea Level Rise:** Rising the river level might cause flooding. This chronic situation was assessed to be Medium-Level Risk in short and medium term, and lift to **High-Level Risk in long term.**

**Drought:** Water shortage from water supply has impact to our refining process. however, Bangchak's has used 3Rs concept to reduce water supply consumption. So that when drought occurred, we can keep operation continuity. Bangchak assessed this situation into **Very Low-Level Risk all-time horizon: short, medium, and long term.**

# Strategy: Physical Risk Impact and Strategic response



For RCP 2.6 and RCP 8.5 scenarios, we have quantified the main impacts to its refinery business around the acute impacts of Flood and Drought.

## Flood Risk Impact on The Financial Planning

From risk projection trends and assessment in time horizon, **Flood situation tier 1** (water level 1.7 m) may be affected to delay product delivery but there is no significant impact. If this situation intensifies, it may **impact refinery operation and service station closing** in some areas resulting to **financial daily loss around 63 Million THB** (The calculation is high due to operating GRM and refining production in Y2022 (same basis previous year only 12 MB).

## Strategic Response of Flood and Sea Level Situation

### Refinery Business

- Monitor flood situation and the sea water level at peer. Bangkok metropolitan flood protection could support equivalent to 2.23 m water level above the sea.
- Empty the rainwater drainage as schedule.
- Installed flood prevention equipment **1 million THB** and Inspect on work plan schedule.
- Basic design of the dam for flood refinery area prevention **3 million THB**.
- Business Continuity Management Plan (BCM)
- Crisis Management Plan (CMP)

### Marketing Business

- Selected and designed service station for flood prevention.
- Business Continuity Management Plan
- Monitor flood situation in high potential hazard area.



## Drought Risk Impact on The Financial Planning

In a **Drought situation**, Bangchak Refinery would require additional water source from groundwater in order to continue operation. However, under RCP 8.5 scenario in 2030, chance of Drought would be less than RCP 2.6 as rainwater will be higher from higher temperatures (the change is slightly increase from historical period). Bangchak forecasted **financial loss of 36 KTHB from groundwater usage** (The calculation is based on assumption of drought in 2 months period).



## Strategic Response of Drought Situation

- Monitor water supply quality in daily from Metropolitan Waterworks Authority (MWA).
- Reduce water supply consumption in production, such as *Improve* Reverse-Osmosis (RO) and Electro-Deionization (EDI) including RO city unit **32 million THB** which can reduce water supply 0.1 million m<sup>3</sup>/year. *Improve* cycle efficiency of cooling tower **375 million THB**. *Improve* groundwater wells which is alternative resources **1.5 million THB**.
- Reuse condensate and stripped water 1.3 million m<sup>3</sup>/year.
- Recycle treated wastewater 0.2 million m<sup>3</sup>/year into production process.

# Strategy: Transitional Risk Assessment in Time Horizon



## Transitional risk assessment in time horizon

Uncertain events that may occur in the future and have a negative effect on Bangchak Corporation's business objective and goals.

Risk levels ■ High ■ Medium ■ Low ■ Very Low

Risk Driver	Impact in time horizon			Impacts on Bangchak's Business	Strategic Response	
	Short term (0-2 years)	Medium term (2-10 years)	Long term (>10 years)			
<b>Policy and Legal</b>	Carbon price	<span style="color: yellow;">■</span>	<span style="color: orange;">■</span>	<span style="color: orange;">■</span>	Increased OPEX from mandatory carbon prices	<ul style="list-style-type: none"> <li>• Increase the proportion of revenue from low carbon businesses</li> <li>• Improve the efficiency of processes</li> <li>• Strive for mitigation and Net Zero GHG Emission targets</li> <li>• Established the Carbon Markets Club to promote carbon trading</li> </ul>
<b>Market</b>	Crude oil price	<span style="color: yellow;">■</span>	<span style="color: orange;">■</span>	<span style="color: orange;">■</span>	Increasing of crude oil price cause gross refining margin decreased	<ul style="list-style-type: none"> <li>• Product diversification to the uplift product value</li> <li>• Enhance flexibility of Crude sourcing via the establishment of BCPT</li> <li>• Refinery optimization via various optimization programs to enhance reliability and mitigate risks of operation downtime</li> </ul>
	Fuel price	<span style="color: green;">■</span>	<span style="color: yellow;">■</span>	<span style="color: orange;">■</span>	Decreasing of demand cause sale volume and margin decreased	<ul style="list-style-type: none"> <li>• Develop model to enhance return, not only to maintain high quality fuel but also new value proposition such as "Greenovative Destination" concept to fulfill customers' needs and meet their changing behavior</li> </ul>
<b>Reputation</b>	Investor demands and data request	<span style="color: green;">■</span>	<span style="color: yellow;">■</span>	<span style="color: yellow;">■</span>	Increased compliance and reporting cost	<ul style="list-style-type: none"> <li>• Assign internal teams to be responsible for data management and reporting obligations.</li> <li>• Apply digital solutions to facilitate the process of data management and reporting</li> </ul>

# Strategy: Transitional Risk Impact and Strategic response



## Transitional Risk Impact on The Financial Planning

The overall negative impact of a global low carbon economy transition to Bangchak Corporation due to carbon price which impact to Bangchak's business and will be pressured more impact by rising of carbon price in the form of **carbon tax or cap and trade** if there is no BCP 316 NET target.

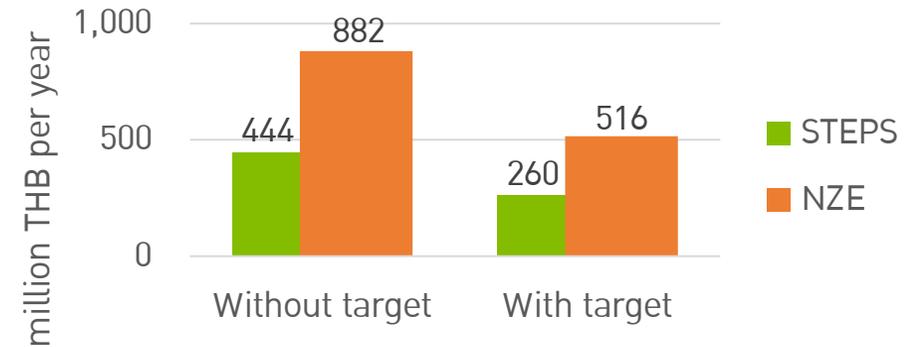
Bangchak uses the International Energy Agency (IEA): World Energy Outlook (WEO) 2022 and Southeast Asia Energy Outlook 2022, with **two main scenarios** there are Stated Policies (**STEPS**) scenario where energy consumption remains mainly fossil fuel based and Net Zero Emissions by 2050 (**NZE**) scenario where the world transitions to low carbon sources of energy to limit the rise in global average temperatures to 1.5°C.

The impacts for carbon price are quantified (million THB per year) as below scenario where our target is not implemented and another where we implement our target. **As per our BCP 316 target**, we assumed that 30% reduction and 10% reforestation were achieved by 2030 and 60% carbon sequestration technology were achieved by 2050 in line with our Net Zero GHG Emission Goal.

Moreover, Refinery and Marketing business will be affected by volatility in crude oil and fuel prices due to change in consumer demand (both climate related and non-climate related). For Natural Resource business will be affected by similar circumstance of the world's transition toward cleaner energy.

By the way, **the overall positive impact** of low carbon economy transition would be affected to our **renewable energy business**. Increasing capacity to meet with future demand.

Implications for Carbon Tax Y2030



Implications for Cap and Trade Y2030



**Assumptions:**

- Carbon tax in Thailand will be implemented before 2030
- For Cap and Trade, the cap reduction will be 2% per year in line with EU-ETS
- Bangchak's business will grow according to current plans
- Conservative assumption of carbon tax on both Scope 1 and 2, typically governments only put carbon price on Scope 1, however in some jurisdictions such as Japan a carbon price is placed both on Scope 1 and 2

# Strategy: Climate-Related Actions

## Scope 1: Direct Operation CO<sub>2</sub> Reduction

- **FAST Plus** (Focus Analysis Success Transform) and Energy efficiency program; energy saving and maximizing resource usage in refinery such as high emissivity **insulation coating** within heat source unit to enhance radiation heat transfer to radiant coil and reduce fuel consumption.
- **Low Conversion Process**; balance product yield pattern, quality and energy usage.
- **Electric Vehicle (EV)**; change company's vehicle from fossil fuel combustion to electric vehicle.

## Scope 2: Indirect CO<sub>2</sub> Emission

We launch 'Energy Saving Campaign' in every unit and Increase Renewable Energy Usage from **Solar Rooftop**;

- Usage Canopy Solar Roof capacity 279 kW and Lithium Battery Storage System 1 MWh at Srinakarin branch service station.
- Usage 20,000 kWh in office area.
- Usage 9,900 kWh at Inthanin and Dakasi.



## Scope 3: Reduce Other Indirect CO<sub>2</sub> Emission by Supplement to Corporate Value Chain

- **Use of sold products** (Category 11); sell **low carbon products-biofuel** including Bioethanol and Biodiesel, reducing third parties' emissions.
- **Upstream and Downstream transportation and distribution** (Category 4 and 9); **minimize sea freight** distance and **replace road transport** by fuel pipeline transportation through our investment in BFPL (Bangkok Fuel Pipeline and Logistics Company Limited).
- **End-of-life treatment of sold products** (Category 12); replace plastic usage by **low carbon packaging** in our non-oil business, such as using bio-degradable cup and plastic sip cap to reduce the use of straws.
- **Purchased goods and services** (Category 1); use 3Rs (Reduce, Reuse and Recycle) concept to **reduce water consumption** in production process and office buildings.
- **Waste generated in operations** (Category 5); maintain '**Zero Waste to Landfill**' target continuously.
- **Employee commuting** (Category 7); provide **EV-bus** for employee's transportation between Refinery and HQ office, raise employee awareness to **use biofuel** through climate action KPI campaign and provide **shuttle carpool service** between employee's
- **Business travel** (Category 6); raise employee awareness to choose the shortest distance or **low carbon flight**.home and worksite.



# Strategy: Ecosystem Creation to Accommodate the Net Zero Target



**CARBON**  
Markets Club



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[www.carbonmarketsclub.com](http://www.carbonmarketsclub.com)  
& Join us now  
(free of charge)



## Ecosystem Creation to Accommodate the Net Zero Target

- **Sustainable Aviation Fuel (SAF)**; Thailand's First and Only SAF from Used Cooking Oil (Capacity: SAF 7 KBD, COD 2024). Reduce GHG emissions from fossil JET A-1 by approximately 82,000 tCO<sub>2</sub>e per year.
- **Carbon Markets Club**; establish to promote carbon credit trading. Result to 262,457 tCO<sub>2</sub>e and RECs 870,763 MWh trading happened in 2022.
- **Battery Swapping as a Service provider (BaSS)** through Winnonie; First electric motorbike rental platform with battery swapping stations in Thailand, as its purpose is to help Motorcycle Taxi cut GHG emissions 793 tCO<sub>2</sub>e while reducing the conventional costs of motorcycle installments, fuel, and maintenance.
- **Partner EV Charger Station**; provide area to install EV charger for electric car more than 229 locations.
- **BTSG Company**; offer a one-stop solution from consultancy of fuel economics, energy management and efficiency of using Liquefied Natural Gas (LNG) with GHG reducing 25-50%.
- **Syn Bio Consortium**; join in setting up the fostering organizational low-carbon culture through various awareness campaigns such as Bangchak 100X Climate Action: All Hands-On Board, Cups for Saplings, Conserve & Share for Happiness and Mobile Refused Waste, etc.
- **Your Tree Campaign** through Bangchak application; raise customer awareness and join GHG reduction by Virtual Forestation .
- **Educating and Communicating** with stakeholders resulting in a sustainable supply chain.
- **Employee Climate action KPI**; join climate action campaign aiming to reduce personal single use plastic and GHG emission.
- **Green Business Investment** with numerous startups that support the low carbon economy transition such as Transitus Energy, a blue/ green hydrogen startup in the UK.
- **Initiate Battery Supply Chain**; Rights to get about 6,000 tons of lithium each year.

# Strategy: Transitional Opportunities in Time Horizon



## Transitional opportunities assessment in time horizon

Uncertain events that may occur in future and have a **positive effect** on Bangchak Corporation's business objective and goals.

Risk levels High Medium Low Very Low

Opportunity Driver	Impact in time horizon			Impacts on Bangchak's Business	Strategic Response	
	Short term (0-2 years)	Medium term (2-10 years)	Long term (>10 years)			
<b>Policy and Legal</b>	Increased requirement of biobased content in fuels by regulation				<ul style="list-style-type: none"> <li>Increased revenue from Bio-based Business</li> </ul>	<ul style="list-style-type: none"> <li>Accelerate Bio-based business expansion</li> </ul>
	Subsidies for carbon reduction technology and renewable energy				<ul style="list-style-type: none"> <li>Improved return on investment for GHG reduction technologies and renewable energy</li> <li>Reduced carbon cost</li> </ul>	<ul style="list-style-type: none"> <li>Monitor and review subsidy opportunities for mitigation technologies suitable for Bangchak Corporation.</li> <li>Encourage private sector and governmental support to deploy key technologies for deep decarbonization</li> </ul>
<b>Technology</b>	Maturation of Carbon Capture, Utilization and Storage (CCUS)				<ul style="list-style-type: none"> <li>Reduced CAPEX for CCUS</li> <li>Reduced carbon cost.</li> </ul>	<ul style="list-style-type: none"> <li>Seek collaboration with strategic partners to pilot and assess CCUS applications</li> </ul>
<b>Marketing</b>	Increased demand for renewable energy (Electricity and Bio-fuel)				<ul style="list-style-type: none"> <li>Increased revenue from Power and Bio-based Business</li> </ul>	<ul style="list-style-type: none"> <li>Invest in Green Power Business (BCPG), Bio-based business (BBGI) and Sustainable Aviation Fuel (BSGF).</li> <li>Continue to enhance the competitiveness of our Power business against other peers</li> <li>Strengthen research and development of advanced biofuel products</li> </ul>

# Strategy: Long Term Strategic Response

## Long Term Strategic Response

Bangchak corporation has been aware of low carbon and energy transition and prepared itself by investing in renewable energy and green bio-base business through **BCPG** and **BBGI** (in 2015 and 2017 respectively). according to IEA STEPS and NZE scenarios, there are more opportunities from green business due to increasing demand for renewable energy whereas decreasing unit cost of capital expenditure and operational costs. Apart from existing **LNG business** and **Sustainable Aviation Fuel business**, we also to invest in the future technologies and Startups; such as Transitus Energy, a blue/ green hydrogen startup in the UK. Our green businesses account for about 30% of Bangchak group EBITDA in Y2020-2025

### Refinery and Oil Trading Business

- Complex refinery with capacity of **120 KBD** (maintained high production levels at 123 KBD throughout Y2022)
- BCP Trading, biggest independent oil trader in Singapore

### Marketing Business

Distribution channels through industrial & retail channels

- **1,343** service stations
- **1,002** Inthanin coffee stores

### Natural Resources

- **Norway-based** company engaged in oil & gas exploration and production
- Capacity of **22 – 25 KBD**

### New Frontier Business

- Initiate in clean tech innovation   
Winnonie, E-motorbike rental platform
- BiiC, Corporate Venture Capital   
investor focusing on new business

### Green Power Business

- **Global** integrated power generation company & service provider of smart energy system
- Capacity of **1,109MW** ppa

### Bio-based Products

No.1 fully integrated biofuel producer & synthetic biology pioneer in Thailand

[Refer to Y2022]



# Risk Management

# Risk Management: Process

## Business Environment

:: MANCOM Meeting ::

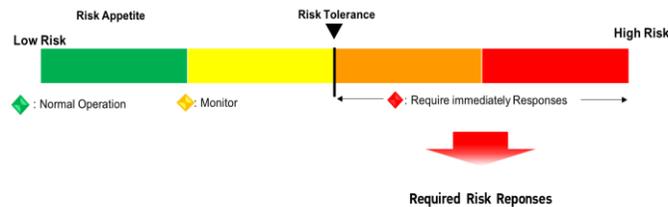


## Strategy: Assumption, Scenario and Budgeting

:: SSS / MANCOM and BoD Meeting ::

## KRI Monitoring

:: ERMC Meeting (Quarterly) ::

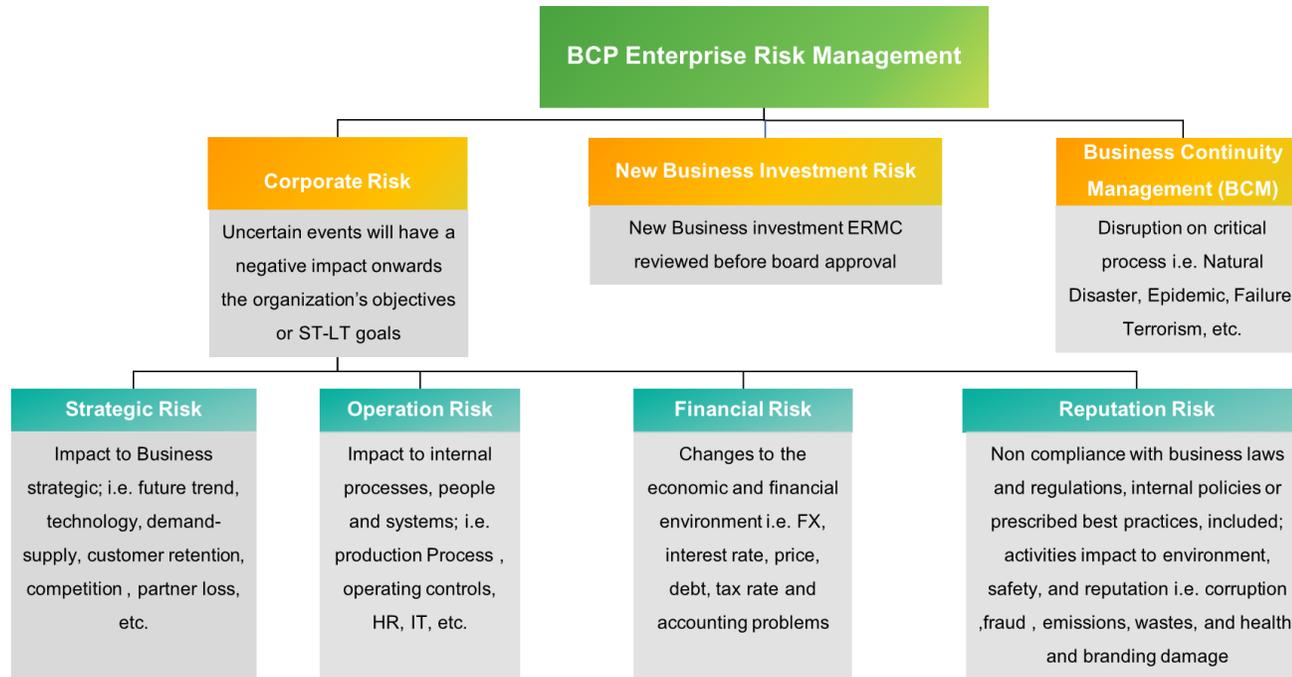


- Used to track the direction of the risk whether the trend has increase or decrease
- Be a warning sign that leads to improvements maintain track of situation
- To follow up on risk management results, whether they are on target or not to have further efficiency improvement

## Corporate Risk & KPIs

:: RMC / MANCOM / ERMC and BoD Meeting ::

# Risk Management: Enterprise Risk Management Policy



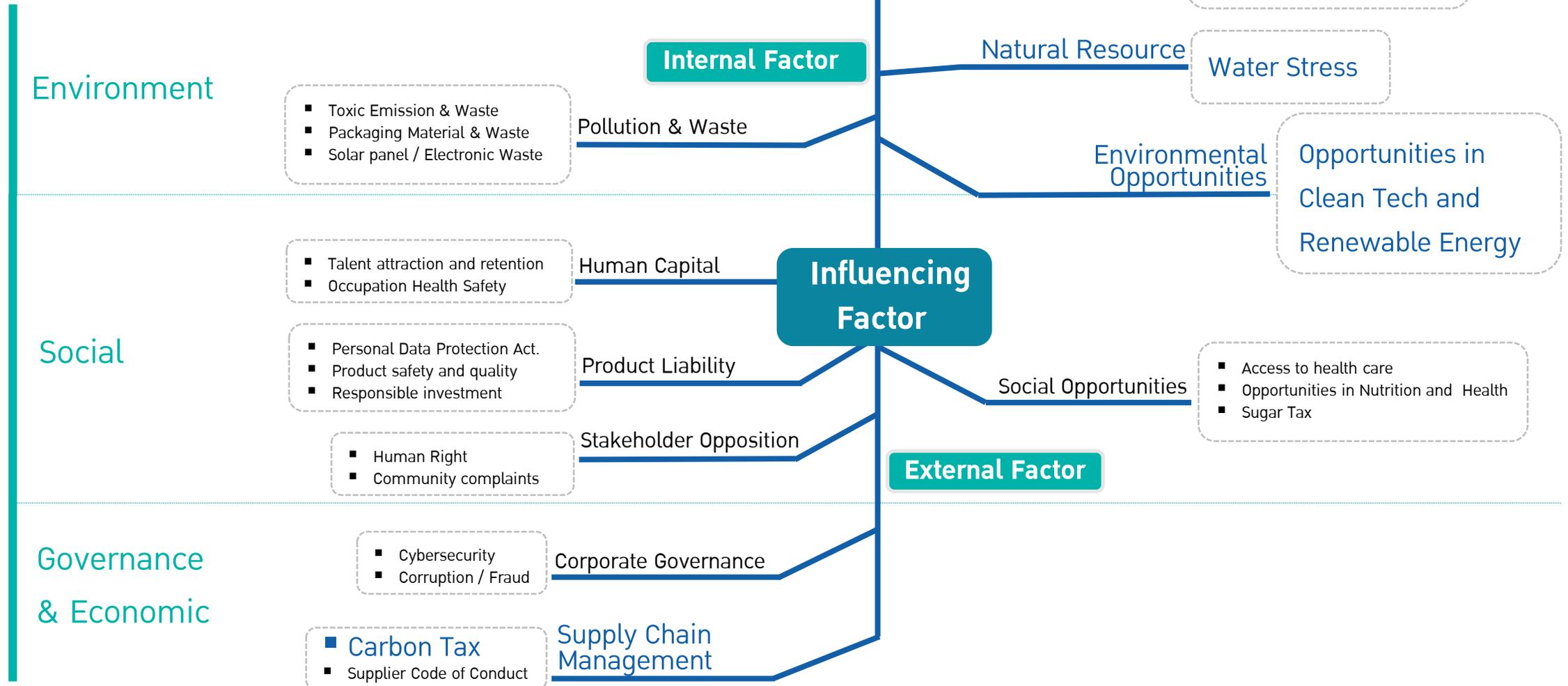
- Executives and all employees of the Company are required to manage risk matters by taking an active role and participating in the development of corporate risk management, as well as fully developing an understanding of their responsibilities.
- An effective risk management process must be established at all business stages with regard to the good corporate governance policy and be integrated with the IT management for superior management, with the goals to lower the probability of risk occurrence and their downside impact, mitigate the uncertainties of overall performance, and enhance the chance of success.
- The Company supports the implementation of risk management to achieve success in all parts, utilizing the limited resources to identify, assess and appropriately manage risks.
- The Company encourages and drives risk management to be a part of our corporate culture and be valued by all employees.
- Executives and employees of all levels, including affiliated companies, adhere to the standard risk management system in order to achieve corporate goals and comply with the Environmental, Social and Governance Policy.

Bangchak Corporation's Enterprise Risk Management system based on Committee of Sponsoring Organizations of the Treadway Commission Enterprise Risk Management (COSO ERM) is intended to help the company identify, evaluate, and manage risks in order to lessen potential impact and assist the accomplishment of our long-term goals and business plan.

The Framework and the principles for risk management that Bangchak Corporation has been utilized to systematize the management of risks linked with climate change throughout the company. The purpose of this is to incorporate climate-related risk management into Bangchak Corporation's internal management to ensure that the company can preserve and generate long-term value.

# Risk Management: Identifying Influencing Factor

Evaluate factors which can affect the goals



Environment

Social

Governance & Economic

# Risk Management: Risk Assessment Matrix

## Risk impacts and likelihood


Impact

## Likelihood

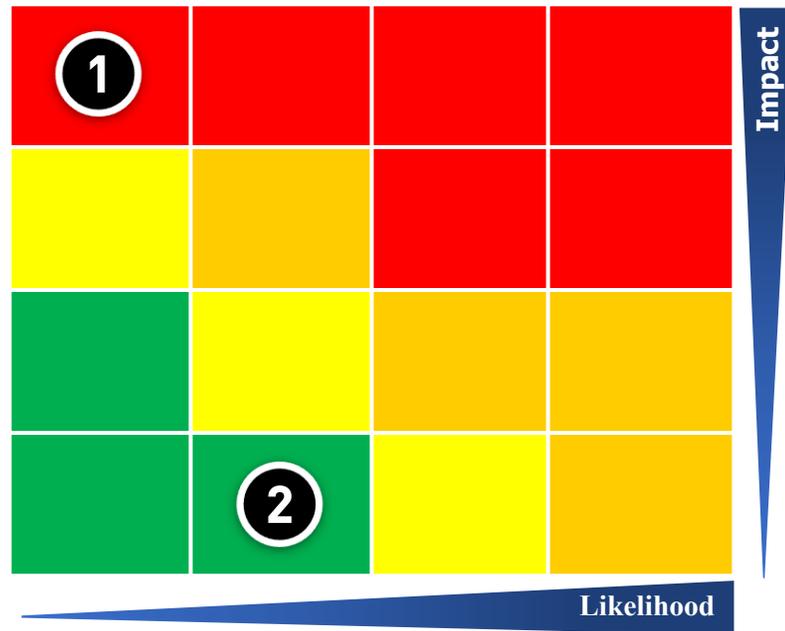
1	2	3	4
<ul style="list-style-type: none"> <li>Likelihood &lt; 20%</li> <li>Low level of data breach risk</li> <li>Might not happened in this year</li> <li>Hardly happen in pass work</li> </ul>	<ul style="list-style-type: none"> <li>Likelihood 20-50%</li> <li>Moderate level of data breach risk</li> <li>Might happen depend of some factor</li> <li>Sometime happened in pass work</li> </ul>	<ul style="list-style-type: none"> <li>Likelihood 50-80%</li> <li>High level of data breach risk</li> <li>Might happen</li> <li>เคยเกิดขึ้นหลายครั้งในการทำงานที่ผ่านมา</li> </ul>	<ul style="list-style-type: none"> <li>Likelihood &gt;80</li> <li>Very high level of data breach risk</li> <li>Will happen in this year</li> <li>Often happen in pass work</li> </ul>

	Financial & Market	Leadership & Governance	Workforce	Customer	Product & Process
4	<ul style="list-style-type: none"> <li>Impact <math>\geq 10\%</math> of target EBITDA/PAT</li> <li>Sale volume decrease <math>\geq 10\%</math></li> <li>Growth rate lower than industry average <math>\geq 5\%</math></li> <li>ROIC <math>\geq 3\%</math></li> </ul>	<ul style="list-style-type: none"> <li>There is a cause of resist /violent protest from community or stakeholder</li> <li>There are headline that cause disreputable and could not resolve (month/year) or cause legal liability</li> </ul>	<ul style="list-style-type: none"> <li>Disable/die due to work process</li> <li><math>\geq 40\%</math> of employee stop working</li> <li>Employee Engagement decrease <math>\geq 10\%</math></li> <li>Talent Focus <math>\geq 8\%</math></li> </ul>	<ul style="list-style-type: none"> <li>Customer KPI lower than target <math>\geq 5\%</math></li> <li>NPS score Gap of standard service station compare with 1<sup>st</sup> rank decrease from target <math>\geq 5\%</math></li> </ul>	<ul style="list-style-type: none"> <li>Accident cause process downtime <math>\geq 50</math> days</li> <li>Production decrease <math>\geq 10\%</math></li> <li>Data breach/infringement of personal data which might highly effect to the data owner<sup>12</sup></li> <li>All IT critical process damaged and impact to confidentiality data level 3 and 4 (secret and top secret)</li> </ul>
3	<ul style="list-style-type: none"> <li>Impact 5- &lt;10% of target EBITDA/PAT</li> <li>Sale volume decrease 5- &lt;10%</li> <li>Growth rate lower than industry average 2- &lt;5%</li> <li>ROIC 1.5- &lt;3%</li> </ul>	<ul style="list-style-type: none"> <li>There is a sue which cause of very dissatisfy from community or stakeholder</li> <li>Widespread disreputable news which take time to resolve (week) or being sued by owner of personal data/ external agency</li> </ul>	<ul style="list-style-type: none"> <li>Be injured due to work process (serious injury)</li> <li><math>\geq 30</math> -40% of employee stop working</li> <li>Employee Engagement decrease 5- &lt;10%</li> <li>Talent Focus decrease 6- &lt;8%</li> </ul>	<ul style="list-style-type: none"> <li>Customer KPI lower than target 2 - &lt;5%</li> <li>NPS score Gap of standard service station compare with 1<sup>st</sup> rank decrease from target 2- &lt;5%</li> </ul>	<ul style="list-style-type: none"> <li>Accident cause process downtime 25-&lt;50 Days</li> <li>Production decrease 5- &lt;10%</li> <li>Data breach/infringement of personal data which might effect to the data owner<sup>12</sup></li> <li>IT critical process damaged and impact to confidentiality data level 1 and 2 (internal used top normal)</li> </ul>
2	<ul style="list-style-type: none"> <li>Impact 1- &lt;5% of target EBITDA/PAT</li> <li>Sale volume decrease 1- &lt;5%</li> <li>Growth rate lower than industry average 1- &lt;2%</li> <li>ROIC 0.5- &lt;1.5%</li> </ul>	<ul style="list-style-type: none"> <li>There is a cause of dissatisfy from community or stakeholder</li> <li>disreputable news which could resolve in 1-3 days</li> </ul>	<ul style="list-style-type: none"> <li>Need doctor medication/ wide spread panic</li> <li><math>\geq 20</math> -30% of employee stop working</li> <li>Employee Engagement decrease 1- &lt;5%</li> <li>Talent Focus decrease 4- &lt;6%</li> </ul>	<ul style="list-style-type: none"> <li>Customer KPI lower than target 1 - &lt;2%</li> <li>NPS score Gap of standard service station compare with 1<sup>st</sup> rank decrease from target 1- &lt;2%</li> </ul>	<ul style="list-style-type: none"> <li>Accident cause process downtime 5- &lt;25 Days</li> <li>Production decrease 1- &lt;5%</li> <li>Data breach/infringement of personal data which might effect to the data owner (not consist of Sensitive data)<sup>12</sup></li> <li>IT process slightly damage and can be recovered</li> </ul>
1	<ul style="list-style-type: none"> <li>Impact &lt;1% of target EBITDA/PAT</li> <li>Sale volume decrease &lt;1%</li> <li>Growth rate lower than industry average &lt;1%</li> <li>ROIC &lt;0.5%</li> </ul>	<ul style="list-style-type: none"> <li>There is a cause of dissatisfy from community or stakeholder which could immediate resolve</li> <li>disreputable news which could immediate resolve</li> </ul>	<ul style="list-style-type: none"> <li>Minor injury/ short term panic</li> <li><math>\geq 10</math> - 20% of employee stop working</li> <li>Employee Engagement decrease &lt;1%</li> <li>Talent Focus decrease &lt;4%</li> </ul>	<ul style="list-style-type: none"> <li>Customer KPI meet targets</li> <li>NPS score Gap of standard service station compare with 1<sup>st</sup> rank decrease from target &lt;1%</li> </ul>	<ul style="list-style-type: none"> <li>Accident cause process downtime &lt; 5 Days</li> <li>Production decrease &lt;1%</li> <li>Data breach/infringement of personal data which might slightly effect to the data owner<sup>12</sup></li> <li>Incident with IT system which and be recovered and on damage</li> </ul>

# Risk Management: Physical Risk Prioritization Matrix

Our risks are prioritized using our Enterprise Risk Management definitions for impact and likelihood.

This prioritization has helped us understand what parts of our strategy we should pursue first. These risks are described below.



Risk levels

■ High
 ■ Medium
 ■ Low
 ■ Very Low

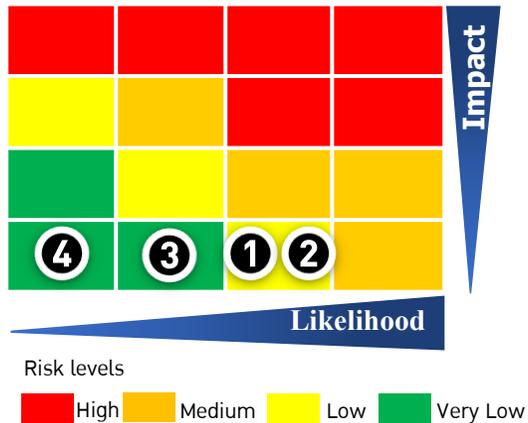
## ① Flood and Sea level rise

Rising river level might cause flooding in the operation area, affecting total production. From the assessment and risk management plan. Bangkok metropolitan flood protection could support equivalent to 2.23 m water level above the sea. Bangchak prepare a business continuity plan to manage the case of flooding in the refinery area.

## ② Drought

Promote the reduction of water consumption in all production processes with all affiliates and business unit. Moreover, a project of drilling for ground water was initiated for secure water storage and supply.

# Risk Management: Transition Risk Prioritization Matrix



## ① Carbon Price

Bangchak has been increasing the proportion of revenue from low carbon businesses while improving the efficiency of processes and using low-emission products to achieve company target on reduction carbon emission 30% by 2030 and a zero GHG emission target by 2050. In addition, The company also founded the Carbon Markets Club to promote carbon credit trading to accelerate the transition into low carbon society.

## ③ Fuel Price

The Group has been developing model to enhance return, not only to maintain high quality fuel but also new value proposition to our value customer as a "Greenovative Destination", a lifestyle destination for intergeneration, to fulfilled customers' needs and meet their changing behavior. The model has included on-site offering of variety food and beverage services (2030 retail EBITDA still increase compare to 2022).

## ② Crude Price

To emphasis more on product diversification, The company has modified the refinery which allows Bangchak to present new, more diverse products to the market, going from a variety of fuels to the production of UO (unconverted oil) for feedstock of lube base oil and paraffin wax along with modifications for greater diversity. An instance solvents, which are key industrial components, including paint, thinner, and resin. Bangchak still plans to sell a more diverse array of products in the future.

## ④ Investor demands and data request

Assign internal teams to be responsible for data management and reporting obligations. Including apply digital solutions to facilitate the process of data management and reporting.

# Risk Management: Mitigating Climate-related Risks

Multiple internal and external risk factors that may affect Bangchak Corporation's business operation have been analyzed in short term, medium term and long-term period. The system incorporates risks in strategy and finance. It is managed with specific key risk indicators (KRIs) to monitor and track the likelihoods and severity of all identified risks and provides treatment plans to mitigate and minimize the risks and drive operations to succeed as planned. Bangchak promotes a culture of risk management in the organization and extends it to Bangchak's group by **allowing all departments to revise a risk plan every year.**

With an action plan for climate change, Bangchak has invested in power business to use renewable energy and have been enhanced green procurement for products and services through supply chain management. In addition, we have conducted scenario analysis of our own internal carbon price. To identify the impact on EBITDA and plan the strategy in different scenarios, a carbon tax aligned with well below 2 degrees Celsius and 1.5 degrees Celsius scenarios, as well as Thailand's cap-and-trade scheme, was considered. Examples of actions to mitigate transition risks include reducing GHG emissions through energy efficiency improvement projects and implementing internal carbon shadow prices for new investment decision-making and energy efficiency projects.

For physical risk, drought and floods pose a significant risk to Bangchak Corporation's businesses and its business partners value chains. We have prepared measures to mitigate and manage these effects. The Refinery and Marketing Business were assessed the likelihood of hazards major receptor risks.



# Metrics and Target

# Metrics and Target

**Bangchak integrates UN SDGs** with business operations by emphasizing the operations in response to the 8 main goals. While striking a good balance among Environment, Society, and Corporate Governance (ESG). For **UN SDG13 Climate action is our key concern** due to top materiality topics of Bangchak's stakeholder are Climate Change Adaptation & Risk Management and GHG Emissions. To ensure focused implementation of climate change strategy, GHG emission reduction is set as **Corporate KPI** in 2022 for the all-executive levels and relevant business unit including Group Chief Executive Officer, Presidents.

Bangchak uses the following methodologies to quantify and track our GHG emissions:

- **Based Year:** 2019 (922,698 tCO<sub>2</sub>e)
- **Boundary:** Refinery business, Marketing business and Headquarter & Regional offices
- **Scopes Covered:** Scope 1 and 2 (absolute based)
- **Emission factor and Methodology Used:** Intergovernmental Panel on Climate Change (IPCC) National Greenhouse Gas Inventory Guidance 2006, ISO 14064-1, American Petroleum Institute (API) GHG Compendium 2009 and Thailand Greenhouse Gas Management Organization (TGO).



We aim to reduce and sequester 100% of Scope 1 and 2 emissions by 2050 through:

**30% Reduction 276,809 tCO<sub>2</sub>e**

Efficiency and Process Improvement

**10% Natural Sequestration 92,270 tCO<sub>2</sub>e**

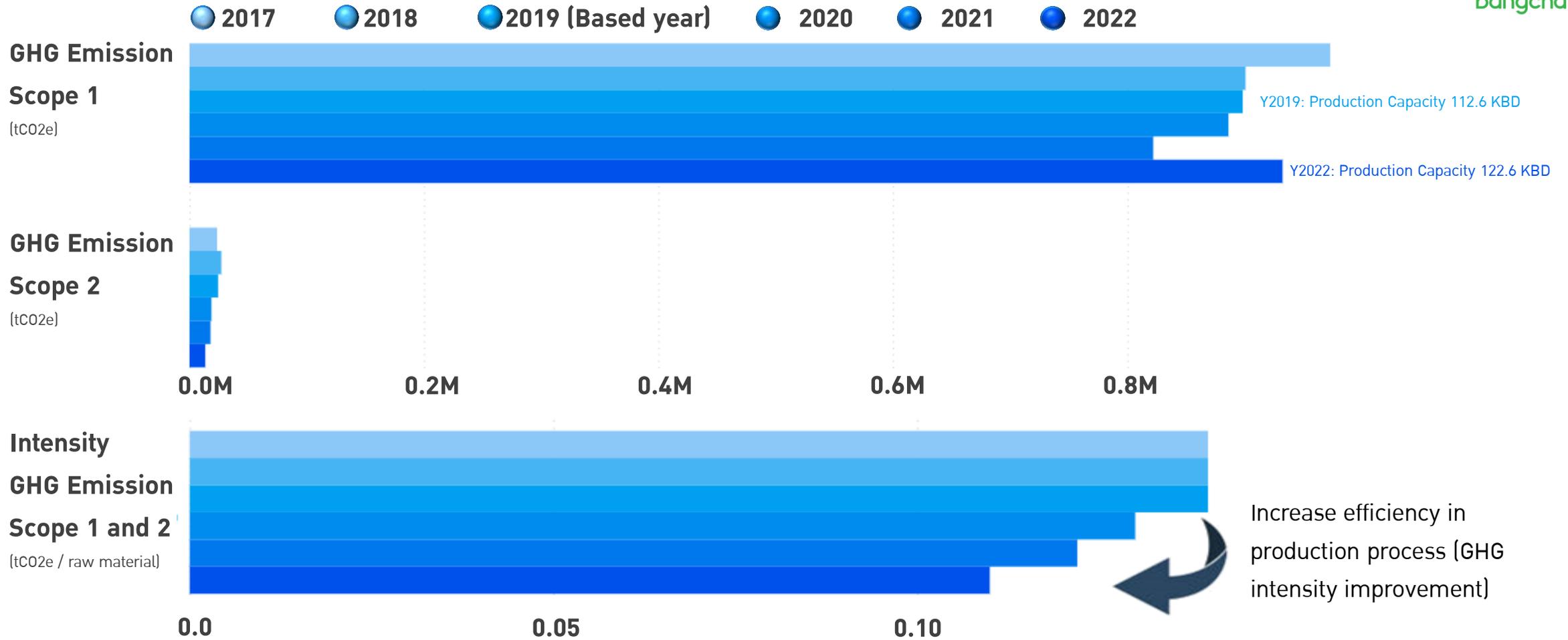
Green and Blue Carbon

**60% Technology Sequestration 553,619 tCO<sub>2</sub>e**

Green Portfolio, Future Technology and Carbon Offset



# GHG Emission Performance Scope 1, 2 and 3



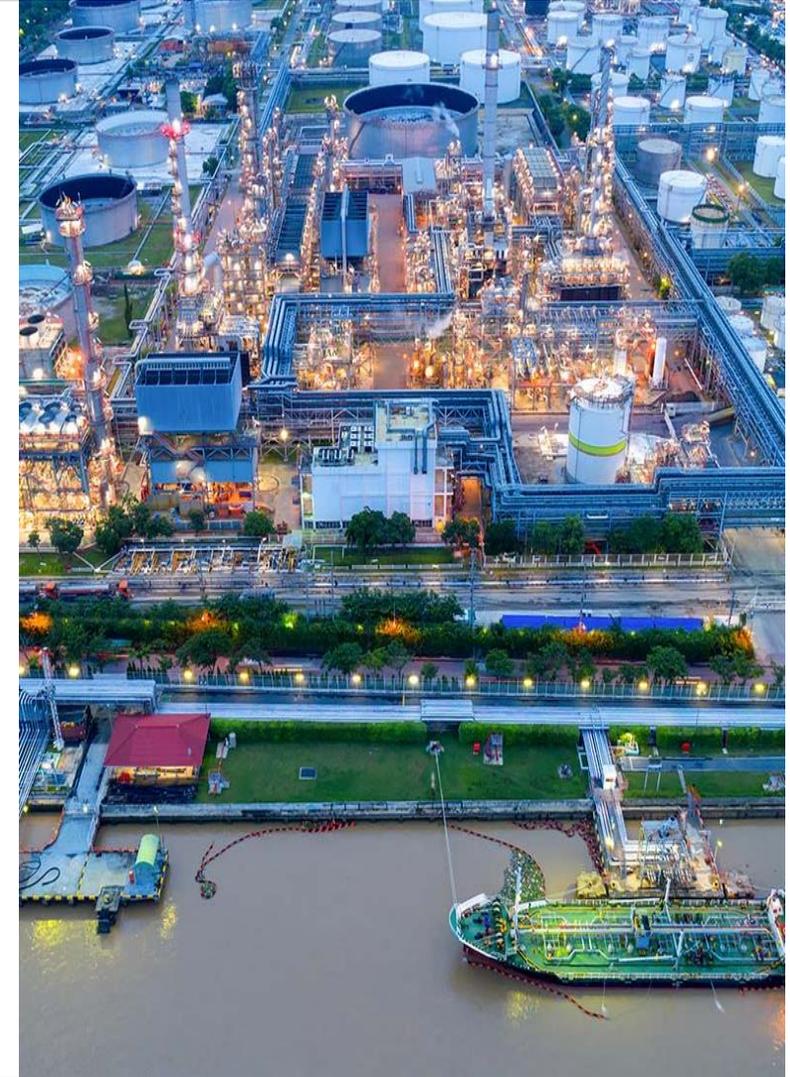
- **GHG Emission Scope 3 Y2022** 3,874,168.13 tCO2e covers Use of sold product (Company Own Company Operate), Upstream transportation and distribution, and Downstream transportation and distribution.
- GHG Emissions, Scope 1, 2 and 3 (tCO<sub>2</sub>e) have been verified by a third party, [Sustainability Report 2022](#)

# GHG Emission Performance Scope 1&2

## Scope 1 and 2 GHG Emission

Bangchak engage in business in harmony with environment and society. Considering environment impact along the cycle, starting with the crude selection, low severity condition as necessary in operation process and low carbon in transportation, etc. In year 2022 GHG emission is 945,665.56 tCO<sub>2</sub>e, an increasing volume due to an increase capacity to serve our community demand. In addition, we continuously Improve in operational stability, operational efficiency, lead to reductions in energy intensity. Energy Consumption for Production [%Fuel Oil equivalent Barrel : %FOEB] is 4.83% which decreases 7.8% from previous year. Bangchak has implemented refinery improvement programs and followed the existing programs since 2019 include,

- Lower Hydrocracking unit conversion and full year utilization of new heat exchanger of UCO rundown.
- Decrease inlet temperature from CCRU (Continuous Catalytic Regeneration Unit)
- Install coating material at the crude oil distillation unit to reduce heat loss at the furnace wall.
- Reduce the use of high-pressure steam in crude oil distillation unit 4.
- Decrease inlet temperature from Diesel quality improvement unit 3.
- Replace catalysts at the naphtha quality improvement unit 2 and 3.
- Stop using gas compressors in the crude oil distillation unit 3.
- Stop using sulfur removable in fuel gas unit 3.
- Improve heat exchanger to reuse waste heat in crude oil distillation unit 2.
- Reduce the use of high-pressure steam at the light naphtha oil improvement tower.
- Reduce the use of medium-pressure steam at the product separation tower of the molecular splitting unit.
- Reduce outlet temperature for the molecular splitting unit furnace.



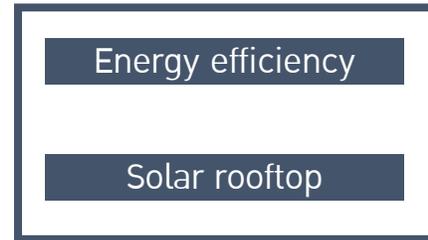
# Internal Carbon Price

## Internal Carbon Price

Our main objective for internal carbon pricing is to support reduction of GHG emissions in our organization in line with our Net Zero target.

- We use an **internal carbon price enforced at rate 15 \$/tCO<sub>2</sub>e** to help us seek and justify in low carbon technologies and energy efficiency to prepare long term carbon reduction strategic plan aims to carbon neutral in Y2030 as a shadow price.
- We also enhance capability for investment in a new improvement project and carbon business by **using carbon incentive or using carbon tax** in investment, if applicable, depended on its location.

*New GHG emission reduction projects*



*New projects which emit GHG emissions*





Crafting a Sustainable World  
with Evolving Greenovation

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