ธนาคารกสิกรไทย
开泰银行 KASIKORNBANK

Climate-Related Scenario Analysis Summary Report 2018

Contents

1. INTRODUCTION

Globally, Climate change is recognized as the biggest challenge of the 21st century. Climate Change not only threatens the well-being of hundreds of millions of people today, but also effects billions more in the future. It is also a significant threat to the economy and critical infrastructures.

Climate change poses two primary issues for companies to consider: risks and opportunities. Though financial sectors do not significantly contribute negatively to climate change, in the sense that they have minimal direct climate change related impact and risks from day-to-day operations, instead they have opportunities through playing a key role in financing funds and investments into environmentally companies, innovations and technologies required for the world to transition from a carbon intensive economy, to a low-carbon economy, which is critical to the environmental sustainability of the planet in terms of limiting the effects of global warming from climate change. For this reason, the financial sector holds the power to push companies to invest into low-carbon technologies, while disapproving loans to more traditional and environmentally harmful projects.

Additionally, the majority of risks for the financial sector lies in their lending portfolio, where lending to high carbon intensity sectors, such as industrial agriculture and petrochemicals may lead to increased probability and risk of loan default when the world transitions to a low carbon economy, introducing taxes and schemes to limit Greenhouse Gas (GHG) emissions, and increasing overall operational costs. While lending to low carbon intensity sectors and green technologies presents the financial sector with countless new opportunities, from access to new markets, new and innovative products/services in addition to positive reputations.

"Financial Sectors hold the power to push companies to invest into low-carbon technologies"

Kasikornbank (KBank) engaged ERM as the external sustainability consultant to conduct KBank's first internal climate-related scenario analysis workshop, with the objective to satisfy the current gap within the Dow Jones sustainability Index Questionnaire (DJSI), with emphasis on question 2.3 Climate Strategy and 2.3.5 Scenario Analysis, under the Environmental Dimension, with a secondary objective to answer CDP Climate Change question on scenario analysis. The climate-scenario workshop is the first step for KBank to carry out analysis of its business and customers, the objective of the first climate related scenario analysis is to.

- To understand what climate scenarios are, and its implications to the sector and company
- To raise awareness of different climate-related scenarios
- To identify risks and opportunities, material to the financial sector and company
- To identify high risk and opportunity customer sectors under the climate-related scenarios,
- To raise awareness of climate-related risk and opportunities, material to the financial sector and company,
- To identify what actions and investments are needed to mitigate future climate-related risks and achieve opportunities.
- To identify relevant risks to KBank in the lending portfolio under the climate-related scenario and their impact to KBank

The climate-related scenario analysis was conducted through a two day workshop with relevant departments head and representatives as follow:

- Enterprise Risk Management
- Corporate Business
- Credit Products
- Kasikorn Research Center
- Corporate Secretariat

Agenda for workshop

Workshop Day 1: Knowledge Sharing Session

- Introduction to climate change and scenario analysis
- Types of risks and opportunities
- Material risks and opportunities to the financial sector

Workshop

- Qualitative evaluation of risks and opportunities

Workshop Day 2: Results and Discussions

- Discussions on quantitative evaluation method

2. SCOPE

As a bank, KBank does not yet have any clear restriction on provision of financial services to any customer groups or sectors, as such, KBanks customers operates in diverse sectors, each with different potential risk and opportunities to consider and applicable to the business. Due to the complexity of scenario analysis, ERM recommended KBank to narrow customer sectors down to the following four sectors for its first scenario analysis for qualitative analysis. In addition KBank conducted quantitative analysis for two sectors, Automotive and Parts and Industrial Agriculture.

- Automotive and Parts
- Industrial Agriculture
- Petroleum & Petrochemical Products, and
- Utilities (Gas and Coal)

These sectors also represent the parts of KBank's portfolio with the highest perceived risks. In total KBank has a lending portfolio valued at over 1,914 billion Baht, the above sectors represent 313,236 million baht or 17.81% of this portfolio.

The purpose of KBank's first climate-related scenario analysis is to first assist relevant departments in getting a comprehensive understanding on how to conduct a scenario analysis. For this reason, selected high risk sectors were focused on for the analysis to ensure that a complete outcome is achieved. In the future, KBank should continuously expand the scenario analysis to other high risk sectors, and eventually to the whole of its lending portfolio.

Background and Scenarios

The Paris Agreement was signed in 2015, at the 21st Conference of the Parties (COP21). It represents an important milestone to the world, as it represents a key progress toward change to a low carbon economy. The Paris Agreement aims to limit global temperature rise to less than 2 degrees (increase compared to pre-industrial levels) and pursue efforts to limit temperature increase to less than 1.5 degrees. This suggests that at least some governments around the world are playing their part in the transition to a low-carbon world. Other countries, which did not sign the agreement, notably the United States of America (USA), or did not set a challenging targets are not contributing to the transition to a low-carbon world. Today the transition is increasingly evident through laws, regulations and requirement changes to report and consider Environmental, Social and Governance (ESG) and climate transition criteria. This is especially evident in Asia, where interests into Green, Social and Sustainability Bonds have dramatically increased in recent years. As a signatory country, Thailand has committed to achieve this ambitious target to limit temperature increase within 2 degrees.

Scenario analyses are analyses of possible future events and its implications, by considering alternative possible outcomes beyond than forecasted events. A climate-related scenario analysis analyzes possible impacts from climate change and its implications for the business. The two key types of scenarios to consider are the Physical Scenarios (or in layman's terms a "High Carbon Scenario") and Transition Scenarios (or in layman's terms "Low Carbon Scenarios"). There are multiple Physical and Transition Scenarios conducted by different organizations, the most commonly used scenarios come from the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA). The IPCC scenarios focus mainly on physical climate changes, while the IEA scenarios focus mainly on transition scenarios, i.e. scenarios for transition to a low carbon economy. Furthermore, the IEA scenarios primarily focuses on energy, therefore transition risks for non-energy sectors are typically not comprehensively analyzed.

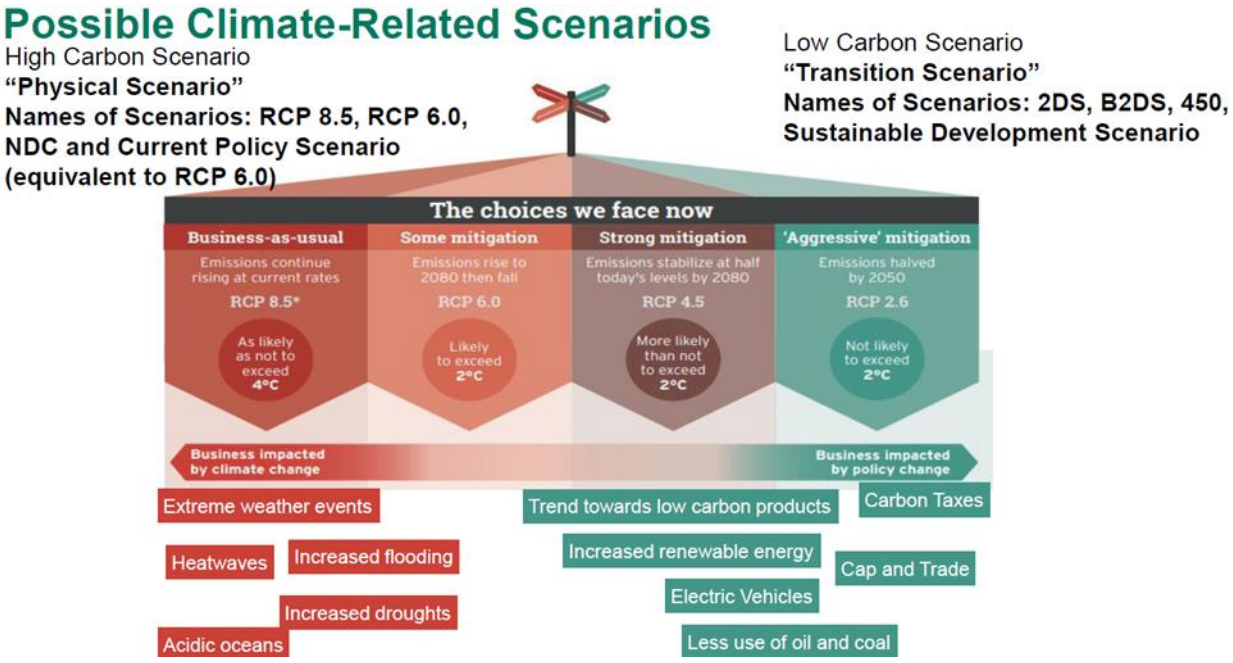

Figure 1. Possible climate-related scenarios

3. SCENARIOS

Scenario 1 – Baseline: National Determined Contributions (NDCs)

Driver:

To contribute to the Paris Agreement, the Thai government and other governments have developed National Determined Contributions (NDCs). The NDC serves as a target to control emissions from all national sources (e.g. private sector, public sector, and all Thai citizens, Agriculture, Forestry and Other Land Use (AFOLU)). The targets aims to reduce emissions from baseline Business as Usual emissions in 2030 at 555 Million tonnes carbon dioxide equivalent (MTCO2e) to 444 MTCO2e, a reduction of 111 MT-CO2e or 20% from business as usual (BAU), focusing on heavy emitting sectors, namely energy and transportation, waste and IPPU, with almost 100% of expected emissions reductions to come from energy use and energy sector.

Carbon price is an instrument which assigns a price to carbon emissions as a way to encourage businesses, especially those classified as heavy emitters to reduce the amount of Greenhouse gas emissions (GHG) they emit into the atmosphere. Thailand is likely to use carbon price as a primary method to drive emission reductions in Thailand and it is likely to start in 2022.

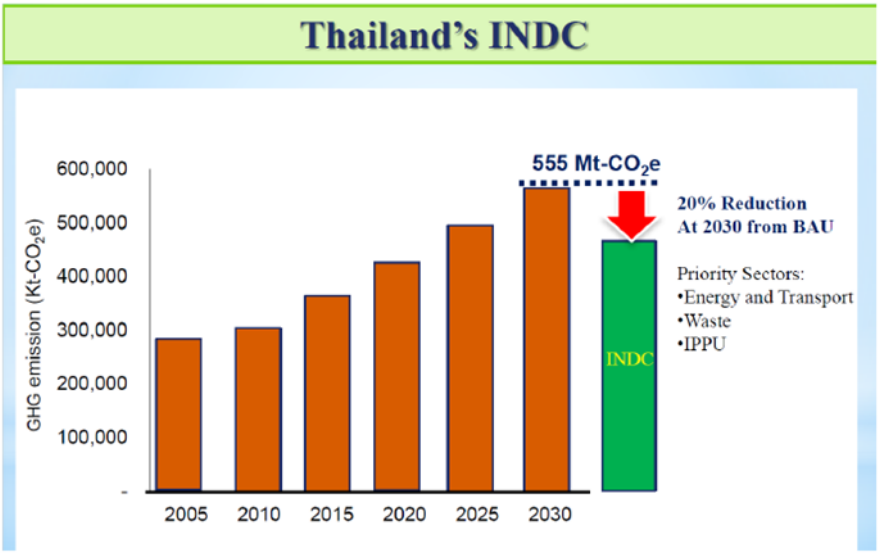

Figure 2. *Thailand's NDCs Target to reduce emissions by 2030*

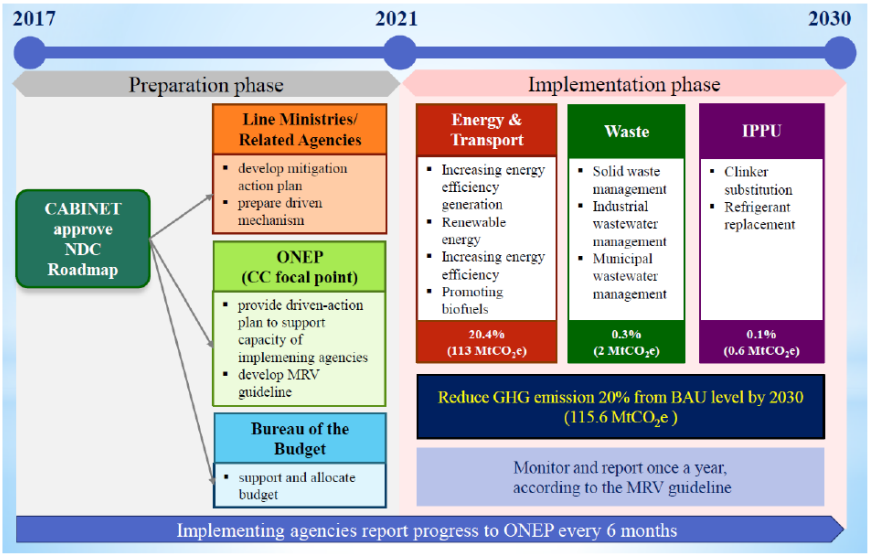

Figure 3. *Thailand's NDCs Implementation plans*

Implications:

The key implications of NDCs comes from the introduction of new regulations to manage and limit carbon emissions within 2021. Within the Thailand context, the Thailand Greenhouse Gas Management Organization (TGO) is currently investigating the method for Thailand to effectively implement **carbon price**. However, it has not yet finalized whether it will be a carbon tax or cap and trade. Key regulations likely to be introduced under the NDCs scenario is the Carbon Price, which include the Cap and trade and Carbon Tax. For example, cap and trade puts a value on the amount of GHG emitted based on the market value, companies emitting over the limit will incurred additional operational costs (similar to tax), to the government as punishment, encouraging investments into low-carbon technologies. The cap and trade system creates a market for carbon emissions, as low emitters can 'sell' emission rights or permits to others heavy emitters as additional revenue.

Scenario 2 – Transition Scenario: International Energy Agency (IEA) 2 degrees Scenario (2DS)

Driver:

The International Energy Agency (IEA), 2 degree scenario (2DS) describes the energy system where emission trajectory is aligned with that of recent climate science research, which indicates that there is an 80% chance that global temperature increase will not exceed 2 degrees when compared to pre-industrial revolution period. The 2DS has multiple assumptions on different energy related variables such as proportion of renewable energy, increase utilization of energy from diverse sources, and low carbon technologies. There are multiple scenarios by different agencies that describe similar transition to low carbon economy, however the IEA's 2DS is most well-known and referenced. In addition to the 2DS the IEA also has a variety of other scenarios such as the Current Policies Scenario and New Policies Scenario to describe other pathways.

Scenario 3 – Physical Scenario (RCP 8.5)

A diverse range of organizations are exposed to climate-related physical risks, as such physical climate-related scenario are particularly relevant for organizations to raise awareness and develop initiatives and mitigation strategies to counter effects from acute or chronic climate changes. These may include:

- Fixed assets;
- Location or operations, especially in climate-sensitive areas (i.e. flood zones, and coastal areas)
- Reliance on availability of water; and
- Effect on the business's value chain.

The scenario focuses on the physical effects from climate change, if temperatures increase beyond 4 degrees when compared to pre-industrial revolution period, monitoring extreme weather threats of moderate to high risk from now to 2030 and threats for 2030 to 2050. Although most climate models for physical scenarios show effects beyond 2050, most organizations focus on a shorter timeframe for physical risks, based on the lifetime of their respective assets or liabilities.

4. METHODS

Risk and opportunity assessments conducted for the analysis are based on a framework by ERM for the Taskforce on Climate Related Financial Disclosure (TCFD), which considers climate-related risks and opportunities and its effects to the business.

Types of Risks and Opportunities are as follows

- **Transition Risks**
  - Policy and Legal Risks
  - Technology Risks
  - Market Risks
  - Reputation Risks
- **Physical Risks**
  - Acute Risks
  - Chronic Risks

4.1 Types of Opportunities

- Resource Efficiency
- Energy Source
- Products and Services
- Market
- Resilience

4.2 Qualitative Analysis

To conduct the qualitative analysis, ERM met with relevant departments within KBank, to discuss different scenarios, drivers, associated assumptions and possible implications and effects to the business. After which, ERM asked for response from KBank, to provide their views regarding possible impacts and outcome of each scenarios to the customer sector and business itself. These responses are then filtered to only retain information relevant to climate change to rank high risk issues for the qualitative ranking. As a pilot analysis, the analysis focuses on effects from Thailand's National Determined Contribution (NDCs), in 2025 and 2040 as the baseline scenario. ERM then escalated these risks and level to the level under 2DS assumptions.

Sector		THAI NDC ASSESSMENT		IEA 2DS ASSESSMENT	
		First Order		First Order	
		KBank - NDC		KBank - 2DS	
Risk Type	Specific Risk	2025	2040	2025	2040
TRANSITION RISKS					
	Carbon tax				
	Regulation on coal power plants				
Policy and Legal					
Technology - New improvements or innovations	Lowered cost of renewables				
	Increased demand for renewables				
Market - shift in supply and demand					
Reputation - Change in customer and community perception	Stigmatization of coal				
PHYSICAL RISKS					
Acute	Flooding				
	Drought				
	High temperature leading to decreased efficiency				
Chronic					
OPPORTUNITIES					
Resource efficiency					
Energy Source					
Low Carbon Product & Services					
Markets					

Figure 4: Assessment Matrix Sample

Quantitative Analysis

To conduct the quantitative analysis, KBank will use with the Energy Transition Risks & Opportunities (ET Risk) research consortium methodology and UNEP FI pilot study methodology as follows:

Step 1: Discuss Scenario Data – include discussion regarding what the company expect the specific climate related impacts to be for customers.

Step 2: Build Asset Data Base – include assessing customer's current financial status, and future expectations.

Step 3: Assessment of Assets' Adaptive Capacities for Risk Mitigation – evaluate the customer's ability to adapt to possible risks and opportunities presented from different scenarios.

Step 4: Forecast Company's Development under Different Scenarios – Forecast the customer's financial performance based on the baseline scenario, and make adjustments accordingly.

Step 5: Forecast market development based on the demand and supply assumptions to derive prices and revenues in the scenarios – Forecast supply and demand of customer products, according to baseline scenario and make adjustments accordingly.

Step 6: Mapping financial impacts on assets/products to companies – Evaluate financial implications, based on financial data collected, to identify if customers credit is at risk of default from climate change.

5. RESULTS

Qualitative Analysis Results

A comprehensive qualitative analysis shows that out of the 3 sectors assessed, Automotive and Parts and Industrial Agriculture had the highest risks under the 2DS scenario and RCP 8.5 scenario respectively.

Auto Motive Industry		THAI NDC ASSESSMENT		IEA 2DS ASSESSMENT	
		First Order		First Order	
		KBank - NDC		KBank - 2DS	
Risk Type	Specific Risk	2025	2040	2025	2040
TRANSITION RISKS					
Policy and Legal	Carbon tax	1	1	1	2
	Regulation on EV cars	2	3	2	3
Technology - New improvements or innovations	EV decreased costs.	2	3	2	3
Market - shift in supply and demand	Increased demand for Evs	1	2	1	3
Reputation - Change in customer and community perception	Stigmatization of fossil fuel based vehicles	1	2	1	2
PHYSICAL RISKS					
Acute	Flooding			2	2
	Drought	1	1	1	1
Chronic	High temperature leading to	1	1	1	1

Figure 5: Auto Motive Industry Qualitative Results

Industrial Agricultural		THAI NDC ASSESSMENT		IEA 2DS ASSESSMENT	
		First Order		First Order	
		KBank - NDC		KBank - 2DS	
Risk Type	Specific Risk	2025	2040	2025	2040
PHYSICAL RISKS					
Acute	Flooding			2	3
	Drought			2	3
Chronic	High temperature leading to decreased efficiency			2	3
	Decreased rainfall			2	3

Figure 6: Industrial Agricultural Qualitative Results

Power Sector (Coal)		THAI NDC ASSESSMENT First Order KBank - NDC		IEA 2DS ASSESSMENT First Order KBank - 2DS	
Risk Type	Specific Risk	2025	2040	2025	2040
TRANSITION RISKS					
Policy and Legal	Carbon tax	2	1	3	2
	Regulation on coal power plants	1	1	1	1
Technology - New improvements or innovations	Lowered cost of renewables	1	1	2	3
Market - shift in supply and demand	Increased demand for renewables	2	2	2	2
Reputation - Change in customer and community perception	Stigmatization of coal	2	3	2	3

Figure 7: Power Sector (Coal) Qualitative Results

Automotive and Parts (2DS Analysis)

- Electric Vehicles (EV) Regulations: Represent high risk, especially for small auto part makers to survive if Thailand introduce a regulation, mandating use of EVs
- EV cost decrease: Assumption that on average, Thai consumers change cars every 5 years, after more than 5 years, there is increased risk for auto part manufacturers who cannot adapt.
- Increase demand for EVs: Assumption that regulations in 2040 enforces use of EV, which represents risks for small auto part makers

Industrial Agriculture (RCP 8.5 Analysis)

- Flooding: Flooding can cause severe issues in KBank customer's supply chain, destroying products and assets.
- Drought: Impacts especially severe to vegetable and fruit farmers.
- High Temperature: Small land owners are especially at risk due to inability to control risks

Power Sector (Coal) (2DS Analysis)

- In general, the power sector is unlikely to be highly impact due to the concession based structure of power sector in Thailand and long term contracts with obligations related to price of electricity
- Carbon tax: High impacts in 2025 but moderate impacts in 2040, power sector is likely to absorb costs from carbon price, but some operators may find it difficult to adjust.
- Lowered cost of renewables: in 2040 this could cause a change in environment regarding authorization of coal plants in favor of renewables
- Reputation: For the above reasons, the coal sector could face reputational issues especially in 2040.

Quantitative Analysis Results

As of the time this report was written, KBank is in the process of evaluating the quantitative and financial in the section above. The expected results of quantitative analysis includes estimates of the positive and negative financial impacts from the lending portfolio under the climate-related scenarios, this includes how the climate scenarios negatively impact the companies leading to a change in probability of default on loans and increased or decreased risk to KBank.

Due to 2DS climate change scenario, KResearch (a research unit of KBank) has preliminarily estimate Thailand rice production and car sale following climate change assumption.

Assumption	2018	2019E	2025E	2040E
Accumulate Vehicle (Unit)	39,551,789	39,990,482	39,232,015	35,414,373
Vehicle Sale (Unit)	1,039,158	1,035,000	1,015,370	916,565
Electric Vehicle (Unit)	21,000	38,400	306,541	768,144
Conventional Vehicle (Unit)	1,018,158	996,600	708,829	148,421
Rice Production (Million Tons)	33.5	33.4	34.0	30.1

Automotive and Parts

As the Paris agreement on climate change crisis which required Thai government to progress on several issues including GHG emission control. To support electric vehicle both supply and demand is one of the top priority agenda. Thus KBank has preliminarily estimated that the electric vehicle will drastically rise which aligned to the electrical vehicle regulation from government and also global demand changing. We expect that our SME autopart producers in portfolio (Mostly are conventional auto part manufacturers) will be minor affected in the next 5 years due to conventional vehicles replacement (98% of total vehicle) and also some parts can partial use in hybrid vehicles. However, in the long term, the higher impact from manufacturing transformation, demand shift and slow adoptation will be highly affected to SME autopart producers and some of corporate autopart producers in our portfolio.

Agriculture Sector (Rice)

For agriculture sector, Rice is one of the important agricultural products of Thailand. As climate change scenario, we has estimated that the production of rice will hardly impact from climate change in the next 5 years due to government subsidiary and agricultural technology improvement which show on better production yield. However, more frequent and long lasting of drought, flood and uncertainty temperature in the long term will result to deteriorate of rice production which will impact to our rice miller and rice exporter in our portfolio in term of rice supply shortage.

Outstanding (Million THB)	2018	2019E	2025E	2040E
Automotive and Parts	5,425	5,398	5,236	1,047
Agriculture Sector (Rice)	34,939	34,835	35,460	31,393

*Rice is one of the important agricultural products of Thailand. This will represent agriculture portfolio.

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