

RISK MANAGEMENT AND RISK FACTORS

RISK MANAGEMENT

PTT Global Chemical Public Company Limited (GC) places great importance on continuously improving our risk management to ensure an integrated process covering all our operations. Information technology has been used to increase organizational efficiency. Our policies are geared towards ensuring that strategic growth is managed using effective risk management and that we can deal with current and future disruptive events while providing a framework within our risk appetite to seek potential business opportunities that support sustainable growth. We adhere to COSO (The Committee of Sponsoring Organizations of the Treadway Commission) or ERM COSO (2017) and ISO (International Organization for Standardization) or ISO 31000:2018 standards as well as the Corporate Governance Code and anti-corruption principles. We have also been certified as a member of the Private Sector Collective Action Coalition against Corruption (CAC) – Thailand’s private-sector movement against corruption. We review our own compliance, with results presented to the Audit Committee, the Corporate Governance Committee, and the Board of Directors to ensure that we have processes in place to combat corruption, including adequate internal controls.

In 2019 GC was 1st ranked in the Dow Jones Sustainability Indices and stayed in the Top 10 global chemical companies for the seventh consecutive year. We also got the first rank in Risk and Crisis Management section in 2019. This achievement reflects our standards of risk and crisis management on a par with international standards.

RISK MANAGEMENT STRUCTURE

Our risk management is organized into three levels: corporate, business units, and operations. At the corporate level, the Board appointed Risk Management Committee (RMC) is responsible for defining the direction of risk management guided by the risk appetite, risk policy, and five risk management frameworks: corporate, foreign exchange, price-and-

spread, subsidiaries, and investment. The Enterprise Risk Management Committee (ERMC) is comprised of executive officers from each function responsible for regularly monitoring risk management progress.

For specific business risk, GC defines risk management for business units and functions or for specific committees as explained below.

- **THE VALUE CHAIN MANAGEMENT (VCM) COMMITTEE** is responsible for closely monitoring and managing pricing, foreign exchange, and supply chain risk weekly using a risk management framework approved by the Risk Management Committee.
- **GC GROUP’S SUSTAINABILITY DEVELOPMENT COMMITTEE (SDC)** is responsible for overall monitoring and follow-up on sustainable development issues as well as ensuring an appropriate direction for managing our long-term sustainability risk.
- **THE INVESTMENT COMMITTEE (IC)** is responsible for governance and considers investment projects aligned with our strategy as well as ensuring effective risk assessment and mitigation for maximum investment efficiency and optimal benefits.
- **OTHER COMMITTEES** include the GC Operational Excellence Committee; the Safety, Health, and Environmental Governance Committee; the Digital and Technology Governance Committee; and the Water Management Task force.

For the business units’ level, the heads of business units apply the corporate risk direction to their units. At the operations level, results of the Control Self-Assessment (CSA) and Operational Risk Management (ORM) are applied to appropriately manage process risk. As for GC’s subsidiaries, there are the GC Way of Conduct harmonizes governs the risk management direction.

RISK MANAGEMENT TOOLS

GC has studied and adopted several risk management tools. Risk has been assessed and prioritized on a risk map, with progress followed up using mitigation plans

and key risk indicators. The Monte Carlo simulation technique has also been employed to model impacts to our operating results using value at risk (VaR) as a metric. Furthermore, we have identified emerging risk using an early warning system (EWS) to increase preparedness, resulting in a proactive approach to risk mitigation.

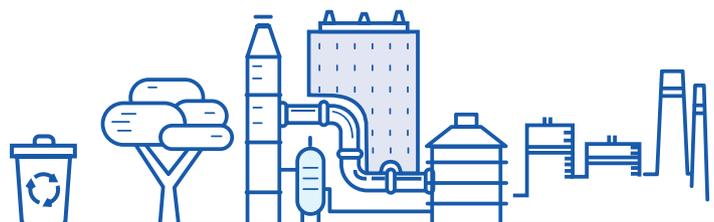
RISK MANAGEMENT CULTURE

We have promoted a risk management culture covering governance, risk management, and internal control and compliance throughout GC to help support stable and sustainable growth. The Board and executives decide risk management policy, objectives, and frameworks used as guidelines and continue to monitor progress at both the management and operation levels. Moreover, we review roles and responsibilities related to risk management, communicating the results to strengthen risk management knowledge for the entire organization.

In 2019, we organized a workshop to foster awareness for the Management, developed newsletters, conducted training sessions, and developed an e-learning platform at the staff level. We have a development plan that fosters the right mindset in all our employees and ingrains it in our work culture. The plan includes extending these values to our subsidiaries in the future.

SUSTAINABILITY AND RISK MANAGEMENT

GC always give precedence to sustainability issue by integrating such matter into our business started with defining our strategies until risk assessment. We appoint risk factors related with sustainability, for example, climate change and water management and continuous increasing environmental concerns (as detail demonstrated in the next section). Besides, we intend to add sustainability, eco-technology and reduction of GHG emission viewpoint into our future investments (as elaborated in investment risk). In 2019, we dedicated new function named Sustainability and Corporate Branding, and also revised sustainability committee to manage all related sustainability issue. These present our intention to manage risk together with sustainability to build confidence for our stakeholders.



RISK FACTORS

We have analyzed both internal and external business environments, along with relevant economic societal, political, technological, industrial, and competitor trends to define our corporate risk categorized into the three groups below.

CURRENT BUSINESS-RELATED RISK FACTORS

Corporate Risk Factors	Important Mitigation Measures
<p>Operational and Safety Risk</p> <p>We strive to maintain high operational standards. To this end, we place the utmost importance on managing our operation and safety risk to ensure that our production processes are both safe and reliable. Our Operational Excellence Management System (OEMS) and Process Safety Management (PSM) are applied continuously: The aim is world-class process safety management.</p>	<p>The following are the measures that GC continuously applied to maintain our operation reliable and safety.</p> <ul style="list-style-type: none">• Collaborate with PTT Group experts to assess OEMS performance and effectiveness. Also, improve reliability by enhancing technical standards and maintenance to maintain stable operations within the first-quartile level.• Cooperate with consultants to strengthen our Process Safety Management, raising it to an international standard during 2017-2022. There are focus on promoting a company-wide culture where employees pride themselves on applying safety to all aspects of work with discipline, with a good example set by executives and the Management downwards.• Assess operation of utility suppliers and together define risk and mitigations. We also continuously follow up such plan to ensure that our suppliers focus on their maintenance efficiently and reliable operate with safety. This directly consequence to our reliability, minimize risk of emergency shutdown and achieve GC's target.• With knowledge gained from consultant development experts and capable employees, nurture experts, develop company personnel, and share such knowledge with all business units and GC Group.• Apply the Business Continuity Management System (BCMS) and develop an Incident Management System (IMS) to manage emergency and crisis events which could interrupt our business to lessen impacts from these events and reduce the recovery period. Our Business Continuity Plan is rehearsed regularly.• GC Group has the necessary insurance to lessen impacts resulting from operational failures.

Corporate Risk Factors

Important Mitigation Measures

Price Volatility Risk

The economic slowdown from the ongoing U.S.-China trade war, OPEC production cuts, and new supply capacity have led to price volatility risk and deviate from our business plan: a mitigation plan is being prepared to handle this situation.

The following are the measures that GC has put forth to closely and continuously mitigate its price volatility risk.

- The risk of price spread, and oil inventory have been managed by applied derivatives and forward sales-and-purchase agreements under a policy and framework approved by the Risk Management Committee and closely controlled and monitored by the Value Chain Management Committee.
- Closely monitor market situation, feedstock, and product prices to adjust sales and production plans for our value chain facing rapidly changing situations.

Sales & Marketing Risk

Our performance results also depend on our ability to maintain sales revenues—especially with volatile business conditions, demand-supply imbalances, trade wars, and geopolitics as factors contributing to market instability.

We always proceed sale and marketing mitigations as follows.

- Closely monitor market situation to accordingly adjust sales and production plan.
- Diversify product portfolio and define sales portfolio including expanding to emerging markets such as the CLMV countries.
- Enter the end-use market and acquire new customers interested in developing high-performance products distinguished by their technology and innovation to meet the needs of the end-use consumer. To this end, we have created a Customer Solution Center to build relationships with partners and customers on product development.
- Develop and improve an end-to-end sales and marketing process in keeping with the changing of business context, consumer behavior, and sales channels.

Joint-Venture Partnership Management Risk

If we grow our business by finding partners with expertise and experience in the target business, we will manage business partners' expectations to achieve the joint-venture target objectives.

GC continuously applies the below mitigation to manage our Joint-Venture Partnership as below.

- Form a joint-venture management team to collaborate with our business partners at all levels to ensure that the joint-venture partnership is aligned with its own targets and our strategy.
- Pursue synergistic opportunities and ways to expand the business with joint-venture partners to foster good working relationships by growing together.
- Implement the GC Way of Conduct (WOC) and continuously monitor. In 2019, we did preliminary assessment to evaluate how our subsidiaries applied the GC WOC and use such assessment to improve the operation. We also communicate the GC WOC to all related parties to raise awareness and understanding.

FUTURE BUSINESS-RELATED RISK FACTORS

Successfully executing established strategies leads to achieving long-term goals, but this may be coupled with volatility and rapid changes in the business environment. Thus, we have managed risk factors related to our future business operations.

Corporate Risk Factors	Important Mitigation Measures
<p>Innovation Risk</p> <p>We focus on innovation to develop new products with increased value to meet market demand, thus developing our capability to carry out research with commercially feasible results is another important factor for our future sustainable growth and maintain our competitiveness.</p>	<p>The following are what GC apply to continuously manage the risk.</p> <ul style="list-style-type: none"><li>• Pursue innovation opportunities through Corporate Venture Capital and Technology Scouting to relentlessly enhance technology, capability, and knowledge of our personnel.<li>• Assess and manage investment risk associated with innovation, including monitoring the progress of invested projects regularly.<li>• Recruit external experts to quickly strengthen innovation capability and related technology to serve targeted customers' expectations. <p>Also, we additionally mitigate such risk as below.</p> <ul style="list-style-type: none"><li>• Develop market and cooperate with customers to expand business opportunities especially both domestic and international brand owners to support long-term sustainability growth for downstream business focusing on high-value products.<li>• Seek technology to further expand into High Value Business (HVB). It also includes to seek opportunities for HVB investment matched with the End-Use market requirements.<li>• Develop digital infrastructure to link all important information together to support and increase innovation performance.

Corporate Risk Factors

Investment Risk

Investments that support our long-term growth give rise to risk requiring close monitoring. This includes selecting the right technologies to invest in and managing resources to achieve our long-term expansion goals.

Important Mitigation Measures

Here are our measures to manage investment risks continuously.

- Implement a stage-gate process to govern investment decisions from the opportunity-seeking stage until investment approval known as Corporate Investment Process: CIM. For projects requiring high capital investment, the Risk Management Committee considers the adequacy of risk assessment performed and the mitigation measures chosen.
- Systematically monitor to ensure investment project progress as planned.
- Perform a lookback analysis to monitor completed projects and use the lessons learned to improve the investment process and increase the success of future investments.
- Prepare investment capital and maintain liquidity as financial policy to support future investment.
- Develop and include sustainability factors covering ecofriendly technology and greenhouse gas (GHG) emissions into investment criteria.

Climate Change Risk

Climate change remains a recurring issue on the international stage, resulting in risk including severe natural disasters and drought. Governments have therefore issued policies, regulations, and laws in response to COP21 with continued emphasis on reducing greenhouse gas emissions. Altering our current processes to accommodate these actions may inevitably increase production costs, while affecting competitiveness and business sustainability.

We continuously manage our GHG emission and water management as following mitigations.

- Establish a climate change team to monitor climate-related activities such as promoting more efficient energy usage, supporting the use of renewable energy, applying eco-design measures for product development, and closely monitoring laws and regulations related to climate change and GHG emissions to ensure our readiness to comply. Thus, we should be able to reduce greenhouse gas emissions as targeted which is aligned with governmental policy and the COP21 Paris Agreement.
- Become involved in the Thailand Voluntary Emission Trading Scheme (Thailand V-ETS) to prepare for the buying and selling of permits for greenhouse gas (GHG) emission allowances.
- Increase the portion of downstream and performance products that release less GHG emissions than the upstream business.

Moreover, the additional mitigations as below.

- Develop a policy and framework to support investment in renewable energy projects and investment to reduce GHG emissions as part of GHG emission mitigation.
- Apply carbon pricing as part of our investment criteria to limit GHG emission in GC's future projects.

Corporate Risk Factors

People and Organization Risk

Our strategic growth plans are always supported by developing our human resources. For effective operation and long-term growth of our business, both in Thailand and overseas, we need to continue developing our employees' knowledge and skills.

Important Mitigation Measures

GC always give priority to manage our people as followed.

- Develop managers at all levels as defined in the people portfolio and continuously develop high-potential employees (Top talent) to support our long-term growth plan.
- Prepare succession plans in time for retiring executives and company growth.
- Continuously strengthen the organizational culture by driving GC SPIRIT through the 4 Core Behaviors.
- Apply technology to enhance our learning program focusing on self-learners.
- Improve performance management to support future sustainable growth.

(More detail in the section "People Management and Development Policy")

Policy & Regulatory Change Risk

We strictly adhere to all laws, regulations, and policies imposed by the government. Changes in these laws and regulations can impact our operations or investment opportunities, thus we monitor these changes regularly and adjust our operations accordingly.

We prepare ourselves for managing the chain in policy and regulatory by following mitigations.

- A laws-and-regulations working team closely monitors important news and information related to proposed changes in regulations and, when enforced, communicates these to related functions to properly comply and apply these policies and regulations to assess the economic feasibility of our investments.



EMERGING RISK FACTORS

With volatility and unexpected changes in business conditions, we have monitored emerging risk to ensure that proactive mitigation measures are in place before they impact our business.

Corporate Risk Factors	Important Mitigation Measures
<p>Continuous Increasing Environmental Concerns</p> <p>Environmental concerns are becoming more serious both domestically and globally. Consumers with increased awareness of long-term environmental impacts have become more empowered. Their significant behavioral changes might impact the future of our business in several ways:</p> <ul style="list-style-type: none"> • The Thai government announced the plastic waste management plan 2018-2030 with a target of replacing single-use plastics with environmentally sustainable products or recyclable plastics by 2022. • Consumers value ecofriendly products and the trend to reduce usage of single-use plastics, with producers needing to change their products, leading to decreased plastics demand in the next 2-3 years. • Awareness of the importance of the circular economy: Our image and reputation of our products bearing on the environment. • Place importance and active on PM 2.5 pollution problem. • Image and reputation of company and our product in term of environmental impact. 	<p>GC has implemented the following mitigations preparing for handle with continuous increasing environmental concerns trend.</p> <ul style="list-style-type: none"> • Reduce business risk by diversifying our portfolio from single-use plastics to durable or semi-durable plastics. • Develop bioplastics and biodegradable plastics business certified by both national and international standards as an ecofriendly alternative solution for consumers. • Implement integrated circular economy concept by cooperating with related parties along the value chain to develop product served with consumer's expectations and raise up awareness to people for the use of petrochemical products as well as preserving the environment together through the projects such as the Upcycling the Oceans; the Thailand/Upcycling Plastic Waste Project; the ThinkCycle Bank Project and the Public Private Partnership (PPP Plastic). • Support cooperation with communities and agencies in sorting plastic waste and using it as raw material for plastic recycling prototype plants, to be operated with experienced business partners for future recycling business. <p>Besides, we intend to implement more measures as below.</p> <ul style="list-style-type: none"> • Promote biodegradable plastics to replace single-use plastics for non-recyclable contaminated products by inventing the GC Compostable label to illustrate GC's commitment to applying innovation to take care of the environment. We restrict the use of such label to our operators as a way of adding value to products and containers. • Associate with Our Khung BangKachao Project to develop end-to-end waste management system, setup learning resources and value added from the waste. • Promote circular economy concept and • Inspire new ideas to optimal resources by Circular Living Symposium 2019: Upcycling Our Planet.

Corporate Risk Factors	Important Mitigation Measures
	<ul style="list-style-type: none"> GC and our subsidiaries intend to support our product comply with Ministry of Energy policy about PM 2.5 pollution reduction actions. Presently, our refinery plant can produce diesel under EURO 5 standard and our subsidiary, Global Green Chemicals Company Limited, can produce Methyl Ester which is a part of diesel type B10 and B20. Support corporation with related parties to sort plastic waste correctly and recycle them as concept of Circular Economy
<p>Digital Technology Transformation: Business Impact of Technological Advances</p> <p>The rapid development of technology and digital technology plays a key role in changing market, product development as well as innovation. This means that every business must increasingly make adjustments to take advantage of new opportunities:</p> <ul style="list-style-type: none"> For petrochemicals, crude oil-to-chemicals (COTC) refers to transformative technology converting crude to higher-value petrochemicals on a scale that would disrupt our business. E-Mobility development of electronic vehicles and batteries might replace the internal combustion engine. Artificial intelligence (AI), robotics, data analytics, and smart factories will disrupt various businesses. Technology infrastructure development and digitalization present the challenge of how to develop our people's capability to cope with these technological advances. 	<p>We conduct the following measures to manage impact arising from technological advances.</p> <ul style="list-style-type: none"> Pursue innovation extension opportunities by open innovation and Corporate Venture Capital (CVC) as elaborated in innovation risk. Follow up and study technological solutions to improve our processes, enhance our competitiveness, and create more value from our products to maintain our competitiveness. Establish a digital technology transformation function to manage digitalization and maintain our competitiveness by focusing on three main perspectives: <ol style="list-style-type: none"> Business Perspective by using digital technology to maintain our competitive advantage and meet stakeholders' expectations Technology Perspective by developing IT and data architecture to more effectively manage cyber threats, and People Perspective by enhancing employees' capabilities aligned with the technological and digital technology transformation.

Corporate Risk Factors

Cyber Threats

Increased dependence on technology leads to increased risk of cyber threats to our production processes and all our operating platforms that rely on Internet connections. Theft of important information or production process interruptions would affect our reliability, credibility, and reputation.

Important Mitigation Measures

We seriously and continuously watch out cyber threats through key mitigations are as follows.

- Monitor and be alert for new cybersecurity threats at both plants and offices. Also, perform penetration tests and vulnerability assessments regularly to be proactive in planning preventive mitigation measures for possible attacks.
- Carry out cybersecurity drills and disaster recovery tests regularly to manage and lessen the impacts should these events occur so as to ensure business continuity.
- Implement an information security management system and asset security practices in accordance with cyber-related international standard.
- Continuously foster cybersecurity awareness, for example, how to defend against cyber threats and IT laws related to employees. The company also regularly performs phishing tests so that employees may exercise caution when using IT communication platforms.

Water Crisis

Climate change is one of the factors could have an affect on water level changing in various area including Thailand. It is possible to turn into water crisis which affect to either drought or declining water quality and interrupt our production and business.

We implement following mitigations to handle water situation which might impact to our operation and business.

- Continuously monitor and analyze water level in Rayong and nearby area to assess situation and risk which possibly to occur.
- Water management using control measures such as the 3Rs (Reduce, Reuse, Recycle); increasing water usage efficiency in our processes; increasing effectiveness of water desalination in our seawater reverse osmosis unit work with agencies in eastern Thailand to develop water resources.

We believe that these mitigation measures can help us minimize risk, increase opportunities for sustainable growth, and achieve our business goals stated in our direction and strategic plans.

