

RISK MANAGEMENT AND RISK FACTORS

RISK MANAGEMENT

The way in which we conduct businesses today is becoming more complicated. Business formats have already undergone a transformation. A major factor is advances in technology, which have disrupted the conventional way of life and consumer behavior. This disruption has already affected many sectors, such as banking, media and retail. And although nothing has clearly indicated that technological advancements are about to impact our current business, there are always potential opportunities and risk factors that may significantly leave their marks on our operation.

Our company, PTT Global Chemical Public Company Limited (PTTGC), has always emphasized an organization-wide system of risk management. With continuous development, our risk management assures that PTTGC is able to handle uncertainties effectively. It is based on internationally acclaimed guidelines, such as the COSO Framework of the Committee of Sponsoring Organizations of the Treadway Commission and ISO 31000 of the International Organization for Standardization, as well as the Corporate Governance Code for listed company 2017 (CG Code 2017) and anti-corruption principles. In 2017, PTTGC was ranked in the top 10 global chemical companies by the Dow Jones Sustainability Indices (DJSI) for the fifth consecutive year. This achievement proves that the company's standards of Risk and Crisis Management is on par with international standards. The following are our risk management guidelines:

RISK MANAGEMENT STRUCTURE

We divide risk management into three levels, namely corporate, business unit and operation levels. At the corporate level, risk are managed by the Risk Management Committee (RMC), which was inaugurated by the Board of Directors. The RMC is tasked with establishing risk management policies and frameworks, as well as monitoring and providing suggestions and advice on the subject matter. Furthermore, we have formed the Enterprise Risk Management Committee (ERMC), whose members are comprised of Executive Officers from the many business units, to closely monitor our risk management performance every month.

For the product price risk and foreign exchange risk that are highly volatile, PTTGC has closely managed on a weekly basis by the Value Chain Management Committee (VCM). This has been implemented under the risk management framework approved by the RMC.

At the business unit level and at plant operations or the subsidiaries level, the corporate risk management has been applied and has made the entire system aligned as one process.

RISK MANAGEMENT TOOLS

We have implemented various tools to analyze and assess risk, including a risk map, mitigation plans and key risk indicators (KRIs). We have also taken advantage of the Monte Carlo simulation to identify potential impacts on our operating results in the form of value at risk (VaR). Furthermore, we have monitored changes in significant external factors through an early warning system (EWS) to proactively prepare mitigation plans for emerging risk.

RISK MANAGEMENT CULTURE

We have focused on promoting a risk management culture throughout our organization to bring about stable and sustainable growth. To this end, we have adhered to our risk management policy and guidelines, as well as continuously monitored our risk management progress at both management and operational levels. Moreover, we have continuously communicated and promoted an understanding of risk management through channels such as the e-learning platform, the quarterly newsletter and training sessions.

RISK FACTORS

We have analyzed our business environment, including internal and external factors, as well as economic, social, political, technological, industrial, competitor and sundry other trends of relevance, to define the corporate risks. These risks are categorized as follows:

RISK FACTORS PERTINENT TO OUR CURRENT BUSINESS

Our current business depends on the continuity of our production, as well as its utmost safety; therefore, we have always put an emphasis on our management of

Operation and Safety Risk To manage these risks, we have put in place the Operational Excellence Management System (OEMS) and Process Safety Management (PSM), as well as strictly adhered to our Safety, Security, Health and Environment (SSHE) Policy. In 2017, we enhanced every plant's Asset Reliability and Integrity Management measures by having an internal expert conduct an Asset Integrity Assessment (AIA) and forming the Reliability Improvement Team (RIT). The team has been tasked with analyzing our machinery's reliability and establishing reliability improvement plans that encompass all factors that may lead to an incident. As a result, the rate of our unplanned shutdowns has been at the lowest point in the last five years. In addition to our production reliability management, we have also placed much importance on sourcing feedstock. Currently, we are constructing the Map Taphut Retrofit Project, which will diversify our resources upon completion. We will be able to use our self-produced naphtha from the refinery and the aromatics plants as feedstock. This project will mitigate our **Long-Term Feedstock Risk**.

Sales and Market Risk is another significant factor that may affect PTTGC's gross revenue, especially in the currently volatile market where there is an imbalance between the supply and demand of products. As a result, we have closely monitored market conditions and made necessary adjustments to our marketing plan whenever appropriate. Additionally, we also attempt to diversify and expand our market. All of this has been done to ensure that we are able to achieve our sales target while maintaining appropriate prices.

The operations of PTTGC today rely on the use of information technology system to connect and analyst the data including the plant automated system. Our production also relies on automated control. There are possible external and internal loopholes in the security that may result in system failure or leak of information. Such failure and leakage are considered as **Cybersecurity Risk**, which poses a threat to the revenue and reputation of PTTGC.

RISK FACTORS PERTINENT TO OUR FUTURE BUSINESS

The successful execution of established strategies leads to the achievement of long-term goals, but such execution maybe affected by the volatility and rapid changes in the business environment, whether they present themselves as business opportunities or **Strategy Execution Risk**. Due to our business growth directions, we have further considered investments in several projects, both domestic and overseas. Because some of these projects require a

large amount of investment capital, we have laid down a stringent consideration process to minimize our **Investment Risk** and to ensure the achievement of our investment goals. Furthermore, expanding our business downstream may require restructuration, as well as recruiting and developing a sufficient number of employees with the required knowledge and expertise for such an expansion, to reduce our **People and Organization Capability Risk**. Meanwhile, the actualization of our research for commercial production is yet another key to our future growth. We, therefore, require to manage our **Innovation Risk** to assure that we will be able to develop new products or enhance existing products serve with the market expectations.

One of the ways to mitigate investment, people, and innovation risk is to find an joint venture partner with an expertise in the investment business target. Nonetheless, we may also face a **Joint-Venture Partnership Management Risk** should we fail to accomplish what we have set out to do.

Additionally, PTTGC has continued to monitor other major risk factors that may affect our future operations in terms of business opportunities and obstacles. Doing so has enabled us to manage or change our strategic direction in a timely manner. These risk factors include **Policy and Regulatory Changes Risk**, such as changes in the policy or regulations of the government or laws and regulations related to our operations. While some of these changes are business opportunities, some are obstacles, such as the Oil Fund Act, New Petroleum Concession Policy, Public Private Partnership Law (PPP), Investment Promotion Act (BOI), Land and Building Tax Act, Eastern Economic Corridor Act (EEC) and the reduction of greenhouse gas (CO₂) emissions.

Because **Disruptive Technology Risk** may bring about either opportunities or risk, PTTGC has kept a close eye on the development of innovations, such as digital technology, vehicles of the future, 3-D printing and renewable energy. Moreover, we have also regarded **Climate Change Risk** with concern since the world has put a greater emphasis on climate change. The agreement made at the 21st session of the Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change may affect our business: The government may issue regulations that require our participation and compliance with the said agreement. This may lead to an increase in our production costs or physical events, such as floods and droughts, that may impact our production. The agreement may also affect consumer

behavior, leading to more demand in eco-friendly products and technology. It may also be used as a trade barrier.

PTTGC's risk mitigation measures can be summarized as follows:

MITIGATION MEASURES

1. OPERATION AND SAFETY RISK

- Together with experts within the PTT Group, we conduct a Pre-Maturity Assessment on our operational excellence management system (OEMS) to ensure the efficiency and effectiveness of the OEMS.
- Focus on enhancing process safety management (PSM) as well as asset reliability and integrity management by accredited international experts perform a benchmarking with peers and improve our PSM level.
- Further develop operation and safety employees to enhance their knowledge and awareness of safety, reliability, and integrity management together with learning from lesson learnt through incident-based learning system. Furthermore, we plan to implement technical authority system throughout the organization.
- Conduct pilot tests for applying new technologies and innovations in big data management, such as Equipment Foresight, Smart Plant Monitoring and Dynamic Risk Analysis. These technologies can help us analyze and assess possibility of an abnormal operating conditions and provide preventive advice that reduces the number of emergency shutdowns. Information collected can be used for improving assets enhancing production capability, and minimizing business opportunities losses.
- For less-likely but potentially severe scenarios that could result in an interruption of our business, we have implemented a business continuity management system (BCMS). The system enables us to mitigate the consequences of such an interruption, curtail its duration and/or reduce any subsequent damage. PTTGC has carried out annually test runs of the Business Continuity Plan covering all plants.
- PTTGC and its subsidiaries have taken out the required insurance policies to mitigate loss that could occur from doing business.

2. LONG-TERM FEEDSTOCK RISK

- Conduct a study to improve flexibility of our production process to use alternative feedstocks.
- Conduct a study on using and importing alternative feedstock from other economical sources.

3. SALES & MARKET RISK

Short-Term Mitigation Measures

- Monitor and forecast prices on a weekly basis as well as analyze customer portfolios and the supply and demand in each region to adjust sale method and mitigate short-term impacts from the market price decline.
- Monitor domestic sale volume and re-analyze current customers whenever our sale revenue misses the target to ensure that we can maintain the domestic market.
- Apply customer relationship management (CRM) to sustain current customer satisfaction.

Medium and Long-Term Mitigation Measures

- Expand market to diversify the risk.
- Expand into an emerging CLMV market, which may be developed into a main market in the future to replace markets in which we may soon our competitive edge.
- Make long-term contracts with major customers to buy a major portion of our products at a suitable price to reduce both our risk and theirs.
- Entry to an end-use market and acquire new customers who are interested in developing functions and performance of product with technology and innovation to serve a better quality of life for the end-user consumer. We have established a Customer Solution Center to foster development collaboration between PTTGC and our partners to develop and deliver value to customers. This will result to gain loyalty and continual purchases from customers. We refer such products as of the high-value products.
- Develop market to new product lines in downstream businesses to diversify our product portfolio.
- Growth alongside with strategic partners who are brand owners to increase market opportunity by pushing our product as a part of the partners' products to sustain demand, for instance, packing in fast-moving consumer goods (FMGC).

4. CYBER SECURITY RISK

- Install a preventive system and monitor the cyber threats both in the office and plant areas. Moreover, conduct the monthly meeting to follow up and monitor the new cyber threats as well as report the attack and resolve result to improve further preventive measures. Conduct penetration test and vulnerability assessment at least once a year to ensure the effectiveness of the current system. Implement an information security management system (ISMS)

according to the ISO/IEC27001 (Information Security) standard. In 2018 we will implement additional ISO/IEC 27032:2012 (Guidelines for Cybersecurity) standard which relate to cyber asset security.

- Promote awareness of cybersecurity to employees at all levels continually including potential threats, prevention, and any relevant IT laws through all internal communication channels. We have also conducted training through our e-learning system, which allows our employees to access any time, at any place and evaluation for the further training program improvement.
- Test the Cybersecurity Drill and rehearsal the disaster recovery testing annually to assure that can handle the situation promptly reduce damage to the IT system and assure our business continuity.

5. STRATEGY EXECUTION RISK

- Drive PTTGC on the Transformation Pathway towards being an international Performance Chemical Business in the future accordance with the appropriate business structure proportion as per the Optimized Portfolio Structure by utilizing developments/findings from our research, development, and innovation.
- Capture opportunity continuously as we are a part of the working groups of the Public - Private Committee to support the initiatives of the government in driving economic and social development of the country in long run. Committees in which PTTGC participated are New S-Curve and Eastern Economic Corridor (EEC) which provided ideal opportunities to exchange knowledge and information, as well as establishing an academic network with leading corporate agencies of the country. This has led to success in the following investment projects in 2017, for example, PO/POLYOLS project and engineering plastic development project.
- Monitor and analyze emerging risk and prepare the back up plans in the case that critical strategic plan be unattainable through the following systems:
 - (1) Develop a system to track and stimulate the undertakings of each Initiative of the strategic plan, to ensure that they achieve their objectives.
 - (2) Develop an Early Warning System (EWS) to track and analyze the internal and external factors that may have an impact on driving the strategic plan of PTTGC, both opportunities and risk, so adequate measures can be prepared in time.

6. INVESTMENT RISK

- Implement a Stage Gate Process to prudently and concisely cover and govern from opportunity seeking until investment approval. In each stage, responsible executives, and experts scrutinize investment projects in all aspects. For the high capital investment projects, the Risk Management Committee (RMC) is also involved in the consideration of the adequacy of risk assessment and mitigation measures which will be used as part of the approval criteria.
- For the high capital investment projects, PTTGC has also established a Steering Committee. Also, project's progress and risk management are closely monitor through the Major Project Management meeting (MPM) to ensure that the major investment projects have been executed as planned.
- Develop a Look Back process to monitor and evaluate the completed projects. This would continuously improve investment process and increase the success of future investment projects.

7. PEOPLE AND ORGANIZATION CAPABILITY RISK

- Strengthen our organizational culture by pushing GC SPIRIT core value through the four core behaviors. This aims to shift mindset and the working methods for our people to be able to handle with the uncertainty, volatility, and complexity.
- Restructure the organization to be able to best respond to the future business and the strategic direction also including manpower for the project development to ensure suitable and sufficient human resources in a timely manner.
- Define a people portfolio to support the PTTGC growth direction and to strengthen the people in the portfolio.
- Revise people's capabilities previously not covered in the people portfolio and prepare to enhance capabilities for the future requirement.
- Strengthen specific competencies in professional areas such as engineers, researchers, and marketers.
- Develop a human-resource recruitment and management plan covering both quality and quantity aspects, in accordance with our future growth business
- Develop continuously our executive as leadership plan.
- Initiate a succession plan for high important position to facilitate a smooth job handover.

8. INNOVATION RISK

- Focus on the development of human resources to provide support for both upstream and downstream businesses innovation through the collaboration with our network in the educational and industrial sectors, including external experts and licensor.
- Align direction and investment pattern for innovation with our strategic plan and business operation to seeking new technologies efficiently through the open innovation and Corporate Venture Capital (CVC) channels.
- Established a dedicated team focusing on clearly outlining the scope and goal of innovation, as well as suitably developing the skills, knowledge and expertise of researchers and partners.
- Apply digital program and tools in our research and development such as program for searching and analyzing big data and program for predicting behavior or property of product etc. These technologies enhance efficiency of our R&D process.
- Implement a procedure to evaluate and prevent abuse and violations of intellectual property for which the international standard IP Code of Practice was adopted as a guideline of practice.

9. JOINT VENTURE PARTNERSHIP MANAGEMENT RISK

- Restructured for joint venture management by establishing new department to collaborate with our partners at all levels and to ensure an alignment of JV process as agreed target.
- Exchange management perspectives, collaborate and prevent any conflicts that may arise.
- Initiate synergy projects with partners such as workshop, progress monitoring through monthly meetings to expand business opportunity together.
- Conduct roadshows between PTTGC and JV companies to ensure the management and governance comply with the PTTGC Way of Conduct
- Develop and strengthen our employees to be ready to work with the Joint venture partner.

10. POLICY & REGULATORY CHANGE RISK

- Provide observations and suggestions that benefit the nation and industries to the related governmental organizations as basic information needed in the preparation of draft laws, regulations, policies, and other benefits.

- PTTGC closely monitors for important news and information related to the government's policies, law and regulations affecting PTTGC's business and notifies the related departments within PTTGC and requests for their consideration, comments, and feedback on the draft policies, laws, and regulations, etc., and sends them to the related governmental agencies or ministries for consideration before adoption, and after they are adopted, PTTGC shall inform all related departments and advise them on the proper practice and adhering to those policies, laws, and regulations.
- Study and consider the changes in the government's laws and regulations and includes them in the evaluation of the economic value of investment projects decision making process.
- Declare our intention to fight against corruption and, in 2014, was certified as member of the Collective Action Coalition (CAC) - which is Thailand's Private Sector movement against corruption and re-certified in 2017. Our process complies with the Prevention and Suppression of Corruption Act. Also, we internally assessed the corruption risk for the process that contacts with governmental agencies. We also review our compliance with our anti-corruption policy and measures, the report of which is submitted to the Audit Committee, the Corporate Governance Committee, and the Board of Directors to verify our practices and operations regularly. Furthermore, Internal Control monitors our operations to prevent misuse or unauthorized use of assets, whether belonging to PTTGC or one of our subsidiaries, by directors, executive officers, or employees. Anti-corruption efforts are, additionally, an integral part of our Risk Management Policy.

11. DISRUPTIVE TECHNOLOGY RISK

- Realize the importance of changing the way we do the business, seeking opportunity from digital technology by setup the Digital Transformation Function to study digitalization management in a sustainable manner.
- Study disruptive technologies that are pertinent to our business, such as digital technology, vehicles of the future, 3-D printing, renewable energy, and green energy, serves as guidelines to produce products that respond to these technologies.

12. CLIMATE CHANGE RISK

- Applied international standard, ISO 14064-1: 2006 standards, for measure, reporting and reduction of greenhouse gas emissions.
- Optimize energy consumption efficiency to reduce our greenhouse gas emission from our business operation.
- Join the pilot project of the Thailand Voluntary Emission Trading Scheme to increase capability to deduct of greenhouse gas emission, also prepare for the changing of law and regulation.
- Applied circular economy concept which bring the waste from production process to reuse in industry such as the Upcycling the Oceans, Thailand project with associated among PTTGC, the Tourism Authority of Thailand and the Ecoalf foundation to recycle plastic waste from the ocean.

- PTTGC has a concrete system of water management in place. We have continuously improved our processes to reduce water consumption. We have established a seawater reverse osmosis (SWRO) plant as a reserve of water, force water management projects, and develop water source development projects with governance agencies through the Sustainable Water Management Working Team.
- Incorporate eco-friendly technology factor as part of investment criteria to align with the overall greenhouse gas emission management and link to the strategy execution risk, the investment risk and the policy and regulatory change risk.

PTTGC believes that by following the aforementioned mitigation measures, we will be able to minimize risk and allow us to achieve our business goals according to our direction and strategies.

