Welcome to your CDP Climate Change Questionnaire 2023

C0. Introduction

C0.1

(C0.1) Give a general description and introduction to your organization.

Global Green Chemicals Public Company Limited or GGC is the first Oleochemical manufacturer in Thailand and is the Green Flagship Company of PTT Global Chemical Group. The company is committed to being the leading Oleochemical producer in the global market, along with continually creating economic sustainability for the agricultural and industrial sectors of Thailand.

Currently, GGC's main products include Methyl Ester or B100 that is used as component in high speed diesel fuel, with a production capacity of 500,000 tons per year, Fatty Alcohol that is used as a main ingredient in cosmetics, surfactant, and various pharmaceuticals, with a production capacity of 100,000 tons per year, and pure Glycerin, which is an ingredient widely used in cosmetics and pharmaceuticals, with a production capacity of 51,000 tons per year. GGC's Production bases are located in the Hemaraj Eastern Industrial Estate (Map Ta Phut), Rayong Province and in the Thai Eastern Industrial Estate, Chonburi Province. In which, the entire GGC's products derived from raw materials from local crude palm oil, and are commercially distributed to both domestic and international customers.

Additionally, in order to become the leader of green chemical company, GGC has established GGC Biochemical Company Limited (GGC Bio) where it has operated and continuously invested in green chemical business. GGC Biochemical Company Limited (GGC Bio) holds 50 percent of GGC KTIS Bioindustrial Co., Ltd. (GKBI), a joint venture of GGC Biochemical Company Limited (GGC Bio) and KTIS Bioethanol Company Limited (KTBE). GKBI determines to expand the investment in biochemical business through investing and constructing 1) Sugarcane Processing Plants 2) Ethanol Processing Plant 3) Biomass Power Plants with electricity selling services for other organization and 4) Related infrastructure investments. As a result, the expected commercial operation date of a new plant is in the first quarter of 2023. GKBI is also the manufacturer of ethanol, "E100", a composition of gasoline, with a nameplate capacity of 600,000 liter per day (186 million liter per year or 147,000 ton per year). Moreover, GKBI's power plant and steam plant can produce electricity of 85 MWh and steam of 475 ton per hour respectively.

Since 2019, GGC has established GGC Biochemical Co., Ltd. at the Nakhonsawan Biocomplex (NBC) in collaboration with KTIS Bioethanol Co., Ltd. and Kaset Thai International Sugar Corporation Public Company Limited. GGC focuses on investments, both domestic and international, to develop low-carbon products. The program covers the production of biofuels and utilities that use sugar cane as the raw material. Currently, GGC is undertaking the construction of Nakhon Sawan Biocomplex (NBC) Phase 2 and investing in infrastructure development and various utilities to support future projects.

For the Sustainability, in 2022 marked GGC's milestone in becoming a world-class sustainable entity, evident in our participation in the Paris Agreement, an accord under the United Nations Framework Convention on Climate Change. To elaborate, GGC has set an ambitious goal of 20% reduction in the Green House Gas (GHG) emissions by 2030 and development of business in pursuit of the Net Zero emissions goal by 2050 through the Decarbonization Pathway action plan, which consists of operating Efficiency-Driven, Portfolio-Driven, Compensation Driven business operations, as well as a plan to expand the scope of operations to cover GHG Scope 3 (other indirect emissions throughout the value chain). Furthermore, GGC's strategy includes active engagement with supplier and customers across the value chain to promote GHG reduction and circularity and become a partnership with industry association and policy marker to accelerate the progress to become Net Zero Emission by 2050. With the GGC climate strategy, for scope 1 and 2 emission, GGC focuses on a development of low carbon products & avoided emissions products with high value added. For scope 3 emission, GGC is collecting the scope 3 emission data in categories that are absent and not verified to be able to set target for scope 3.

C0.2

(C0.2) State the start and end date of the year for which you are reporting data and indicate whether you will be providing emissions data for past reporting years.

Reporting year

Start date

January 1, 2022

End date

December 31, 2022

Indicate if you are providing emissions data for past reporting years

Yes

Select the number of past reporting years you will be providing Scope 1 emissions data for

3 years

Select the number of past reporting years you will be providing Scope 2 emissions data for

3 years

Select the number of past reporting years you will be providing Scope 3 emissions data for

3 years

C0.3

(C0.3) Select the countries/areas in which you operate.

Thailand

C0.4

(C0.4) Select the currency used for all financial information disclosed throughout your response.

THB

C0.5

(C0.5) Select the option that describes the reporting boundary for which climate-related impacts on your business are being reported. Note that this option should align with your chosen approach for consolidating your GHG inventory.

Operational control

C-CH0.7

(C-CH0.7) Which part of the chemicals value chain does your organization operate in?

Row 1

Bulk organic chemicals

Bulk inorganic chemicals

Other chemicals

Specialty organic chemicals

C0.8

(C0.8) Does your organization have an ISIN code or another unique identifier (e.g., Ticker, CUSIP, etc.)?

Indicate whether you are able to provide a unique identifier for your organization	Provide your unique identifier
Yes, an ISIN code	TH7920010009 (Local), TH7920010017 (Foreign)

C1. Governance

C1.1

(C1.1) Is there board-level oversight of climate-related issues within your organization?

Yes

C1.1a

(C1.1a) Identify the position(s) (do not include any names) of the individual(s) on the board with responsibility for climate-related issues.

Position of individual or committee	Responsibilities for climate-related issues
Board Chair	The Board Chair holds the top power and authority amongst the board of directors who provide visions, missions, directions, and operational strategies, independent from the company's management bodies. The Board Chair oversees the clear pictures of its climate-related risk exposures in terms of physical impacts from climate change, foreseen transitions to a low-carbon economy, as well as arisen opportunities to the company. To deal with the risks, the Board Chair hold his/her duties and responsibilities in supervising, formulating strategies, setting operational plans and monitoring the performance of risk and opportunity management of the organization in order to set measures to mitigate the risks and form a suitable framework for GGC's operations. This includes preparation for GGC to fully support the move towards a low carbon economy that may lead to the discovery of new business opportunities in the future. In addition, the Board Chair makes certain that the climate-change mitigation measures are in alignment between the two committees, i.e., Corporate Governance and Sustainable Development Committee (CG&SD), and Risk Management Committee (RMC). An example of key climate-related decision made in 2021 is to become net zero by 2050. The board chair, GGC has commitment to be a Leading Green Chemical company to foster growth and become a sustainable development role model while remaining poised to cope with challenging transformation now and in the future, as well as operating with socioenvironmental responsibility under corporate governance.
Board-level committee	Climate-related issues are under the direct responsibilities of the Corporate Governance and Sustainable Development Committee (CG&SD), and the Risk Management Committee (RMC). Both are appointed by the board of directors. Each committee consists of three members from the board of directors and an independent Chairman. The Committees are responsible for monitoring regulations related to climate change so that GGC can respond quickly to changes, whether in the form of energy efficiency, alternative energy applications, or setting greenhouse gas emission targets. An example of key climate-related decision made in 2021 is to become net zero by

	2050. Furthermore, the CG&SD ensured that business commanded stewardship of and responsibility for all stakeholders (customers, suppliers, creditors, employees, communities, investors, shareholders, society, the environment including climate-related issue, and health & safety) through report presentation by responsible agencies every quarter. The RMC also endorsed the 2022 enterprise risk management (ERM) guidelines for dealing with all GGC's important risk including climate-related risk and instructed GGC to track updates on the 2021 ERM residual risks efficiently in line with the plan.
Chief Executive Officer (CEO)	CEO, director and secretary to the board of directors, is tasked with managing the company according to established policies, plans and budgets under the authority granted by the board of directors. CEO is a member of Risk Management Committee and a chairperson of Management Committee. CEO shall provide strategies to deal with climate related risks and opportunities, and ensure sufficient resources climate related risk treatment. The CEO is also responsible for the distribution of work and management of company operations according to the strategies, policies, and budgets that have been allocated. This includes the formulation of support plans and control of operations to achieve GGC's short-term and long-term targets.

C1.1b

(C1.1b) Provide further details on the board's oversight of climate-related issues.

Frequency with which climate-related issues are a scheduled agenda item	Governance mechanisms into which climate-related issues are integrated	Please explain
Scheduled – all meetings	Reviewing and guiding strategy Overseeing and guiding the development of a transition plan Monitoring the implementation of a transition plan Overseeing the setting of corporate targets Monitoring progress towards corporate targets	The Corporate Governance and Sustainable Development Committee (CG&SDC), which is appointed by the board of directors, consists of at least three directors and at least one of them as well as the Chairman must be an independent director. The current members of the CG&SDC are all independent directors, with a three-year term of office, or term ending upon termination of GGC's directorship status or resignation or removal. The CG&SDC performs its duties as assigned by the Board in defining guidelines, providing recommendations on policy and procedures in relation to the code of conduct and business ethics, in line with corporate governance principles before submitting the report to the Board and management. The CG&SDC also monitored CG implementation, provided consultation, conducted assessment and reviewed

		related policies and procedures to be in compliance with corporate governance principles (code) and in line with those of the Securities and Exchange Commission, Thailand (SEC), the Stock Exchange of Thailand (SET) and leading organizations to ensure that the Company's CG is up to international standards. In 2022, The CG&SDC held six meetings in total in carrying out their tasks as stated in the Charter and as assigned by the Board and reported progress of the implementation under the Corporate Governance (CG) policy to the Board and management quarterly, as well as publishing it in the annual report for the shareholders. In the topic of pursuit of sustainable development, especially climate-related issues, the six meetings were held, with the following highlights: - Followed up the progress of the Company's sustainable development operation in accordance with the international standard, United Nations Charter (UN Global Compact). - Prepared to participate in Dow Jones Sustainability Indices (DJSI) and planned to leverage the Carbon Disclosure Project (CDP) level from last year. - GGC earned the highest level of "Eco Factory plus Social Value: Eco Factory +SV" Award and "CSR DIW for eight year straight from the Department of Industrial Works by collaborating with the Thai Red Cross Society and Standard Manufacturing Co., Ltd., a business partner, produced alcohol hand gel with GGC's glycerine product for inclusion in the Covid-19 survival kit and delivering the CHOB alcohol gel to flood victims. - Approved the 2022 sustainable development plan in line with its strategies, global situations, and dynamic challenges along with monitoring the targets against the Net Zero Target within 2050. The CG&SDC regularly submitted the reports on the progress the development to the Board for further advice and recommendations to take better care of stakeholders.
Scheduled – some meetings	Reviewing and guiding the risk management process	The Risk Management Committee (RMC), formed by the board of directors, consists of at least three directors, including one independent director. The RMC

		sets policies, risk appetite, and risk management scope, including climate-related risks, as an operational framework for GGC's risk management. GGC aligns the company's business with its strategy and goals, focusing on early warning signs, assessing emerging risks, and identifying priorities based on risk impact and likelihood. The RMC defines effective risk management methods, monitors their effectiveness, provides input on potential risks in investment projects, manages joint ventures and contracts, promotes internal control assessment, and ensures compliance with laws and international standards. In 2022, the RMC, in performing their duties under the scope of responsibilities as stipulated in its Charter and as assigned by the Board, held a total of 9 meetings and submitted its performance report to the Board quarterly with the following highlights: - Monitored, provided opinions, and made recommendations on corporate-level risk and crisis management for 2022 and also provided opinions on the mitigation measures for emerging risks. Considered and commented on the improvement and reviewed the risk management framework in various aspects i.e., raw material and product price fluctuation, inventory management, investment in key projects, and foreign exchange rates. - Monitored, provided comments, and suggestions on the biodiesel market situation and risk management related to prices and price differences (hedging). Furthermore, the RMC followed up on the operational results of inventory risk management on a quarterly basis to mitigate the impact of stock loss and exchange rate movements. Additionally, the RMC made suggestions on preparing and seeking guidelines for the use of Green or Carbon Credits. - Considered, provided opinions, and recommendations on the development and study of the project investment model, risk management, risk management measures of major projects, and aligning long-term corporate strategies with global trends and the company’s business growth strategies. - Considered, provided opinions, and suggestions for the risk assessment and internal-control self-assessment project (RCSA) to be in line with the company’s guidelines and corporate governance. - The RMC reviewed and approved risk factors and

		corporate risk management measures for 2023. They provided guidelines for risk mitigation measures based on economic conditions, industry trends, and uncertainties. Additionally, they monitored the progress of remaining corporate risk management activities in 2022 to ensure their effectiveness as per the plan. -Reviewed the risk management policy and the Risk Management Committee Charter to be consistent with the guidelines for risk management throughout the organization (COSO ERM 2017 “Enterprise Risk Management”).
Scheduled – all meetings	Overseeing and guiding employee incentives	The Board of Directors of GGC have approved the Key Performance Indicators (KPIs) for 2022 and 2023, demonstrating their recognition of the importance of aligning incentives with the strategic objectives of the company. One of the key KPIs is linked to sustainability and the pursuit of a decarbonization pathway. The corporate KPIs are cascaded into each employee KPIs and evaluation which align the expectation and direction throughout the organizations. Therefore, the board plays a crucial and proactive role in overseeing and guiding employee incentives to ensure the achievement of the company's strategic objectives.

C1.1d

(C1.1d) Does your organization have at least one board member with competence on climate-related issues?

	Board member(s) have competence on climate-related issues	Criteria used to assess competence of board member(s) on climate-related issues
Row 1	Yes	GGC places climate-related knowledge and understanding as a hard requirement for candidates to the Corporate Governance and Sustainable Development Committee. The competency in the issue is part of the selection process criteria. The candidate must acquire high-levelled knowledge and experience on climate-related issues. GGC periodically conducts knowledge and skills assessments of the Board and Committee members to ensure that persons holding positions in the company’s governance bodies, especially in the Corporate Governance and Sustainable Development Committee, are competent to perform his/her duties in the position. The assessments are generally conducted in two levels: a group and an Individual. For the Group level, the assessment topics consist of the composition and

		qualifications of the Corporate Governance and Sustainable Development Committee, performance, practices, meeting attendance, and reporting and performance assessment of the Committee. For the Individual assessment, main interests are knowledge and expertise of the Committee, performance, practices, time devotion and meeting attendance. In 2022, the results of the assessment of the Corporate Governance and Sustainable Development Committee are: - Group assessment: an average score of 95.81% - Individual assessment: an average score of 92.50% For example of qualifications related to climate change, see the profile of the Chairman of the Board of Director disclosed in Annual Report 2022 page 243. The chairman received a PhD in chemical engineering and has working experience related to chemical industry which reflects his competency in energy efficiency and conservation in chemical industry.

C1.2

(C1.2) Provide the highest management-level position(s) or committee(s) with responsibility for climate-related issues.

Position or committee

Chief Executive Officer (CEO)

Climate-related responsibilities of this position

Providing climate-related employee incentives
Developing a climate transition plan
Implementing a climate transition plan
Integrating climate-related issues into the strategy
Monitoring progress against climate-related corporate targets
Managing climate-related risks and opportunities

Coverage of responsibilities

Reporting line

Reports to the board directly

Frequency of reporting to the board on climate-related issues via this reporting line

Quarterly

Please explain

Chief Executive Officer (CEO) a chairperson of Management Committee, which approved the corporate Key Performance Indicators (KPIs), which are an integral process of business strategy monitoring. One of the KPIs is directly linked to the decarbonization path, which is considered as a climate transition plan to for GHG emission reduction through operational efficiency and new product portfolio. Subsequently, the corporate KPIs will be cascaded to C-Suites' and relevant employee's KPIs. The corporate KPIS will be accounted for 70% of C-suites individual KPIs. Therefore, the CEO bears the responsibility of providing climate-related employee incentives through the setting of corporate KPIs. Once the corporate KPIs are established, the CEO oversees the monitoring of progress against climate-related corporate targets and updates and reports the progress to the board of directors quarterly. Moreover, the CEO plays an importance role in approving the climate strategy for the period 2023-2030, aiming to achieve net-zero emissions by 2050. This involves developing and implementing a climate transition plan consisting of three pillars: efficiency-driven, portfolio-driven, and compensation-driven. Additionally, the CEO actively manages climate-related risks and identifies opportunities for the company through the reviewing of corporate risk assessment and physical and transitional climate related risks analysis.

Position or committee

Chief Risks Officer (CRO)

Climate-related responsibilities of this position

Monitoring progress against climate-related corporate targets
Assessing climate-related risks and opportunities
Managing climate-related risks and opportunities

Coverage of responsibilities

Reporting line

Reports to the board directly

Frequency of reporting to the board on climate-related issues via this reporting line

Quarterly

Please explain

The Chief Risk Officer or Risk Management Committee (RMC) is responsible for defining and reviewing policies, risk appetite, and the scope of risk management, including climate-related risks. This serves as an operational framework for GGC's risk management process, with a focus on early warning signs, managing and assessing climate-related risks and opportunities. The objective is to monitor and ensure that risks are identified and prioritized by assessing their impact and likelihood, while also pursuing business opportunities. Moreover, at GGC, together with CEO, CRO will also

be responsible of overseeing sustainability strategies and Climate Related Strategies. CRO will monitor and oversee the progress update of the corporate climate related targets. CRO will also attend the board update meeting in terms of sustainability progress. This can help GGC to incorporate climate related risks/ actions into the ERM process, which brings about seamless action plans towards the climate related development. Overall, RMC provides quarterly reports on its performance to the board.

Position or committee

Other C-Suite Officer, please specify

Enterprise Risk Mangement Committee (ERMC)

Climate-related responsibilities of this position

Assessing climate-related risks and opportunities

Managing climate-related risks and opportunities

Coverage of responsibilities

Reporting line

Risk - CRO reporting line

Frequency of reporting to the board on climate-related issues via this reporting line

Quarterly

Please explain

The C-Suite Officer or Enterprise Risk Management Committee (ERMC) takes the lead in the management of climate risks, which includes the identification, assessment, prioritization, and mitigation actions. Additionally, the ERMC is responsible for monitoring the performance of climate-related risk and opportunity management. The roles and responsibilities of ERMC are publicly disclosed in the TCFD report, which includes steering and monitoring of regular risk management actions, leading climate risks management process covering identification, assessment and prioritization and mitigation actions, monitor climate related risk/opportunity management performance and assign working group or any department responsible for managing climate related risk to propose a prevention plan as warnings increase or when such risks pose a significant threat to the business operations. The progress and outcomes are reported directly to the Risk Management Committee (RMC) on a quarterly basis.

C1.3

(C1.3) Do you provide incentives for the management of climate-related issues, including the attainment of targets?

	Provide incentives for the management of climate-related issues	Comment

Row 1	Yes	There are incentive system in place to engage each level to drive climate related activity and management to achieve Net Zero target.

C1.3a

(C1.3a) Provide further details on the incentives provided for the management of climate-related issues (do not include the names of individuals).

Entitled to incentive

Chief Executive Officer (CEO)

Type of incentive

Monetary reward

Incentive(s)

Bonus - % of salary
Bonus – set figure
Salary increase

Performance indicator(s)

Achievement of climate transition plan KPI
Achievement of a climate-related target
Reduction in absolute emissions
Company performance against a climate-related sustainability index (e.g., DJSI, CDP Climate Change score etc.)

Incentive plan(s) this incentive is linked to

Long-Term Incentive Plan

Further details of incentive(s)

GGC has established the climate strategy in order to achieve the climate strategy targets and goals. Consequently, GGC has embedded the climate related targets into the corporate KPIs, which is an integral role for monitoring the progress against targets. The corporate KPIS later cascaded into the executive's KPIs, including the KPIs for CEO and other relevant C-Suites that overlook the operational and commercial site of GGC's businesses. Therefore, the KPIs evaluation structure for CEO and other C-Suites would consist of Corporate KPIs, which account for 70 % and Personal KPIs, which account for 30 %, reflecting the compensation structure for our CEO, relevant C-Suites and employees. The Corporate and CEO KPIs in 2022 is aligned with sustainability development under the decarbonization roadmap, which consists of reducing 20% of Scope 1+2 emissions by 2023 target. As a result, the CEO KPIs evaluation and monetary rewards will depend on this climate related targets and the abilities to achieve the targets. The CEO will be given performance evaluation from the score of 1 (the least satisfaction performance) to 5 (the most satisfaction performance). The monetary compensation will be allocated to relevant executives based on their performance. The

CE Executive will receive a bonus and other monetary rewards if they can score 3 or above.

Explain how this incentive contributes to the implementation of your organization's climate commitments and/or climate transition plan

The Corporate Key Performance Indicators (KPIs) in sustainability at GGC are fully aligned with the company's Climate Strategy 2023-2030. As per the guidelines set by the Task Force on Climate-Related Financial Disclosures (TCFD), GGC has established an ambition target of reducing 20% of Scope 1+2 emissions by 2030. This commitment reflects GGC's dedication to achieving Net Zero Emissions by 2050 and building business resilience in anticipation of a low carbon future, consistent with a 2°C or lower scenario. The strategy undergoes regular revision to ensure effectiveness and alignment with national and global targets. Moreover, the Corporate KPIs also includes the company performance against a Climate-related sustainability index (e.g. CDP Climate Changes Scores and Thailand Sustainability Assessment (THSI)) in order to drive the company's Sustainability recognition and improve company's performance in terms of sustainability aspects.

Entitled to incentive

Other C-Suite Officer

Type of incentive

Monetary reward

Incentive(s)

Bonus - % of salary
Bonus – set figure
Salary increase

Performance indicator(s)

Achievement of a climate-related target
Reduction in absolute emissions

Incentive plan(s) this incentive is linked to

Long-Term Incentive Plan

Further details of incentive(s)

GGC has established the climate strategy in order to achieve the climate strategy targets and goals. Consequently, GGC has embedded the climate related targets into the corporate KPIs, which is an integral role for monitoring the progress against targets. The corporate KPIS later cascaded into the executive's KPIs, including the KPIs for CEO and other relevant C-Suites in particularly the Operational Excellence Executives that is equivalent to C-Suite position. The OE Executive will overlook the production process, including the efficiency driven to reduce the use of resources and reduce the GHG Emissions within the operational process. As a result, the KPIs evaluation structure for OE Executive would consist of Corporate KPIs, which account for 70 % and

Personal KPIs, which account for 30 %, reflecting the compensation structure for our CEO, relevant C-Suites and employees. The Corporate and OE Individual KPIs in 2022 is aligned with sustainability development under the decarbonization roadmap, which consists of reducing 20% of Scope 1+2 emissions by 2023 target. The OE Executive's KPIs evaluation and monetary rewards will depend on this climate related targets. The OE Executive will be given performance evaluation from the score of 1 (the least satisfaction performance) to 5 (the most satisfaction performance). The monetary compensation will be allocated to relevant executives based on their performance. The CE Executive will receive a bonus and other monetary rewards if they can score 3 or above.

Explain how this incentive contributes to the implementation of your organization's climate commitments and/or climate transition plan

The Corporate Key Performance Indicators (KPIs) in sustainability are aligned with GGC's Climate Strategy 2023-2030 which has been approved by the board. According to Task Force on Climate-Related Financial Disclosures (TCFD) of GGC Climate Strategy 2023- 2030 aims to transform the company into a global sustainable organization with Net Zero Emissions by 2050. The decarbonization roadmap, one of the KPIs plays a crucial component in this strategy. Within the strategy, the Efficiency Driven pillar focuses on low carbon/renewable heat and power, process efficiency measures and advanced technology, which will be monitor and manage by the Operational Excellence Executive. With the Efficiency Driven pillar, it helps GGC accelerates climate transition plan and contributing significantly to the achievement of GGC sustainability KPI objectives.

Entitled to incentive

Other C-Suite Officer

Type of incentive

Monetary reward

Incentive(s)

Bonus - % of salary
Bonus – set figure
Salary increase

Performance indicator(s)

Increased investment in low-carbon R&D
Increased share of revenue from low-carbon products or services in product or service portfolio

Incentive plan(s) this incentive is linked to

Both Short-Term and Long-Term Incentive Plan

Further details of incentive(s)

GGC has established the climate strategy in order to achieve the climate strategy targets and goals. Consequently, GGC has embedded the climate related targets into the corporate KPIs, which is an integral role for monitoring the progress against targets. The corporate KPIS later cascaded into the executive's KPIs, including the KPIs for CEO and other relevant C-Suites in particularly the Commercial Excellence Executive which is an equivalent to C-Suite position. The CE Executive will overlook the commercial side of the business, including monitoring the sales, market shares of GGC's products, market movement, demands of product as well as introducing new products, such as, low carbon products and high-value-added products. As a result, the KPIs evaluation structure for CE Executive would consist of Corporate KPIs, which account for 70 % and Personal KPIs, which account for 30 %, reflecting the compensation structure. The Corporate and CE individual KPIs in 2022 is aligned with decarbonization pathway which follows GGC Climate Strategy 2023-2030 under the pillar of Portfolio Driven, concentrating in development of low carbon products & avoided emission products with high value-added products. The CE Executive's KPIs evaluation and monetary rewards will depend on this climate related targets and portfolio driven targets. The CE Executive will be given performance evaluation from the score of 1 (the least satisfaction performance) to 5 (the most satisfaction performance). The monetary compensation will be allocated to relevant executives based on their performance. The CE Executive will receive a bonus and other monetary rewards if they can score 3 or above.

Explain how this incentive contributes to the implementation of your organization's climate commitments and/or climate transition plan

The Corporate Key Performance Indicators (KPIs) in sustainability are aligned with GGC's Climate Strategy 2023-2030 which has been approved by the board. According to Task Force on Climate-Related Financial Disclosures (TCFD) of GGC Climate Strategy 2023- 2030 aims to transform the company into a global sustainable organization with Net Zero Emissions by 2050. The decarbonization roadmap, one of the KPIs plays a crucial component in this strategy. Within the strategy, the Portfolio Driven pillar focuses on the development of low carbon and high-value-added products. These include First Gen Biofuel, Advanced Biofuel, Specialty Oleochemicals, Biochemicals, Food & Nutraceuticals, and others. By prioritizing the development of these products, it helps GGC accelerates climate transition plan and contributing significantly to the achievement of GGC sustainability KPI objectives.

C2. Risks and opportunities

C2.1

(C2.1) Does your organization have a process for identifying, assessing, and responding to climate-related risks and opportunities?

Yes

C2.1a

(C2.1a) How does your organization define short-, medium- and long-term time horizons?

	From (years)	To (years)	Comment
Short-term	0	5	Risk assessment is an integral part of the Company's corporate strategy as well as investment and business planning that cover short term risks, medium term risks, long term risks and emerging risks. In addition, GGC has also developed emergency plans for unexpected incident.
Medium-term	5	10	Risk assessment is an integral part of the Company's corporate strategy as well as investment and business planning that cover short term risks, medium term risks, long term risks and emerging risks. However, GGC realizes that the medium term risks might occur sooner than when the risks was expected, GGC has developed adaptation plan to cope with the risks.
Long-term	10	30	Risk assessment is an integral part of the Company's corporate strategy as well as investment and business planning that cover short term risks, medium term risks, long term risks and emerging risks. The long term risk management plan also includes GGC new business in the future to prepare for responding plan.

C2.1b

(C2.1b) How does your organization define substantive financial or strategic impact on your business?

Climate change is important to the company's strategy and business growth . GGC defined substantive financial or strategic impact from the possibilities of risks ranging from business related risks to climate related risks that could interrupt our value chain and operations, or affect the ability to achieve the company's strategy and business objectives, or materially impact the license to operate (including reputation issues). The climate related risks include acute physical risks including drought and flood, chronic related risks include the risen of temperature and transitional risks include regulatory, reputation and technical risks.

- a) Financial: Impacts on GGC's EBITDA/ cash flow or subsidiaries' EBITDA/cash flow above 10%
- b) Health, Safety and Environment: involvement in severe injury case and above environmental impact of magnitude, but reversible with mitigation actions
- c) Partner/customer: reduction of sales volume by 10-20%, or loss of contract with suppliers and customers
- d) Regulation: Violation of laws and regulations
- e) Brand/reputation/social: Above concern/complaints of public groups/organizations, and impact on local communities, but reversible with long-term mitigation
- f) Goal/achievement: Above business disruption and unachievable corporate goals

The risk level of the above category will be evaluated based on probability and magnitude of impact:

- a) Probability of occurrence (Rarely, Unlikely, Possible, Probable)
- b) Magnitude of Impact (Minor, Moderate, Major, and Severe)

Considering the combination of the magnitude of impacts with the probability of occurrence, the risk factors with low financial impact, but high probability, might also be classified as 'high risk' occurrence as well.

C2.2

(C2.2) Describe your process(es) for identifying, assessing and responding to climate-related risks and opportunities.

Value chain stage(s) covered

Direct operations
Upstream
Downstream

Risk management process

Integrated into multi-disciplinary company-wide risk management process

Frequency of assessment

More than once a year

Time horizon(s) covered

Short-term
Medium-term
Long-term

Description of process

GGC manages enterprise risks under the ISO 31000 - Risk Management scope and COSO Enterprise Risk Management guidelines and institutes a risk management policy for all.

GGC carries out the climate related-risk in an integral manner with corporate-wide risk management process, starting by identifying, assessing, and managing risks at the corporate and unit levels that could compromise enterprise goal achievement, embracing year-round risks, and specifies risk mitigations plans to systematically manage risks.
GGC assesses risks by recognizing in external factors and emerging risks, monitors the management of GGC's risks against GGC's risk appetite, and defines key risk indicators (KRIs) to early warning any changes that may hinder the achievement of objectives, which report monthly to Enterprise Risk Management Committee (ERMC) for acknowledgment and reports to the Board and Risk Management Committee (RMC)

every quarter. Thus, this iterative process of risk assessment occurs more than once a year.

GGC uses the risk management policy as guidelines for the implementation and development of risk management procedures to ensure continual efficiency of the risk management of GGC. The company divides risks into 2 groups as followed:
1. Corporate Risks: are risks from external factors with impacts on corporate business strategy, and risks with impacts on the efficiency of its business performance and corporate goals under the short-term and long-term corporate strategic plans. Corporate risks were identified and assessed, and mitigation measures were defined to manage the risks so that ultimately the company can achieve its goals.
2. Operational Risks: are risks from operational process of the organization which have in place the management process or internal control system, and clear risk owners. Risk factors will be identified and assessed, and mitigation measures of operational level defined.

The scope of risk identification, assessment and management covers the entire value chain including upstream activities (Tier-1 and non-tier 1suppliers), operations and downstream activities (customers). The timeframe of evaluation are in shot-term (current-5 years) medium (5-10 years) and long-term (>10 years).

Risk identification and assessment process;
Identification: GGC identifies climate-related risks to determine situations or scenarios that could interrupt along value chain operations, affect the reasonable expectation of achieving the company's strategy and business objectives or materially impact the license to operate (including reputation issues). In terms of measuring severity of impact, GGC has defined the following criteria (Thresholds) for the risks events in different categories.

Assessment: Short-, medium- and long-term opportunities and risks are assessed once a year in the context of the forecasting and the budgeting/planning process by Risk owners at BU. Opportunities and risks are potential which are deviated from set targets and planned/forecast EBITDA or net income above 10% would consider as substantive. Short-term and medium-term risks deviated from planned/forecast EBITDA or net income will be further assessed. All opportunities and risks are then analyzed and prioritized. The top risks and opportunities (in terms of the expected financial impact as well as the non-financial impact) are complied together with the measures.

The climate-related risks and opportunities, according to the quantitative result, can be located in one of the four regions in the risk matrix: – green = should be followed-up /monitored within a business unit (risk classified as low); – yellow = must have an action plan and implement all of the actions identified (risk classified as medium); – orange = must have risk mitigation plan and report mitigation progress to Enterprise Risk Management Committee monthly (risk classified as high); – red = must have risk mitigation plan, a special risk mitigation team and report mitigation progress to Enterprise Risk Management Committee monthly (risk classified as extreme).

C2.2a

(C2.2a) Which risk types are considered in your organization's climate-related risk assessments?

	Relevance & inclusion	Please explain
Current regulation	Relevant, always included	National Determined Contribution (NDC) has influenced the company to switch from conventional electricity usage into renewable energy which increase the total expenditure in order to meet the national emission reduction target which is 40% by 2030 and the Net Zero goal by 2065.
Emerging regulation	Relevant, always included	As the world is moving towards low carbon society, the policies and regulations are progressing towards more stringent control of GHG emission which could result in the implementation of carbon trading/carbon tax scheme. This may affect the profit gains by increasing of the operational expense proportional to the amount of GHG emission the company generates.
Technology	Relevant, always included	Due to the fast development of technology, EV cars have a high potential to affect GGC's revenues and profits, as they have been negatively impacted by the demand for internal combustion engine (ICE) fuel, including both diesel and gasoline. The demand for these products has a tendency to decrease as customers switch to EVs in the future.
Legal	Relevant, always included	The European Union (EU) has announced the Carbon Border Adjustment Mechanism (CBAM) regulation, which initially applies to imports in five emissions-intensive sectors that have a greater risk of carbon leakage: cement, iron, steel, aluminum, fertilizers, and electricity. It is possible that in the future, the CBAM regulations might extend to other industries including chemical. Therefore, if GGC doesn't prepare for or have the decarbonization pathway in place, the CBAM might be a barrier to entry for future international market and reduce the competitive advantages of GGC and reduction of market share in Oleochemical sectors.
Market	Relevant, always included	Eco-customers are increasingly seeking environmentally friendly products, and as a result, there has been a significant increase in the demand for alternative fuels. To secure the business and stay competitive, GGC needs to continue developing low-carbon products and alternative fuels. Failing to do so could potentially result in GGC losing market share to competitors who are better prepared to meet the growing demand for green products and the alternative fuels.
Reputation	Relevant, always included	Failure to achieve the committed target and low ESG assessment score would also affect the confidence of investors and lenders resulting in opportunity loss in financial access. Oil palm plantations

		and sugarcane plantations, which are the main raw materials for GGC, have been associated with deforestation in tropical countries including Southeast Asia. These crops require a large area, leading to the clearance of forests including valuable biodiversity-rich ecosystems. it also results in habitat loss for endangered species, increased GHG emissions due to the release of carbon that has been sequestered in forests. This negative environmental impacts from suppliers may lead to the company gaining a negative reputation in the market through the purchasing of goods and services from the suppliers who conducts deforestation.
Acute physical	Relevant, always included	Drought, Flood and tropical cyclone are the natural disaster that can lower agricultural yield and trigger the loss in storage, leading to business disruption. Moreover, without an efficient water management plan, GGC's operations may be affected and disrupted by water shortage, which may decrease GGC's revenue and increasing procedures for implementation of new measures and laws.
Chronic physical	Relevant, always included	The increasing of mean temperature can result in the loss of agricultural products and lower yield from farming because during cultivation the increased temperature can enhance the rate of growth in microorganism and inhibit the ripen stage of palm flowers leading the company to more likely have discontinuity in operation.

C2.3

(C2.3) Have you identified any inherent climate-related risks with the potential to have a substantive financial or strategic impact on your business?

Yes

C2.3a

(C2.3a) Provide details of risks identified with the potential to have a substantive financial or strategic impact on your business.

Identifier

Risk 1

Where in the value chain does the risk driver occur?

Upstream

Risk type & Primary climate-related risk driver

Acute physical

Drought

Primary potential financial impact

Decreased revenues due to reduced production capacity

Company-specific description

Thailand is a country that is ranked among the top countries most affected by physical climate risk. Our business relies on agricultural feedstock as our main raw material, palm oil and sugarcane, which are vulnerable to change in climate patterns especially drought and flood. Drought is the most impactful to our main feedstocks, which is sugarcane and palm oil production and their quality. This will lead to increase of feedstock cost to our biochemical business. As a result of risk assessment throughout value chain, drought and flood is likely to have medium-high impact on upstream activity, especially on the reduction of productivity from acute physical climate event resulting in soaring prices and feedstock shortage which can be so severe to cause GGC plants to lower its production capacity or even shutdown. This results in loss of revenue, increased cost of feedstock, and narrowed profit margin for GGC.

Time horizon

Medium-term

Likelihood

Likely

Magnitude of impact

Medium-high

Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

Potential financial impact figure (currency)

450,000,000

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

The max number of consecutive dry days in Nakhon Sawan is likely to increase the most under RCP 1.9 (8%) both in 2030 and 2050, as well as under RCP 8.5 (7%) in 2050. The financial impact proxy is based on the extreme drought event in 2021 driving up the mill gate price of sugarcane from 1,000 THB to 1,300 THB (30% increase). At maximum plant's capacity, this may result in the financial impact on additional feedstock cost around 450 million THB. For oil palm, 2017 extreme flood event in the southern region where most of oil palm was produced, was reported to drive up the cost of Fresh Fruit Bunches (FFB) by 40% from 4.20 THB/kg to 7 THB/ton. Due to the complex cost structure of crude palm oil, the financial impact in increased feedstock cost cannot be directly estimated.

Cost of response to risk

14,400,000

Description of response and explanation of cost calculation

Upstream mitigation measures for feedstock soaring price and shortage include 1) monitoring of water situation across Thailand region and prepare to diversify supply sources of palm oil and sugarcane so that when the flood and drought occurs there are alternative sources of feedstock. there is no cost of diversifying or changing supply sources due to it is part of normal procurement operation. 2) The use of derivatives on feedstock price to reduce financial risk from price volatility. Furthermore, 3) GGC also has planned to construct rain harvesting and water storage system for its suppliers in order to handle water scarcity issues. The water back-up plan also affect the direct cost of GGC. The cost of responses have been calculated from water back up plan investment, which is calculated from water consumption per day (800 m3/day) x 300 THB per m3 x 60 (days) = 14,400,000 THB. The timescale for construction of rain harvesting and water storage as part of water backup plan would be 1-2 years.

Comment

Identifier

Risk 2

Where in the value chain does the risk driver occur?

Direct operations

Risk type & Primary climate-related risk driver

Current regulation

Carbon pricing mechanisms

Primary potential financial impact

Increased direct costs

Company-specific description

Climate related laws and regulations in Thailand is going to be more stringent driven by the global momentum, i.e. UN Climate Change Conference (COP26), the Sixth Assessment Report, Climate Change 2021 by Intergovernmental Panel on Climate Change (IPCC). In COP 26, Thailand has pledged to become carbon neutral by 2050 and net zero by 2065. It is also under consideration to escalate the Nationally Determined Contributions (NDC) from 20-25% GHG reduction up to 40% reduction by 2030 compared to Business-As-Usual (BAU). These certainly will have more impact on industries going forward through increasing policies and regulations aiming to cut GHG reduction. As majority of the business is in Thailand, GGC anticipates that the carbon price may emerge in various form i.e. carbon trading under cap & trade scheme, carbon tax or carbon offset price. The carbon price may be embedded in utility cost (electricity and steam) from upstream or GGC may have to pay directly i.e. in case of carbon tax and offset. Carbon price will affect GGC by increasing the operational expense proportional to the amount of GHG emission.

Time horizon

Medium-term

Likelihood

Likely

Magnitude of impact

Medium-high

Are you able to provide a potential financial impact figure?

Yes, an estimated range

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

53,000,000

Potential financial impact figure – maximum (currency)

622,000,000

Explanation of financial impact figure

GGC conducted the scenario analysis on our future projection under the IEA's Stated Policies (STEPS) and Net Zero Emissions 2050 (NZE) scenarios. GGC evaluated the potential financial implications that may arise from the implementation of a carbon tax mechanism under the ""worst-case"" assumption that GGC would need to pay carbon tax for 100% of its emissions every year. It is assumed that the STEPS scenario is representative of GGC's ""business-as-usual"" scenario while NZE represents a ""low carbon"" scenario. GGC's forecasted scope 1 and 2 emissions (without considering any interventions and reduction initiatives) was multiplied by the IEA World Energy Outlook 2022 carbon price forecast. The carbon price was 416 THB/tonne CO2 for STEPS 2030, 928 THB/tonne CO2 for STEPS 2050, 800 THB/tonne CO2 for NZE 2030, and 5,763 THB/tonne CO2 for NZE 2050.

The transition scenario analysis results indicated that by 2030, carbon tax costs would potentially range from 53 million THB under STEPS to 100 million THB under NZE. By 2050, carbon tax costs would potentially range from 102 million THB under STEPS to 622 million THB under NZE. Therefore the potential financial impact figure was determined as a range of 53 million THB to 622 million THB, reflecting minimum and maximum potential impacts.

Cost of response to risk

24,000,000

Description of response and explanation of cost calculation

GGC has planned to increase capital expenditure directed for increasing the share of renewable energy consumption, enhancing energy efficiency in GGC operation and investing more in low carbon/decarbonization technology. The cost of response is calculated from the company's investment on the major environmental investments such

as the reduction of steam consumption at methanol distillation investment (14,000,000 THB) and the installation of second reboiler (economizer) for steam saving (10,000,000 THB), both of these projects are expected to provide a cost saving of around 5,000,000 THB per year. Therefore, the total cost of response is 24,000,000 THB. Moreover, GGC plans to increase investment on low carbon process technology and renewable energy that can significantly mitigate impact from carbon price regulation in the near future. The timescale of environmental investment would be 5-10 years.

Comment

Identifier

Risk 3

Where in the value chain does the risk driver occur?

Downstream

Risk type & Primary climate-related risk driver

Technology

Substitution of existing products and services with lower emissions options

Primary potential financial impact

Decreased revenues due to reduced demand for products and services

Company-specific description

Electric vehicle (EV) technology is gaining momentum both in international level and in Thailand. EV could be a solution for decarbonization of transportation sector as well as air pollution mitigation such as PM 2.5 which is a concerning issue in Thailand. In alignment with climate-related commitments, Thailand has issued EV promotion policy to have 30% EV by 2023 policy which aims to produce zero emission vehicle at least 30% of total vehicle production. While GGC's main revenue stream is from methyl ester (B100) which is used in to mix with diesel oil for internal combustion engine, the accelerating rate of EV adoption is an emerging risk for business. As a result of risk assessment throughout value chain, EV adoption is likely to have high direct impact on GGC operation in terms of shrinking revenue on biofuel (B100) for on-road vehicles.

Time horizon

Medium-term

Likelihood

Very likely

Magnitude of impact

Medium-high

Are you able to provide a potential financial impact figure?

Yes, an estimated range

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

1,163,000,000

Potential financial impact figure – maximum (currency)

6,383,000,000

Explanation of financial impact figure

Considering the revenue from methyl ester (B100) in 2021 at 15,308 million THB as a base case, the change in methyl ester (B100) demand under two policy scenarios related to EV promotion may result in 1,163 million THB (-20%) and 6,383 million THB (-43.10%) revenue reduction for GGC in 2040.

Cost of response to risk

8,930,000,000

Description of response and explanation of cost calculation

GGC has developed mitigation plan for risks of oil demand amid EV industrial development as follow:
- Closely monitor the Alternative Energy Development Plan (AEDP) for amendment to align with the national EV policy from AEDP 2018 (2018-2037)
- Join hands with business partners in studying and developing the domestic market to sustain future investment and identify suitable technology for project investment in advanced biofuels, including Bio-Hydrogenated Diesel (BHD), Bio-Jet, and Bio-Naphtha
- Study marketing data in conjunction with GC Group to identify marketing opportunities and seek suitable technology for the project on extension of ethanol's value, including Bio-Ethylene and Pharma-grade Ethanol—and extension to Food & Nutraceutical products
- Jointly investigate with business partners and technology licensors the expansion to Bioplastics based on Biochemical feedstock
- Study and extend the Oleochemical business toward downstream products via the higher-value Home and Personal Care (HPC) product group.

The cost of response to risk is calculated based on our initial investment approved recently to diversify our business which are the establishment of Nakhonsawan Biocomplex Phase 1 (7.5 billion THB) and Phase 2 Project (1.43 billion THB). The commercial operation date of Nakhon Sawan Biocomplex would be in 2024. The production of new products can extend the product portfolios and create outreach to other markets. The Research & Development process and the commercialization are expected to take place from 2025 to 2050.

Comment

C2.4

(C2.4) Have you identified any climate-related opportunities with the potential to have a substantive financial or strategic impact on your business?

Yes

C2.4a

(C2.4a) Provide details of opportunities identified with the potential to have a substantive financial or strategic impact on your business.

Identifier

Opp1

Where in the value chain does the opportunity occur?

Direct operations

Opportunity type

Resource efficiency

Primary climate-related opportunity driver

Use of more efficient production and distribution processes

Primary potential financial impact

Reduced indirect (operating) costs

Company-specific description

Energy conservation and energy efficiency management are one of the opportunity areas that we identified. Energy reduction in our operation not only save energy cost but also contributes to lowering GHG emissions which can have an impact on lower costs associated with carbon emission in the future. Energy consumption at GGC mainly includes purchased electricity, purchased steam and self-generated steam from fuel oil. These are used for raw material pre-heating, facilitating chemical reaction, and distillation process at the plants. While the source of these energy are still fossil based, saving energy means reducing the GHG emission from fossil fuels.

Time horizon

Medium-term

Likelihood

Very likely

Magnitude of impact

Medium-high

Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

Potential financial impact figure (currency)

9,800,000

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

The financial impact is estimated from the energy cost saving from three major energy efficiency program at GGC in 2022 including;
(1) Advance Process Control at Fractionation Column of FAOH plant, with 2,929 MWh/year energy saving and 2.60 million THB cost saving. This can reduce the GHG Emission by 540 ton CO2e.
(2) Pre-treatment Vacuum Ejector Motive Steam Optimization, with 13,600 tons of steam/year reduction and reduce in energy consumption from steam generation of 0.3777 MWh and 4.60 million THB cost saving
(3) Water quality improvement project from steam production, with 316,635 MWh/year energy saving and 2.60 million THB cost saving. This can reduce GHG emission by 395 tCO2e per year.

These products contributed to 319,564.3777 MWh energy saving per year, 1,393 tCO2 per year GHG reduction and saved operating cost approximately by 9,800,000 THB per year in total due to improvement of energy efficiency.

Cost to realize opportunity

6,960,000

Strategy to realize opportunity and explanation of cost calculation

GC set climate-related target including 20% reduction in the GHG emissions by 2030 and Net Zero emissions by 2050 where improvement of energy conservation and energy efficiency management is one of the most important parts in GGC climate strategy to achieve the targets.

GGC has a various energy conservation and efficiency improvement both by the enhanced energy management and hardware, for example, advanced process control modelling, visualized real-time unit monitoring, process optimization, hardware upgrades.

Three major projects in 2022 were
(1) Advance Process Control at Fractionation Column of FAOH plant is a system that automatically controls valve opening and closing through the
detection of temperature changes and reflux flow of the fractionation column back to the refinery tower. The CAPEX cost is accounted for 4,3600,000 per year, respectively. The payback period is 2.11 years.

(2) Pre-treatment Vacuum Ejector Motive Steam Optimization by using the Steam Ejector to create a vacuum in the production process. As the project is an operational efficiency, there is no significant cost of opportunity in this project.

(3) water quality improvement project for steam production which is a filtration of the raw water through a reverse osmosis (RO) system to create purified water. This project reduces the production of wastewater and energy loss. Doing so can reduce the consumption of oil in the water heating process by 25 liters per hour. The operating cost is 2,600,000 THB per year.

The cost to realize this opportunity was a calculated from the decision to invest in these three projects which cost THB 6,960,000 in 2022.

Comment

Identifier

Opp2

Where in the value chain does the opportunity occur?

Direct operations

Opportunity type

Energy source

Primary climate-related opportunity driver

Shift toward decentralized energy generation

Primary potential financial impact

Reduced direct costs

Company-specific description

GGC business focus has been on producing biofuels, biochemicals and other high value added bio-products. Renewable energy from biomass fits well with our business direction to utilize sugarcane in bioethanol, bioplastic and other biochemicals production, as the bagasse can used as an energy source for electricity and stream generation. Besides renewable electricity from solar cells is also becoming and interesting source of energy due to the price drop as the technology progresses. The existing palm oil-based plants (ME1 and ME 2) also have the opportunity to switch the fuel from carbon intensive sources such as fuel oil to other low carbon alternatives such as natural gas and biogas.

Time horizon

Medium-term

Likelihood

Very likely

Magnitude of impact

Medium

Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

Potential financial impact figure (currency)

180,500,000

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

The financial impact is based on the investment value with joint venture called "Nakhonsawan Biocomplex Project". In term of opportunity for renewable energy consumption, the Nakhonsawan Biocomplex Project Phase 1 consists of a biomass power plant with high-pressure steam production, whose nameplate capacities will be 85 megawatts (MW) and 475 tons per hour of steam. The energy from the biomass power plant will be self-consumed that can save operating cost due to energy sourcing by approximately 180,500,000 THB per year.

In addition, the project phase 1 also consist of a sugarcane juice and sugarcane syrup plant with a capacity of 2.4 million tons per year, and an ethanol plant with a nameplate capacity of 186 million liters per year or 600,000 liters per day, whose raw material is processed sugarcane juice or sugarcane syrup. For the project phase 2, there would be an extension project for Bioplastics and Biochemicals industries (under appropriate technology and joint-venture partner investigation).

Cost to realize opportunity

7,500,000,000

Strategy to realize opportunity and explanation of cost calculation

To capture the opportunity arise from biomass utilization for energy generation, GGC developed a joint venture called "Nakhonsawan Biocomplex Project". The Nakhonsawan Biocomplex Project Phase 1 consists of a biomass power plant with high-pressure steam production, whose nameplate capacities will be 85 megawatts (MW) and 475 tons per hour of steam. The construction budget is 7,500,000,000 THB with the commercial operation date (COD) is expected to be in the first quarter of 2024.

GGC believes that this investment will increase the Company's capabilities for future investment in Biochemicals and sugarcane-based Bioplastics. This will bring synergy benefits between Bioindustry and sugarcane industry and foster the well-being of sugarcane farmers in Thailand.

Furthermore, GC set climate-related target including 20% reduction in the GHG

emissions by 2030 and Net Zero emissions by 2050 where the use of low carbon and renewable energy is one of the most important parts in GGC climate strategy to achieve the targets.

For existing palm oil-based plants in Rayong and Chonburi, GGC is exploring options in fuel switching from fuel oil to other low carbon alternatives such as natural gas and biogas which will be implemented in the future. This will be in combination with renewable electricity from solar cell to lower GGC's overall emission.

Comment

Identifier

Opp3

Where in the value chain does the opportunity occur?

Downstream

Opportunity type

Markets

Primary climate-related opportunity driver

Access to new markets

Primary potential financial impact

Increased revenues resulting from increased demand for products and services

Company-specific description

As consumers nowadays are increasingly paying attention to the environmental and social sustainability of the products they buy (i.e. home care and personal care), the consumer product companies who are our customers are looking for low carbon and sustainable raw materials. Having certified low carbon and sustainable products, thus, provides a big market opportunity for GGC. The development of low carbon products and/or sustainable products also allows GGC to comply with trade regulations such as Carbon Border Adjustment Mechanism (CBAM), which opens the market in other regions and provides competitive advantage for both GGC and our customers. The emerging Carbon Offsetting and Reduction Scheme in Aviation (CORSIA) will also push the airline companies to source low carbon fuels which presents an opportunity for GGC to capture in terms of Sustainable Aviation Fuel (SAF) and other advanced biofuels.

Time horizon

Medium-term

Likelihood

Very likely

Magnitude of impact

High

Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

Potential financial impact figure (currency)

22,578,300,000

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

The reported financial impact figure was calculated from current low carbon product (Pre-cut and main-cut fatty alcohol) and product the helps third-party to avoid emission (Bio-Methyl Ester) which accounts for 90 percent of GGC revenue in 2022.

For more information, in 2022, the sales revenue from Pre-cut and main-cut fatty alcohol were 8,529,580,000 THB, and the sales revenue from Bio-Methyl Este was 14,048,720,000 THB, or 22,578,300,000 THB in total.

It should be noted that GGC also has developed and sold products from raw material certified with Round Table of Sustainable Palm Oil (RSPO) for fatty alcohol and refined glycerin products at premium price but not included in calculation here to avoid double counting. The sales revenue from RSPO-certified refined glycerin product has increased 723 percent from 2020.

Moreover, GGC will receive more revenue from biomass-fueled electricity and steam in Nakhon Sawan Biocomplex which are considered low carbon product. The commencement is expected to be in the first quarter in 2022. The second phase of the project is being considered to support the polylactic acid (PLA) bioplastic project, which expands the uses of biosuccinic acid, a biochemical that is the raw material for polybutylene succinate (PBS) bioplastics which are green product.

Cost to realize opportunity

15,720,000

Strategy to realize opportunity and explanation of cost calculation

GGC has a strategy to invests in low carbon and sustainable product development as follows;

The first investment of the NBC project phase 2 that consists of low carbon biochemical and bioplastic products will be on the utility provider and infrastructure for extending to grow the caliber and value of the Project. This investment promotes the project's readiness and create value addition to farm products under various future investment projects to use its public utilities and infrastructures without the need for such investment. In addition, the driving and development of the project to higher capability on a par with other industrial estates together with more Biochemicals project

investments address Thailand's development strategy under the Bio-Circular-Green Economic Model (BCG Model) in addition to underlining GGC's leadership in the Green Business.

GGC successfully attracted a new investor from the USA with confirmation of joint investment made by NatureWorks LLC ("NatureWorks"), the world's No. 1 producer of Polylactic Acid (PLA). In this company, GC holds 50 percent of the shares, as does Cargill Incorporated (Cargill). For this investment, GGC and the Kaset Thai International Sugar Corporation Public Company Limited (KTIS) Group provide public utility and infrastructural support through GGC KTIS Bioindustrial Company Limited (GKBI)'s operation with an investment of about 1,430,000,000 THB, including high-stability power distribution, steam production and distribution, water production and wastewater treatment, and long-term sugar dissolution systems. Project construction and COD is expected to be completed by early 2024. The overall construction progress is 17.73%.

Moreover, in 2022, GGC and The German Agency for International Cooperation (GIZ) launched Sustainable and Climate-Friendly Palm Oil Production and Procurement in Thailand (SPOPP) to promote and develop the caliber of small farmers up to the RSPO standard. The total investment cost for this project from 2022 to 2024 was 15,772,000 TH. The total investment cost for this project from 2022 to 2024 was 15,772,000 THB, consisting of 5,900,000 THB in 2022, 4,400,000 THB in 2023, and 5,420,000 THB in 2024. THB in 2024.

Comment

Identifier

Opp4

Where in the value chain does the opportunity occur?

Direct operations

Opportunity type

Markets

Primary climate-related opportunity driver

Other, please specify

Development and/or expansion of low emission goods and services

Primary potential financial impact

Increased revenues resulting from increased demand for products and services

Company-specific description

With global efforts to decarbonize various sectors, biofuels have been identified as one of the key enablers of a low carbon economy transition in the short-term. Particularly for the transport sector, biofuels play an important role in decarbonizing the sector by providing low carbon solutions that can be utilized with existing technologies. A review

of global biofuel market trends indicate an increase in demand with demand peaking in 2030 before gradually declining due to electrification and the utilization of alternative fuels (e.g. green hydrogen). However, looking at the near-term (i.e. up to 2030), GGC identifies opportunities in potentially increasing our ME production as there is still appetite for biofuels in upcoming years. In 2022, biofuels (Methyl Ester (ME) or B100) was one of GGC's main products and revenue stream. accounting for over 70% of GGC's total revenue.

Time horizon

Short-term

Likelihood

Very likely

Magnitude of impact

Medium

Are you able to provide a potential financial impact figure?

Yes, an estimated range

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

725,000,000

Potential financial impact figure – maximum (currency)

1,298,000,000

Explanation of financial impact figure

In GGC's transition scenario analysis, the potential financial impacts from change in biofuel demand was identified as an opportunity. The financial impact is estimated from the potential revenue from additional production of biofuels in the short-term (2030) by using biofuel consumption data (sourced from the IEA World Energy Outlook 2022) as a proxy for demand and projecting GGC’s production of ME against the year-on-year percentage change in liquid bioenergy consumption under STEPS and NZE. To quantify the associated financial implication that may arise from this opportunity, the revenue from the forecasted production of biofuels under each of the two scenarios was estimated with the change between the base case compared to each scenario indicating the degree of opportunity. By 2030, the potential revenue from additional production of biofuels is 725 million THB under STEPS and 1,298 million THB under NZE scenario.

Cost to realize opportunity

1,430,000,000

Strategy to realize opportunity and explanation of cost calculation

To capture additional opportunities from change in biofuel demand, GGC has a strategy to invest in low carbon and sustainable product development including investments in the Nakhonsawan Biocomplex (NBC) project phase 2 which aims to support and expand

the development of low carbon biochemical and bioplastic products in Thailand. This investment promotes production of biofuels (including methyl ester) and other utilities that use sugar canes as a raw material. Upon the completion of the project, the NBC will support increased biofuel production capacity to meet growing demands for biofuels. The project will increase Thailand's capability to compete with other industrial estates with more investments in biochemical projects that compliment Thailand's development strategy under the Bio-Circular-Green Economic Model (BCG Model). Through our investments in the NBC, GGC underlines its leadership position in the Green Business.

GGC successfully attracted a new investor from the USA with confirmation of joint investment made by NatureWorks LLC (“NatureWorks”), the world’s No. 1 producer of Polylactic Acid (PLA). In this company, GC holds 50 percent of the shares, as does Cargill Incorporated (Cargill). For this investment, GGC and the Kaset Thai International Sugar Corporation Public Company Limited (KTIS) Group provide public utility and infrastructural support through GGC KTIS Bioindustrial Company Limited (GKBI)’s operation with an investment of about 1,430,000,000 THB, including high-stability power distribution, steam production and distribution, water production and wastewater treatment, and long-term sugar dissolution systems. Project construction and COD is expected to be completed by early 2024. The overall construction progress is 17.73%.

Comment

C3. Business Strategy

C3.1

(C3.1) Does your organization’s strategy include a climate transition plan that aligns with a 1.5°C world?

Row 1

Climate transition plan

Yes, we have a climate transition plan which aligns with a 1.5°C world

Publicly available climate transition plan

Yes

Mechanism by which feedback is collected from shareholders on your climate transition plan

We have a different feedback mechanism in place

Description of feedback mechanism

GGC held Opportunity Day and Analysis Meeting to communicate and engage with shareholders which include various agendas concerning the business activities, business strategies, update of sustainability progress as well as climate related strategies. One of the agendas include climate transition plan. GGC has informed the

shareholders about GGC's Decarbonization Strategy which outlines the journey for GGC to become a Net Zero company. The strategies can divide into four pillars: Efficiency Driven, Compensation Driven, Portfolio Driven and ESG Leadership. GGC sees climate change as an important issue. Therefore, GGC has set a target to reduce 20% of GHG emission Scope 1 and Scope 2 by 2030 and become Net Zero by 2050. Furthermore, the meeting is also providing an opportunity for shareholders through questionnaires documents to share their feedbacks and expectation for GGC in order to improve and accelerate the process to achieve the targets.
Furthermore, GGC also hold an Annual General Shareholders' Meeting where GGC distributed series of questionnaires for stakeholders to ask about their opinions regarding Low Carbon Transition Plan, Energy Management & Climate Change, Circular Economy & Eco-efficiency, Sustainable Water Management and Biodiversity. The questionnaires can be found here:
https://docs.google.com/forms/d/e/1FAIpQLSdUG1M2cS-jdtGpLXZ2jyv8J-3FiKLWgSe9CJwVbZTsumQsIg/formResponse

Frequency of feedback collection

More frequently than annually

Attach any relevant documents which detail your climate transition plan (optional)

Integrated Sustainability Report 2022.pdf
GGC Anuual report 2022.pdf

C3.2

(C3.2) Does your organization use climate-related scenario analysis to inform its strategy?

	Use of climate-related scenario analysis to inform strategy
Row 1	Yes, qualitative and quantitative

C3.2a

(C3.2a) Provide details of your organization's use of climate-related scenario analysis.

Climate-related scenario	Scenario analysis coverage	Temperature alignment of scenario	Parameters, assumptions, analytical choices
Physical climate scenarios RCP 1.9	Company-wide		Quantitative and qualitative of flood and drought scenario analysis Parameters: Number of Heavy Rainfall Days (Days with precipitation >20mm) was used as a parameter for flood. Number of consecutive dry days was used as a parameter for drought. Assumptions: The number of heavy rainfall day is

			associated with the potential occurrence of flood which may affect the production of our critical feedstock - palm oil. The number of consecutive dry days was associated with the drought which could affect the production of our critical feedstock - sugarcane. Analytical choices: The time horizon was in 2030 and 2050. The analysis was based on anomalies of these two parameters from 1995-2014 baseline under RCP 1.9, RCP 4.5 and RCP 8.5 scenarios. The data source was based on Climate Change Knowledge Portal, World Bank Group. Public accessibility and robustness of information were the main criteria used in our parameter and analytical choice selection.
Physical climate scenarios RCP 4.5	Company-wide		Quantitative and qualitative of flood and drought scenario analysis Parameters: Number of Heavy Rainfall Days (Days with precipitation >20mm) was used as a parameter for flood. Number of consecutive dry days was used as a parameter for drought. Assumptions: The number of heavy rainfall day is associated with the potential occurrence of flood which may affect the production of our critical feedstock - palm oil. The number of consecutive dry days was associated with the drought which could affect the production of our critical feedstock - sugarcane. Analytical choices: The time horizon was in 2030 and 2050. The analysis was based on anomalies of these two parameters from 1995-2014 baseline under RCP 1.9, RCP 4.5 and RCP 8.5 scenarios. The data source was based on Climate Change Knowledge Portal, World Bank Group. Public accessibility and robustness of information were the main criteria used in our parameter and analytical choice selection.
Physical climate scenarios RCP 8.5	Company-wide		Quantitative and qualitative of flood and drought scenario analysis Parameters: Number of Heavy Rainfall Days (Days with precipitation >20mm) was used as a parameter for flood. Number of consecutive dry days was used

			as a parameter for drought. Assumptions: The number of heavy rainfall day is associated with the potential occurrence of flood which may affect the production of our critical feedstock - palm oil. The number of consecutive dry days was associated with the drought which could affect the production of our critical feedstock - sugarcane. Analytical choices: The time horizon was in 2030 and 2050. The analysis was based on anomalies of these two parameters from 1995-2014 baseline under RCP 1.9, RCP 4.5 and RCP 8.5 scenarios. The data source was based on Climate Change Knowledge Portal, World Bank Group. Public accessibility and robustness of information were the main criteria used in our parameter and analytical choice selection.
Transition scenarios IEA NZE 2050	Company-wide		1. Quantitative and qualitative carbon price scenario analysis Parameters: Financial impact of carbon price on GGC (THB) Assumptions: The carbon price GGC has to pay in 2030 and 2050 may vary depending on the price of carbon under different scenarios and the amount of excess GHG emission against IEA NZE 2050 (aligning with SBTi Net Zero standard) trajectory and Nationally Determined Contribution (NDC) trajectory which is equivalent to IEA APS in national context. Analytical choices: The time horizon was in 2030 and 2050. The chosen scenario was IEA NZE 2050 and NDC which were used to estimate excess emission in Business-As-Usual and current target scenario. The data source of carbon price was based on IEA World Energy Outlook 2021. Public accessibility and robustness of information were the main criteria used in our parameter and analytical choice selection.
Transition scenarios IEA STEPS (previously IEA NPS)	Company-wide		1. Quantitative and qualitative carbon price scenario analysis Parameters: Financial impact of carbon price on GGC (THB), Opportunities from change in biofuel demand.

			Assumptions: The IEA Net Zero Emissions 2050 (NZE) scenario reflects a pathway for the global energy sector to achieve net zero emissions and limit global warming to 1.5 °C in 2100 where advanced economies are expected to reach net zero missions ahead of other economies. 1. Carbon price - Rapidly increasing carbon price over time with carbon price being most intense under the NZE scenario. 2. Biofuel demand - Increasing biofuel market demand in the near-term which will peak in 2030 before gradually declining as newer technologies become available. Analytical choices: The time horizon was in 2030 and 2050. The chosen scenario were IEA STEPS and NZE 2050 which reflects a "business-as-usual" scenario and a "low carbon" scenario, respectively. The data source of carbon price was based on IEA World Energy Outlook 2022. Public accessibility and robustness of information were the main criteria used in our parameter and analytical choice selection.
Transition scenarios Customized publicly available transition scenario	Company-wide	2.1ºC - 3ºC	1. Quantitative and qualitative carbon price scenario analysis Parameters: Financial impact of carbon price on GGC (THB), Opportunities from change in biofuel demand. Assumptions: The IEA STEPS scenario reflects current efforts in pursuing GHG emissions to limit temperature rise to 2.6°C in 2100. Efforts are mostly driven by policies and regulations including the Nationally Determined Contributions in alignment with the Paris Agreement. 1. Carbon price - Rapidly increasing carbon price over time with carbon price being most intense under the NZE scenario. 2. Biofuel demand - Increasing biofuel market demand in the near-term which will peak in 2030 before gradually declining as newer technologies become available. Analytical choices: The time horizon was in 2030 and 2050. The chosen scenario were IEA STEPS and NZE 2050 which reflects a "business-as-usual"

			scenario and a "low carbon" scenario, respectively. The data source of carbon price was based on IEA World Energy Outlook 2022. Public accessibility and robustness of information were the main criteria used in our parameter and analytical choice selection.

C3.2b

(C3.2b) Provide details of the focal questions your organization seeks to address by using climate-related scenario analysis, and summarize the results with respect to these questions.

Row 1

Focal questions

GGC conducted scenario analysis according to the key physical risks and transition risks identified in order to answer two sets of questions as follows;

Physical Scenario Analysis
1. What is the direction of change and to what extent flood and drought is going to progress in 2030 and 2050?
2. How might these changes affect the production of GGC's critical agricultural feedstock; sugarcane and palm oil?

Transition Scenario Analysis
1. How much would the carbon price be for GGC in 2030 and 2050 following IEA STEPS and NZE trajectories?
2. How may the changing demand of biofuels affect GGC's business operations?

GGC will regularly revisit all the above questions to update all contextual changes as possible for better drive GGC climate-related targets.

Results of the climate-related scenario analysis with respect to the focal questions

Physical Scenario Analysis
1. What is the direction of change and to what extent flood and drought is going to progress in 2030 and 2050?
In the big picture, according to the Climate Change Knowledge Portal, both flood and drought are likely to be more intensified in the future. As the southern part of Thailand is likely to experience growing number of days with heavy rainfall (>20 mm). Flood is also likely to intensify in the future with highest intensity in RCP 1.9 scenario in 2030. followed by RCP 4.5 and RCP 8.5. Furthermore, as the max number of consecutive dry days in Nakhon Sawan is likely to increase, drought is likely to intensify in the future with highest intensity in RCP 1.9 scenario in 2030. followed by RCP 8.5 and RCP 4.5.

2. How might these changes affect the production of GGC's critical agricultural feedstock; sugarcane and palm oil?
The scenario anslyses for flood and drought impact were conducted based on the specific provinces where feedstock were mainly sourced from. For example, Nakhon Sawan for sugarcane and Krabi, Surat Thani and Chumphon for palm oil. According to the studies, the physical impact of climate change would cause the production of palm oil to reduce between 13-14% in 2030 and 15-22% in 2050 and cause to production of sugarcane to reduce by 25-35% in 2050. These can have a significant feedstock cost implications for GGC and might be used to manage the security of feedstock in the future.

Transition Scenario Analysis
1. How much would the carbon price be for GGC in 2030 and 2050 following IEA STEPS and NZE trajectories?
Carbon price may affect GGC by increasing the operational expense proportional to the amount of GHG emission. Carbon price may come in various form i.e. carbon trading under cap & trade scheme, carbon tax or carbon offset price. The carbon price may be embedded in utility cost in upstream or GGC may have to pay directly. The carbon price under STEPS and NZE in 2030 ranges between 53-102 million THB and could potential rise up to 100-622 million THB in 2050.

2. How may the changing demand of biofuels affect GGC's business operations?
In 2030, there are potential opportunities from additional biofuel production in both STEPS and NZE reflecting the forecasted biofuel market demand trend where demand increases until peaking in 2030. The potential opportunity from additional production of biofuels in 2030 is 725 million THB under STEPS and 1,298 million THB under NZE. In the long-term, opportunities will decline due to decreased biofuel market demand due to electrification and adoption of alternative fuels such as green hydrogen. This trend will be observed first under NZE followed by STEPS. By 2050, the potential revenue from additional production of biofuels is 181 million THB under STEPS and -298 million THB under NZE.

C3.3

(C3.3) Describe where and how climate-related risks and opportunities have influenced your strategy.

	Have climate-related risks and opportunities influenced your strategy in this area?	Description of influence
Products and services	Yes	As one of the main biofuel producers of Thailand, GGC integrates the climate change management into its business operation, production process as well as business strategy in order to reduce the company overall GHGs

		emissions in order to provide lower GHG emission products for GGC customer. Furthermore, the BCG Model (Bio-Circular-Green Economy) as one of Thailand's policy also drives GGC to produce more high value-added bio-based products for the low carbon future. In addition, the opportunity from low-carbon and sustainable product demand growth has driven GGC to develop the products made from RSPO certified feedstock. As a result, GCC has set the corporate KPIs have the indicators and targets on the sales drive of low carbon products and the drive of RSPO certified product sales.
Supply chain and/or value chain	Yes	Physical impacts from climate change such as drought and flooding can affect GGC and its stakeholders, either directly or indirectly, particularly palm oil and sugarcane producers. These drive GGC to develop an effective supply chain management strategy e.g. diversification of supply sources, preparation of alternative transportation route to minimize business disruption. Otherwise, the operation would be shut downed or disrupted because of lack of feedstock, logistic problem, etc. As a result of risk assessment throughout value chain, physical risks are likely to have high impact on the reduced production of feedstock resulting in increased procurement cost at an unpredictable timing, in which GGC uses the feedstock price hedging as strategy to respond to price volatility. GGC also engages and set corporate KPIs to increase the engagement with palm oil farmers through RSPO project in order to expand the sustainable supply chain for sustainable and low carbon products in the future.
Investment in R&D	Yes	Climate opportunities has influenced GGC to invest in low carbon product development and certification and invest in innovation to produce high value added bioproducts based using palm oil and sugarcane as a raw material. GGC also invests in biochemical products and bioplastics. This is an extension of the development of the Biocomplex project using sugar cane as a raw material. Currently, the second phase of the project is being considered to support the PLA bioplastic project, which expands the uses of BioSuccinic Acid, a biochemical that is the raw material for PBS bioplastics. The project will be undertaken with business partners, linking business operations of GC Group companies, including looking for investment opportunities in businesses with potential and operating the business in line with GGC's business growth plan as well.
Operations	Yes	Climate physical risks could affect our operation to be disrupted or slowed down, such as drought causing water

		shortages for operation, flooding can disrupt the transportation to and from the plant, etc. GGC, therefore, has developed and tested the business continuity plan regularly to ensure smooth operation. Installed onsite water storage and joined the local water management working team to keep track of the water supply situation. For transition risks, Thailand's Emission Trading Schemes (ETS) developed by the Thailand Greenhouse Gas Management Organization (TGO) might be launched within the next 3-5 years, GGC have to comply the schemes, thus implementing various measure, such as energy management in accordance with ISO 50001 standards, operating and investing in a variety of energy reduction projects, e.g. a project to reduce the use of steam in the methanol purification process. Moreover, GGC will expand low carbon or renewable energy consumption from solar cells and biomass. These are also to capture climate opportunities in terms of resource efficiency and renewable energy.

C3.4

(C3.4) Describe where and how climate-related risks and opportunities have influenced your financial planning.

	Financial planning elements that have been influenced	Description of influence
Row 1	Revenues Direct costs Indirect costs Capital expenditures	All identified impact drivers in physical and transition risks have caused both direct and indirect financial impact. For Physical risks, loss of revenues and direct cost have been perceived due to the unplanned plant shutdown and assets' maintenance cost. For transition risks, upcoming mandatory carbon price mechanism and Thailand NDC triggered the company to allocate capital expenditure to support low-carbon, climate response projects such as increasing renewable energy usage in operation. For Climate-related opportunities, GGC has constructed the first phase of the Nakornsawan Bio-Complex Project consisting of a sugar cane mill with a capacity of 2.4 million tons per year, an ethanol plant with a capacity of 600,000 liters per day, and a biomass power plant with the capacity of producing 85 megawatts of electricity and 475 tons of steam per hour. This action will cause dramatic increase in GGC revenue because of the high demand bioethanol and green products around 1,600 million THB per year by 2025. Moreover, GGC continuously invested 1,430 million THB for utility provider and infrastructure for NBC

		phase II. The phase II project represents Thailand's first Bio Hub, run by the joint venture GGC KTIS Bio Industrial Co., Ltd. (GKBI), creating high value-added products for agricultural produce by converting them into industrial products, raise our capability for the biofuel business, and growing investment opportunities for biochemical and bioplastic businesses. Besides, the project also supports the BCG Model (Bio-Circular-Green Economy) to elevate national competitiveness and drive Thailand's achievement of Sustainable Development Goals (UN SDGs) as planned, apart from fostering confidence among business partners to invest with us further on the NBC Project. That project would capture opportunities for new low-carbon products needs and transition incentive from national and international financial support to lower transition cost. Moreover, information from scenarios analysis of both physical and transition risks helps GGC to prepare mitigation or adaptation plans as well as investment plans to deal with the risks that critically impact on GGC financial position including operational status.

C3.5

(C3.5) In your organization's financial accounting, do you identify spending/revenue that is aligned with your organization's climate transition?

	Identification of spending/revenue that is aligned with your organization's climate transition
Row 1	Yes, we identify alignment with our climate transition plan

C3.5a

(C3.5a) Quantify the percentage share of your spending/revenue that is aligned with your organization's climate transition.

Financial Metric

Revenue/Turnover

Type of alignment being reported for this financial metric

Alignment with our climate transition plan

Taxonomy under which information is being reported

Objective under which alignment is being reported

Amount of selected financial metric that is aligned in the reporting year (unit currency as selected in C0.4)

22,575,960,000

Percentage share of selected financial metric aligned in the reporting year (%)

90

Percentage share of selected financial metric planned to align in 2025 (%)

90

Percentage share of selected financial metric planned to align in 2030 (%)

90

Describe the methodology used to identify spending/revenue that is aligned

In 2022, there are 4 group of products sold by GGC, methyl ester, fatty alcohol, refined glycerin and others. The revenues that align with our company's transition to a 1.5°C world is calculated based on the revenue from low carbon products and products that helps third-parties to avoid emissions. In 2022, 56% of total product revenue is from the product that helps third-parties to avoid emissions, namely, Bio-Methyl Ester. Furthermore, the low carbon products namely fatty alcohol main-cut and fatty alcohol pre-cut have contributed 34% of total revenue. Thus, 90% in total. Rapidly increasing demand of Bio-Methyl Ester is difficult to determine as it is highly dependent on government's decision e.g., blending percentage, where several factors such as oil price, feedstock price, annual stock and production are at play. Despite this, we the expansion of revenue from low carbon and avoided emission products in the future, potentially through the development of other advanced biofuel and other biochemical products in the future.

C4. Targets and performance

C4.1

(C4.1) Did you have an emissions target that was active in the reporting year?

Absolute target
Intensity target

C4.1a

(C4.1a) Provide details of your absolute emissions target(s) and progress made against those targets.

Target reference number

Abs 1

Is this a science-based target?

No, and we do not anticipate setting one in the next two years

Target ambition

Year target was set

2020

Target coverage

Company-wide

Scope(s)

Scope 1

Scope 2

Scope 2 accounting method

Market-based

Scope 3 category(ies)

Base year

2020

Base year Scope 1 emissions covered by target (metric tons CO2e)

27,714

Base year Scope 2 emissions covered by target (metric tons CO2e)

71,974

Base year Scope 3, Category 1: Purchased goods and services emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 2: Capital goods emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 4: Upstream transportation and distribution emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 5: Waste generated in operations emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 6: Business travel emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 7: Employee commuting emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 8: Upstream leased assets emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 9: Downstream transportation and distribution emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 10: Processing of sold products emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 11: Use of sold products emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 12: End-of-life treatment of sold products emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 13: Downstream leased assets emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 14: Franchises emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 15: Investments emissions covered by target (metric tons CO2e)

Base year Scope 3, Other (upstream) emissions covered by target (metric tons CO2e)

Base year Scope 3, Other (downstream) emissions covered by target (metric tons CO2e)

Base year total Scope 3 emissions covered by target (metric tons CO2e)

Total base year emissions covered by target in all selected Scopes (metric tons CO2e)

99,688

Base year Scope 1 emissions covered by target as % of total base year emissions in Scope 1

100

Base year Scope 2 emissions covered by target as % of total base year emissions in Scope 2

100

Base year Scope 3, Category 1: Purchased goods and services emissions covered by target as % of total base year emissions in Scope 3, Category 1: Purchased goods and services (metric tons CO2e)

Base year Scope 3, Category 2: Capital goods emissions covered by target as % of total base year emissions in Scope 3, Category 2: Capital goods (metric tons CO2e)

Base year Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) emissions covered by target as % of total base year emissions in Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) (metric tons CO2e)

Base year Scope 3, Category 4: Upstream transportation and distribution covered by target as % of total base year emissions in Scope 3, Category 4: Upstream transportation and distribution (metric tons CO2e)

Base year Scope 3, Category 5: Waste generated in operations emissions covered by target as % of total base year emissions in Scope 3, Category 5: Waste generated in operations (metric tons CO2e)

Base year Scope 3, Category 6: Business travel emissions covered by target as % of total base year emissions in Scope 3, Category 6: Business travel (metric tons CO2e)

Base year Scope 3, Category 7: Employee commuting covered by target as % of total base year emissions in Scope 3, Category 7: Employee commuting (metric tons CO2e)

Base year Scope 3, Category 8: Upstream leased assets emissions covered by target as % of total base year emissions in Scope 3, Category 8: Upstream leased assets (metric tons CO2e)

Base year Scope 3, Category 9: Downstream transportation and distribution emissions covered by target as % of total base year emissions in Scope 3, Category 9: Downstream transportation and distribution (metric tons CO2e)

Base year Scope 3, Category 10: Processing of sold products emissions covered by target as % of total base year emissions in Scope 3, Category 10: Processing of sold products (metric tons CO2e)

Base year Scope 3, Category 11: Use of sold products emissions covered by target as % of total base year emissions in Scope 3, Category 11: Use of sold products (metric tons CO2e)

Base year Scope 3, Category 12: End-of-life treatment of sold products emissions covered by target as % of total base year emissions in Scope 3, Category 12: End-of-life treatment of sold products (metric tons CO2e)

Base year Scope 3, Category 13: Downstream leased assets emissions covered by target as % of total base year emissions in Scope 3, Category 13: Downstream leased assets (metric tons CO2e)

Base year Scope 3, Category 14: Franchises emissions covered by target as % of total base year emissions in Scope 3, Category 14: Franchises (metric tons CO2e)

Base year Scope 3, Category 15: Investments emissions covered by target as % of total base year emissions in Scope 3, Category 15: Investments (metric tons CO2e)

Base year Scope 3, Other (upstream) emissions covered by target as % of total base year emissions in Scope 3, Other (upstream) (metric tons CO2e)

Base year Scope 3, Other (downstream) emissions covered by target as % of total base year emissions in Scope 3, Other (downstream) (metric tons CO2e)

Base year total Scope 3 emissions covered by target as % of total base year emissions in Scope 3 (in all Scope 3 categories)

Base year emissions covered by target in all selected Scopes as % of total base year emissions in all selected Scopes

100

Target year

2030

Targeted reduction from base year (%)

20

Total emissions in target year covered by target in all selected Scopes (metric tons CO2e) [auto-calculated]

79,750.4

Scope 1 emissions in reporting year covered by target (metric tons CO2e)

25,613

Scope 2 emissions in reporting year covered by target (metric tons CO2e)

70,854

Scope 3, Category 1: Purchased goods and services emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 2: Capital goods emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 4: Upstream transportation and distribution emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 5: Waste generated in operations emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 6: Business travel emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 7: Employee commuting emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 8: Upstream leased assets emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 9: Downstream transportation and distribution emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 10: Processing of sold products emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 11: Use of sold products emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 12: End-of-life treatment of sold products emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 13: Downstream leased assets emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 14: Franchises emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 15: Investments emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Other (upstream) emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Other (downstream) emissions in reporting year covered by target (metric tons CO2e)

Total Scope 3 emissions in reporting year covered by target (metric tons CO2e)

Total emissions in reporting year covered by target in all selected scopes (metric tons CO2e)

96,467

Does this target cover any land-related emissions?

No, it does not cover any land-related emissions (e.g. non-FLAG SBT)

% of target achieved relative to base year [auto-calculated]

16.1554048632

Target status in reporting year

Underway

Please explain target coverage and identify any exclusions

GGC has set a long-term companywide target to reduce scope 1+2 GHG reduction by 20% by 2030 compared to base year in 2020. This covers 100% of scope 1 and 2 emission without any exclusion of significant sources of emissions. This target covered GGC own operation which includes ME1, ME2 operational plant. The baseline year is subject to revision should there be any additional business expansion in the future years.

Plan for achieving target, and progress made to the end of the reporting year

GGC is determined to enact environmental policies covering climate change, power management, waste management, and water resource management in order to maximize the utilization of resources throughout the supply chain. GGC has established a policy of Safety, Occupational Health, Environment, and Business Continuity (QSHEB), which covers systematic environmental management, and biodiversity. GGC also manages the environment in accordance with the laws, regulations, and various standards both nationally and internationally. Moreover, GGC operated under the strategy of innovation and product development, as well as s emphasizes human resource development in research and development. GGC is focusing on building and development of research to increase product value through Efficiency-Driven. Examples of the project include Advance Process Control at Fractionation Column of FAOH Plant, Pre-treatment Vacuum Ejector Motive Steam Optimization, Switch Mode Time Reduction Project, Increase COD Treatment in the Wastewater Treatment System Efficiency Project, Reduction of ME Residue at Biodiesel Process Plant, Recovery Oil Loss from Wastewater Project.

List the emissions reduction initiatives which contributed most to achieving this target

Target reference number

Abs 2

Is this a science-based target?

Yes, we consider this a science-based target, and we have committed to seek validation of this target by the Science Based Targets initiative in the next two years

Target ambition

1.5°C aligned

Year target was set

2021

Target coverage

Company-wide

Scope(s)

Scope 1
Scope 2

Scope 2 accounting method

Market-based

Scope 3 category(ies)

Base year

2020

Base year Scope 1 emissions covered by target (metric tons CO2e)

27,714

Base year Scope 2 emissions covered by target (metric tons CO2e)

71,974

Base year Scope 3, Category 1: Purchased goods and services emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 2: Capital goods emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 4: Upstream transportation and distribution emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 5: Waste generated in operations emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 6: Business travel emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 7: Employee commuting emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 8: Upstream leased assets emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 9: Downstream transportation and distribution emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 10: Processing of sold products emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 11: Use of sold products emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 12: End-of-life treatment of sold products emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 13: Downstream leased assets emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 14: Franchises emissions covered by target (metric tons CO2e)

Base year Scope 3, Category 15: Investments emissions covered by target (metric tons CO2e)

Base year Scope 3, Other (upstream) emissions covered by target (metric tons CO2e)

Base year Scope 3, Other (downstream) emissions covered by target (metric tons CO2e)

Base year total Scope 3 emissions covered by target (metric tons CO2e)

Total base year emissions covered by target in all selected Scopes (metric tons CO2e)

99,688

Base year Scope 1 emissions covered by target as % of total base year emissions in Scope 1

100

Base year Scope 2 emissions covered by target as % of total base year emissions in Scope 2

100

Base year Scope 3, Category 1: Purchased goods and services emissions covered by target as % of total base year emissions in Scope 3, Category 1: Purchased goods and services (metric tons CO2e)

Base year Scope 3, Category 2: Capital goods emissions covered by target as % of total base year emissions in Scope 3, Category 2: Capital goods (metric tons CO2e)

Base year Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) emissions covered by target as % of total base year emissions in Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) (metric tons CO2e)

Base year Scope 3, Category 4: Upstream transportation and distribution covered by target as % of total base year emissions in Scope 3, Category 4: Upstream transportation and distribution (metric tons CO2e)

Base year Scope 3, Category 5: Waste generated in operations emissions covered by target as % of total base year emissions in Scope 3, Category 5: Waste generated in operations (metric tons CO2e)

Base year Scope 3, Category 6: Business travel emissions covered by target as % of total base year emissions in Scope 3, Category 6: Business travel (metric tons CO2e)

Base year Scope 3, Category 7: Employee commuting covered by target as % of total base year emissions in Scope 3, Category 7: Employee commuting (metric tons CO2e)

Base year Scope 3, Category 8: Upstream leased assets emissions covered by target as % of total base year emissions in Scope 3, Category 8: Upstream leased assets (metric tons CO2e)

Base year Scope 3, Category 9: Downstream transportation and distribution emissions covered by target as % of total base year emissions in Scope 3, Category 9: Downstream transportation and distribution (metric tons CO2e)

Base year Scope 3, Category 10: Processing of sold products emissions covered by target as % of total base year emissions in Scope 3, Category 10: Processing of sold products (metric tons CO2e)

Base year Scope 3, Category 11: Use of sold products emissions covered by target as % of total base year emissions in Scope 3, Category 11: Use of sold products (metric tons CO2e)

Base year Scope 3, Category 12: End-of-life treatment of sold products emissions covered by target as % of total base year emissions in Scope 3, Category 12: End-of-life treatment of sold products (metric tons CO2e)

Base year Scope 3, Category 13: Downstream leased assets emissions covered by target as % of total base year emissions in Scope 3, Category 13: Downstream leased assets (metric tons CO2e)

Base year Scope 3, Category 14: Franchises emissions covered by target as % of total base year emissions in Scope 3, Category 14: Franchises (metric tons CO2e)

Base year Scope 3, Category 15: Investments emissions covered by target as % of total base year emissions in Scope 3, Category 15: Investments (metric tons CO2e)

Base year Scope 3, Other (upstream) emissions covered by target as % of total base year emissions in Scope 3, Other (upstream) (metric tons CO2e)

Base year Scope 3, Other (downstream) emissions covered by target as % of total base year emissions in Scope 3, Other (downstream) (metric tons CO2e)

Base year total Scope 3 emissions covered by target as % of total base year emissions in Scope 3 (in all Scope 3 categories)

Base year emissions covered by target in all selected Scopes as % of total base year emissions in all selected Scopes

100

Target year

2050

Targeted reduction from base year (%)

100

Total emissions in target year covered by target in all selected Scopes (metric tons CO2e) [auto-calculated]

0

Scope 1 emissions in reporting year covered by target (metric tons CO2e)

25,613

Scope 2 emissions in reporting year covered by target (metric tons CO2e)

70,854

Scope 3, Category 1: Purchased goods and services emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 2: Capital goods emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 4: Upstream transportation and distribution emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 5: Waste generated in operations emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 6: Business travel emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 7: Employee commuting emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 8: Upstream leased assets emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 9: Downstream transportation and distribution emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 10: Processing of sold products emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 11: Use of sold products emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 12: End-of-life treatment of sold products emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 13: Downstream leased assets emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 14: Franchises emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Category 15: Investments emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Other (upstream) emissions in reporting year covered by target (metric tons CO2e)

Scope 3, Other (downstream) emissions in reporting year covered by target (metric tons CO2e)

Total Scope 3 emissions in reporting year covered by target (metric tons CO2e)

Total emissions in reporting year covered by target in all selected scopes (metric tons CO2e)

96,285

Does this target cover any land-related emissions?

No, it does not cover any land-related emissions (e.g. non-FLAG SBT)

% of target achieved relative to base year [auto-calculated]

3.4136505898

Target status in reporting year

Underway

Please explain target coverage and identify any exclusions

GGC has set a long-term companywide target in 2021 to reduce scope 1+2 GHG reduction by 20% by 2030 compared to base year in 2020. This covers 100% of scope 1 and 2 emission without any exclusion of significant sources of emissions. This target covered GGC own operation which includes ME1, ME2 operational plant. The baseline year is subject to revision should there be any additional business expansion in the future years.

Plan for achieving target, and progress made to the end of the reporting year

GGC is determined to enact environmental policies covering climate change, power management, waste management, and water resource management in order to maximize the utilization of resources throughout the supply chain. GGC has established a policy of Safety, Occupational Health, Environment, and Business Continuity (QSHEB), which covers systematic environmental management, and biodiversity. GGC also manages the environment in accordance with the laws, regulations, and various standards both nationally and internationally. Moreover, GGC operated under the strategy of innovation and product development, as well as s emphasizes human resource development in research and development. GGC is focusing on building and development of research to increase product value through Efficiency-Driven. Examples of the project include Advance Process Control at Fractionation Column of FAOH Plant, Pre-treatment Vacuum Ejector Motive Steam Optimization, Switch Mode Time Reduction Project, Increase COD Treatment in the Wastewater Treatment System Efficiency Project, Reduction of ME Residue at Biodiesel Process Plant, Recovery Oil Loss from Wastewater Project.

List the emissions reduction initiatives which contributed most to achieving this target

C4.1b

(C4.1b) Provide details of your emissions intensity target(s) and progress made against those target(s).

Target reference number

Int 1

Is this a science-based target?

Yes, we consider this a science-based target, and we have committed to seek validation of this target by the Science Based Targets initiative in the next two years

Target ambition

1.5°C aligned

Year target was set

2020

Target coverage

Company-wide

Scope(s)

Scope 1

Scope 2

Scope 2 accounting method

Market-based

Scope 3 category(ies)

Intensity metric

Metric tons CO2e per unit revenue

Base year

2020

Intensity figure in base year for Scope 1 (metric tons CO2e per unit of activity)

0.000001523

Intensity figure in base year for Scope 2 (metric tons CO2e per unit of activity)

0.000003954

Intensity figure in base year for Scope 3, Category 1: Purchased goods and services (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 2: Capital goods (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 4: Upstream transportation and distribution (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 5: Waste generated in operations (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 6: Business travel (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 7: Employee commuting (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 8: Upstream leased assets (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 9: Downstream transportation and distribution (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 10: Processing of sold products (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 11: Use of sold products (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 12: End-of-life treatment of sold products (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 13: Downstream leased assets (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 14: Franchises (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Category 15: Investments (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Other (upstream) (metric tons CO2e per unit of activity)

Intensity figure in base year for Scope 3, Other (downstream) (metric tons CO2e per unit of activity)

Intensity figure in base year for total Scope 3 (metric tons CO2e per unit of activity)

Intensity figure in base year for all selected Scopes (metric tons CO2e per unit of activity)

0.000005477

% of total base year emissions in Scope 1 covered by this Scope 1 intensity figure

100

% of total base year emissions in Scope 2 covered by this Scope 2 intensity figure

100

% of total base year emissions in Scope 3, Category 1: Purchased goods and services covered by this Scope 3, Category 1: Purchased goods and services intensity figure

% of total base year emissions in Scope 3, Category 2: Capital goods covered by this Scope 3, Category 2: Capital goods intensity figure

% of total base year emissions in Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) covered by this Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) intensity figure

% of total base year emissions in Scope 3, Category 4: Upstream transportation and distribution covered by this Scope 3, Category 4: Upstream transportation and distribution intensity figure

% of total base year emissions in Scope 3, Category 5: Waste generated in operations covered by this Scope 3, Category 5: Waste generated in operations intensity figure

% of total base year emissions in Scope 3, Category 6: Business travel covered by this Scope 3, Category 6: Business travel intensity figure

% of total base year emissions in Scope 3, Category 7: Employee commuting covered by this Scope 3, Category 7: Employee commuting intensity figure

% of total base year emissions in Scope 3, Category 8: Upstream leased assets covered by this Scope 3, Category 8: Upstream leased assets intensity figure

% of total base year emissions in Scope 3, Category 9: Downstream transportation and distribution covered by this Scope 3, Category 9: Downstream transportation and distribution intensity figure

% of total base year emissions in Scope 3, Category 10: Processing of sold products covered by this Scope 3, Category 10: Processing of sold products intensity figure

% of total base year emissions in Scope 3, Category 11: Use of sold products covered by this Scope 3, Category 11: Use of sold products intensity figure

% of total base year emissions in Scope 3, Category 12: End-of-life treatment of sold products covered by this Scope 3, Category 12: End-of-life treatment of sold products intensity figure

% of total base year emissions in Scope 3, Category 13: Downstream leased assets covered by this Scope 3, Category 13: Downstream leased assets intensity figure

% of total base year emissions in Scope 3, Category 14: Franchises covered by this Scope 3, Category 14: Franchises intensity figure

% of total base year emissions in Scope 3, Category 15: Investments covered by this Scope 3, Category 15: Investments intensity figure

% of total base year emissions in Scope 3, Other (upstream) covered by this Scope 3, Other (upstream) intensity figure

% of total base year emissions in Scope 3, Other (downstream) covered by this Scope 3, Other (downstream) intensity figure

% of total base year emissions in Scope 3 (in all Scope 3 categories) covered by this total Scope 3 intensity figure

% of total base year emissions in all selected Scopes covered by this intensity figure

100

Target year

2050

Targeted reduction from base year (%)

100

Intensity figure in target year for all selected Scopes (metric tons CO2e per unit of activity) [auto-calculated]

0

% change anticipated in absolute Scope 1+2 emissions

100

% change anticipated in absolute Scope 3 emissions

0

Intensity figure in reporting year for Scope 1 (metric tons CO2e per unit of activity)

0.00000102

Intensity figure in reporting year for Scope 2 (metric tons CO2e per unit of activity)

0.00000282

Intensity figure in reporting year for Scope 3, Category 1: Purchased goods and services (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 2: Capital goods (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2) (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 4: Upstream transportation and distribution (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 5: Waste generated in operations (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 6: Business travel (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 7: Employee commuting (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 8: Upstream leased assets (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 9: Downstream transportation and distribution (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 10: Processing of sold products (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 11: Use of sold products (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 12: End-of-life treatment of sold products (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 13: Downstream leased assets (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 14: Franchises (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Category 15: Investments (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Other (upstream) (metric tons CO2e per unit of activity)

Intensity figure in reporting year for Scope 3, Other (downstream) (metric tons CO2e per unit of activity)

Intensity figure in reporting year for total Scope 3 (metric tons CO2e per unit of activity)

Intensity figure in reporting year for all selected Scopes (metric tons CO2e per unit of activity)

0.00000384

Does this target cover any land-related emissions?

No, it does not cover any land-related emissions (e.g. non-FLAG SBT)

% of target achieved relative to base year [auto-calculated]

29.8886251598

Target status in reporting year

Underway

Please explain target coverage and identify any exclusions

GGC has set a long-term companywide target in 2021 to become net zero in scope 1+2 GHG emission by 2050 compared to base year in 2020. This covers 100% of scope 1 and 2 emission without any exclusion of significant sources of emissions. This target covered GGC own operation which includes ME1, ME2 operational plant. The baseline year is subject to revision should there be any additional business expansion in the future years.

Plan for achieving target, and progress made to the end of the reporting year

GGC is determined to enact environmental policies covering climate change, power management, waste management, and water resource management in order to maximize the utilization of resources throughout the supply chain. GGC has established a policy of Safety, Occupational Health, Environment, and Business Continuity (QSHEB), which covers systematic environmental management, and biodiversity. GGC also manages the environment in accordance with the laws, regulations, and various standards both nationally and internationally. Moreover, GGC operated under the strategy of innovation and product development, as well as s emphasizes human resource development in research and development. GGC is focusing on building and development of research to increase product value through Efficiency-Driven. Examples of the project include Advance Process Control at Fractionation Column of FAOH Plant, Pre-treatment Vacuum Ejector Motive Steam Optimization, Switch Mode Time Reduction Project, Increase COD Treatment in the Wastewater Treatment System Efficiency Project, Reduction of ME Residue at Biodiesel Process Plant, Recovery Oil

Loss from Wastewater Project.

List the emissions reduction initiatives which contributed most to achieving this target

C4.2

(C4.2) Did you have any other climate-related targets that were active in the reporting year?

Net-zero target(s)
Other climate-related target(s)

C4.2b

(C4.2b) Provide details of any other climate-related targets, including methane reduction targets.

Target reference number
Oth 1

Year target was set
2020

Target coverage
Company-wide

Target type: absolute or intensity
Intensity

Target type: category & Metric (target numerator if reporting an intensity target)
Energy consumption or efficiency
MWh

Target denominator (intensity targets only)
Other, please specify
Ton of Production

Base year
2020

Figure or percentage in base year
2.1341

Target year
2022

Figure or percentage in target year

2.12

Figure or percentage in reporting year

1.54

% of target achieved relative to base year [auto-calculated]

4,213.475177305

Target status in reporting year

Achieved

Is this target part of an emissions target?

Abs 1, Abs2, Int1, NZ1

Is this target part of an overarching initiative?

No, it's not part of an overarching initiative

Please explain target coverage and identify any exclusions

GGC has set a long-term corporate wide intensity target to limit energy consumption intensity not exceeding 2.120 MWh per ton production in 2022. This covers all energy consumption without any exclusion of significant sources of energy consumption. This target covered GGC own operation which includes ME I and ME II operational plants.

Plan for achieving target, and progress made to the end of the reporting year

List the actions which contributed most to achieving this target

GGC is determined to enact environmental policies covering climate change, power management, waste management, and water resource management in order to maximize the utilization of resources throughout the supply chain. GGC has established a policy of Safety, Occupational Health, Environment, and Business Continuity (QSHEB), which covers systematic environmental management, and biodiversity. GGC also manages the environment in accordance with the laws, regulations, and various standards both nationally and internationally. Moreover, GGC operated under the strategy of innovation and product development, as well as s emphasizes human resource development in research and development. GGC is focusing on building and development of research to increase product value through Efficiency-Driven. Examples of the project include Advance Process Control at Fractionation Column of FAOH Plant, Pre-treatment Vacuum Ejector Motive Steam Optimization, Switch Mode Time Reduction Project, Increase COD Treatment in the Wastewater Treatment System Efficiency Project, Reduction of ME Residue at Biodiesel Process Plant, Recovery Oil Loss from Wastewater Project.

Target reference number

Oth 2

Year target was set

2022

Target coverage

Company-wide

Target type: absolute or intensity

Intensity

Target type: category & Metric (target numerator if reporting an intensity target)

Energy consumption or efficiency

MWh

Target denominator (intensity targets only)

Other, please specify

Ton of Production

Base year

2020

Figure or percentage in base year

2.1341

Target year

2027

Figure or percentage in target year

2.0647

Figure or percentage in reporting year

1.54

% of target achieved relative to base year [auto-calculated]

856.0518731988

Target status in reporting year

Achieved

Is this target part of an emissions target?

GGC has set a long-term corporate wide intensity target to reduce energy consumption intensity per ton production by 3.25% by 2027 compared to 2020 baseline (0.65% per year between 2023-2027). This covers all energy consumption without any exclusion of significant sources of energy consumption. This target covered GGC own operation which includes ME1, ME2 operational plant.

Is this target part of an overarching initiative?

No, it's not part of an overarching initiative

Please explain target coverage and identify any exclusions

GGC has set a long-term corporate wide intensity target to limit energy consumption intensity not exceeding 2.120 MWh per ton production in 2022. This covers all energy consumption without any exclusion of significant sources of energy consumption. This target covered GGC own operation which includes ME I and ME II operational plants.

Plan for achieving target, and progress made to the end of the reporting year

List the actions which contributed most to achieving this target

GGC is determined to enact environmental policies covering climate change, power management, waste management, and water resource management in order to maximize the utilization of resources throughout the supply chain. GGC has established a policy of Safety, Occupational Health, Environment, and Business Continuity (QSHEB), which covers systematic environmental management, and biodiversity. GGC also manages the environment in accordance with the laws, regulations, and various standards both nationally and internationally. Moreover, GGC operated under the strategy of innovation and product development, as well as s emphasizes human resource development in research and development. GGC is focusing on building and development of research to increase product value through Efficiency-Driven. Examples of the project include Advance Process Control at Fractionation Column of FAOH Plant, Pre-treatment Vacuum Ejector Motive Steam Optimization, Switch Mode Time Reduction Project, Increase COD Treatment in the Wastewater Treatment System Efficiency Project, Reduction of ME Residue at Biodiesel Process Plant, Recovery Oil Loss from Wastewater Project.

C4.2c

(C4.2c) Provide details of your net-zero target(s).

Target reference number

NZ1

Target coverage

Company-wide

Absolute/intensity emission target(s) linked to this net-zero target

Abs1
Abs2
Int1
Int2

Target year for achieving net zero

2050

Is this a science-based target?

Yes, we consider this a science-based target, and we have committed to seek validation of this target by the Science Based Targets initiative in the next two years

Please explain target coverage and identify any exclusions

GGC has set a long-term companywide target in 2021 to become net zero in scope 1+2 GHG emission by 2050 compared to base year in 2020. This covers 100% of scope 1 and 2 emission without any exclusion of significant sources of emissions. This target covered GGC own operation which includes ME1, ME2 operational plant. The baseline year is subject to revision should there be any additional business expansion in the future years.

Do you intend to neutralize any unabated emissions with permanent carbon removals at the target year?

Yes

Planned milestones and/or near-term investments for neutralization at target year

GGC is intended to neutralize the unabated emissions with 3 pillars of approaches starting in 2030 or sooner in order to achieve a net zero target in 2050.

1) Efficiency Driven: GGC would like to focus on developing process efficiency measures, advanced technology and investment in Low carbon/ renewable heat and power.
2) Portfolio Driven: GGC would like to focus on developing of low carbon products & avoided emissions products with high value-added, for instance, investment in 1st Gen Biofuel, Advanced Biofuel, specialty Oleochemicals, Biochemicals and other value-added products for food & nutraceuticals
3) Compensation Driven: GGC would like to invest in carbon offset approaches including Renewable Energy Certificates (REC), which is considered for scope 2 GHG reduction and high-quality carbon credits from recognized market such as Thailand Voluntary Emission Reduction Scheme (T-VER).

Planned actions to mitigate emissions beyond your value chain (optional)

C4.3

(C4.3) Did you have emissions reduction initiatives that were active within the reporting year? Note that this can include those in the planning and/or implementation phases.

Yes

C4.3a

(C4.3a) Identify the total number of initiatives at each stage of development, and for those in the implementation stages, the estimated CO2e savings.

	Number of initiatives	Total estimated annual CO2e savings in metric tonnes CO2e (only for rows marked *)
Under investigation		
To be implemented*		
Implementation commenced*		
Implemented*	2	998
Not to be implemented		

C4.3b

(C4.3b) Provide details on the initiatives implemented in the reporting year in the table below.

Initiative category & Initiative type

Energy efficiency in production processes
Process optimization

Estimated annual CO2e savings (metric tonnes CO2e)

540

Scope(s) or Scope 3 category(ies) where emissions savings occur

Scope 1

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in C0.4)

2,600,000

Investment required (unit currency – as specified in C0.4)

4,360,000

Payback period

1-3 years

Estimated lifetime of the initiative

16-20 years

Comment

GGC has installed a system that automatically controls valve opening and closing through the detection of temperature changes and reflux flow of the fractionation column back to the refinery tower, which is a part of fatty alcohol production. This initiative can decrease energy consumption by 2,929 MWh per year and reduction of GHG emission reduction by 540 tCO2 per year.

Initiative category & Initiative type

Energy efficiency in production processes

Other, please specify

Steam Reduction in pre-treatment process

Estimated annual CO2e savings (metric tonnes CO2e)

458

Scope(s) or Scope 3 category(ies) where emissions savings occur

Scope 1

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in C0.4)

4,600,000

Investment required (unit currency – as specified in C0.4)

0

Payback period

No payback

Estimated lifetime of the initiative

16-20 years

Comment

GGC invested in the modification the Pre-treatment Process by using the Steam Ejector to create a vacuum in the production process. The results obtained in 2022 showed that GGC was able to use less steam: from the original 2,800 kilograms per hour to 1,100 kilograms per hour or equivalent a difference of 13,600 tons of steam per year. This translates to a cost reduction of 4.6 million THB per year and a reduction in energy consumption from steam generation of 0.3777 megawatt-hours or 458 tons of carbon dioxide equivalent per year.

C4.3c

(C4.3c) What methods do you use to drive investment in emissions reduction activities?

Method	Comment
Dedicated budget for other emissions reduction activities	The project of energy conservation and energy efficiency management resulted in GGC being able to reduce energy consumption and the emission of greenhouse gases. In 2022, GGC has implemented three major emissions reduction initiatives including 1) advance process control at fractionation column of FAOH plant, 2)

	water pre-treatment Process by using the Steam Ejector and 3) Increase of COD Treatment in the Wastewater Treatment System Efficiency Project. To illustrate, 1) The advance process control includes the installation of a system that automatically controls valve opening and closing through the detection of temperature changes and reflux flow of the fractionation column back to the refinery tower, which is a part of fatty alcohol production. This initiative can decrease energy consumption by 2,929 MWh per year and reduction of GHG emission reduction by 540 ton CO2 per year. 2) The adjustment of Pretreatment Process in Steam Ejector can help reduce the use of steam from 2,800 Kg/hr to 1,100 kg/hr. and can be able to reduce the 13,600 ton per year, which reducing the expensed for 4.6 million THB per year and reduce the GHG Emissions from energy reduction by 458 ton CO2e per year. 3) The investment to increase of COD Treatment in the Wastewater Treatment systems brings about cost saving by 7 million THB per year and reduce the GHG Emissions in Scope 3 by 187 kg. CO2e.

C4.5

(C4.5) Do you classify any of your existing goods and/or services as low-carbon products?

Yes

C4.5a

(C4.5a) Provide details of your products and/or services that you classify as low-carbon products.

Level of aggregation

Group of products or services

Taxonomy used to classify product(s) or service(s) as low-carbon

Other, please specify

Internal Life Cycle Assessment

Type of product(s) or service(s)

Chemicals and plastics

Other, please specify

Fatty alcohol

Description of product(s) or service(s)

GGC focuses on continuous development of low carbon products with the goal of reducing GHG emission throughout the product life cycle. The group of GGC's products identified as low carbon product is fatty alcohol consisting of main-cut and pre-cut fatty alcohol.

Have you estimated the avoided emissions of this low-carbon product(s) or service(s)

Yes

Methodology used to calculate avoided emissions

Estimating and Reporting the Comparative Emissions Impacts of Products (WRI)

Life cycle stage(s) covered for the low-carbon product(s) or services(s)

Cradle-to-gate

Functional unit used

Equal amount of main-cut and pre-cut fatty alcohol produced by GGC in 2022

Reference product/service or baseline scenario used

Equal amount of conventional product in the market

Life cycle stage(s) covered for the reference product/service or baseline scenario

Cradle-to-gate

Estimated avoided emissions (metric tons CO2e per functional unit) compared to reference product/service or baseline scenario

206,322.55

Explain your calculation of avoided emissions, including any assumptions

Carbon Footprint Reduction Label (CFR) or Global Warming Reduction Label is a label that demonstrates a certified Carbon Footprint of Product (CFP) and its emissions reduction based on the TGO eligible reduction criteria. The CFR evaluation and process include the quantification and certification of base year and present year CFP and the comparison results between the base year and present year certified CFP or against its product category benchmarking threshold announced by TGO.

The product registered as CFR shall comply with the following requirements,

1. The certified CFP of its present year compared to base year certified CFP shall be reduced not less than 2% or
2. The certified CFP of its present year is equal to or less than the product category benchmarking threshold and not more than its base year certified value. (http://thaicarbonlabel.tgo.or.th/index.php?lang=EN&mod=Y21Wa2RXTjBhVzl1WDJseg)

Therefore, this is in accordance with the attributional approach by the Comparative

Emissions Impacts of Products (WRI) where the same type of product is compared with those that would otherwise be produced in the market.

Revenue generated from low-carbon product(s) or service(s) as % of total revenue in the reporting year

34

Level of aggregation

Group of products or services

Taxonomy used to classify product(s) or service(s) as low-carbon

The EU Taxonomy for environmentally sustainable economic activities

Type of product(s) or service(s)

Biofuels

Other, please specify

Bio-Methyl Ester

Description of product(s) or service(s)

GGC focuses on continuous development of low carbon products with the goal of reducing GHG emission throughout the product life cycle. The group of GGC's products identified as an avoided emission product is Bio-Methyl Ester.

Have you estimated the avoided emissions of this low-carbon product(s) or service(s)

Yes

Methodology used to calculate avoided emissions

Estimating and Reporting the Comparative Emissions Impacts of Products (WRI)

Life cycle stage(s) covered for the low-carbon product(s) or services(s)

Cradle-to-gate

Functional unit used

Equal amount of Bio-Methyl Ester produced by GGC in 2022

Reference product/service or baseline scenario used

Equal amount of conventional product in the market

Life cycle stage(s) covered for the reference product/service or baseline scenario

Cradle-to-gate

Estimated avoided emissions (metric tons CO2e per functional unit) compared to reference product/service or baseline scenario

243,097.8

Explain your calculation of avoided emissions, including any assumptions

Carbon Footprint Reduction Label (CFR) or Global Warming Reduction Label is a label that demonstrates a certified Carbon Footprint of Product (CFP) and its emissions reduction based on the TGO eligible reduction criteria. The CFR evaluation and process include the quantification and certification of base year and present year CFP and the comparison results between the base year and present year certified CFP or against its product category benchmarking threshold announced by TGO.

The product registered as CFR shall comply with the following requirements,

1. The certified CFP of its present year compared to base year certified CFP shall be reduced not less than 2% or
2. The certified CFP of its present year is equal to or less than the product category benchmarking threshold and not more than its base year certified value.
(http://thaicarbonlabel.tgo.or.th/index.php?lang=EN&mod=Y21Wa2RXTjBhVzl1WDJseg
)

Therefore, this is in accordance with the attributional approach by the Comparative Emissions Impacts of Products (WRI) where the same type of product is compared with those that would otherwise be produced in the market.

Revenue generated from low-carbon product(s) or service(s) as % of total revenue in the reporting year

56

C5. Emissions methodology

C5.1

(C5.1) Is this your first year of reporting emissions data to CDP?

No

C5.1a

(C5.1a) Has your organization undergone any structural changes in the reporting year, or are any previous structural changes being accounted for in this disclosure of emissions data?

Row 1

Has there been a structural change?

No

C5.1b

(C5.1b) Has your emissions accounting methodology, boundary, and/or reporting year definition changed in the reporting year?

	Change(s) in methodology, boundary, and/or reporting year definition?
Row 1	No

C5.2

(C5.2) Provide your base year and base year emissions.

Scope 1

Base year start

January 1, 2020

Base year end

December 31, 2020

Base year emissions (metric tons CO2e)

27,714

Comment

GGC has set a target of 20% reduction in the GHG emissions by 2030 and development of business in pursuit of the Net Zero emissions target by 2050— challenging goals, yet an opportunity for driving GGC toward ongoing growth for long-term sustainability. These targets align with the Paris Agreement, an accord under the United Nations Framework Convention on Climate Change.

Scope 2 (location-based)

Base year start

January 1, 2020

Base year end

December 31, 2020

Base year emissions (metric tons CO2e)

6,367

Comment

GGC purchases electricity from Electricity Generating Authority of Thailand (EGAT) and Provincial Electricity Authority (PEA) which are grid mix of generation technologies for the operation. For the emission calculation, the national default value of Emission Factor is applied.

GGC has set a target of 20% reduction in the GHG emissions by 2030 and development of business in pursuit of the Net Zero emissions target by 2050— challenging goals, yet an opportunity for driving GGC toward ongoing growth for long-term sustainability. These targets align with the Paris Agreement, an accord under the United Nations Framework Convention on Climate Change.

Scope 2 (market-based)

Base year start

January 1, 2020

Base year end

December 31, 2020

Base year emissions (metric tons CO2e)

65,607

Comment

GGC purchases electricity from Electricity Generating Authority of Thailand (EGAT) and Provincial Electricity Authority (PEA) which are grid mix of generation technologies for the operation. For the emission calculation, the national default value of Emission Factor is applied. In addition, GGC did not purchase electricity from a contractual instruments or Renewable Energy Certificates (RECs) in 2022. Therefore, GHG scope 2 emission for location-based and market-based, in 2020, were equal.

GGC has set a target of 20% reduction in the GHG emissions by 2030 and development of business in pursuit of the Net Zero emissions target by 2050— challenging goals, yet an opportunity for driving GGC toward ongoing growth for long-term sustainability. These targets align with the Paris Agreement, an accord under the United Nations Framework Convention on Climate Change.

Scope 3 category 1: Purchased goods and services

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

500,194.97

Comment

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.
(ii) Activity data: Quantity and monetary of purchased goods and services
(iii) Emissions factors: Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018 and Ecoinvent 2.2
(iv) GWP values: IPCC 2007 GWP 100a.

The category involves GHG emissions from raw material or purchased feedstock as upstream in value chain. As GGC has been using seven materials, including crude palm oil (CPO), refined bleached deodorized palm kernel oil (RBDPKO), refined palm oil

(RPO), palm fatty acid distillate (PFAD), palm stearin (PS), crude glycerin and methanol, as the main feedstocks in the production line contributing to Scope 3 emission of the company.

Scope 3 category 2: Capital goods

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

0

Comment

The category "Capital goods" has been excluded from GGC's Scope 3 emissions. This exclusion is due to the category's perceived irrelevance to GGC's business activities, primarily because of its low proportion of emissions, approximately 5% of the total Scope 1 and 2 emissions. Furthermore, this category is not targeted for reduction by the company, and it presents a low risk and minimal impact on opportunities.

Scope 3 category 3: Fuel-and-energy-related activities (not included in Scope 1 or 2)

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

3,125

Comment

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol’s Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.
(ii) Activity data: Electricity consumption taken from bill and meter.
(iii) Emissions factors: Emission Factors from Thailand Greenhouse Gas Organization (TGO).
(iv) GWP values: GWP AR4 IPCC 2007 100 years.

Due to GRI 305-3 (other indirect GHG emissions), the reported value is scope 3 emission from energy transmission loss only.

Scope 3 category 4: Upstream transportation and distribution

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

11,167.9

Comment

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.
(ii) Activity data: Quantity and monetary of upstream transportation and distribution including the transportation and distribution of Refined Palm Oil (RPO), Palm Sterine (PS), Palm Fatty Acid Distillate (PFAD) Refined bleached Deodorized Palm Kernel Oil (RBDPKO), Methanol by using truck and transportation of methanol and RPO by using Boat.
(iii) Emissions factors: Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018
(iv) GWP values: IPCC 2007 GWP 100a.

Scope 3 category 5: Waste generated in operations

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

676.16

Comment

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.
(ii) Activity data: Hybrid method of waste generated in operations icluding transportation of hazardous waste and non-hazardous waste using trucks, as well as the amounts of hazardous waste, non-hazardous waste, general waste, contaminated water, and sweet water.
(iii) Emissions factors: IPCC Chapter 5: Incineration and Open Burning of Waste, IPCC

Guidelines for National Greenhouse Gas Inventories - Volume 5: Waste, and the Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018)
(iv) GWP values: IPCC 2007 GWP 100a.

Scope 3 category 6: Business travel

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

1.8

Comment

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.
(ii) Activity data: Quantity and monetary of business travel
(iii) Emissions factors: Defra, 2010. The category includes domestic air traveling, business class for business purpose.
(iv) GWP values: IPCC 2007 GWP 100a.

Scope 3 category 7: Employee commuting

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

370.43

Comment

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.
(ii) Activity data: average data method of employee commuting including commuting of employee using personal car (gasohol), personal car (diesel) and rented van for employees (diesel).
(iii) Emissions factors: PCC Vol.2 table 3.2.1, 3.2.2, DEDE and IPCC Vol.2 table 2.2, DEDE LPG 1 litre = 0.54 kg.

(iv) GWP values: IPCC 2007 GWP 100a.

Scope 3 category 8: Upstream leased assets

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

0

Comment

The category "Upstream leased assets" has been excluded from GGC's Scope 3 emissions. This exclusion is due to the category's perceived irrelevance to GGC's business activities, primarily because of its low proportion of emissions, approximately 5% of the total Scope 1 and 2 emissions. Furthermore, this category is not targeted for reduction by the company, and it presents a low risk and minimal impact on opportunities.

Scope 3 category 9: Downstream transportation and distribution

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

9,796.32

Comment

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol’s Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.
(ii) Activity data: Quantity and monetary of downstream transportation and distribution including transportation of products by trucks and boat.
(iii) Emissions factors: Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018
(iv) GWP values: IPCC 2007 GWP 100a.

Scope 3 category 10: Processing of sold products

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

0

Comment

The category "Processing of sold products" has been excluded from GGC's Scope 3 emissions. This exclusion is due to the category's perceived irrelevance to GGC's business activities, primarily because of its low proportion of emissions, approximately 5% of the total Scope 1 and 2 emissions. Furthermore, this category is not targeted for reduction by the company, and it presents a low risk and minimal impact on opportunities.

Scope 3 category 11: Use of sold products

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

0

Comment

GGC does include the "Use of Sold Products" category in its Scope 3 emissions calculations. However, due to the nature of GGC's products such as Glycerin, Fatty Alcohol, and Methyl Ester, which are utilized in downstream processes, the emissions attributable to GGC in these categories are effectively zero. This outcome is based on the understanding that the emissions associated with the use and end-of-life treatment of these products fall under the responsibility of the downstream operators. Therefore, although these categories are factored into GGC's calculations, they contribute zero emissions to GGC's overall Scope 3 emissions total.

Scope 3 category 12: End of life treatment of sold products

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

0

Comment

GGC does include the "End of Life Treatment of Sold Products" category in its Scope 3 emissions calculations. However, due to the nature of GGC's products such as Glycerin, Fatty Alcohol, and Methyl Ester, which are utilized in downstream processes, the

emissions attributable to GGC in these categories are effectively zero. This outcome is based on the understanding that the emissions associated with the use and end-of-life treatment of these products fall under the responsibility of the downstream operators. Therefore, although these categories are factored into GGC's calculations, they contribute zero emissions to GGC's overall Scope 3 emissions total.

Scope 3 category 13: Downstream leased assets

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

0

Comment

Scope 3 emissions for downstream leased assets is not applicable to GGC because GGC does not lease any assets.

Scope 3 category 14: Franchises

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

0

Comment

GGC operates without franchises business. Therefore, scope 3 emissions for franchises is not applicable to GGC

Scope 3 category 15: Investments

Base year start

January 1, 2021

Base year end

December 31, 2021

Base year emissions (metric tons CO2e)

0

Comment

Scope 3 emission from investment was included in emission scope 1 and 2 form operation.

Scope 3: Other (upstream)

Base year start
January 1, 2021

Base year end
December 31, 2021

Base year emissions (metric tons CO2e)
0

Comment
This category in this category is not applicable for GGC.

Scope 3: Other (downstream)

Base year start
January 1, 2021

Base year end
December 31, 2021

Base year emissions (metric tons CO2e)
0

Comment
This category in this category is not applicable for GGC.

C5.3

(C5.3) Select the name of the standard, protocol, or methodology you have used to collect activity data and calculate emissions.

IPCC Guidelines for National Greenhouse Gas Inventories, 2006
ISO 14064-1
Thailand Greenhouse Gas Management Organization: The National Guideline Carbon Footprint for organization
The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)

C6. Emissions data

C6.1

(C6.1) What were your organization's gross global Scope 1 emissions in metric tons CO2e?

Reporting year

Gross global Scope 1 emissions (metric tons CO2e)

25,613

Start date

January 1, 2022

End date

December 31, 2022

Comment

GGC collected and consolidated GHG emission to report in 2022 covering 100% of the operational control.

Past year 1

Gross global Scope 1 emissions (metric tons CO2e)

30,708

Start date

January 1, 2021

End date

December 31, 2021

Comment

GGC collected and consolidated GHG emission to report in 2021 covering 100% of the operational control.

Past year 2

Gross global Scope 1 emissions (metric tons CO2e)

27,714

Start date

January 1, 2020

End date

December 31, 2020

Comment

GGC collected and consolidated GHG emission to report in 2020 covering 100% of the operational control.

Past year 3

Gross global Scope 1 emissions (metric tons CO2e)

4,128

Start date

January 1, 2019

End date

December 31, 2019

Comment

GGC collected and consolidated GHG emission to report in 2019 covering 100% of the operational control.

C6.2

(C6.2) Describe your organization's approach to reporting Scope 2 emissions.

Row 1

Scope 2, location-based

We are reporting a Scope 2, location-based figure

Scope 2, market-based

We are reporting a Scope 2, market-based figure

Comment

GGC purchased electricity from both grid-based electricity from Electricity Generating Authority of Thailand (EGAT), Provincial Electricity Authority (PEA) and GPSC.

C6.3

(C6.3) What were your organization's gross global Scope 2 emissions in metric tons CO2e?

Reporting year

Scope 2, location-based

7,097

Scope 2, market-based (if applicable)

63,757

Start date

January 1, 2022

End date

December 31, 2022

Comment

GGC collected and consolidated GHG emission to report in 2022 covering 100% of the operational control.

Past year 1

Scope 2, location-based

8,362.12

Scope 2, market-based (if applicable)

49,119.04

Start date

January 1, 2021

End date

December 31, 2021

Comment

GGC collected and consolidated GHG emission to report in 2021 covering 100% of the operational control.

Past year 2

Scope 2, location-based

6,367

Scope 2, market-based (if applicable)

65,607

Start date

January 1, 2020

End date

December 31, 2020

Comment

GGC collected and consolidated GHG emission to report in 2020 covering 100% of the operational control.

Past year 3

Scope 2, location-based

61,382

Scope 2, market-based (if applicable)

61,382

Start date

January 1, 2019

End date

December 31, 2019

Comment

GGC collected and consolidated GHG emission to report in 2019 covering 100% of the operational control.

C6.4

(C6.4) Are there any sources (e.g. facilities, specific GHGs, activities, geographies, etc.) of Scope 1, Scope 2 or Scope 3 emissions that are within your selected reporting boundary which are not included in your disclosure?

No

C6.5

(C6.5) Account for your organization's gross global Scope 3 emissions, disclosing and explaining any exclusions.

Purchased goods and services

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

471,538.9

Emissions calculation methodology

Spend-based method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

100

Please explain

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.
(ii) Activity data: Quantity and monetary of purchased goods and services
(iii) Emissions factors: Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018 and Ecoinvent 2.2
(iv) GWP values: IPCC 2007 GWP 100a.

The category involves GHG emissions from raw material or purchased feedstock as upstream in value chain. As GGC has been using seven materials, including crude palm oil (CPO), refined bleached deodorized palm kernel oil (RBDPKO), refined palm oil (RPO), palm fatty acid distillate (PFAD), palm stearin (PS), crude glycerine and methanol, as the main feedstocks
in the production line contributing to Scope 3 emission of the company.

Hence, emission from purchased goods and services is 471,538.90 metric tons CO2e.

Capital goods

Evaluation status

Not relevant, explanation provided

Please explain

The category "Capital goods" has been excluded from GGC's Scope 3 emissions. This exclusion is due to the category's perceived irrelevance to GGC's business activities, primarily because of its low proportion of emissions, approximately 5% of the total Scope 1 and 2 emissions. Furthermore, this category is not targeted for reduction by the company, and it presents a low risk and minimal impact on opportunities.

Fuel-and-energy-related activities (not included in Scope 1 or 2)

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

3,812

Emissions calculation methodology

Average data method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol’s Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.
(ii) Activity data: Electricity consumption taken from bill and meter.
(iii) Emissions factors: Emission Factors from Thailand Greenhouse Gas Organization (TGO).
(iv) GWP values: GWP AR4 IPCC 2007 100 years.

Due to GRI 305-3 (other indirect GHG emissions), the reported value is scope 3 emission from energy transmission loss only.

Upstream transportation and distribution

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

13,232.94

Emissions calculation methodology

Spend-based method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

100

Please explain

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.
(ii) Activity data: Quantity and monetary of upstream transportation and distribution including the transportation and distribution of Refined Palm Oil (RPO), Palm Sterine (PS), Palm Fatty Acid Distillate (PFAD) Refined bleached Deodorized Palm Kernel Oil (RBDPKO), Methanol by using truck and transportation of methanol and RPO by using Boat.
(iii) Emissions factors: Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018
(iv) GWP values: IPCC 2007 GWP 100a.

Hence, emission from upstream transportation and distribution is 13,232.94 metric tons CO2e.

Waste generated in operations

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

612.92

Emissions calculation methodology

Average data method
Spend-based method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.

(ii) Activity data: Average data method and spend-based method of waste generated in operations including transportation of hazardous waste and non-hazardous waste using trucks, as well as the amounts of hazardous waste, non-hazardous waste, general waste, contaminated water, and sweet water.
(iii) Emissions factors: IPCC Chapter 5: Incineration and Open Burning of Waste, IPCC Guidelines for National Greenhouse Gas Inventories - Volume 5: Waste, and the Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018)
(iv) GWP values: IPCC 2007 GWP 100a.

Hence, emission from waste generated in operations is 612.92 metric tons CO2e.

Business travel

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

4.2

Emissions calculation methodology

Spend-based method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.
(ii) Activity data: Quantity and monetary of business travel
(iii) Emissions factors: Defra, 2010. The category includes domestic air traveling, business class for business purpose.
(iv) GWP values: IPCC 2007 GWP 100a.

Hence, emission from business travel in operations is 4.2 metric tons CO2e.

Employee commuting

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

369.35

Emissions calculation methodology

Average data method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.
(ii) Activity data: average data method of employee commuting including commuting of employee using personal car (gasohol), personal car (diesel) and rented van for employees (diesel).
(iii) Emissions factors: PCC Vol.2 table 3.2.1, 3.2.2, DEDE and IPCC Vol.2 table 2.2, DEDE LPG 1 litre = 0.54 kg.
(iv) GWP values: IPCC 2007 GWP 100a.

Hence, emission from employee commuting in operations is 369.35 metric tons CO2e.

Upstream leased assets

Evaluation status

Not relevant, explanation provided

Please explain

The category "Upstream leased assets" has been excluded from GGC's Scope 3 emissions. This exclusion is due to the category's perceived irrelevance to GGC's business activities, primarily because of its low proportion of emissions, approximately 5% of the total Scope 1 and 2 emissions. Furthermore, this category is not targeted for reduction by the company, and it presents a low risk and minimal impact on opportunities.

Downstream transportation and distribution

Evaluation status

Relevant, calculated

Emissions in reporting year (metric tons CO2e)

1,040,165.27

Emissions calculation methodology

Spend-based method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

100

Please explain

GGC used the emissions calculation including
(i) Methodology: Methodology: Greenhouse Gas Protocol's Corporate Value Chain (Scope 3) Accounting and Reporting Standard and ISO14064-1:2006 Specification with guidance at the organizational level for quantification and reporting of greenhouse gas emissions and removals.
(ii) Activity data: Quantity and monetary of downstream transportation and distribution including transportation of products by trucks and boat.
(iii) Emissions factors: Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018
(iv) GWP values: IPCC 2007 GWP 100a.

Hence, emission from downstream transportation and distribution is 1,040,165.27 metric tons CO2e.

Processing of sold products

Evaluation status

Not relevant, explanation provided

Please explain

The category "Processing of sold products" has been excluded from GGC's Scope 3 emissions. This exclusion is due to the category's perceived irrelevance to GGC's business activities, primarily because of its low proportion of emissions, approximately 5% of the total Scope 1 and 2 emissions. Furthermore, this category is not targeted for reduction by the company, and it presents a low risk and minimal impact on opportunities.

Use of sold products

Evaluation status

Not relevant, calculated

Emissions in reporting year (metric tons CO2e)

0

Emissions calculation methodology

Average data method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

100

Please explain

GGC does include the "Use of Sold Products" category in its Scope 3 emissions calculations. However, due to the nature of GGC's products such as Glycerin, Fatty Alcohol, and Methyl Ester, which are utilized in downstream processes, the emissions attributable to GGC in these categories are effectively zero. This outcome is based on the understanding that the emissions associated with the use and end-of-life treatment of these products fall under the responsibility of the downstream operators. Therefore,

although these categories are factored into GGC's calculations, they contribute zero emissions to GGC's overall Scope 3 emissions total.

End of life treatment of sold products

Evaluation status

Not relevant, calculated

Emissions in reporting year (metric tons CO2e)

0

Emissions calculation methodology

Average data method

Percentage of emissions calculated using data obtained from suppliers or value chain partners

100

Please explain

GGC does include the "End of Life Treatment of Sold Products" category in its Scope 3 emissions calculations. However, due to the nature of GGC's products such as Glycerin, Fatty Alcohol, and Methyl Ester, which are utilized in downstream processes, the emissions attributable to GGC in these categories are effectively zero. This outcome is based on the understanding that the emissions associated with the use and end-of-life treatment of these products fall under the responsibility of the downstream operators. Therefore, although these categories are factored into GGC's calculations, they contribute zero emissions to GGC's overall Scope 3 emissions total.

Downstream leased assets

Evaluation status

Not relevant, explanation provided

Please explain

Scope 3 emissions for downstream leased assets is not applicable to GGC because GGC does not lease any assets.

Franchises

Evaluation status

Not relevant, explanation provided

Please explain

GGC operates without franchises business. Therefore, scope 3 emissions for franchises is not applicable to GGC

Investments

Evaluation status

Not relevant, explanation provided

Please explain

Scope 3 emission from investment was included in emission scope 1 and 2 form operation.

Other (upstream)

Evaluation status

Not relevant, explanation provided

Please explain

Not applicable for GGC

Other (downstream)

Evaluation status

Not relevant, explanation provided

Please explain

Not applicable for GGC

C6.5a

(C6.5a) Disclose or restate your Scope 3 emissions data for previous years.

Past year 1

Start date

January 1, 2021

End date

December 31, 2021

Scope 3: Purchased goods and services (metric tons CO2e)

500,194.98

Scope 3: Capital goods (metric tons CO2e)

0

Scope 3: Fuel and energy-related activities (not included in Scopes 1 or 2) (metric tons CO2e)

3,125

Scope 3: Upstream transportation and distribution (metric tons CO2e)

11,167.9

Scope 3: Waste generated in operations (metric tons CO2e)

676.17

Scope 3: Business travel (metric tons CO2e)

1.8

Scope 3: Employee commuting (metric tons CO2e)

370.43

Scope 3: Upstream leased assets (metric tons CO2e)

0

Scope 3: Downstream transportation and distribution (metric tons CO2e)

9,796.32

Scope 3: Processing of sold products (metric tons CO2e)

0

Scope 3: Use of sold products (metric tons CO2e)

0

Scope 3: End of life treatment of sold products (metric tons CO2e)

0

Scope 3: Downstream leased assets (metric tons CO2e)

0

Scope 3: Franchises (metric tons CO2e)

0

Scope 3: Investments (metric tons CO2e)

0

Scope 3: Other (upstream) (metric tons CO2e)

0

Scope 3: Other (downstream) (metric tons CO2e)

0

Comment

In 2021, GGC calculated Scope 3 emissions for a total of 7 categories that are relevant to its business activities. These categories include Purchased Goods and Services, Fuel- and Energy-Related Activities, Upstream Transportation and Distribution, Waste Generated in Operations, Business Travel, Employee Commuting, and Downstream Transportation and Distribution.

Past year 2

Start date

July 1, 2020

End date

December 31, 2020

Scope 3: Purchased goods and services (metric tons CO2e)

785,798

Scope 3: Capital goods (metric tons CO2e)

0

Scope 3: Fuel and energy-related activities (not included in Scopes 1 or 2) (metric tons CO2e)

3,874

Scope 3: Upstream transportation and distribution (metric tons CO2e)

0

Scope 3: Waste generated in operations (metric tons CO2e)

0

Scope 3: Business travel (metric tons CO2e)

0

Scope 3: Employee commuting (metric tons CO2e)

0

Scope 3: Upstream leased assets (metric tons CO2e)

0

Scope 3: Downstream transportation and distribution (metric tons CO2e)

0

Scope 3: Processing of sold products (metric tons CO2e)

0

Scope 3: Use of sold products (metric tons CO2e)

0

Scope 3: End of life treatment of sold products (metric tons CO2e)

0

Scope 3: Downstream leased assets (metric tons CO2e)

0

Scope 3: Franchises (metric tons CO2e)

0

Scope 3: Investments (metric tons CO2e)

0

Scope 3: Other (upstream) (metric tons CO2e)

0

Scope 3: Other (downstream) (metric tons CO2e)

0

Comment

In 2020, GGC calculated Scope 3 emissions for a total of 2 categories that are relevant to its business activities. These categories include purchased goods and services, fuel and energy-related activities (not included in Scope 1 and 2 and End of life treatment of sold products.

Past year 3

Start date

January 1, 2019

End date

December 31, 2019

Scope 3: Purchased goods and services (metric tons CO2e)

0

Scope 3: Capital goods (metric tons CO2e)

0

Scope 3: Fuel and energy-related activities (not included in Scopes 1 or 2) (metric tons CO2e)

0

Scope 3: Upstream transportation and distribution (metric tons CO2e)

0

Scope 3: Waste generated in operations (metric tons CO2e)

0

Scope 3: Business travel (metric tons CO2e)

0

Scope 3: Employee commuting (metric tons CO2e)

0

Scope 3: Upstream leased assets (metric tons CO2e)

0

Scope 3: Downstream transportation and distribution (metric tons CO2e)

0

Scope 3: Processing of sold products (metric tons CO2e)

0

Scope 3: Use of sold products (metric tons CO2e)

0

Scope 3: End of life treatment of sold products (metric tons CO2e)

0

Scope 3: Downstream leased assets (metric tons CO2e)

0

Scope 3: Franchises (metric tons CO2e)

0

Scope 3: Investments (metric tons CO2e)

0

Scope 3: Other (upstream) (metric tons CO2e)

0

Scope 3: Other (downstream) (metric tons CO2e)

0

Comment

In 2019, GGC have not collected data and calculated Scope 3 emission.

C6.7

(C6.7) Are carbon dioxide emissions from biogenic carbon relevant to your organization?

No

C6.10

(C6.10) Describe your gross global combined Scope 1 and 2 emissions for the reporting year in metric tons CO2e per unit currency total revenue and provide any additional intensity metrics that are appropriate to your business operations.

Intensity figure

0.228

Metric numerator (Gross global combined Scope 1 and 2 emissions, metric tons CO2e)

96,467

Metric denominator

metric ton of product

Metric denominator: Unit total

423,122

Scope 2 figure used

Market-based

% change from previous year

14.18

Direction of change

Increased

Reason(s) for change

Change in output

Please explain

An increase in GHG intensity (based on production) is associated with a decrease in production. To elaborate, high production is more eco-efficient than low production due to economy of scale.

Intensity figure

0.000003846

Metric numerator (Gross global combined Scope 1 and 2 emissions, metric tons CO2e)

96,467

Metric denominator

unit total revenue

Metric denominator: Unit total

25,084,000,000

Scope 2 figure used

Market-based

% change from previous year

8.75

Direction of change

Decreased

Reason(s) for change

Other emissions reduction activities
Change in revenue

Please explain

In 2022, GGC's GHG intensity, measured in terms of revenue, decreased by 8.75%. This improvement was a result of a 17% increase in revenue, combined with the successful implementation of GHG reduction activities within the company's operations. Specifically, initiatives such as the Advanced Process Control at the Fractionation Column of the FAOH Plant, and the Optimization of Pre-treatment Vacuum Ejector Motive Steam, played a significant role in reducing emissions. These strategies led to a decrease in emissions by 540 and 458 tonnes of CO2e per year, respectively, contributing to the overall reduction in GGC's GHG intensity.

C7. Emissions breakdowns

C7.1

(C7.1) Does your organization break down its Scope 1 emissions by greenhouse gas type?

Yes

C7.1a

(C7.1a) Break down your total gross global Scope 1 emissions by greenhouse gas type and provide the source of each used greenhouse warming potential (GWP).

Greenhouse gas	Scope 1 emissions (metric tons of CO2e)	GWP Reference
CO2	25,476.7	IPCC Fourth Assessment Report (AR4 - 100 year)
CH4	24.63	IPCC Fourth Assessment Report (AR4 - 100 year)
N2O	59.01	IPCC Fourth Assessment Report (AR4 - 100 year)
SF6	0	IPCC Fourth Assessment Report (AR4 - 100 year)
HFCs	202.18	IPCC Fourth Assessment Report (AR4 - 100 year)
PFCs	0	IPCC Fourth Assessment Report (AR4 - 100 year)

C7.2

(C7.2) Break down your total gross global Scope 1 emissions by country/area/region.

Country/area/region	Scope 1 emissions (metric tons CO2e)
Thailand	25,613

C7.3

(C7.3) Indicate which gross global Scope 1 emissions breakdowns you are able to provide.

By facility

C7.3b

(C7.3b) Break down your total gross global Scope 1 emissions by business facility.

Facility	Scope 1 emissions (metric tons CO2e)	Latitude	Longitude
ME I	339	12.695574	101.126806
ME II	25,423	13.072901	101.387526

C-CE7.4/C-CH7.4/C-CO7.4/C-EU7.4/C-MM7.4/C-OG7.4/C-ST7.4/C-TO7.4/C-TS7.4

(C-CE7.4/C-CH7.4/C-CO7.4/C-EU7.4/C-MM7.4/C-OG7.4/C-ST7.4/C-TO7.4/C-TS7.4) Break down your organization's total gross global Scope 1 emissions by sector production activity in metric tons CO2e.

	Gross Scope 1 emissions, metric tons CO2e	Comment
Chemicals production activities	25,613	GGC produces 3 types of Green Chemical products comprising (1) Methyl Ester, a component of high speed diesel fuel, (2) Fatty Alcohol, a main ingredient in cosmetics, surfactants, and various pharmaceuticals, and (3) Refined Glycerine, a common ingredient widely used in cosmetics and pharmaceuticals

C7.5

(C7.5) Break down your total gross global Scope 2 emissions by country/area/region.

Country/area/region	Scope 2, location-based (metric tons CO2e)	Scope 2, market-based (metric tons CO2e)
Thailand	7,097	63,757

C7.6

(C7.6) Indicate which gross global Scope 2 emissions breakdowns you are able to provide.

By facility

C7.6b

(C7.6b) Break down your total gross global Scope 2 emissions by business facility.

Facility	Scope 2, location-based (metric tons CO2e)	Scope 2, market-based (metric tons CO2e)
ME I	0	63,757
ME II	7,097	0

C7.7

(C7.7) Is your organization able to break down your emissions data for any of the subsidiaries included in your CDP response?

Not relevant as we do not have any subsidiaries

C-CE7.7/C-CH7.7/C-CO7.7/C-MM7.7/C-OG7.7/C-ST7.7/C-TO7.7/C-TS7.7

(C-CE7.7/C-CH7.7/C-CO7.7/C-MM7.7/C-OG7.7/C-ST7.7/C-TO7.7/C-TS7.7) Break down your organization's total gross global Scope 2 emissions by sector production activity in metric tons CO2e.

	Scope 2, location-based, metric tons CO2e	Scope 2, market-based (if applicable), metric tons CO2e	Comment
Chemicals production activities	7,097	63,757	GGC purchases only grid based electricity from Electricity Generating Authority of Thailand (EGAT) and Provincial Electricity Authority (PEA) and Global Power Synergy Plc (GPSC).

C-CH7.8

(C-CH7.8) Disclose the percentage of your organization's Scope 3, Category 1 emissions by purchased chemical feedstock.

Purchased feedstock	Percentage of Scope 3, Category 1 tCO2e from purchased feedstock	Explain calculation methodology
Other (please specify) Refine Palm Oil (RPO)	22	GGC used purchased raw materials, including crude palm oil (CPO), refined bleached deodorized palm kernel oil (RBDPKO), refined palm oil (RPO), palm fatty acid distillate (PFAD), crude glycerine, palm stearin (PS), methanol, in production process. There are 471,538.89 metric tons CO2e of scope 3 emission from the suppliers. GGC used refined palm oil (RPO) 113,943,481 kg in 2022. With the emission factor obtained from Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018) that is 0.9607 kgCO2e/kg, there was 103,312.55 TonCO2e or 22% of total scope 3

		emission from purchased goods and services.
Other (please specify) Palm Stearin (PS)	13	GGC used purchased raw materials, including crude palm oil (CPO), refined bleached deodorized palm kernel oil (RBDPKO), refined palm oil (RPO), palm fatty acid distillate (PFAD), crude glycerine, palm stearin (PS), methanol, in production process. There are 471,538.89 metric tons CO2e of scope 3 emission from the suppliers. GGC used palm stearin (PS) 40,804,180 kg in 2022. With the emission factor obtained from Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018) that is 1.5328 kgCO2e/kg, there was 62,554.64 TonCO2e or 13% of total scope 3 emission from purchased goods and services.
Other (please specify) Palm Fatty Acid Distillate (PFAD)	3	GGC used purchased raw materials, including crude palm oil (CPO), refined bleached deodorized palm kernel oil (RBDPKO), refined palm oil (RPO), palm fatty acid distillate (PFAD), crude glycerine, palm stearin (PS), methanol, in production process. There are 471,538.89 metric tons CO2e of scope 3 emission from the suppliers. GGC used Palm Fatty Acid Distillate (PFAD) 11,348,100 kg in 2022. With the emission factor obtained from Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018) that is 1.4511 kgCO2e/kg, there was 16,467.23 TonCO2e or 3% of total scope 3 emission from purchased goods and services.
Other (please specify) Refined Bleached Deodorized Palm Kernel Oil (RBDPKO)	34	GGC used purchased raw materials, including crude palm oil (CPO), refined bleached deodorized palm kernel oil (RBDPKO), refined palm oil (RPO), palm fatty acid distillate (PFAD), crude glycerine, palm stearin (PS), methanol, in production process. There are 471,538.89 metric tons CO2e of scope 3 emission from the suppliers. GGC used Refined Bleached Deodorized Palm Kernel Oil (RBDPKO) 116,055,800 kg in 2022. With the emission factor obtained from Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018) that is 1.399 kgCO2e/kg, there was 162,362.06 TonCO2e or 34 of total scope 3 emission from purchased goods and services.
Other (please specify)	6	GGC used purchased raw materials, including crude palm oil (CPO), refined bleached deodorized palm kernel

Methanol		oil (RBDPKO), refined palm oil (RPO), palm fatty acid distillate (PFAD), crude glycerine, palm stearin (PS), methanol, in production process. There are 471,538.89 metric tons CO2e of scope 3 emission from the suppliers. GGC used Methanol 39,001,774 kg in 2022. With the emission factor obtained from Ecoinvent 2.2, IPCC 2007 GWP 100a that is 0.7212 kgCO2e/kg, there was 28,128.08 TonCO2e or 6% of total scope 3 emission from purchased goods and services.
Other (please specify) Crude Palm Oil (CPO)	20	GGC used purchased raw materials, including crude palm oil (CPO), refined bleached deodorized palm kernel oil (RBDPKO), refined palm oil (RPO), palm fatty acid distillate (PFAD), crude glycerine, palm stearin (PS), methanol, in production process. There are 471,538.89 metric tons CO2e of scope 3 emission from the suppliers. GGC used Crude Palm Oil (CPO) 105,404,250 kg in 2022. With the emission factor obtained from Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018) that is 0.9067 kgCO2e/kg, there was 95,570.34 TonCO2e or 20% of total scope 3 emission from purchased goods and services."
Other (please specify) Crude Glycerin	1	GGC used purchased raw materials, including crude palm oil (CPO), refined bleached deodorized palm kernel oil (RBDPKO), refined palm oil (RPO), palm fatty acid distillate (PFAD), crude glycerine, palm stearin (PS), methanol, in production process. There are 471,538.89 metric tons CO2e of scope 3 emission from the suppliers. GGC used Crude Glycerine 3,649,600 kg in 2022. With the emission factor obtained from Thai National LCI Database, TIIS-MTEC-NSTDA (with TGO electricity 2016-2018) that is 0.8642 kgCO2e/kg, there was 3,153.98 TonCO2e or 1% of total scope 3 emission from purchased goods and services.

C-CH7.8a

(C-CH7.8a) Disclose sales of products that are greenhouse gases.

	Sales, metric tons	Comment
Carbon dioxide (CO2)	0	We have no sales of greenhouse gases products..

Methane (CH4)	0	We have no sales of greenhouse gases products.
Nitrous oxide (N2O)	0	We have no sales of greenhouse gases products.
Hydrofluorocarbons (HFC)	0	We have no sales of greenhouse gases products.
Perfluorocarbons (PFC)	0	We have no sales of greenhouse gases products.
Sulphur hexafluoride (SF6)	0	We have no sales of greenhouse gases products.
Nitrogen trifluoride (NF3)	0	We have no sales of greenhouse gases products.

C7.9

(C7.9) How do your gross global emissions (Scope 1 and 2 combined) for the reporting year compare to those of the previous reporting year?

Increased

C7.9a

(C7.9a) Identify the reasons for any change in your gross global emissions (Scope 1 and 2 combined), and for each of them specify how your emissions compare to the previous year.

	Change in emissions (metric tons CO2e)	Direction of change in emissions	Emissions value (percentage)	Please explain calculation
Change in renewable energy consumption	0	No change	0	There were no renewable energy consumption activities occurred in the reporting year.
Other emissions reduction activities	998	Decreased	1.13	The change from emission reduction initiatives is calculated based on the sum of initiatives implemented in 2022 that contribute to Scope 1 and Scope 2 emission reduction excluding renewable projects to avoid double counting. To explain the calculation in brief, 998 tCO2e was avoided from emission reduction initiatives. Total Scope 1+2 emissions in 2021 was 88,189.31 tCO2e, therefore we arrived at 1.13 % through

				(998/88,189.31) * 100 = -1.13 (a 1.13% decrease in emissions).
Divestment	0	No change	0	There were no divestment activities occurred in the reporting year.
Acquisitions	0	No change	0	There were no acquisition activities occurred in the reporting year.
Mergers	0	No change	0	There were no merger activities occurred in the reporting year.
Change in output	8,277.69	Increased	9.39	This increased in emission can be attributed to the temporary shutdown of operations for maintenance purposes. To explain the calculation in brief, 8,277.690 tCO2e was increased from last year. Total Scope 1+2 emissions in 2021 was 88,189.31 tCO2e, therefore we arrived at 9.39 %through (8,277.690/88,189.31) * 100 = 9.39% (a 9.39% increase in emissions).
Change in methodology	0	No change	0	There was no methodological change occurred in the reporting year.
Change in boundary	0	No change	0	There was no change in reporting boundary in the reporting year.
Change in physical operating conditions	0	No change	0	Due to the context of our operating country, the change in physical operating conditions is not applicable and not accounted.
Unidentified	0	No change	0	There were no unidentified activities occurred in the reporting year.
Other	0	No change	0	There were no other activities occurred in the reporting year. C7.9b

C7.9b

(C7.9b) Are your emissions performance calculations in C7.9 and C7.9a based on a location-based Scope 2 emissions figure or a market-based Scope 2 emissions figure?

Market-based

C8. Energy

C8.1

(C8.1) What percentage of your total operational spend in the reporting year was on energy?

More than 0% but less than or equal to 5%

C8.2

(C8.2) Select which energy-related activities your organization has undertaken.

	Indicate whether your organization undertook this energy-related activity in the reporting year
Consumption of fuel (excluding feedstocks)	Yes
Consumption of purchased or acquired electricity	Yes
Consumption of purchased or acquired heat	No
Consumption of purchased or acquired steam	Yes
Consumption of purchased or acquired cooling	No
Generation of electricity, heat, steam, or cooling	Yes

C8.2a

(C8.2a) Report your organization's energy consumption totals (excluding feedstocks) in MWh.

	Heating value	MWh from renewable sources	MWh from non-renewable sources	Total (renewable and non-renewable) MWh

Consumption of fuel (excluding feedstock)	LHV (lower heating value)	0	94,057.71	94,057.71
Consumption of purchased or acquired electricity		0	51,616.49	51,616.49
Consumption of purchased or acquired steam		0	265,456.63	265,456.63
Consumption of self-generated non-fuel renewable energy		0		0
Total energy consumption		0	411,130.83	411,130.83

C-CH8.2a

(C-CH8.2a) Report your organization's energy consumption totals (excluding feedstocks) for chemical production activities in MWh.

Consumption of fuel (excluding feedstocks)

Heating value

LHV (lower heating value)

MWh consumed from renewable sources inside chemical sector boundary

0

MWh consumed from non-renewable sources inside chemical sector boundary (excluding recovered waste heat/gases)

94,057.71

MWh consumed from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary

0

Total MWh (renewable + non-renewable + MWh from recovered waste heat/gases) consumed inside chemical sector boundary

94,057.71

Consumption of purchased or acquired electricity

MWh consumed from renewable sources inside chemical sector boundary

0

MWh consumed from non-renewable sources inside chemical sector boundary (excluding recovered waste heat/gases)

51,616.49

MWh consumed from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary

0

Total MWh (renewable + non-renewable + MWh from recovered waste heat/gases) consumed inside chemical sector boundary

51,616.49

Consumption of purchased or acquired steam

MWh consumed from renewable sources inside chemical sector boundary

0

MWh consumed from non-renewable sources inside chemical sector boundary (excluding recovered waste heat/gases)

265,456.63

MWh consumed from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary

0

Total MWh (renewable + non-renewable + MWh from recovered waste heat/gases) consumed inside chemical sector boundary

265,456.63

Consumption of self-generated non-fuel renewable energy

MWh consumed from renewable sources inside chemical sector boundary

0

MWh consumed from non-renewable sources inside chemical sector boundary (excluding recovered waste heat/gases)

0

MWh consumed from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary

0

Total MWh (renewable + non-renewable + MWh from recovered waste heat/gases) consumed inside chemical sector boundary

0

Total energy consumption

MWh consumed from renewable sources inside chemical sector boundary

0

MWh consumed from non-renewable sources inside chemical sector boundary (excluding recovered waste heat/gases)

411,130.83

MWh consumed from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary

0

Total MWh (renewable + non-renewable + MWh from recovered waste heat/gases) consumed inside chemical sector boundary

411,130.83

C8.2b

(C8.2b) Select the applications of your organization's consumption of fuel.

	Indicate whether your organization undertakes this fuel application
Consumption of fuel for the generation of electricity	No
Consumption of fuel for the generation of heat	No
Consumption of fuel for the generation of steam	Yes
Consumption of fuel for the generation of cooling	No
Consumption of fuel for co-generation or tri-generation	No

C8.2c

(C8.2c) State how much fuel in MWh your organization has consumed (excluding feedstocks) by fuel type.

Sustainable biomass

Heating value

LHV

Total fuel MWh consumed by the organization

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

0

Comment

In 2022, GGC does not consume sustainable biomass as a fuel for its operations.

Other biomass

Heating value

LHV

Total fuel MWh consumed by the organization

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

0

Comment

In 2022, GGC does not consume other biomass as a fuel for its operations.

Other renewable fuels (e.g. renewable hydrogen)

Heating value

LHV

Total fuel MWh consumed by the organization

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

0

Comment

In 2022, GGC does not consume other renewable fuels (e.g. renewable hydrogen) as a fuel for its operations.

Coal

Heating value

LHV

Total fuel MWh consumed by the organization

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

0

Comment

In 2022, GGC does not consume coal as a fuel for its operations.

Oil

Heating value

LHV

Total fuel MWh consumed by the organization

92,903.31

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

92,903.31

Comment

In 2022, GGC consumed fuel oil to generate steam for its operations.

Gas

Heating value

LHV

Total fuel MWh consumed by the organization

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

0

Comment

In 2022, GGC does not consume gas as a fuel for its operations.

Other non-renewable fuels (e.g. non-renewable hydrogen)

Heating value

LHV

Total fuel MWh consumed by the organization

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

0

Comment

In 2022, GGC does not consume other non-renewable fuels (e.g. non-renewable hydrogen) as a fuel for its operations.

Total fuel

Heating value

LHV

Total fuel MWh consumed by the organization

92,903.31

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-generation of steam

92,903.31

Comment

In 2022, GGC consumed Fuel Oil to generate steam for its operations.

C8.2d

(C8.2d) Provide details on the electricity, heat, steam, and cooling your organization has generated and consumed in the reporting year.

	Total Gross generation (MWh)	Generation that is consumed by the organization (MWh)	Gross generation from renewable sources (MWh)	Generation from renewable sources that is consumed by the organization (MWh)
Electricity	0	0	0	0
Heat	0	0	0	0
Steam	48,960.05	48,960.05	0	0
Cooling	0	0	0	0

C-CH8.2d

(C-CH8.2d) Provide details on electricity, heat, steam, and cooling your organization has generated and consumed for chemical production activities.

Electricity

Total gross generation inside chemicals sector boundary (MWh)

0

Generation that is consumed inside chemicals sector boundary (MWh)

0

Generation from renewable sources inside chemical sector boundary (MWh)

0

Generation from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary (MWh)

0

Heat

Total gross generation inside chemicals sector boundary (MWh)

0

Generation that is consumed inside chemicals sector boundary (MWh)

0

Generation from renewable sources inside chemical sector boundary (MWh)

0

Generation from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary (MWh)

0

Steam

Total gross generation inside chemicals sector boundary (MWh)

48,960.05

Generation that is consumed inside chemicals sector boundary (MWh)

48,960.05

Generation from renewable sources inside chemical sector boundary (MWh)

0

Generation from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary (MWh)

0

Cooling

Total gross generation inside chemicals sector boundary (MWh)

0

Generation that is consumed inside chemicals sector boundary (MWh)

0

Generation from renewable sources inside chemical sector boundary (MWh)

0

Generation from waste heat/gases recovered from processes using fuel feedstocks inside chemical sector boundary (MWh)

0

C8.2e

(C8.2e) Provide details on the electricity, heat, steam, and/or cooling amounts that were accounted for at a zero or near-zero emission factor in the market-based Scope 2 figure reported in C6.3.

Country/area of low-carbon energy consumption

Thailand

Sourcing method

None (no active purchases of low-carbon electricity, heat, steam or cooling)

Energy carrier

Low-carbon technology type

Low-carbon energy consumed via selected sourcing method in the reporting year (MWh)

Tracking instrument used

Country/area of origin (generation) of the low-carbon energy or energy attribute

Are you able to report the commissioning or re-powering year of the energy generation facility?

Commissioning year of the energy generation facility (e.g. date of first commercial operation or repowering)

Comment

In 2022, GGC did no actively purchase low-carbon electricity, heat, steam or cooling

C8.2g

(C8.2g) Provide a breakdown by country/area of your non-fuel energy consumption in the reporting year.

Country/area
Thailand

Consumption of purchased electricity (MWh)
51,616.49

Consumption of self-generated electricity (MWh)
0

Consumption of purchased heat, steam, and cooling (MWh)
282,175.49

Consumption of self-generated heat, steam, and cooling (MWh)
0

Total non-fuel energy consumption (MWh) [Auto-calculated]

333,791.98

C-CH8.3

(C-CH8.3) Does your organization consume fuels as feedstocks for chemical production activities?
No

C9. Additional metrics

C9.1

(C9.1) Provide any additional climate-related metrics relevant to your business.

Description
Energy usage

Metric value
2.87

Metric numerator
Energy Consumption (MWh)

Metric denominator (intensity metric only)
Ton of products

% change from previous year
41.84

Direction of change

Decreased

Please explain

A decreased in energy consumption intensity is associated with initiative projects. To elaborate, Advance Process Control at Fractionation Column of FAOH Plant contributed to energy consumption reduction by 2,929 MWh per year.

Description

Waste

Metric value

10,637.83

Metric numerator

Total amount of waste generation (tons)

Metric denominator (intensity metric only)

-

% change from previous year

83.87

Direction of change

Increased

Please explain

In 2022, GGC has built a new infrastructure for Autorack and arrange the warehouse layout, which creates more concrete waste and results in higher total amount of non-hazardous waste (tons) than previous year.

C-CH9.3a

(C-CH9.3a) Provide details on your organization's chemical products.

Output product

Other, please specify

Methyl Ester

Production (metric tons)

283,382

Capacity (metric tons)

500,000

Direct emissions intensity (metric tons CO2e per metric ton of product)

0.0903

Electricity intensity (MWh per metric ton of product)

0.1821

Steam intensity (MWh per metric ton of product)

0.9367

Steam/ heat recovered (MWh per metric ton of product)

0

Comment

GGC produces 3 types of Green Chemical products comprising (1) Methyl Ester, a component of high speed diesel fuel, with a production capacity of 500,000 tons per year; (2) Fatty Alcohol, a main ingredient in cosmetics, surfactants, and various pharmaceuticals, with a production capacity of 100,000 tons per year; and (3) Refined Glycerine, a common ingredient widely used in cosmetics and pharmaceuticals, with a production capacity of 51,000 tons per year.

Output product

Other, please specify

Fatty Alcohol

Production (metric tons)

95,852

Capacity (metric tons)

100,000

Direct emissions intensity (metric tons CO2e per metric ton of product)

0.2672

Electricity intensity (MWh per metric ton of product)

0.5385

Steam intensity (MWh per metric ton of product)

2.7694

Steam/ heat recovered (MWh per metric ton of product)

0

Comment

GGC produces 3 types of Green Chemical products comprising (1) Methyl Ester, a component of high speed diesel fuel, with a production capacity of 500,000 tons per year; (2) Fatty Alcohol, a main ingredient in cosmetics, surfactants, and various pharmaceuticals, with a production capacity of 100,000 tons per year; and (3) Refined Glycerine, a common ingredient widely used in cosmetics and pharmaceuticals, with a production capacity of 51,000 tons per year.

Output product

Other, please specify

Refined Glycerine

Production (metric tons)

43,888

Capacity (metric tons)

51,000

Direct emissions intensity (metric tons CO2e per metric ton of product)

0.5836

Electricity intensity (MWh per metric ton of product)

1.1761

Steam intensity (MWh per metric ton of product)

6.0485

Steam/ heat recovered (MWh per metric ton of product)

0

Comment

GGC produces 3 types of Green Chemical products comprising (1) Methyl Ester, a component of high speed diesel fuel, with a production capacity of 500,000 tons per year; (2) Fatty Alcohol, a main ingredient in cosmetics, surfactants, and various pharmaceuticals, with a production capacity of 100,000 tons per year; and (3) Refined Glycerine, a common ingredient widely used in cosmetics and pharmaceuticals, with a production capacity of 51,000 tons per year.

C-CE9.6/C-CG9.6/C-CH9.6/C-CN9.6/C-CO9.6/C-EU9.6/C-MM9.6/C-OG9.6/C-RE9.6/C-ST9.6/C-TO9.6/C-TS9.6

(C-CE9.6/C-CG9.6/C-CH9.6/C-CN9.6/C-CO9.6/C-EU9.6/C-MM9.6/C-OG9.6/C-RE9.6/C-ST9.6/C-TO9.6/C-TS9.6) Does your organization invest in research and development (R&D) of low-carbon products or services related to your sector activities?

	Investment in low-carbon R&D	Comment
Row 1	Yes	GGC has established Climate Strategy 2023-2030 to become a global sustainable company with Net Zero Emission by 2050. The strategy is based on three key drivers: efficiency-driven, portfolio-driven, and compensation-driven approaches. For portfolio driven, GGC aims to develop low-carbon products & avoided emissions products with high value-added. The products consists of 1st Gen Biofuel, Advance Biofuel, Specialty Oleochemicals, Biochemicals, Food & Nutraceuticals and others. Examples of low-carbon project are that GGC is in partnership with KTIS Bioethanol Co., Ltd and

		Kaset Thai International Sugar Corporation Public Company Limited, established GGC Biochemical Co., Ltd at the Nakhonsawan Biocomplex (NBC) with a goal to develop low-carbon products. This initiative focuses on the manufacturing of biofuels and utilities utilizing sugar crane as a primary source for raw material. Furthermore, GGC has participated with public sector in developing a pilot project that aims to produce bio-inflammable transformer oil from palm oil, utilizing technology invented in Thailand. This project serves to address the issue of oversupply of palm oil while also adding value to agricultural products in order to help farmers. This project has received funding from some of government's investment budget.

C-CH9.6a

(C-CH9.6a) Provide details of your organization's investments in low-carbon R&D for chemical production activities over the last three years.

Technology area

Bio technology

Stage of development in the reporting year

Basic academic/theoretical research

Average % of total R&D investment over the last 3 years

2

R&D investment figure in the reporting year (unit currency as selected in C0.4) (optional)

Average % of total R&D investment planned over the next 5 years

40

Explain how your R&D investment in this technology area is aligned with your climate commitments and/or climate transition plan

In 2022, GGC embarked on a new research and development project with the objective of creating a low-carbon product by increasing the usage of renewable feedstock. The plan is to transform used cooking oil (UCO), Palm Fatty Acid Distillate (PFAD), and Palm Oil Mill Effluent (POME), a waste product from palm oil production, into Sustainable Aviation Fuel (SAF), biohydrogenated diesel (BHD), Bio-Naphtha and Bio-LPG. These alternative fuels are expected to become obligatory for international flights in developed countries as part of efforts to reduce carbon dioxide emissions. The new alternative fuel anticipates reducing GHG Emissions by 84% from traditional aviation fuel. This initiative is representing a portfolio driven strategy, which is one of 3 strategies towards GGC Net Zero Emission by 2050. Under the Portfolio Driven, GGC aims to develop low carbon product & avoided emissions products with new products including advanced biofuel.

Technology area

Bio technology

Stage of development in the reporting year

Pilot demonstration

Average % of total R&D investment over the last 3 years

96

R&D investment figure in the reporting year (unit currency as selected in C0.4) (optional)

Average % of total R&D investment planned over the next 5 years

20

Explain how your R&D investment in this technology area is aligned with your climate commitments and/or climate transition plan

GGC cooperated with many sectors, both the public and private, which have gained the confidence of the public throughout the production chain, to develop a pilot project to produce less flammable bio-transformer oil from palm oil with domestically develop technology that can reduce GHG emission from petroleum-based oil production process. The project also included field test in the transformer to build confidence in the new product while driving sustainable.
commercial use. This project will help to reduce the problem of palm oil oversupply, which is worsening every year. It will also increase the value of palm oil in Thailand by 565%, which is more than cooking oil and biodiesel, whose added value are only 67%and 23%, respectively. This project was planned for a period of 3 years, and it has also received seme government as well.

Technology area

Bio technology

Stage of development in the reporting year

Basic academic/theoretical research

Average % of total R&D investment over the last 3 years

40

R&D investment figure in the reporting year (unit currency as selected in C0.4) (optional)

Average % of total R&D investment planned over the next 5 years

2

Explain how your R&D investment in this technology area is aligned with your climate commitments and/or climate transition plan

In 2022, GGC initiated a new research and development project. Their objective was to create a low-carbon product by expanding the use of renewable feedstock. The strategy is to convert Ethanol, derived from renewable sources like cellulosic material from Bagasse, into Sustainable Aviation Fuel (SAF) and Bio-Naphtha Bio-LPG. These green fuels are anticipated to be mandatory for international flights in developed nations, contributing to efforts to diminish carbon dioxide emissions. The new alternative fuel anticipates reducing GHG Emissions by 63% from traditional aviation fuel. This initiative is representing a portfolio driven strategy, which is one of 3 strategies towards GGC Net Zero Emission by 2050. Under the Portfolio Driven, GGC aims to develop low carbon product & avoided emissions products with new products including advanced biofuel.

C10. Verification

C10.1

(C10.1) Indicate the verification/assurance status that applies to your reported emissions.

	Verification/assurance status
Scope 1	Third-party verification or assurance process in place
Scope 2 (location-based or market-based)	Third-party verification or assurance process in place
Scope 3	Third-party verification or assurance process in place

C10.1a

(C10.1a) Provide further details of the verification/assurance undertaken for your Scope 1 emissions, and attach the relevant statements.

Verification or assurance cycle in place

Annual process

Status in the current reporting year

Complete

Type of verification or assurance

Moderate assurance

Attach the statement

GGC assurance-statement-2022.pdf

Page/ section reference

LRQA Assurance PDF. page 1 and 2

Relevant standard

AA1000AS

Proportion of reported emissions verified (%)

100

C10.1b

(C10.1b) Provide further details of the verification/assurance undertaken for your Scope 2 emissions and attach the relevant statements.

Scope 2 approach

Scope 2 location-based

Verification or assurance cycle in place

Annual process

Status in the current reporting year

Complete

Type of verification or assurance

Moderate assurance

Attach the statement

GGC assurance-statement-2022.pdf

Page/ section reference

LRQA Assurance PDF. page 1 and 2

Relevant standard

AA1000AS

Proportion of reported emissions verified (%)

100

Scope 2 approach

Scope 2 market-based

Verification or assurance cycle in place

Annual process

Status in the current reporting year

Complete

Type of verification or assurance
Moderate assurance

Attach the statement

GGC assurance-statement-2022.pdf

Page/ section reference
LRQA Assurance PDF. page 1 and 2

Relevant standard
AA1000AS

Proportion of reported emissions verified (%)
100

C10.1c

(C10.1c) Provide further details of the verification/assurance undertaken for your Scope 3 emissions and attach the relevant statements.

Scope 3 category
Scope 3: Fuel and energy-related activities (not included in Scopes 1 or 2)

Verification or assurance cycle in place
Annual process

Status in the current reporting year
Complete

Type of verification or assurance
Moderate assurance

Attach the statement

GGC assurance-statement-2022.pdf

Page/section reference
LRQA Assurance PDF. page 1 and 2

Relevant standard
AA1000AS

Proportion of reported emissions verified (%)
100

C10.2

(C10.2) Do you verify any climate-related information reported in your CDP disclosure other than the emissions figures reported in C6.1, C6.3, and C6.5?

Yes

C10.2a

(C10.2a) Which data points within your CDP disclosure have been verified, and which verification standards were used?

Disclosure module verification relates to	Data verified	Verification standard	Please explain
C8. Energy	Energy consumption	ISAE3000	Evaluating the reliability of data and information for only the selected environmental and social indicators in ISR 2022 PDF p. 173 as listed below; - GRI 302-1 Energy Consumption within the organization - GRI 302-3 Energy Intensity 1
C4. Targets and performance	Other, please specify Waste mangement	ISAE3000	Evaluating the reliability of data and information for only the selected environmental and social indicators in ISR 2022 PDF p. 173 as listed below; - GRI 306-3: Waste generated - GRI 306-4: Waste diverted from disposal - GRI 306-5: Waste directed to disposal 1

C4. Targets and performance	Other, please specify Water management	ISAE3000	Evaluating the reliability of data and information for only the selected environmental and social indicators in ISR 2022 PDF p. 173 as listed below; - GRI 303-3: Water withdrawal - GRI 303-4: Water discharge - GRI 303-5: Water consumption 1
C8. Energy	Product footprint verification	Thailand Greenhouse Gas Management Organization's Product Carbon Footprint. The Thailand Greenhouse Gas Management Organization (Public Organization) or TGO has promoted the CFO implementation project focused on promoting targeted organizations in conducting their GHG disclosure and verification. The project aims to follow tasks, including, 1) capacity building on quantifying GHG emissions and removals from production processes and services in order to initiate effective GHG reduction approaches for organizations, 2) strengthening environmental performance and building up capability on global market competitiveness of organizations for both industrial and business sectors, and 3) preparing GHG reporting readiness for industries and services in case that the government has to deploy the mandatory GHG reporting policy in the future and to create accessibility for the Thai voluntary carbon market.	Four GGC products have been certified with Product Carbon Footprint Standard by TGO for 1. Fatty alcohol main-cut 2. Fatty alcohol pre-cut 3. Methyl Ester 4. Refined Glycerin, referencing in ISR 2022 PDF P.130 1
C8. Energy	Product footprint verification	Thailand Greenhouse Gas Management Organization (TGO)'s Carbon Footprint Reduction Label Scheme. The Carbon Footprint Reduction Label (CFR) or Global Warming Reduction Label is a label	Two GGC products have been certified with Product Carbon Footprint Reduction Label Scheme by TGO 1. Fatty alcohol main-cut 2. Fatty alcohol

		that demonstrates a certified Carbon Footprint of Product (CFP) and its emissions reduction based on the TGO eligible reduction criteria. The CFR evaluation and process include the quantification and certification of base year and present year CFP and the comparison results between the base year and present year certified CFP or against its product category benchmarking threshold announced by TGO.	pre-cut, referencing in ISR 2022 PDF P.130 1

[1]Integrated Sustainability Report 2022.pdf

C11. Carbon pricing

C11.1

(C11.1) Are any of your operations or activities regulated by a carbon pricing system (i.e. ETS, Cap & Trade or Carbon Tax)?

No, but we anticipate being regulated in the next three years

C11.1d

(C11.1d) What is your strategy for complying with the systems you are regulated by or anticipate being regulated by?

GGC realizes that any carbon price mechanism, such as carbon trading under cap & trade scheme, carbon tax or carbon offset price, can affect GGC in term of increasing the operational expense proportional to the amount of GHG emission. Especially, domestic carbon price mechanism will directly affect to GGC probably in short-term according to Thailand's targets. For medium-term and long-term, the international carbon price mechanism would affect to GGC due to business expansion that is included in GGC business strategy.

Internal carbon pricing (IPC) is an effective tool for addressing the risks. Therefore, GGC has planned to initiate internal carbon pricing project to set the ICP in the near future with the following objectives;
1) To conduct climate-related risk management by applying Thailand's NDC and company target (Reduce 40% of GHG emission within 2030 and achieve net zero emission by 2065).
2) To prepare for responding stakeholder expectations
3) To Change internal behavior
4) To drive energy efficiency projects
5) To drive low-carbon investments with consideration of ICP as part of specific investment criteria for GHG emission reduction projects

6) To test investment stress and identify low-carbon opportunities e.g. increasing renewable energy and enhancing energy saving, etc.
7) To engage with suppliers
8) To raise awareness and encourage participation of GHGs reduction for both internal and external stakeholders including shareholder, customer and community

In 2022, GGC has reviewed, identified gap with peers, and studied the suitability of internal carbon price for GGC. For the next year, GGC will continue develop the carbon pricing system and engage with both internal and external stakeholders to inform and receive feedback for improvement.

C11.2

(C11.2) Has your organization canceled any project-based carbon credits within the reporting year?

No

C11.3

(C11.3) Does your organization use an internal price on carbon?

Yes

C11.3a

(C11.3a) Provide details of how your organization uses an internal price on carbon.

Type of internal carbon price

Shadow price

How the price is determined

Other, please specify

IEA STEPS

Objective(s) for implementing this internal carbon price

Drive energy efficiency
Drive low-carbon investment
Stakeholder expectations

Scope(s) covered

Scope 1
Scope 2

Pricing approach used – spatial variance

Uniform

Pricing approach used – temporal variance

Evolutionary

Indicate how you expect the price to change over time

The carbon price is expected to increase in the future as Thailand announced a Nationally Determined Contribution (NDC) to reduce 40 % by 2030 and the Net Zero goal by 2065. The carbon price may be embedded in utility cost (electricity and steam) in upstream or GGC may have to pay directly i.e., in case of carbon tax and offset. Carbon price will affect GGC by increasing the operational expense proportional to the amount of GHG emission.

Actual price(s) used – minimum (currency as specified in C0.4 per metric ton CO2e)

1,333

Actual price(s) used – maximum (currency as specified in C0.4 per metric ton CO2e)

5,334

Business decision-making processes this internal carbon price is applied to

Capital expenditure
Operations
Value chain engagement

Mandatory enforcement of this internal carbon price within these business decision-making processes

Yes, for all decision-making processes

Explain how this internal carbon price has contributed to the implementation of your organization's climate commitments and/or climate transition plan

The result from scenario analysis was used to inform the strategy and GHG target setting. It is also used to estimate the cost GHG may have to pay per ton of GHG emission in order to evaluate the cost-effectiveness of investment projects. It is also used to set a reference for overall investment cost to comply with strategy and target. This will also be used in target revision to escalate our commitment in alignment with Paris Agreement and SBTi Net Zero target standard in the future.

C12. Engagement

C12.1

(C12.1) Do you engage with your value chain on climate-related issues?

Yes, our suppliers
Yes, our customers/clients
Yes, other partners in the value chain

C12.1a

(C12.1a) Provide details of your climate-related supplier engagement strategy.

Type of engagement

Engagement & incentivization (changing supplier behavior)

Details of engagement

Run an engagement campaign to educate suppliers about climate change
Climate change performance is featured in supplier awards scheme

% of suppliers by number

28

% total procurement spend (direct and indirect)

100

% of supplier-related Scope 3 emissions as reported in C6.5

96.32

Rationale for the coverage of your engagement

GGC has a goal of encouraging 800 smallholder farmers to become certified by the Roundtable on Sustainable Palm Oil (RSPO) by 2024. This certification aims to meet the demands of customers who value social, economic, and environmental responsibility in the sourcing of raw materials. GGC has partnered with the Deutsche Gesellschaft für International Zusammenarbeit (GIZ), Thailand, and the Thailand Oil Palm Smallholder Academy (TOPSA) to launch the Sustainable Palm Oil Production and Procurement in Thailand (SPOPP) Project. This project aims to promote sustainability, provide training programs, and enhance the capabilities of small farmers, who are the primary producers in the Thai palm oil supply chain, to meet the standards set by the RSPO. The TOPSA course featured more than 49 farmers as lecturers educating about the preparation to expand the knowledge of sustainable palm oil plantations to smallholder farmers who participated in the project. The TOPSA curriculum includes 5 important topics: RSPO sustainable Palm Oil Production Standard, Group Management, Farming, Environment and Society. The RSPO is a crucial tool for accessing global markets and creating market opportunities for sustainable palm oil from Thailand.

Impact of engagement, including measures of success

GGC has a goal of encouraging 800 smallholder farmers to become certified by the Roundtable on Sustainable Palm Oil (RSPO) by 2024. GGC continued to support the Round Table for Sustainable Palm Oil (RSPO) standard in order to meet the needs of customers. For the measure of success, in 2022, Sustainable Palm Oil Production and Procurement (SPPOP) have been implemented in 4 pilot provinces, namely Krabi, Trang, Phang Nga and Chumphon. Currently, there are 7 farmers participating in the project, namely, 7 oil palm extraction plants and 1,000 members of the farmers' networks, with GHG emission reduction estimated to be over 3,000 tCO2e per year. In

the reporting year, GGC has 28 suppliers out of 100 of intermediate suppliers certified by RSPO. These account for 100% of our spending on RSPO-certified products.

Comment

Type of engagement

Information collection (understanding supplier behavior)

Details of engagement

Collect GHG emissions data at least annually from suppliers

% of suppliers by number

100

% total procurement spend (direct and indirect)

100

% of supplier-related Scope 3 emissions as reported in C6.5

96.32

Rationale for the coverage of your engagement

GGC holds an annual assessment of the ESG performance for all of its active suppliers. The ESG assessment covers occupational health & safety, environment, human rights, labor, as well as ethics and compliance with laws, rules and regulations, according to the company's procurement policy, resulting in sustainable business growth together. The assessment also includes whether they have environmental policy in place and operate in line with ISO14001 standard which relates to their environmental management. The supplier subject to the annual assessment covers 100% of GGC procurement spend.

Impact of engagement, including measures of success

GGC Credit Rating Committee is required to select and register business partners by taking into account the operations of trade partners in terms of technical operations, quality, occupational health & safety, environment, finance, and social responsibility. The selected partners will enter the Vendor Master system and will continue to be registered on the Approved Vendor List. As a result, GGC will divide the suppliers into three groups: Feedstock suppliers, non-feedstock suppliers, and other services suppliers. GGC also assesses its active suppliers in terms of Environment, Social, and Governance (ESG) as well as ISO14001 standard to cover all dimensions of sustainable business operations. In 2022, there were 28 out of 100 of total suppliers that GGC found to have ISO14001 standard and/or has environmental policy in place.

Comment

C12.1b

(C12.1b) Give details of your climate-related engagement strategy with your customers.

Type of engagement & Details of engagement

Education/information sharing

Run an engagement campaign to educate customers about the climate change impacts of (using) your products, goods, and/or services

% of customers by number

5

% of customer - related Scope 3 emissions as reported in C6.5

100

Please explain the rationale for selecting this group of customers and scope of engagement

GGC keeps track of environmental indicators i.e. GHG emissions, energy consumption, water usage and waste disposal and report through the sustainability report annually. We also share in-depth environmental data with interested customers (mostly home care and personal care products) to enable environmental reporting and product improvement. For example, we engage annually with Colgate-Palmolive Company on GHG data sharing. The customers under this scope of engagement are estimated to account for nearly 100% of scope 3: processing of sold products of GGC.

Impact of engagement, including measures of success

The engagement between GGC and Colgate trigger GGC to do more on GHG emissions and water usage measurement. GGC is aspired to share environmental information which is useful to all partners along the value chain. In addition, due to the engagement, GGC supplied RSPO palm oil certified as a sustainable product with No Deforestation, No Peat, and No Exploitation (NDPE) commitment to Colgate-Palmolive for supporting its sustainability strategy in 2022. In 2022, the revenue from Colgate-Palmolive is accounted for approximately 5% of RGL product. Therefore, it was accounted for 5% of additional revenue from RSPO sales. Another impact of the engagement includes the drive of demand for RSPO through requirement from customers to supply RSPO products as such the requirement from Colgate-Palmolive. This can lead to more adoption of RSPO Certification from suppliers including farmers. This will create a positive impact to the environment and society through responsible agricultural, no deforestation and responsible labor practices.

Type of engagement & Details of engagement

Education/information sharing

Run an engagement campaign to educate customers about the climate change impacts of (using) your products, goods, and/or services

% of customers by number

2

% of customer - related Scope 3 emissions as reported in C6.5

100

Please explain the rationale for selecting this group of customers and scope of engagement

Unilever strongly aware of sustainable sourcing in its supply chain. Therefore, Unilever started using RSPO certified palm oil in 2009. One of the actions from Unilever climate strategy, which has a target to achieve net zero emissions across its value chain by 2039, is reducing emissions through our supply chain that palm oil product certified by RSPO can obviously serve its action. To help Unilever improve its strategy and action plan, GGC shares information as a RSPO palm oil supplier prospective aiming to contribute more comprehensive information for Unilever. The customers under this scope of engagement are estimated to account for nearly 100% of scope 3: processing of sold products of GGC.

Impact of engagement, including measures of success

The engagement between GGC and Unilever trigger GGC to do more on GHG emissions and water usage measurement. GGC is aspired to share environmental information which is useful to all partners along the value chain. In addition, due to the engagement, GGC supplied RSPO palm oil certified as a sustainable product with No Deforestation, No Peat, and No Exploitation (NDPE) commitment to Unilever for supporting its sustainability strategy in 2022. In 2022, the revenue from Unilever is accounted for approximately 2% of fatty alcohol product. Therefore, it was accounted for 2% of additional revenue from RSPO sales. Another impact of the engagement includes the drive of demand for RSPO through requirement from customers to supply RSPO products as such the requirement from Unilever. This can lead to more adoption of RSPO Certification from suppliers including farmers. This will create a positive impact to the environment and society through responsible agricultural, no deforestation and responsible labor practices.

C12.1d

(C12.1d) Give details of your climate-related engagement strategy with other partners in the value chain.

For GGC, other partners in value chain includes those that are not directly our supplier or customers but are important for our business such as technology providers, research and development groups, or indirect customers. Currently, GGC closely work with public sector mainly for research and development of future products or process improvement that could lead to the expansion of low carbon products and cleaner or more efficient process technology. In 2022, GGC participated the development of less flammable bio-transformer oil from palm oil and integrated pilot field test to promote its commercial and sustainable use project. The project

is a collaboration between GGC and the government to develop a pilot project to produce bio-inflammable transformer oil from palm oil using technology invented in Thailand. The project includes field testing in the transformer to build confidence in the efficacy of bio-transformer oil derived from palm oil while promoting sustainable commercial usage.
The project helps reduce the problem of oversupply of palm oil and creates added value for agricultural products in order to help local farmer. GGC received more than 70 percent in government support, which is equivalent to 20.8 million THB. Furthermore, by collaborating with the government, the time to enter the market is expected to reduce by at least 3 years since working with government organizations reduces product testing time. The project also promotes the country's standardization of bio-transformer oil.
Additionally, this project will significantly increase the value of palm oil in Thailand by 565% which is higher than cooking oil and biodiesel, whose added value are only 67% and 23%, respectively. It is also expected that this product can reduce the oversupply of palm oil by more than 33 million liters and generate the country revenue for 6,000 THB per year.

C12.2

(C12.2) Do your suppliers have to meet climate-related requirements as part of your organization's purchasing process?

Yes, climate-related requirements are included in our supplier contracts

C12.2a

(C12.2a) Provide details of the climate-related requirements that suppliers have to meet as part of your organization's purchasing process and the compliance mechanisms in place.

Climate-related requirement

Complying with regulatory requirements

Description of this climate related requirement

GGC holds an annual assessment of the ESG performance of its active suppliers. The ESG assessment covers occupational health & safety, environment, human rights, labor, as well as ethics and compliance with laws, rules and regulations, according to the company's procurement policy, resulting in sustainable business growth together. Under the environmental aspect includes a consideration whether the company has environmental policy and management process in place such as ISO14001 standard and/or environmental policy which are related to energy and GHG emission management.

% suppliers by procurement spend that have to comply with this climate-related requirement

100

% suppliers by procurement spend in compliance with this climate-related requirement

28

Mechanisms for monitoring compliance with this climate-related requirement

Certification
Supplier self-assessment
First-party verification
Supplier scorecard or rating

Response to supplier non-compliance with this climate-related requirement

Retain and engage

C12.3

(C12.3) Does your organization engage in activities that could either directly or indirectly influence policy, law, or regulation that may impact the climate?

Row 1

External engagement activities that could directly or indirectly influence policy, law, or regulation that may impact the climate

Yes, we engage directly with policy makers
Yes, our membership of/engagement with trade associations could influence policy, law, or regulation that may impact the climate
Yes, we fund organizations or individuals whose activities could influence policy, law, or regulation that may impact the climate

Does your organization have a public commitment or position statement to conduct your engagement activities in line with the goals of the Paris Agreement?

Yes

Attach commitment or position statement(s)

GGC Integrated Sustainability Report 2022, https://www.ggcplc.com/storage/document/sustainability-report/2022/integrated-sustainability-report-2022.pdf - Commitment -Document page 2-7 - Position Statement - Document page 8-9, 2-7, 26-32
GGC Annual Report 2022, https://www.ggcplc.com/en/document/viewer/65710/form-56-1-one-report-2022 - Commitment - Document page 6-7 - Position Statement - Document page 2-3, 6-7, 59-60

Integrated Sustainability Report 2022.pdf

Describe the process(es) your organization has in place to ensure that your external engagement activities are consistent with your climate commitments and/or climate transition plan

GGC has in place the process to ensure that our activities are consistent with the overall climate change strategy. This begins with the result from risk and opportunity assessment process. The areas of risks and opportunities where GGC can better safeguard our risks and enhance our opportunities though external engagement will be emphasized for further activities. The stakeholders involved such as governmental agencies, trade associations, etc. are identified along with channel of engagement i.e. through a roundtable, club or working group. The discussion on the direction and progress of these engagement activities are brought into to Sustainability Development Committee meeting on quarterly basis to ensure corporatewide consistency with GGC climate strategy. Thus far, GGC has announced our public commitment to become a net zero organization in line with Paris Agreement which aims to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels, meaning that all of our external stakeholder engagement activities are moving towards this direction. See PDF page 6 Message from the Chairman for our commitment statement.

C12.3a

(C12.3a) On what policy, law, or regulation that may impact the climate has your organization been engaging directly with policy makers in the reporting year?

Specify the policy, law, or regulation on which your organization is engaging with policy makers

Thailand Voluntary Emission Reduction Program (T-VER) is a program from voluntary GHG emission policy to generate carbon credits. The main objective of the policy is to encourage companies in private sector to reduce GHG emission by monetary measure. Currently, Thailand Greenhouse Gas Organization (TGO) and IEA have studied the implementation of Cap and Trade policy which will limit the GHG emission in chemical sector. The IEA predicted that Thailand with legislate cap and trade regulation within less than 5 years Moreover, carbon price may affect GGC by increasing the operational expense proportional to the amount of GHG emission. Carbon price may come in various form i.e. carbon trading under cap & trade scheme, carbon tax or carbon offset price. The carbon price may be embedded in utility cost in upstream or GGC may have to pay directly. The regulation related to carbon prices/tax is close to enforcement in the near future due to the climate change act. is planned to announce enforcing polluters in managing GHG emission.

Category of policy, law, or regulation that may impact the climate

Carbon pricing, taxes, and subsidies

Focus area of policy, law, or regulation that may impact the climate

Carbon taxes

Emissions trading schemes

Policy, law, or regulation geographic coverage

National

Country/area/region the policy, law, or regulation applies to

Thailand

Your organization's position on the policy, law, or regulation

Support with no exceptions

Description of engagement with policy makers

GGC has engaged with Thailand Greenhouse Gas Management Organization (TGO) to take action in solving climate change problems by utilizing mechanisms in effectively reducing GHG emission, while also taking into account the three dimensions of balance: Economy, environment and society. As parts of GHG emission reduction, GGC has continuously supported TGO through sharing information to TGO and planning to join the Thailand Voluntary Emission Reduction Program (T-VER) in the next year to participate in GHG emission reduction program and to generate carbon credits. GGC also periodically engages with the government agencies related to the environmental protection to share information, particularly regarding the law and regulation affecting to the company. From this engagement, GGC has contributed information to create a more sustainable business sector, including climate change matter, and supportive policy. GGC also keeps up-to-date with new legislation to be imposed by the government. To elaborate, GGC closely follow up on the draft of the Climate Change Act that aims to enforce Carbon Tax and Emissions Trading Scheme (ETS) to prepare implementation plan. The risks will be considered in strategic plan with potential changes in national policy and regulation on climate change. The company need to control and limit GHG emissions to comply with the regulations.

Details of exceptions (if applicable) and your organization's proposed alternative approach to the policy, law or regulation

Have you evaluated whether your organization's engagement on this policy, law, or regulation is aligned with the goals of the Paris Agreement?

Yes, we have evaluated, and it is aligned

Please explain whether this policy, law or regulation is central to the achievement of your climate transition plan and, if so, how?

With the anticipated shifts in national policies and regulations regarding climate change, particularly in relation to carbon credits, GGC can effectively reduce greenhouse gas emissions by implementing a carbon pricing mechanism. This approach entails placing a monetary value on carbon emissions, providing an economic incentive to adopt cleaner technologies and make investments in renewable energy sources. This also would prioritize the implementation of necessary actions to reduce the GHG emissions. By embracing these measures, we can work towards achieving our Net-Zero target by 2050.

C12.3b

(C12.3b) Provide details of the trade associations your organization is a member of, or engages with, which are likely to take a position on any policy, law or regulation that may impact the climate.

Trade association

Other, please specify

The Roundtable on Sustainable Palm Oil (RSPO)

Is your organization's position on climate change policy consistent with theirs?

Consistent

Has your organization attempted to influence their position in the reporting year?

Yes, we publicly promoted their current position

Describe how your organization's position is consistent with or differs from the trade association's position, and any actions taken to influence their position

The Roundtable on Sustainable Palm Oil (RSPO) is a non-profit organization that supports stakeholders related to palm oil businesses such as palm farmers, consumer product manufacturers, palm oil retailers, financial institutions, NGOs in environmental and social development, etc. Combatting land use change (carbon stock) and promoting low carbon palm oil farming and milling are some of the components that RSPO drives that could have a significant impact on climate change.

Funding figure your organization provided to this trade association in the reporting year (currency as selected in C0.4)

120,000

Describe the aim of your organization's funding

Together with the Deutsche Gesellschaft für International Zusammernarbeit (GIZ), Thailand, GGC launched the Sustainable and Climate-Friendly Palm Oil Production and Procurement in Thailand (SPOPP) Project to promote and develop the caliber of small farmers up to the Roundtable on Sustainable Palm Oil (RSPO) standard, a key tool to carve marketing opportunities for Thailand's sustainable palm oil, enabling it to access world markets. GGC continued to support the Round Table for Sustainable Palm Oil (RSPO) standard in order to meet the needs of customers. For the measure of success, GGC aim to promote 800 small farmers to be certified RSPO by 2024.

Have you evaluated whether your organization's engagement with this trade association is aligned with the goals of the Paris Agreement?

Yes, we have evaluated, and it is aligned

Trade association

Other, please specify

The Federation of Thai Industries (F.T.I)

Is your organization's position on climate change policy consistent with theirs?

Consistent

Has your organization attempted to influence their position in the reporting year?

Yes, we publicly promoted their current position

Describe how your organization's position is consistent with or differs from the trade association's position, and any actions taken to influence their position

The Federation of Thai Industries is a non-profit organization that strengthens Thailand's private business institutions which will enable the continuity of the industrial sector's development mechanism in combination with the country's economic development and protection of national interest in the global economy. It also aims to promote good practices in energy efficiency, environmental stewardship, resource utilization and GHG reduction across the industry.

Funding figure your organization provided to this trade association in the reporting year (currency as selected in C0.4)

30,000

Describe the aim of your organization's funding

GGC has joined and supported F.T.I as a member to shares information for contributing to enhance business competitiveness and establishing good and sustainable practices, and educating the public on social and environmental issues, to ensure that the operations will lead to sustainable development.

Have you evaluated whether your organization's engagement with this trade association is aligned with the goals of the Paris Agreement?

Yes, we have evaluated, and it is aligned

Trade association

Other, please specify

Thailand Business Council for Sustainable Development (TBCSD)

Is your organization's position on climate change policy consistent with theirs?

Consistent

Has your organization attempted to influence their position in the reporting year?

Yes, we publicly promoted their current position

Describe how your organization's position is consistent with or differs from the trade association's position, and any actions taken to influence their position

Thailand Business Council for Sustainable Development (TBCSD) is an organization that promotes environmental awareness within the business sector under the concept of sustainable development. It focuses on sustainable development in three areas: development of sustainability policies in Thailand, building business competitiveness and good and sustainable practices, and educating the public on social and environmental issues.

Funding figure your organization provided to this trade association in the reporting year (currency as selected in C0.4)

250,000

Describe the aim of your organization's funding

GGC is a member of the TBCSD to exchange information on its business operations to promote the social and environmental responsibility for chemical industry sector, which also supports the UNSDGs.

Have you evaluated whether your organization's engagement with this trade association is aligned with the goals of the Paris Agreement?

Yes, we have evaluated, and it is aligned

Trade association

Other, please specify

Thai Biodiesel Producer Association (TBPA)

Is your organization's position on climate change policy consistent with theirs?

Consistent

Has your organization attempted to influence their position in the reporting year?

Yes, we publicly promoted their current position

Describe how your organization's position is consistent with or differs from the trade association's position, and any actions taken to influence their position

The Thai Biodiesel Producer Association plays a vital role in driving the progress of the biodiesel sector in Thailand, aligning with the country's objectives of diversifying its energy sources. By advocating for and promoting the use of biodiesel, the association

actively contributes to reducing greenhouse gas emissions and fostering the adoption of a renewable and eco-friendly fuel alternative.

Funding figure your organization provided to this trade association in the reporting year (currency as selected in C0.4)

8,000

Describe the aim of your organization's funding

GGC is a member of Thai Biodiesel Producer Association with an objective to promote the production of biodiesel to meet quality standards and an adequate quantity to fulfill the country's demand and monitoring market trends both domestically and internationally.

Have you evaluated whether your organization's engagement with this trade association is aligned with the goals of the Paris Agreement?

Yes, we have evaluated, and it is aligned

Trade association

Other, please specify

Thai Bioplastics Industry Association (TBIA)

Is your organization's position on climate change policy consistent with theirs?

Consistent

Has your organization attempted to influence their position in the reporting year?

Yes, we publicly promoted their current position

Describe how your organization's position is consistent with or differs from the trade association's position, and any actions taken to influence their position

The Thai Bioplastics Industry Association (TBIA) promotes the principles of sustainability and the circular economy within the bioplastics industry. It encourages its members to adopt environmentally friendly practices, such as using renewable feedstocks, implementing efficient production processes, and supporting the proper disposal and recycling of bioplastics, which ultimately can help reduce the GHG emissions within the production process.

Funding figure your organization provided to this trade association in the reporting year (currency as selected in C0.4)

10,000

Describe the aim of your organization's funding

GGC actively participates as a member of the Thai Bioplastics Industry Association (TBIA) to drive the advancement of eco-friendly substitutes for conventional plastics, promote waste reduction, and facilitate the transition towards a circular economy.

Have you evaluated whether your organization's engagement with this trade association is aligned with the goals of the Paris Agreement?

Yes, we have evaluated, and it is aligned

C12.3c

(C12.3c) Provide details of the funding you provided to other organizations or individuals in the reporting year whose activities could influence policy, law, or regulation that may impact the climate.

Type of organization or individual

Governmental institution

State the organization or individual to which you provided funding

Thailand Greenhouse Gas Management Organization (TGO) is an autonomous public organization established in 2007 in accordance with Thai law to manage and expedite development and implementation of GHG reduction projects and support public, private and international organization partnerships to promote implementation of climate action.

Funding figure your organization provided to this organization or individual in the reporting year (currency as selected in C0.4)

0

Describe the aim of this funding and how it could influence policy, law or regulation that may impact the climate

GGC joined as a member of the Thailand Carbon Neutral Network (TCNN), which was established by TGO, to promote cooperation between the government, the private sector, and the local/community sectors for reducing GHG emissions. To create sustainable growth in a climate-friendly society, achieving net zero of GHG emissions is important following the international community as reflected in Thailand's goals as well as the Paris Agreement on climate change. The network will build demand for carbon credits from the T-VER project that will promote the expansion of the domestic voluntary carbon market with more liquidity.

Have you evaluated whether this funding is aligned with the goals of the Paris Agreement?

Yes, we have evaluated, and it is aligned

Type of organization or individual

International Governmental Organization (IGO)

State the organization or individual to which you provided funding

The UNGC is the world's largest corporate sustainability initiative to promote the ten principles in business activities around the world and support of broader UNSDGs. The

UNGC provides tools to improve cooperate strategy and operations consistent with the Ten Principles including applying in business activities and encouraging action to support the UNSDGs.

Funding figure your organization provided to this organization or individual in the reporting year (currency as selected in C0.4)

245,174.25

Describe the aim of this funding and how it could influence policy, law or regulation that may impact the climate

GGC support UNGC through being a membership. GGC will comply all the issues in the Ten Principles to be a part of the strategy down to the action plans until it is embedded in the company culture and day-to-day operations. GGC will also engage in collaborative projects, which advance the broader development goals of the United Nations, particularly the Sustainable Development Goals. Moreover, GGC will make a clear statement of this commitment to UNGC's stakeholders and the general public, and annually submit a Communication on Progress (COP), as a key requirement, which describes our company's efforts to implement the Ten Principles. In addition, GGC garnered acclaim by UN Global Compact as one of the world's 41 LEAD entities indicating that GGC excellently followed the UNGC framework and the ten principles.

Have you evaluated whether this funding is aligned with the goals of the Paris Agreement?

Yes, we have evaluated, and it is aligned

Type of organization or individual

International Governmental Organization (IGO)

State the organization or individual to which you provided funding

The German Agency for International Cooperation or (GIZ) is an international enterprise owned by the German Federal Government, operating in many fields across more than 130 countries. GIZ offers demand-driven, tailor-made and effective services for sustainable development. There is GIZ's Academy for International Cooperation (AIZ) has established a training facility in Bangkok with several activities including reduction of GHG emissions and improvement of the adaptation to climate change.

Funding figure your organization provided to this organization or individual in the reporting year (currency as selected in C0.4)

4,400,000

Describe the aim of this funding and how it could influence policy, law or regulation that may impact the climate

In 2021, GGC and GIZ launched Sustainable and Climate-Friendly Palm Oil Production and Procurement in Thailand (SCPOPP) to promote and develop the caliber of small farmers up to the Roundtable on Sustainable Palm Oil (RSPO) standard, a key tool to carve marketing opportunities for Thailand's sustainable palm oil, enabling it to access

world markets and still continue to support until these days. The total expense regarding the collaboration with GIZ in 2022-2023 is 15,720,000 THB. In 2022, the expense is accounted for 4,400,000.

Have you evaluated whether this funding is aligned with the goals of the Paris Agreement?

Yes, we have evaluated, and it is aligned

C12.4

(C12.4) Have you published information about your organization's response to climate change and GHG emissions performance for this reporting year in places other than in your CDP response? If so, please attach the publication(s).

Publication

In voluntary sustainability report

Status

Complete

Attach the document

Integrated Sustainability Report 2022.pdf

Page/Section reference

Integrated Sustainability Report 2022, https://www.ggcplc.com/storage/document/sustainability-report/2022/integrated-sustainability-report-2022.pdf, Highlight Performance Metrics Document Page.14-16, Decarbonization Pathway Document Page. 32, Efficiency Driven Document Page. 93-101, Carbon Sequestration and Compensation Document Page.102-103, Verification according to GRI PDF P.173-176.

Content elements

Governance
Strategy
Emissions figures
Emission targets
Other metrics

Comment

The Integrated Sustainability Report has been reported in accordance with GRI Standard. Several indicators that are related to climate disclosure have been verified by third party. Those indicators include GRI 305-1 Direct Scope 1 GHG Emissions, 305-2 Energy Indirect GHG Emissions (Scope 2), 305-3 Other Indirect GHG Emissions (Scope 3 - Only Transmission Loss), 302-1 Energy Consumption within Organization and 302-3 Energy Intensity.

Publication

In mainstream reports, incorporating the TCFD recommendations

Status

Complete

Attach the document

ggc-tcfd-disclosure-2022.pdf

Page/Section reference

GGC TCFD Report, Page All, https://www.ggcplc.com/storage/document/climate-strategy/ggc-tcfd-disclosure-2022.pdf

Content elements

Governance
Strategy
Risks & opportunities
Emissions figures
Emission targets

Comment

GGC TCFD reports has been reported as per TCFD recommendations. The reports consist of Governance, Strategy, Risks & Opportunities, Emissions figures and targets. It also shows the climate related strategy of a company with 3 pillars, Efficiency Driven, Portfolio Driven and Compensation Driven. These 3 pillars are the main driven force on the path to achieve Net Zero Emissions by 2050.

C12.5

(C12.5) Indicate the collaborative frameworks, initiatives and/or commitments related to environmental issues for which you are a signatory/member.

	Environmental collaborative framework, initiative and/or commitment	Describe your organization's role within each framework, initiative and/or commitment
Row 1	Task Force on Climate-related Financial Disclosures (TCFD) UN Global Compact	In 2022, GGC has established the Task Force on Climate Related Financial Disclosure (TCFD) to disclose guidelines on climate change management, strategies and goals, GGC's greenhouse gas reduction, as well as the relevant risk assessment results. The TCFD Disclosure can be found in https://www.ggcplc.com/storage/document/climate-strategy/ggc-tcfd-disclosure-2022.pdf. Moreover, GGC has signed the UN Global Compact Membership to take part in being a business organization that supports business operations with social responsibility on the basis of voluntary and

		practical measures. GGC has become membership since 2018 and has received advanced level for its Communication on Progress. The communication on progress for 2022 can be found in https://unglobalcompact.org/participation/report/cop/advanced/467265.

C15. Biodiversity

C15.1

(C15.1) Is there board-level oversight and/or executive management-level responsibility for biodiversity-related issues within your organization?

	Board-level oversight and/or executive management-level responsibility for biodiversity-related issues	Description of oversight and objectives relating to biodiversity
Row 1	Yes, both board-level oversight and executive management-level responsibility	Within GGC Quality, Security, Safety, Occupational Health, Environment, and Business Continuity (QSHEB) Policy, all management levels are responsible to drive the business to meet corporate target achievements as well as being as role models in developing and maintaining GGC's QSHEB system by providing sufficient resources for all employees to participate in policy implementation. Managing director (MD), as a board-level, has signed in the policy meaning that MD is responsible to oversee the company performance including biodiversity issue. In addition, the policy also stated to biodiversity-related objectives, which is to assess and prevent impacts on the environment and ecosystem, as well as maintaining biodiversity by managing integration of environment as well as maintaining efficiency of GHG reduction and ability to adapt to climate change. Biodiversity-related laws and regulations, including respect legally designated protected areas and species, were strictly complied that was stated in the policy. Within (GC) Biodiversity Statement, GGC, as a GC's subsidiary, has to follow our parent company's guidelines and commitments to protect and manage biodiversity. The statement has committed to maintain the target of 'No Net Loss' (NNL) for own operation. Adoption of the mitigation hierarchy approach, and protection of high conservation value areas and protected species were also included in the statement. All the commitments have to be overseen by board-level and executed

		by management-level.

C15.2

(C15.2) Has your organization made a public commitment and/or endorsed any initiatives related to biodiversity?

	Indicate whether your organization made a public commitment or endorsed any initiatives related to biodiversity	Biodiversity-related public commitments	Initiatives endorsed
Row 1	Yes, we have made public commitments and publicly endorsed initiatives related to biodiversity	Commitment to No Net Loss Adoption of the mitigation hierarchy approach Commitment to not explore or develop in legally designated protected areas Commitment to respect legally designated protected areas Commitment to avoidance of negative impacts on threatened and protected species Commitment to no conversion of High Conservation Value areas	SDG

C15.3

(C15.3) Does your organization assess the impacts and dependencies of its value chain on biodiversity?

Impacts on biodiversity

Indicate whether your organization undertakes this type of assessment

Yes

Value chain stage(s) covered

Direct operations
Upstream
Downstream

Tools and methods to assess impacts and/or dependencies on biodiversity

TNFD – Taskforce on Nature-related Financial Disclosures

Please explain how the tools and methods are implemented and provide an indication of the associated outcome(s)

The tool to calculate impact and dependency that GGC uses is WWF Biodiversity Suites. The tool is designed to be used by companies and financial institutions for

company- and portfolio-level screening and prioritization to identify risk hotspots across companies' operational and supply chain sites. By using spatially explicit data on biodiversity at global scale, the tools provide location-specific and industry specific assessments of biodiversity physical, regulatory and reputational risks. The tools aim to help companies and financial institutions to better prioritize where and on what to focus contextual responses as well as inform their biodiversity-stewardship strategies and target setting. The tools would generate the results based on the sector specific location by utilizing the databased on biodiversity risk for different industries and different geographic location, which will harbor different scores for the impacts and the dependencies. With that company will be presented with the result of the assessment would be the level of score to show the dependency and impact in each risks category from 1(Lowest) to 5 (Highest). As a result, the example of significant impacts (3 score or more) under physical risks for GGC includes Pressures on Biodiversity, Pollution, Land Freshwater, Landslide and Sea Use Change. The example of significant impacts (3 score or more) under reputational risks includes whether company is located near the Key Biodiversity Areas or Protected/Conserved Areas or whether company has affected the Ecosystem Condition. with the notion of the impact on biodiversity, GGC can prioritize and allocate resources to prevent aforementioned biodiversity risks and implement biodiversity related actions plans following the principles of mitigation hierarchy that includes Avoid, Minimize, Restore and Offset.

Dependencies on biodiversity

Indicate whether your organization undertakes this type of assessment

Yes

Value chain stage(s) covered

Direct operations
Upstream
Downstream

Tools and methods to assess impacts and/or dependencies on biodiversity

TNFD – Taskforce on Nature-related Financial Disclosures

Please explain how the tools and methods are implemented and provide an indication of the associated outcome(s)

The tool to calculate impact and dependency that GGC uses is WWF Biodiversity Suites. The tool is designed to be used by companies and financial institutions for company- and portfolio-level screening and prioritization to identify risk hotspots across companies' operational and supply chain sites. By using spatially explicit data on biodiversity at global scale, the tools provide location-specific and industry specific assessments of biodiversity physical, regulatory and reputational risks. The tools aim to help companies and financial institutions to better prioritize where and on what to focus contextual responses as well as inform their biodiversity-stewardship strategies and target setting. The tools would generate the results based on the sector specific location by utilizing the databased on biodiversity risk for different industries and different geographic location, which will harbor different scores for the impacts and the

dependencies. With that company will be presented with the result of the assessment would be the level of score to show the dependency and impact in each risks category from 1(Lowest) to 5 (Highest). As a result, the example of significant dependencies (3 score or more) under physical risks for GGC includes soil conditions, water conditions, extreme heat, tree cover loss and forest productivity and distance to markets. This is due to majority of GGC's raw materials require palm oil. The example of significant dependencies (3 score or more) under reputational risks includes political situation and media scrutiny. This is due to the plantation of palm oil often received media scrutiny. One misstep can create severe negative reputation to the company. With the notion of the impact on biodiversity, GGC can prioritize and allocate resources to prevent aforementioned biodiversity risks and implement biodiversity related actions plans following the principles of mitigation hierarchy that includes Avoid, Minimize, Restore and Offset.

C15.4

(C15.4) Does your organization have activities located in or near to biodiversity-sensitive areas in the reporting year?

Not assessed

C15.5

(C15.5) What actions has your organization taken in the reporting year to progress your biodiversity-related commitments?

	Have you taken any actions in the reporting period to progress your biodiversity-related commitments?	Type of action taken to progress biodiversity-related commitments
Row 1	Yes, we are taking actions to progress our biodiversity-related commitments	Law & policy Other, please specify Biodiversity Risks Assessment within supply chain covering own operation, upstream and downstream activities. This considered as the first step of actions to identify mitigation plans

C15.6

(C15.6) Does your organization use biodiversity indicators to monitor performance across its activities?

	Does your organization use indicators to monitor biodiversity performance?	Indicators used to monitor biodiversity performance
Row 1	No, we do not use indicators, but plan to within the next two years	Response indicators

C15.7

(C15.7) Have you published information about your organization's response to biodiversity-related issues for this reporting year in places other than in your CDP response? If so, please attach the publication(s).

Report type	Content elements	Attach the document and indicate where in the document the relevant biodiversity information is located
In voluntary sustainability report or other voluntary communications	Content of biodiversity-related policies or commitments	The Biodiversity Commitment is disclosed in GGC's website. https://www.ggcplc.com/en/sustainability/environment/environmental-policy-and-management-system
In voluntary sustainability report or other voluntary communications	Risks and opportunities	The Biodiversity Risk Assessment is disclosed in GGC's website. https://www.ggcplc.com/en/sustainability/environment/environmental-policy-and-management-system

C16. Signoff

C-FI

(C-FI) Use this field to provide any additional information or context that you feel is relevant to your organization's response. Please note that this field is optional and is not scored.

C16.1

(C16.1) Provide details for the person that has signed off (approved) your CDP climate change response.

	Job title	Corresponding job category
Row 1	Managing Director (MD) (Equivalent to Chief Executive Officer (CEO))	Chief Executive Officer (CEO)

SC. Supply chain module

SC0.0

(SC0.0) If you would like to do so, please provide a separate introduction to this module.

Global Green Chemicals Public Company Limited or GGC is the first Oleochemical manufacturer in Thailand and is the Green Flagship Company of PTT Global Chemical Group. The company is committed to being the leading Oleochemical producer in the world market, along with continually creating economic sustainability for the agricultural and industrial sectors of Thailand.

Currently, GGC's main products include Methyl Ester or B100 that is used as component in high speed diesel fuel, with a production capacity of 500,000 tons per year, Fatty Alcohol that is used as a main ingredient in cosmetics, surfactant, and various pharmaceuticals, with a production capacity of 100,000 tons per year, and pure Glycerin, which is an ingredient widely used in cosmetics and pharmaceuticals, with a production capacity of 51,000 tons per year. GGC's Production bases are located in the Hemaraj Eastern Industrial Estate (Map Ta Phut), Rayong Province and in the Thai Eastern Industrial Estate, Chonburi Province. In which, the entire GGC's products derived from raw materials from local crude palm oil, and are commercially distributed to both domestic and international customers.

In addition, in 2022, GGC has carried out the construction and commissioning of the Utility Provider and Infrastructure project for the Nakornsawan Bio-Complex Phase 2 Project (NBC2) which is a public utility investment to be used in Polylactic Acid (PLA) bioplastics factory, one of company's strategic plan to create and lead the development of the country's first fully integrated Biocomplex. The project will also support and create added value for agricultural products through technology and innovation, together with sustainability principles driving the business forward according to Thailand's economic model for sustainable development (Bio-Circular-Green Economic Model or BCG Model). GGC, in collaboration with its business partners, is also in the research phase of a project for Bio-Succinic Acid (BSA), which is a raw material for bioplastic Polybutylene succinate (PBS) to create sustainable synergy benefit throughout the chain of the bio-industry. GGC also aims to use sugarcane from local farmers as a main raw material in the future to create a synergy benefits throughout the biological industry chain.

For the Sustainability, in 2022 marked GGC's milestone in becoming a world-class sustainable entity, evident in our participation in the Paris Agreement, an accord under the United Nations Framework Convention on Climate Change. To elaborate, GGC has set a goal of 20% reduction in the Green House Gas (GHG) emissions by 2030 and development of business in pursuit of the Net Zero emissions goal by 2050— challenging goals, yet an opportunity for driving GGC toward ongoing growth for long-term sustainability. The targets covered all direct and indirect emission (scope 1+2) from GGC operation. In addition, the scope 3 emission (other indirect emissions that occur in a company's value chain) was acknowledge to cover approximately 75-80% of total GHG emission, especially, upstream in value as a majority of

emission in scope 3. GHG reduction initiatives in upstream value chain is crucial in achieving low carbon footprint product. Therefore, GGC also set strategy to encourage and support upstream GGC's partners to reduce their GHG emission. With the GGC climate strategy, for scope 1 and 2 emission, GGC focuses the future investment for GHG emission. For scope 3 emission, GGC is collecting the scope 3 emission data in major categories that are absent and not verified to be able to set target for scope 3.

SC0.1

(SC0.1) What is your company's annual revenue for the stated reporting period?

	Annual Revenue
Row 1	25,084,000

SC1.1

(SC1.1) Allocate your emissions to your customers listed below according to the goods or services you have sold them in this reporting period.

Requesting member

Colgate Palmolive Company

Scope of emissions

Scope 1

Scope 2 accounting method

Scope 3 category(ies)

Allocation level

Company wide

Allocation level detail

Emissions in metric tonnes of CO2e

1,280.65

Uncertainty (±%)

5

Major sources of emissions

GGC emitted in scope 1 by the combustion of fuel oil for steam generation as the main emission source.

Verified

Yes

Allocation method

Allocation based on the market value of products purchased

Market value or quantity of goods/services supplied to the requesting member

100,345,000

Unit for market value or quantity of goods/services supplied

Currency

Please explain how you have identified the GHG source, including major limitations to this process and assumptions made

GGC conducted corporate GHG accounting, which has been verified by third party. Major sources of emissions were based on primary data collection.

Requesting member

Colgate Palmolive Company

Scope of emissions

Scope 2

Scope 2 accounting method

Market-based

Scope 3 category(ies)

Allocation level

Company wide

Allocation level detail

Emissions in metric tonnes of CO2e

3,542.7

Uncertainty (±%)

5

Major sources of emissions

Scope 2 Electricity purchased from Thai grid and direct PPA is partially fossil-based. Steam generation from our supplier is based on fossil fuel.

Verified

Yes

Allocation method

Allocation based on the market value of products purchased

Market value or quantity of goods/services supplied to the requesting member

100,345,000

Unit for market value or quantity of goods/services supplied

Currency

Please explain how you have identified the GHG source, including major limitations to this process and assumptions made

GGC conducted corporate GHG accounting, which has been verified by third party. Major sources of emissions were based on primary data collection

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Requesting member

Colgate Palmolive Company

Scope of emissions

Scope 3

Scope 2 accounting method

Scope 3 category(ies)

Category 1: Purchased goods and services
Category 3: Fuel-and-energy-related activities (not included in Scopes 1 or 2)
Category 4: Upstream transportation and distribution
Category 5: Waste generated in operations
Category 6: Business travel
Category 7: Employee commuting
Category 9: Downstream transportation and distribution

Allocation level

Company wide

Allocation level detail

Emissions in metric tonnes of CO2e

76,486.78

Uncertainty (±%)

5

Major sources of emissions

GGC emitted and reported scope 3 emission from purchased goods and services, energy transmission loss only in in fuel-and-energy-related activities (not included in Scope 1 or 2), upstream transportation, waste generation from operation, business

travel, employee commuting and downstream transportation. In 2022, GGC has verified the scope 3 GHG emission on energy transmission loss only in in fuel-and-energy-related activities (not included in Scope 1 or 2) only.

Verified

Yes

Allocation method

Allocation based on the market value of products purchased

Market value or quantity of goods/services supplied to the requesting member

100,345,000

Unit for market value or quantity of goods/services supplied

Currency

Please explain how you have identified the GHG source, including major limitations to this process and assumptions made

GGC emitted and reported scope 3 emission from purchased goods and services, energy transmission loss only in in fuel-and-energy-related activities (not included in Scope 1 or 2), upstream transportation, waste generation from operation, business travel, employee commuting and downstream transportation. In 2022, GGC has verified the scope 3 GHG emission on energy transmission loss only in in fuel-and-energy-related activities (not included in Scope 1 or 2) only.

SC1.2

(SC1.2) Where published information has been used in completing SC1.1, please provide a reference(s).

GGC total revenue is disclosed in Annual Report 2022 PDF page 6
https://www.ggcplc.com/en/document/viewer/65710/form-56-1-one-report-2022
The verification for GHG Scope 1, 2, 3 can be found in Integrated Sustainability Report PDF P. 171-176
https://www.ggcplc.com/storage/document/sustainability-report/2022/integrated-sustainability-report-2022.pdf

SC1.3

(SC1.3) What are the challenges in allocating emissions to different customers, and what would help you to overcome these challenges?

Allocation challenges	Please explain what would help you overcome these challenges
We face no challenges	-

SC1.4

(SC1.4) Do you plan to develop your capabilities to allocate emissions to your customers in the future?

Yes

SC1.4a

(SC1.4a) Describe how you plan to develop your capabilities.

Apart from allocating the emission to our customers based on revenue, GGC plans to allocate emissions based on the mass of specific products sold to customers in the future. GGC also aims to progress on expanding the quantification of scope 3 GHG emissions in other categories in order to reflect the complete emission profile across our value chain. This will be used to inform our engagement strategy to lower GHG emission across our value chain and align our emission reduction activities with Net Zero Target as suggested by Science-Based Target Initiative.

SC2.1

(SC2.1) Please propose any mutually beneficial climate-related projects you could collaborate on with specific CDP Supply Chain members.

Requesting member

Colgate Palmolive Company

Group type of project

Other, please specify

Education/information sharing

Type of project

Other, please specify

Run an engagement campaign to educate customers about the climate change impacts of (using) your products, goods, and/or services

Emissions targeted

Actions that would reduce both our own and our customers' emissions

Estimated timeframe for carbon reductions to be realized

Other, please specify

To be determined as we are still at the beginning of engagement process. The result from information sharing could lead to future cross-value chain initiatives that reduces both our operational emission, customer emission and upstream emission

Estimated lifetime CO2e savings

0

Estimated payback

Other, please specify

To be determined as we are still at the beginning of engagement process. The result from information sharing could lead to future cross-value chain initiatives that reduces both our operational emission, customer emission and upstream emission.

Details of proposal

GGC keeps track of environmental indicators i.e. GHG emissions, energy consumption, water usage and waste disposal and report through the sustainability report annually. We also share in-depth environmental data with interested customers (mostly home care and personal care products) to enable environmental reporting and product improvement. For example, we engages annually with Colgate-Palmolive Company on GHG data sharing. The customers under this scope of engagement are estimated to account for the majority of scope 3: processing of sold products of GGC.

The engagement between GGC and Colgate trigger GGC to do more on GHG emissions and water usage measurement. GGC is aspired to share environmental information, which is useful to all partners along the value chain. In addition, due to the engagement, GGC supplied RSPO certified palm oil product as a sustainable product with No Deforestation, No Peat, and No Exploitation (NDPE) commitment to Colgate-Palmolive for supporting its sustainability strategy in 2022. It was accounted to 48,680 USD of additional revenue from RSPO sales.

SC2.2

(SC2.2) Have requests or initiatives by CDP Supply Chain members prompted your organization to take organizational-level emissions reduction initiatives?

No

SC4.1

(SC4.1) Are you providing product level data for your organization's goods or services?

Yes, I will provide data

SC4.1a

(SC4.1a) Give the overall percentage of total emissions, for all Scopes, that are covered by these products.

0.95

SC4.2a

(SC4.2a) Complete the following table for the goods/services for which you want to provide data.

Name of good/ service

Refined Glycerin

Description of good/ service

Refined glycerin a palm oil-based product derived from crude glycerin of methyl ester plant and fatty alcohol plant. The scope of carbon footprint covers the raw material sourcing and production (Cradle-to-gate)

Type of product

Intermediate

SKU (Stock Keeping Unit)

-

Total emissions in kg CO2e per unit

3.84

±% change from previous figure supplied

33

Date of previous figure supplied

July 21, 2022

Explanation of change

The production of refined glycerin has increased by 6.34% from 2021 and the total GHG emission in 2022 also increased.

Methods used to estimate lifecycle emissions

SC4.2b

(SC4.2b) Complete the following table with data for lifecycle stages of your goods and/or services.

Name of good/ service

Refined Glycerin

Please select the scope

Scope 1, 2 & 3

Please select the lifecycle stage

Cradle to gate

Emissions at the lifecycle stage in kg CO2e per unit

3.84

Is this stage under your ownership or control?

Yes

Type of data used

Secondary

Data quality

GGC conducted corporate GHG accounting and used the accounted data as a major source to calculate the GHG emission of the products within the scope of cradle-to-gate lifecycle stage. GGC is preparing to apply GHG product standard for help in assessing data quality in the near future. The process will help GGC to acknowledge the emission data quality to report to customers, and limitation for improving the data quality as well.

If you are verifying/assuring this product emission data, please tell us how

GGC realizes that verification of GHG emission from products is important to provide the accurate data for customers' GHG emission accounting. This will also be helpful for customer for setting their climate-related strategy and planning actions to achieve the targets. GGC will continue to verify GHG data for the products following the Thailand Greenhouse Gas Management Organization's Guidance on Carbon Footprint of Product (CFP) and other international standards as the first priority.

SC4.2c

(SC4.2c) Please detail emissions reduction initiatives completed or planned for this product.

Name of good/ service	Initiative ID	Description of initiative	Completed or planned	Emission reductions in kg CO2e per unit
Refined Glycerin	Initiative 1	The B100 steam saving project was implemented during the COVID-19 pandemic, which causes a decrease of demand for Methyl Ester, which refined glycerin is a by-product from Methyl Ester production process. Therefore, GGC has adjusted its processes to reduce steam and electricity consumption in the Methyl Ester (B100) purification process. As a result, GGC has reduced the use of high-pressured steam by 0.92 tons per hour and reduced electricity consumption by 28.5 kWh as well as reduced GHG emission by 1,223.72 tCO2e per year or 0.0029 tCO2e per product per year.		0

SC4.2d

(SC4.2d) Have any of the initiatives described in SC4.2c been driven by requesting CDP Supply Chain members?

No

Submit your response

In which language are you submitting your response?

English

Please confirm how your response should be handled by CDP

	I understand that my response will be shared with all requesting stakeholders	Response permission
Please select your submission options	Yes	Public

Please confirm below

I have read and accept the applicable Terms