Biodiversity in Actions

Biodiversity Commitment

Convention on Biological Diversity

The scope of GC's commitment to support biodiversity and ecosystem covers own operations and key stakeholders, including suppliers and business partners, with an emphasis to:

- Ensure the complete and effective implementation of habitat and biodiversity protection, in order to maintain the target of 'No Net Loss' (NNL).
- Encourage all new operation sites to achieve 'Net Positive Impact' (NPI) that aligned with Net Zero target in 2050.
- Commit to 'No Net Deforestation' throughout the value chain, including Tier-1 suppliers and business partners; the future reforestation to compensate, where possible, the current forest loss or future implementation, and no exploitation of people and local communities who live next to the areas that aligned with Net Zero target in 2050.
- Promise to 'No Gross Deforestation' for own operations; end all deforestation for business activities that aligned with Net Zero target in 2050.

Our actions toward the protection and improvement of biodiversity include:

- Integrate biodiversity assessment and management through our QSHEB policy.
- Conduct a biodiversity risk assessment on all GC's own operations, including key suppliers and key customers, to ensure that priority areas (the operation sites with a high degree of exposure to biodiversity and ecosystem service risks) are strictly controlled and managed.
- Apply operating practices that are required a value chain to avoid operational activities, near sites containing globally or nationally important biodiversity areas; IUCN Red list, UNESCO World Heritage areas, Ramsar wetlands, UNESCO MAB and biosphere reserve areas, and IUCN Category I-IV protected areas.
- Apply the "Mitigation Hierarchy" in a step-by-step process:
  - Avoid –avoid creating impacts on biodiversity.
  - Minimize –reduce the intensity of impact on biodiversity that is unable to avoid.
  - Restore –rehabilitate degraded ecosystem.
  - Offset –compensate for the loss of biodiversity

More information of Biodiversity Statement:
https://sustainability.pttgcgroup.com/storage/document/biodiversity/gc-biodiversity-statement-en.pdf

Biodiversity-related Definitions

Net Positive Impact (NPI): a commitment that aligned with the 'Post-2020 Global Biodiversity Framework', for outcomes in which the impacts on biodiversity across a company's value chain are stabilized in the next 10 years (by 2030) and allow for the recovery of natural ecosystems in the following 20 years with net improvements by 2050 to achieve the Convention's vision of "living in harmony with nature by 2050".

No Net Loss (NNL): the point at which project-related impacts on biodiversity are balanced by measures taken to avoid and minimize the project's impacts, to undertake on-site restoration, and finally to offset significant residual impacts, if any, on an appropriate geographic scale (e.g., local, landscape-level, national, regional). **In the case of GC, the targets to work towards NNL includes:**

- Avoidance or reduction of sourcing from areas of critical biodiversity.
- Reduce pollution from all sources to levels that are not harmful to biodiversity and ecosystem functions and human health.
- Maintain and enhance nature's contributions to the regulation of air quality, quality and quantity of water, and protection from hazards and extreme events for all people.
- Reduction of resource exploitation (e.g., water use in water-stressed areas, fisheries with stocks outside biologically sustainable levels)
- Compensation through reforestation programs/creation of protected areas or reserves.

No Gross Deforestation: zero or zero-gross deforestation which refers to voluntary commitments to stop or reduce all deforestation associated with commodities that they produce, trade, and/or sell.

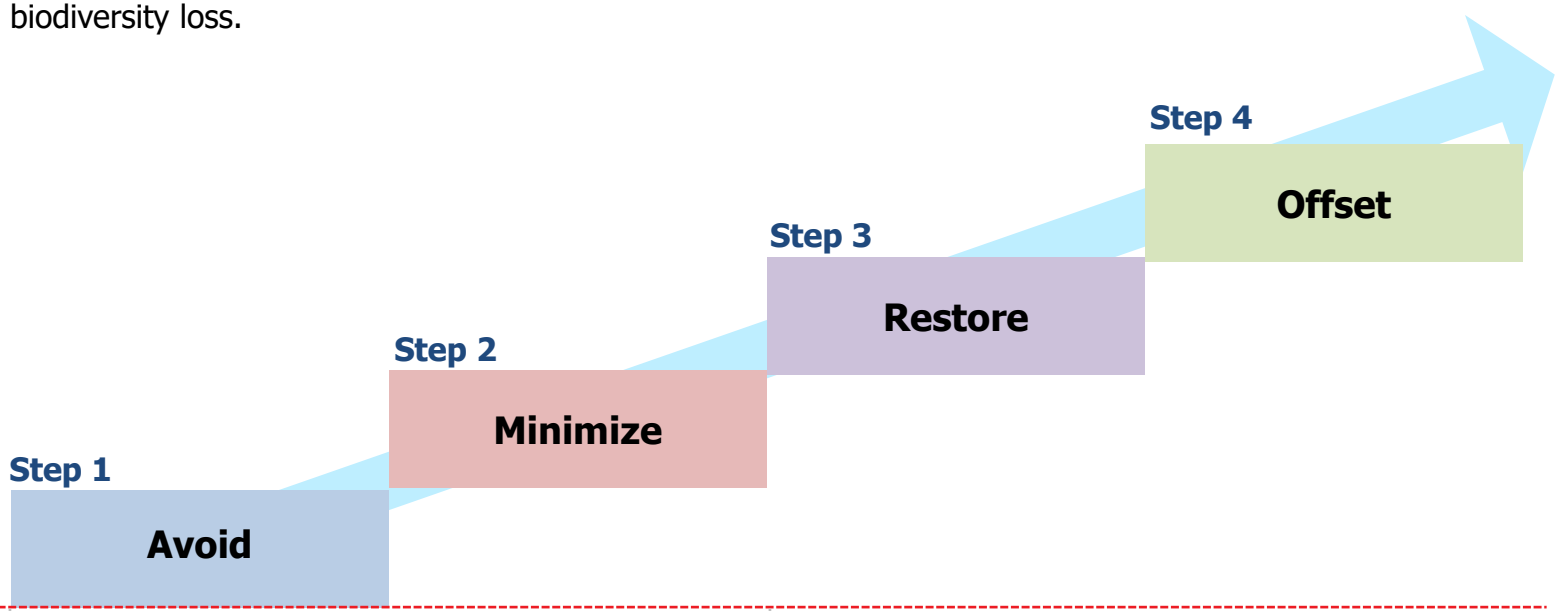
No Net Deforestation: zero-net deforestation that promises future reforestation to compensate for current forest loss, while future implementation deadlines allow for preemptive clearing.

GC strictly applies the mitigation hierarchy to minimize negative impacts on nature with a long-term outlook. This is to ensure that all implementation of biodiversity improvement will be effectively conducted that potentially leading the company toward **achieving NNL and NPI targets**.

Application of Mitigation Hierarchy

SCIENCE BASED TARGETS NETWORK
GLOBAL COMMONS ALLIANCE

Mitigation Hierarchy: the prioritized approach guides companies to first, avoid the impacts, and if not possible, limit or reduce impacts on nature, and next, hold themselves accountable for restoring areas and ecosystems adversely impacted by business operations. Additionally, the option to offset or compensate aims to compensate for any residual, adverse impacts after full implementation of the previous three steps of the mitigation hierarchy. Building on this, companies might take transformative actions that address the socio-economic systems in which organizations are embedded and currently accelerate biodiversity loss.



	Step 1 Avoid	Step 2 Minimize	Step 3 Restore	Step 4 Offset
Approaches and programs	• Promise the **commitment** to not conduct any business activities under any critical biodiversity area. • Establish group-wide policy (**QSHEB policy**) to effectively manage all waste types to not effect on ecosystem.	• Apply **eco-design**, where biodiversity-related impact is integrated, on product development. • Research and develop the **biodegradable plastics**.	• **Reforest/rehabilitate** the degraded lands. Examples of the projects included: 1) Rayong Wanarom Ecological Forest Project 2) Khao Huai Mahad Reforestation and Water Conservation Project.	• Aim to expand the boundary of company's current reforestation programs to the area that considered as critical damage in biodiversity.
More information:	GC's QSHEB Policy	GC's Product Stewardship Strategy	GC's Reforestation projects	GC's Biodiversity Programs

Biodiversity Risk Assessment: Methodology (1/2)

As biodiversity forms many aspects and foundations for all living life, businesses that have long utilized nature's resources without paying a full price for the privilege might expose the externalities of their actions. This could have brought the planet to a turning point, where the externalities continue elevated levels of dependency and impact biodiversity. To ensure that all business operations do not encounter any critical dependency and impacts of biodiversity, the biodiversity risk assessment should then be used to identify and assess the potential risks.

GC decided to utilize the WWF biodiversity risk filter (WWF BRF) to assess potential ecological dependency and impacts of the company's existing and proposed projects in the future, including any business activities involved in the operations. The BRF is designed as a corporate-level screening and prioritization tool to help companies better assess and respond to biodiversity risks and opportunities across their operations and value chains.

Overview of implementation steps to run the WWF BRF Assess Modules

Step 0: Scoping the Assessment

The WWF BRF Inform Module and Explore Modules can help focus the scope of the assessment on priority industries and geographies as recommended by TNFD and SBTN.

Step 0A: Identifying Industry Materiality	Step 0B: Exploring Biodiversity and Water Importance and Integrity
The WWF BRF Inform Module provides information about the level of dependencies on ecosystem services and impacts on biodiversity for a total of 25 industry sector.	The WWF BRF Explore Modules provide maps showing the level of risk worldwide based on a total of 33 biodiversity risk indicators and 32 water risk indicators.

Step 1: Collecting Location-specific Company and Supply Chain Data

After refining the scope of the assessment in Step 0, collect location-specific data on (portfolio) companies' operational and supply chain sites. The following input data is required to use the Assess Modules of the WWF BRF tools.

Step 2: Assessing Biodiversity-related Risks

The Assess Module combines the sites' industry materiality rating (0A) and the local biodiversity importance or integrity rating (0B) into a scape risk score for each company location. This comprises 33 biodiversity indicators from "water scarcity" to "terrestrial modification" following the BRF risk hierarch

Biodiversity Risk Filter

WWF

Remarks:

- For more information on **dependencies and impacts on biodiversity for the industry** (Step 0A), and **33 biodiversity risk indicators** (Step 0B) could be found in Appendix A of this document.

Source: WWF Biodiversity Risk Filter Methodology Documentation, January 2023

Biodiversity Risk Assessment: Methodology (2/2)

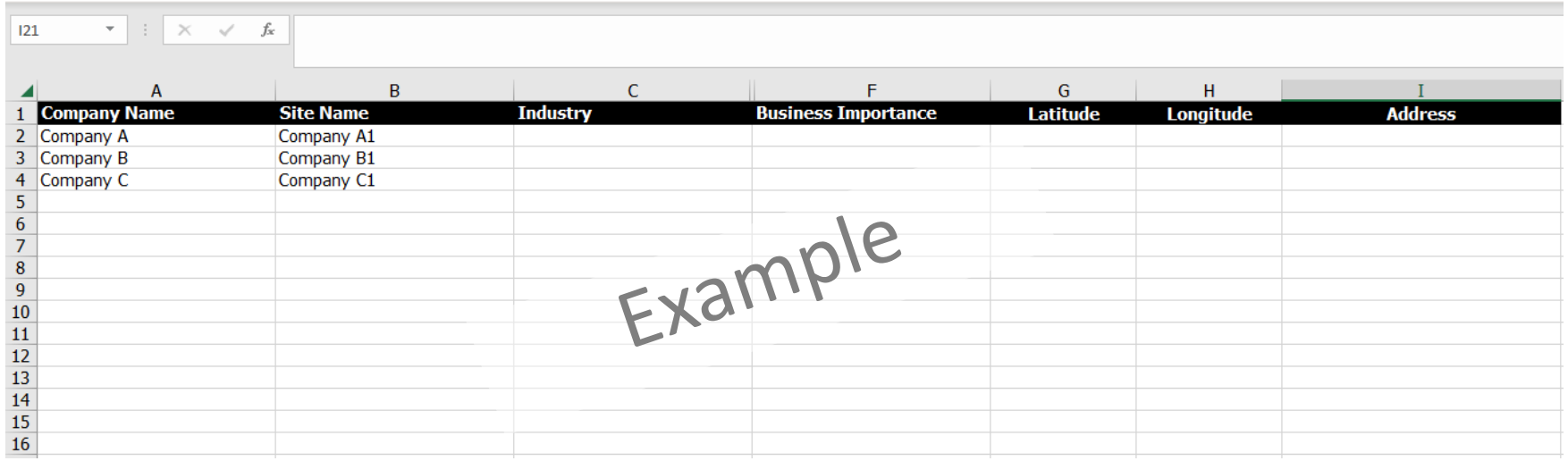
WWF BRF establishes and categorizes risk indicators into two types i.e., **Physical Risk and Reputational Risk**. Each type of risk will provide insights into the cause and impact arising from those risk indicators, including how those will influence to company and its stakeholder groups.

- **Physical Risk** is driven by the ways in which a business depends on nature and can be affected by both natural and human-induced conditions of land- and seascapes.
- **Reputational Risk** can result from a company's actual or perceived impacts on nature and people. Reputational risk represents stakeholders' and local communities' perceptions on whether companies conduct business sustainably or responsibly with respect to biodiversity, and can ultimately affect brand value and market share, among other factors. Reputational risk is influenced both by operational factors (i.e., what a company does) and scape-based factors (i.e., the conditions of the places in which those operations occur).

Source: WWF Biodiversity Risk Filter Interpretation Guidance

WWF BRF provides the template for company to collect the specific information that is necessary for biodiversity assessment of dependencies and impacts. The specific information required as inputs for assessing the dependencies and impacts is detail of all operational sites of the business group, which include company name, site name, industry sector, business importance, and location site (Latitude and Longitude).

Figure illustrated the WWF BRF template of collecting information for biodiversity assessment



Biodiversity Risk Assessment: Implementation (1/6)

GC Group utilized the **WWF biodiversity risk filter (WWF BRF)**, the WWF's biodiversity risk assessment, as a **references of methodologies to assess physical and reputational risks from biodiversity perspectives**. This is a tool for assessing the potential risks (impacts and dependencies) on biodiversity associated with a company's operations as **a location-specific approach**. The tool evaluates a range of factors based on the location of the operations, including threatened species, ecosystems, and protected areas.

1 Scoping the Assessment

- Identifying industry materiality
  - Dependencies
  - Impacts
- Identifying the company's operational sites to be assessed throughout value chain.

2 Collecting Location-specific Company and Supply Chain Data

- Specifying site's location
- Specifying industry sector
- Identifying business importance of each operational sites.

3 Assessing Biodiversity-related Risks

- Calculating scape risk (risk score per indicator)
- Calculating site-level risk (overall risk score)
- Interpreting and evaluating biodiversity risks from the WWF BRF calculation.

4 Aggregating Biodiversity Risk to the Company and Portfolio Level

- Integrating the identified biodiversity risks into multi-disciplinary company-wide risk management processes

Remarks:
The scope of biodiversity risk assessment covers own operations, adjacent areas to own operations, upstream activities, downstream activities

Biodiversity Risk Assessment: Implementation (2/6)

Biodiversity Risk Filter

WWF

1 Scoping the Assessment

This step is to identify which jurisdiction or provinces that have GC's operational sites would be included in the biodiversity risk assessment. The below table is a summary of the company name and operational sites that would be included in the assessment, as well as detail of the scope of the assessment throughout GC's value chain.

Type of Site	Location	Sites
Own operation, Subsidiaries, and Joint Ventures (41 sites)	**Rayong, Thailand (36 sites)**	• PTTGC 1 (Rayong Office) • GC 2 (OLE4) • GC 2 (OLE1& UT) • GC 3 • GC 4 • GC 5 • GC 6 • GC 7 (Jetty & BTF) • GC 8 (Aromatics Tank Farm) • GC 9 (Laboratory Service Center) • GC 11 (LD) • GC 11 (LL) • GC 11 (PE) • GC 12 • GC 13 • GC 14 • GC 15 • GCL • GCO • GCP • GCS • GC Estate • GC Glycol (EA) • GC Gylcol (EG) • GCMPTA • GGC • HMC • NPC S&E • PPCL (BPA) • PPCL (Phenol) • PTT MCC • PTTAC • PTTME • TPRC • TTT • ENVICCO
	Bangkok, Thailand (1 site)	• GC Head Office (Energy Complex)
	Chon Buri, Thailand (1 site)	• GGC (MEII)
	Minnesota, USA (1 site)	• NatureWork
	Loxstedt, Germany (1 site)	• Emery I
	Selangor, Malaysia (1 site)	• Emery II
Upstream Activities (1 site)	**Rayong, Thailand (1 site)**	• PTT GSPs
Downstream Activities (2 sites)	**Samut Prakan, Thailand (1 site)**	• Customer I
	Samut Sakhon, Thailand (1 site)	• Customer II
Adjacent Area (0 site)	**-**	• -

GC

Biodiversity Risk Assessment: Implementation (3/6)

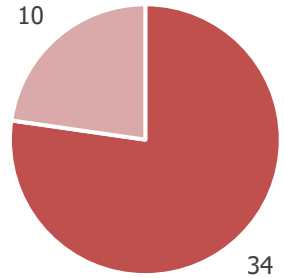
2 Collecting location-specific company and supply chain data

In this step, GC has identified the geographic location of the assessed site in terms of the coordinates (Latitude/Longitude) on the map, including the industry sector and levels of business importance of each site has also been specified as well. In the assessment, we classify our own operational site, suppliers (upstream), customers (downstream), and the representative adjacent area (if any). The criteria for evaluating the business importance level will be classified by the following:

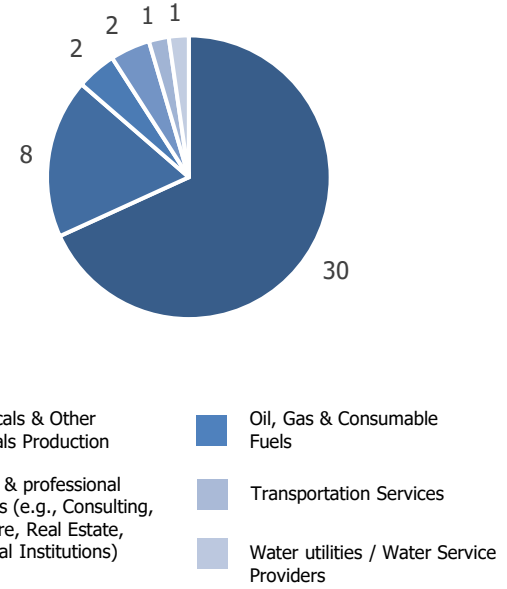
Criteria for classifying different levels of business importance of own operational sites:

- High business importance level
  - Revenue-generating companies
  - Equal to or more than 75% of share holding
- Medium business importance level
  - Revenue-generating companies
  - Equal to or more than 50% of share holding
- Low business importance level
  - Non-revenue-generating companies
  - Equal to or less than 50% of share holding

Number Sites Breakdown by Business Importance



Number Sites Breakdown by Industry Sector

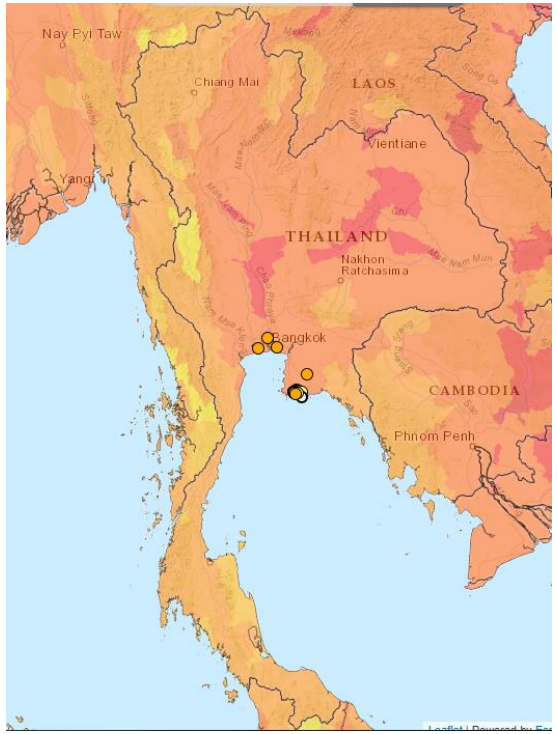


Biodiversity Risk Assessment: Implementation (4/6)

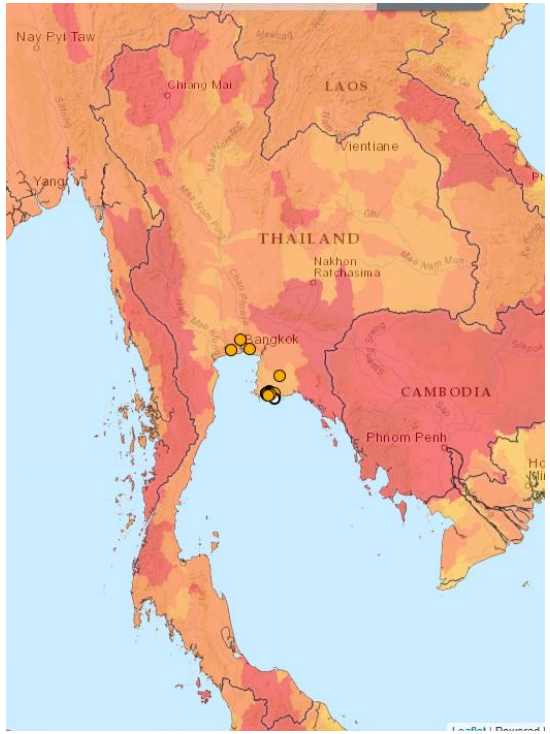
3 Assessing Biodiversity-related Risks

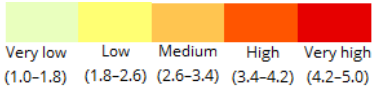
According to the result of the biodiversity-related risk assessment, it would be interpreted that most of the operational sites within GC's business value chain have risk potentials as either medium or low levels. Additionally, there is no operational site that is assessed as a very high-risk level. However, there are only three sites considered high-risk level, which all of them are located within Thailand.

Scape Physical Risk



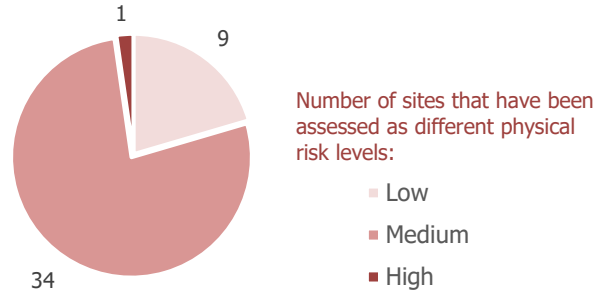
Scape Reputational Risk



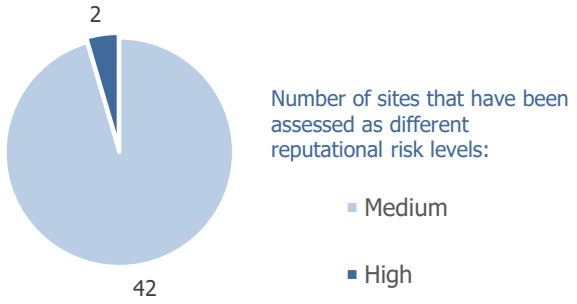


WWF Biodiversity Risk Filter levels

Scape Physical Risk

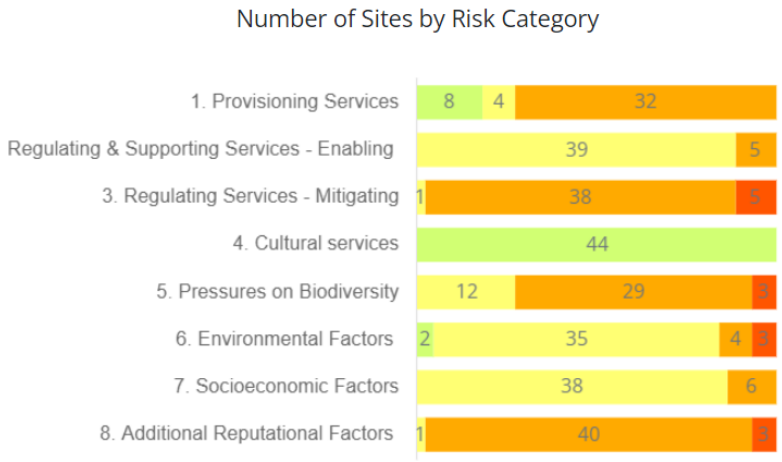


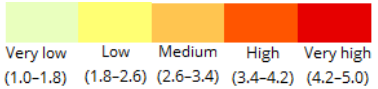
Scape Reputational Risk



Biodiversity Risk Assessment: Implementation (5/6)

3 Assessing Biodiversity-related Risks





WWF Biodiversity Risk Filter levels

The infographic shows the number of operational sites throughout GC's value chain that have been assessed for biodiversity risk. The summary of the risk types that either of the majority of GC's sites encountered above medium risk level or have at least one site has been assessed as High or Very High levels will be described as follows:

Physical risk

Item 1. Provisioning Services

- Background: Many industries or companies rely directly on the provisioning of natural inputs for their operations or production. As such, declines in the quantity or quality of direct inputs for feed, raw materials, genetic materials, etc., can result in an increased cost or disruption of production.
- Included Risks: freshwater, timber, wild flora, and fauna species as well as marine fish

Item 3. Regulating Services - Mitigating

- Background: The occurrence of natural hazards can disturb or disrupt projects, operations, or entire value chains, and can in some cases result in severe damage to or loss of assets. Intact ecosystems can help to mitigate the impact of some natural hazards.
- Included Risks: landslides, wildfire hazard, plant/forest/aquatic pests and diseases, herbicide resistance, and extreme heat.

Item 5. Pressures on Biodiversity

- Background: Direct drivers or pressures are drivers that unequivocally influence biodiversity and ecosystem processes. Areas with high pressures on biodiversity are likely to decline in the future, independent of whether the current status of biodiversity is intact or already compromised.
- Included Risks: land, freshwater, and sea use change; tree cover loss; invasives and pollution

Reputational risk

Item 6. Environmental Factors

- Background: Reputational risk can be driven by negative impacts on local environmental assets and the local prevalence of biodiversity-related issues.
- Included Risks: 1) Protected and Conserved Areas, 2) Key Biodiversity Areas, 3) Other Important Delineated Areas 4) Ecosystem Condition, 5) Range Rarity.

Item 8. Additional Reputation Factors

- Background: Reputational risk can be driven by the actual or perceived importance or value of ecological assets and socioeconomic conditions and can be aggravated further by the level of public scrutiny on businesses operating in a given geography.
- Included Risks: 1) Media Scrutiny, 2) Political Situation, 3) Sites of International Interest 4) Risk Preparation.

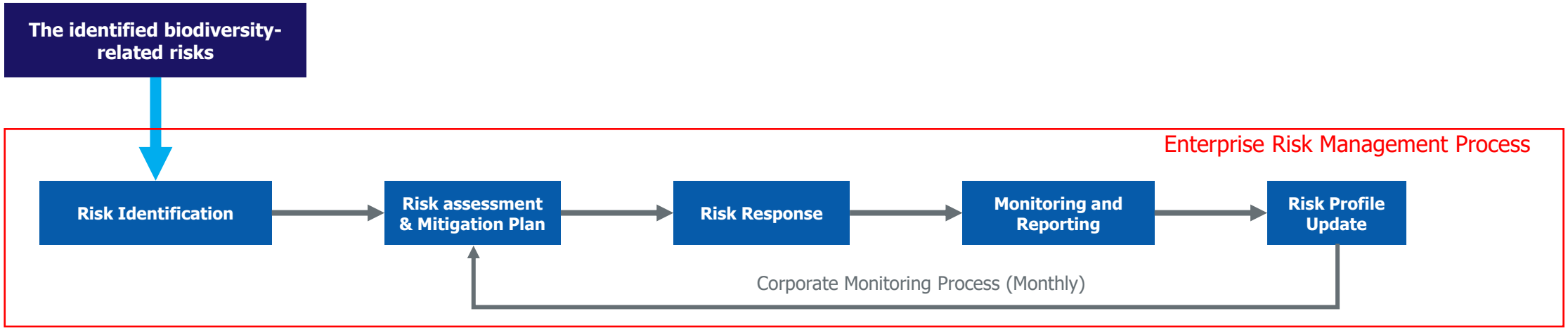
For more information: WWF Biodiversity Risk Filter – Interpretation Guidance

Biodiversity Risk Assessment: Implementation (6/6)

4 Aggregating Biodiversity Risk to the Company and Portfolio Level

The biodiversity-related risks identified as presented in step 3 (assessing biodiversity-related risks) will be integrated into the company's multi-disciplinary company-wide risk management processes that are comprised of many other risk indicators e.g., revenue generation and production capacity, etc. This integration was developed to ensure that GC considers all the possible risks and is capable of effectively managing and controlling the business operations in a way that the risks have been minimized, which favors financial performance and satisfies the sustainability strategy.

GC multi-disciplinary company-wide risk management processes



For more information of GC's ERM: Risk Management | PTT Global Chemical (pttgcgroup.com)

Appendix A

Examples of Biodiversity Risk Importance on Each Industry (Step 0A)

Table 7: Industry materiality matrix (industry-specific weightings)

Industry Sectors

Biodiversity Risk Indicators

	BRF Indicators	Impact/ Dependency	Agriculture (animal products)	Agriculture (plant products)	Appliances & General Goods Manufacturing	Automotive, Electrical Equipment & Machinery Production	Chemicals & Other Materials Production	Construction Materials	Electric Energy Production - Combustion (Biomass, Coal, Gas, Nuclear, Oil), Geothermal Energy	Electric Energy Production – Hydropower	Electric Energy Production - Solar, Wind	Electronics & Semiconductor Manufacturing	Fishing and aquaculture
Physical Risk													
1.1	**Water Scarcity**	Dependency	5	5	4	4	4	5	5	5	3	4	5
1.2	**Forest Productivity and Distance to Markets**	Dependency	0	0	0	0	0	4	4	0	0	0	0
1.3	**Limited Wild Flora & Fauna Availability**	Dependency	1	1	0	3	1	1	0	0	0	0	3
1.4	**Limited Marine Fish Availability**	Dependency	0	0	0	0	0	0	0	0	0	0	5
5.1	**Land, Freshwater and Sea Use Change**	Impact	5	5	1	1	1	1	1	5	3	1	5
5.2	**Tree Cover Loss**	Impact	5	5	1	1	1	5	4	4	1	1	1
5.3	**Invasives**	Impact	3	3	0	0	0	2	0	2	0	0	3
5.4	**Pollution**	Impact	5	5	5	5	5	5	5	4	4	5	5

The 33 biodiversity risk indicators (Step 0B) identified by WWF BRF.

1. Water Scarcity
2. Forest Productivity and Distance to Markets
3. Limited wild flora & Fauna Availability
4. Limited Marine Fish Availability
5. Soil Condition
6. Water Condition
7. Air Condition
8. Ecosystem Condition
9. Pollination
10. Landslides
11. Wildfire Hazard
12. Plant/Forest/Aquatic Pests and Diseases
13. Herbicide Resistance
14. Extreme Heat
15. Tropical Cyclones
16. Tourism Attractiveness
17. Land, Freshwater and Sea Use Change
18. Tree Cover Loss
19. Invasives
20. Pollution
21. Protected/Conserved Areas
22. Key Biodiversity Areas
23. Other Important Delineated Areas
24. Ecosystem Condition
25. Range Rarity
26. Indigenous Peoples (IPs); Local Communities (LCs) Lands and Territories
27. Resource Scarcity: Food – water – Air
28. Labor/ Human Rights
29. Financial Inequality
30. Media Scrutiny
31. Political Situation
32. Sites of International Interest
33. Risk Preparation

Source: WWF Biodiversity Risk Filter Methodology Documentation, January 2023