
GREEN SKY
SUSTAINABILITY
Meaningful Sustainability Solutions

# Example TCFD Risks

| | Physical risk | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 ~ Low risk** | **Acute** | **Chronic or Slow Onset** | | | | | | | | | **Average** | **Max** | **Min** |
| **5 ~ High risk** | Increased severity of extreme events | Changes in precipitation patterns | Changes in temperature ranges and timing | Changes in wind patterns, direction and intensity | Changes in the jet stream and "stuck" weather patterns | Rising sea levels (from all causes) | Ocean acidification | Ocean warming | Deoxygenation and stratification | Melting arctic (less sea ice) | | | |
| LNG facility example | | | | | | | | | | | | | |
| Organization | 3 | 1 | 2 | 1 | 2 | 3 | 0 | 0 | 0 | 0 | 1.2 | 3 | 0 |
| Suppliers of raw materials - upstream gas producers - wells; gas plants, compressor stations & their service providers | 3 | 3 | 3 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 1.5 | 3 | 0 |
| Suppliers of energy - electricity | 3 | 4 | 3 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 1.4 | 4 | 0 |
| Suppliers of transportation from gas producers in collector pipelines | 2 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0.8 | 2 | 0 |
| Suppliers of transportation - shipping gas to LNG facility | 2 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0.8 | 2 | 0 |
| Suppliers of transportation from - LNG ships | 3 | 1 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | -1 | 1.1 | 3 | -1 |
| LNG terminals in markets | 3 | 1 | 3 | 1 | 1 | 3 | 0 | 0 | 0 | 0 | 1.2 | 3 | 0 |
| Customers use of products - asian users of LNG - japan, S korea, china | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2.5 | 3 | 2 |
| | | | | | | | | | | Average | 1.3 | 2.9 | 0.1 |
| | | | | | | | | | | Max | 2.5 | 4 | 2 |
| | | | | | | | | | | Min | 0.8 | 2 | -1 |

"1" refers to lower risk, "5" refers to higher risk

More or different columns can be added/removed to better reflect the applicable hazards

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# Example TCFD Risks Comments

| | Physical risk | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Acute | Chronic or Slow Onset | | | | | | | | |
| | Increased severity of extreme events | Changes in precipitation patterns | Changes in temperature ranges and timing | Changes in wind patterns, direction and intensity | Changes in the jet stream and "stuck" weather patterns | Rising sea levels (from all causes) | Ocean acidification | Ocean warming | Deoxygenation and stratification | Melting arctic (less sea ice) |
| LNG facility example | | | | | | | | | | |
| Organization | Could impact operations | Minor impact | Could impact storage tanks and cooling needed | Minor impact | Could impact operations on occasion | Yes depending on where it is built | No direct impact known | No direct impact known | No direct impact known | No direct impact known |
| Suppliers of raw materials - upstream gas producers - wells; gas plants, compressor stations & their service providers | Could impact operations | Could impact operations | Could impact operations | Could impact operations | Could impact operations | No direct impact known | No direct impact known | No direct impact known | No direct impact known | No direct impact known |
| Suppliers of energy - electricity | Could impact operations | Could impact generation capacity | Could impact operations | Could impact operations on occasion | Could impact operations on occasion | No direct impact known | No direct impact known | No direct impact known | No direct impact known | No direct impact known |
| Suppliers of transportation from gas producers in collector pipelines | Could impact operations on occasion | Could impact operations on occasion | Could impact operations on occasion | Minor impact | Minor impact | No direct impact known | No direct impact known | No direct impact known | No direct impact known | No direct impact known |
| Suppliers of transportation - shipping gas to LNG facility | Could impact operations on occasion | Could impact operations on occasion | Could impact operations on occasion | Minor impact | Minor impact | No direct impact known | No direct impact known | No direct impact known | No direct impact known | No direct impact known |
| Suppliers of transportation from - LNG ships | Could impact operations | Minor impact | Could impact operations on occasion | Could impact operations on occasion | Could impact operations on occasion | Could impact operations on occasion | No direct impact known | No direct impact known | No direct impact known | Could be a benefit |
| LNG terminals in markets | Could impact operations | Minor impact | Minor impact | Minor impact | Minor impact | Could impact operations on occasion | No direct impact known | No direct impact known | No direct impact known | No direct impact known |
| Customers use of products - asian users of LNG - Japan, S Korea, China | Could impact operations | Could impact operations | Could impact operations | Could impact operations | Could impact operations | Could impact operations on occasion | Could impact operations on occasion | Could impact operations on occasion | Could impact operations on occasion | Could impact operations on occasion |

More or different columns can be added/removed to better reflect the applicable hazards

# Description

| # | Description |
|---|---|
| 1 | This tool is based on the TCFD final report, Mostly table 1. It mainly illustrates the process and is meant to be flexible. It can be easily changed. The focus might be on both risk and opportunities categories or just one of these. |
| 2 | It is intended to assist anyone wishing to understand the physical climate change risks of the organization, including a financier (i.e. financial institution or lender) to understand and qualify physical risk of an organization they wish to invest in or lend money to |
| 3 | The main risk work is accomplished in the TCFD physical risk tab. The user would work through each cell. Ideally a team would conduct each risk / opportunity assessment. |
| 4 | The categories on the horizontal axis at the top are only examples. The user might wish to modify existing columns, insert additional columns or remove non-applicable columns. |
| 5 | On the vertical axis is a breakdown of a manufacturing organization and its value chain (suppliers and customers). Additional rows can be added or removed to change the granularity. |
| 6 | The risk assessment process would proceed as follows: the team conducting the risk assessment would begin at the top row and the first hazard category. The question to be asked in each case is "how would that part of the organization be affected by the particular hazard. The user can add a description, a rationale as to how they came to their conclusion and might also include a risk ranking - like low, moderate or high. 1-3, 1-5, 1-7 etc. are also possible. Perhaps the rating scales should match the way the investor or financial institution will sub-divide their investment or lending opportunities. numbers have the advantage of being able to be summed with Excel macros. |
| 7 | After the first or second attempt, it is estimated that the users can assess the risk of a typical organization in a day or so. A team might become quite skillful at assessing the risk of similar organizations and further reduce the time required and the quality of the risk assessment. |
| 8 | This process can easily be written up into a standard or part of one. A standardized process - while maybe not the best way for each organization - still allows for comparison and learning lessons. The matrix could be further refined with experience into the most likely risks and opportunities - perhaps by sector. maybe the tool could be reviewed and revised periodically and released as version 1, 2, 3 etc. |
| 9 | This process also has the benefit of closely following the TCFD recommendations which will facilitate common forms of disclosure. One change was that 2 categories of slow onset change have been added to the physical risk tab - 1) changes in temperature patterns and timing 2) changes in wind patterns, direction and intensity; 3) changes in the jet stream and "stuck" weather patterns; 4) ocean acidification; 5) ocean warming; 6) deoxygenation and stratification of oceans; and 7) melting arctic |
| 10 | An example case study is provided to illustrate the use of the tool. In this case it is a real project - LNG Canada - to provide LNG from BC's NE gas fields via pipeline to the west coast (Kitimat) and then via LNG tankers to Asian ports in S Korea, Japan and China. The case study is based on pubically available information and Green Sky Sustainability's insights from working in the oil & gas industry in NE BC and BC's and global climate change for over 10 years. Normally, such a case study would be conducted by a team of at least 2-3 with as much information about the company, its up and downstream value chain and transitional risk considerations. With information readily available and some experience with the tool, such a team could do tis exercise in about one day. |
| 11 | The case study is presented with two tabs for the risk - one tab for the risk values and one to describe the rationale behind assigning a value. This is a qualitative assessment based on expert opinions/judgment. |
| 12 | The next step is to assign a team to re-test the same scenario and compare results with what Green Sky Sustainability came up with. Next assign a team to test it out on other investment/lending opportunities. Perhaps some adjustments on the process will be decided? |
| 13 | Green Sky Sustainability will maintain ownership of the current version of the tool. It will also maintain the right to convert this into an app or other application. In this current version, Green Sky Sustainability freely offers this tool for use in any ISO standards. Green Sky Sustainability is also willing to consider applications by other governmental or institutional users if requested with recognition of its origin. |

# Flow Chart

Describe organization and value chain as system elements of the system at risk - list on y-axis

| |
|---|
| Supply |
| Manufacturing |
| Shipping |
| Warehousing |

List generic climate hazards (Temperature, Precipitation, wind - chronic, acute, variable), others like Sea Level Rise, Ocean Acidification - list of x-axis

| | Increased temperature | | | Increased precipitation | | |
|---|---|---|---|---|---|---|
| | Chronic | Acute | Variable | Chronic | Acute | Variable |
| Supply | | | | | | |
| Manufacturing | | | | | | |
| Shipping | | | | | | |
| Warehousing | | | | | | |

| | Increased temperature | Increased precipitation | Decreased precipitation | Increased wind | Decreased wind |
|---|---|---|---|---|---|
| Supply | | | | | |
| Manufacturing | | | | | |
| Shipping | | | | | |
| Warehousing | | | | | |

In Matrix, screen for Exposure in next row (Yes or No)

| **Exposed** | Increased temperature | Increased precipitation | Decreased precipitation | Increased wind | Decreased wind |
|---|---|---|---|---|---|
| Supply | Y | Y | Y | Y | Y |
| Manufacturing | Y | Y | Y | Y | Y |
| Shipping | Y | Y | Y | Y | Y |
| Warehousing | N | N | N | N | N |

E.g., offshore warehouse

In Matrix, screen for Sensitivity in next row (Yes or No)

| **Sensitive** | Increased temperature | Increased precipitation | Decreased precipitation | Increased wind | Decreased wind |
|---|---|---|---|---|---|
| Supply | Y | Y | Y | Y | N |
| Manufacturing | Y | N | Y | N | N |
| Shipping | N | Y | N | Y | N |
| Warehousing | | | | | |

In Matrix, combine exposed and sensitive (i.e..), both Yes)

| **Vulnerable** | Increased temperature | Increased precipitation | Decreased precipitation | Increased wind | Decreased wind |
|---|---|---|---|---|---|
| Supply | Y | Y | Y | Y | N |
| Manufacturing | Y | N | Y | N | N |
| Shipping | N | Y | N | Y | N |
| Warehousing | | | | | |

In Matrix, describe applicable potential climate impacts (wildfire, erosions, drought, floods, extreme heat, etc.)

| **Impact** | Increased temperature | Increased precipitation | Decreased precipitation | Increased wind | Decreased wind |
|---|---|---|---|---|---|
| Supply | Drought | Flood | Fire | Fire | |
| Manufacturing | AC load | | Water shortage | | |
| Shipping | | Road hazards | | Road hazards | |
| Warehousing | | | | | |

In Matrix, team makes judgment on consequence of impact on system element at risk

| **Consequence** | Increased temperature | Increased precipitation | Decreased precipitation | Increased wind | Decreased wind |
|---|---|---|---|---|---|
| Supply | Low | High | High | Moderate | |
| Manufacturing | Low | | Moderate | | |
| Shipping | | Low | | Moderate | |
| Warehousing | | | | | |

In Matrix, team makes judgment on likelihood of impact on system element at risk

| **Likelihood** | Increased temperature | Increased precipitation | Decreased precipitation | Increased wind | Decreased wind |
|---|---|---|---|---|---|
| Supply | High | Moderate | Moderate | Moderate | |
| Manufacturing | High | | Moderate | | |
| Shipping | | Moderate | | Moderate | |
| Warehousing | | | | | |

In Matrix, team makes judgment on risk of impact on system element at risk (no adaptive capacity)

| **Risk** | Increased temperature | Increased precipitation | Decreased precipitation | Increased wind | Decreased wind |
|---|---|---|---|---|---|
| Supply | 1 | 5 | 5 | 3 | |
| Manufacturing | 1 | | 3 | | |
| Shipping | | 1 | | 3 | |
| Warehousing | | | | | |

*All tables presented are intended solely as illustrative examples.*

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