S&P Global
Market Intelligence

Trucost Climate Change Physical Risk Data

Methodology Guide

Climate and Impact Analytics

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Document Overview

What You Will Find in This User Guide

The purpose of this document is to provide a description of the methods by which Trucost Climate Change Physical Risk Data ("Trucost Physical Risk data") is collected, standardized, and calculated.

Supporting Documentation

There are several supporting documents specific to Trucost Physical Risk data on the Support Center website:

- *Trucost Climate Change Physical Risk Data - Xpressfeed™ User Guide* – This user guide provides an overview of Trucost Physical Risk data through Xpressfeed, including the data structure of the packages, database schema, specific details about working with the data, and a common way of querying Trucost data with SQL examples.
- *Trucost Climate Change Physical Risk Data Item List* – This spreadsheet provides table names by package and dataItemIds/data item names/data item definitions that exist in each table.
- *S&P Capital IQ Base Files User Guide* – The Base Files associate companies, symbols, securities, and other objects across all S&P Capital IQ data sets. This guide describes the data structure of the Base Files as well as integration of the Base Files with other S&P Capital IQ data sets.
- *Xpressfeed Loader User Guide* – This user guide outlines the features and capabilities of the Xpressfeed Loader. The Xpressfeed Loader generates a database schema and structure and loads the data records as a set of fully indexed tables. The Loader automates the daily updates of records and keeps your database up to date.
- *Xpressfeed File Delivery Technical Guide* – This guide provides information for clients who download S&P Global Market Intelligence data files directly from our server and write their own loading procedures.
- *File Format Spreadsheets* – These spreadsheets contain full and change file zip file prefixes, individual text file names, and information for each column in the file (e.g., column names, column data types, whether the column is nullable, and primary keys).
- *Xpressfeed EDX FTP File Delivery Schedule* – This spreadsheet provides expected full and change file delivery times as well as the length of time the files remain on the server.

- *SNL Reference Data User Guide* – This user guide provides the schema for the SNL Reference package and detailed descriptions of all tables and fields; information on how to link SNL Reference data to S&P Capital IQ data sets or to Compustat data using the Company Cross Reference File; and common ways of querying SNL Reference data and SQL examples.

If you are linking to other S&P Global Market Intelligence data sets, supporting documents are available on the Support Center website.

Data Collection

Trucost Climate Change Physical Risk Methodology

In the initial release, the Trucost[1] Climate Change Physical Risk methodology ("Trucost Physical Risk methodology") generates a company-level score reflecting a company's exposure to climate hazards. Asset-level scores will be available in a subsequent release.

The Trucost Climate Change Physical Risk Data ("Trucost Physical Risk data"), together with Trucost Physical Risk methodology, enable investors, companies, and governments to weigh risk of company's assets from physical impacts of climate change.

Key features

- Developed with input from experts in the investment, business, and scientific communities.
- Robust and science-based climate change physical hazard characterization approach, drawing on public, private and Trucost-owned datasets.
- Coverage of seven key climate change physical risks
- Coverage of three climate change scenarios and three time periods
- Analysis based on proprietary S&P Market Intelligence, S&P Platts, and Trucost assembled data sets, linking over 500,000 assets to over 15,000 companies in the Trucost CorePlus Universe.[2]
- Physical risk estimation for companies where asset-level information is unavailable.

Data

Climate Change Physical Risk Indicators

The Trucost Physical Risk methodology delivers physical risk scores that reflect the expected sensitivity of each company to seven key climate hazards, based on company-specific data coverage.

[1] Trucost is part of the S&P Global family, operated by S&P Market Intelligence. Trucost assesses and prices risks relating to climate change, natural resource constraints, and broader ESG factors.

[2] Trucost's *Core Plus* universe (which includes its *Core* universe) consists of companies in the S&P Broad Market Index (BMI) (approximately 11,500 large-, mid-, small- and micro-cap companies); S&P China A SmallCap 300 Index; S&P 500 Index; S&P Global 1200 Index; S&P/TOPIX 150 Index; S&P/TSX Composite Index; S&P/ASX 200 Index; S&P/ASX 300 Index; and other large listed companies added per client request (approximately 1,500 companies). An additional universe—*Cemetery*—consists of approximately 1,000 delisted or 'dead' companies.

- Water Stress
- Heatwave
- Coldwave
- Hurricane
- River Flood
- Coastal Flood
- Wildfire

The analysis metric, definition, geographic coverage, spatial resolution, and data sources for each physical risk indicator are presented below:

Climate Hazard Indicator	Analysis Metric	Indicator Definition	Geographic Coverage	Spatial Resolution	Data Sources
Water Stress	Water Stress Index	Projected future ratio of water withdrawals to total renewable water supply in a given area.	Global	River Basin	WRI Aqueduct Trucost Analysis
River Flood	River Flood Risk	Indicator of flood risk exposure within a river basin.	Global	River Basin (soon to be upgraded to 30x30m)	WRI Aqueduct Trucost Analysis
Heatwave	Heatwave Days	The occurrence of periods of extreme heat relative to local climatic conditions, measured based on the Excess Heat Factor.	Global	100x100km to 200x200km	CMIP5 multi-model average Trucost Analysis
Coldwave	Coldwave Days	The occurrence of extreme cold relative to local climatic conditions, measured based on the Excess Cold Factor.	Global	100x100km to 200x200km	CMIP5 multi-model average Trucost Analysis
Hurricane	Hurricane Index	Composite index representing the historical incidence and severity / strength of hurricane, typhoon or cyclone activity at a given location, weighted in favor of recent events.	Global	Approximately 10x10km	NOAA Trucost Analysis
Wildfire	Burnt Area	Risk of wildfire occurrence by location based modelled area of burnt vegetation.	Global	100x100km to 200x200km	CMIP5 multi-model average Trucost Analysis
Coastal Flood	Coastal Flood Risk	Indicator of coastal risk exposure within a river basin.	Global	River Basin (Soon to be updated to Sea Level Rise data at approx. 5x5m (USA) / approx. 30x30m (Rest of World) resolution)	WRI Aqueduct Trucost Analysis

Climate Change Scenarios

The analysis includes three future climate change scenarios, based on IPCC[3] Representative Concentration Pathways (RCPs) [4] and informed by the TCFD technical guidelines (June 2017):[5]

High Climate Change Scenario (RCP 8.5): Continuation of business as usual with emissions at current rates. This scenario is expected to result in warming in excess of 4 degrees Celsius by 2100.

Moderate Climate Change Scenario (RCP 4.5): Strong mitigation actions to reduce emissions to half of current levels by 2080. This scenario is more likely than not to result in warming in excess of 2 degrees Celsius by 2100.

Low Climate Change Scenario (RCP 2.6): Aggressive mitigation actions to halve emissions by 2050. This scenario is likely to result in warming of less than 2 degree Celsius by 2100.

Climate Change Future Time Periods

Physical risks are evaluated in three future time periods[6]:

Short-term: 2020 (baseline)

Medium-term: 2030

Long-term: 2050 (subject to data availability)

The scenario and time period availability for each indicator are presented below:

Indicator	Low Scenario (RCP 2.6)			Moderate Scenario (RCP4.5)			High Scenario (RCP 8.5)			Static (No Scenario)	Notes
	Base	2030	2050	Base	2030	2050	Base	2030	2050	Historical	
Water Stress											Base year represents 2020. 2040 data used to represent 2050.
River Flood											Historical risk only.
Heatwave											Base year represents average 2010 - 2020.
Coldwave											Base year represents average 2010 - 2020.
Hurricane											Historical risk only.
Wildfire											Base year represents average 2010 - 2020.
Coastal Flood											Base year represents 2020.

Data available. Data not currently available.

[3] The Intergovernmental Panel on Climate Change Reports (IPCC) is the United Nations body for assessing the science related to climate change.
[4] RCPs were adopted by the IPCC for climate modeling, to describe different climate futures and research.
[5] Taskforce for Climate Financials Disclosures (TCFD), an organization formed by the Financial Stability Board (FSB), charged with considering "the physical, liability and transition risks associated with climate change and what constitutes effective financial disclosure across industries." For the recommendations of the TCFD on climate-related financial disclosures, click here.
[6] These estimates are in line with recommendations by TCFD).

CMIP5 Climate Models

Trucost uses climate variables (outputs of the CMIP5 climate change models) to calculate climate physical risk indicators. The data for climate variables used to calculate climate hazard indicators is sourced from general circulation models (GCMs) from the CMIP5[7] project. Trucost selected seven[8] models based on coverage of the three RCP scenarios, relevant variables, and demonstrated applications in prior research studies.

Trucost Physical Risk Analytics: CMIP5 GCMs used for climate indicator calculations

The attributes of the selected models for each indicator are presented below:

Model	Institution	Resolution (degrees)	Climate Hazard Indicator
GFDL-ESM2M	NOAA Geophysical Fluid Dynamics Laboratory	2 x 2.5°	Heatwave/Coldwave Water Stress
HadGEM-ES	Met Office Hadley Centre (additional HadGEM2-ES realizations contributed by Instituto Nacional de Pesquisas Espaciais)	1.25 x 1.9°	Heatwave/Coldwave
IPSL-CM5A-LR	Institut Pierre-Simon Laplace	1.9 x 3.75°	Heatwave/Coldwave
MPI-ESM-LR	Max-Planck-Institut für Meteorologie (Max Planck Institute for Meteorology)	1.9 x 1.9°	Wildfire Water Stress*
MPI-ESM-MR	Max-Planck-Institut für Meteorologie (Max Planck Institute for Meteorology)	1.9 x 1.9°	Heatwave/Coldwave Wildfires
MRI CGCM3	Meteorological Research Institute	1.1 x 1.13°	Heatwave/Coldwave Water Stress*
CCSM4	National Centre for Atmospheric Research	1.25 x 0.9375°	Water Stress*
CNRM-CM5	National Center for Meteorological Research—European Center for Research and	1.4 x 1.4°	Water Stress*

[7] The Coupled Model Intercomparison Project Phase 5 (CMIP5) was established by the Working Group on Coupled Modelling (WGCM) under the World Climate Research Programme (WCRP). CMIP5 provides a framework for coordinated climate change experiments for the next five years and promotes a standard set of model simulations to provide projections of future climate change on two time scales, near term (out to about 2035) and long term (out to 2100 and beyond)

[8] Burnt area is currently available only for two GCMs.

Model	Institution	Resolution (degrees)	Climate Hazard Indicator
	Advanced Training in Scientific Computation		
INM-CM4	Institute for Numerical Mathematics	2 x 1.5°	Water Stress*

*Based on analysis by the World Resources Institute.

- The first ensemble member is selected for each model[9] (r1i1p1) and all data is re-gridded to a common 1° x 1° resolution using bilinear interpolation.
- Climate hazard indicators are calculated individually for each model, under each scenario, for the ten years from 2010 to 2020, and for three years centered on 2030 (i.e., 2029, 2030, and 2031), and 2050.
- Results are averaged across models and years to arrive at the indicator value for the year of interest.

Trucost Physical Risk Analytics: Climate hazard indicator details

The table below describes the methodology applied to characterize each climate hazard indicator using data derived from CMIP5 models and other sources:

Indicator	Analysis Metric	Description	Trucost Analysis
Heatwave	Excess Heat Factor (EHF)	The EHF index measures heatwave occurrence and intensity based on two factors: 1. If the daily mean temperature over a three day period is higher than the historical[10] 95th percentile, and 2. How hot the daily mean temperature is with respect to the previous 30 days.	Trucost derived the indicator using temperature data from CMIP5 models. Positive EHF days were counted over the course of a year to arrive at the total number of heatwave days per year. Results were averaged across models and years as described above.
Coldwave	Excess Cold Factor (ECF)	The ECF index measures heatwave occurrence and intensity based on two factors:	Trucost derived the indicator using temperature data from CMIP5 models. Positive ECF days were

[9] Multiple ensemble members are used for burnt area (r2i1p1 and r3i1p1) due to lack of available GCMs.
[10] Historical baseline period of 1970-2005 is used.

Indicator	Analysis Metric	Description	Trucost Analysis
		1. If the daily mean temperature over a three day period is lower than the historical 95th percentile, and 2. How cold the daily mean temperature is with respect to the previous 30 days.	counted over the course of a year to arrive at the total number of coldwave days per year. Results were averaged across models and years as described above.
Water Stress	Baseline Water Stress Index	Baseline water stress is the ratio of total water withdrawals within an area to the available water resources in surface and ground water. The analysis covers water consumptive and non-consumptive withdrawals for domestic, industrial, irrigation and livestock use. Water availability considers the impact of upstream consumptive water users and dams. Higher values indicate more competition among users for available water resources.	This indicator is calculated by the World Resources Institute.[11] For further information on the methodology, please see Hofste et al (2019).
Wildfire	Burnt Area	The fraction of entire grid cell that is covered by burnt vegetation.	Trucost used the burnt area variable from CMIP5 models. The max burnt area over the course of a year was calculated for each grid cell. Results were averaged across models and years

[11] For further information on the methodology, please see Hofste, R.W. et al. (2019). *Aqueduct 3.0: Updated Decision-Relevant Global Water Risk Indicators*. [Online]. https://www.wri.org/publication/aqueduct-30.

Indicator	Analysis Metric	Description	Trucost Analysis
			as described above.
River Flood	Riverine Flood Risk	The riverine flood risk metric represents the proportion of the population in each river basin that are expected to be affected by riverine flooding in an average year. The metric is focused on inundation caused by river overflow and accounts for existing flood protection measures.	This indicator is calculated by the World Resources Institute.[12]
Coastal Flood	Coastal Flood Risk	The coastal flood risk metric represents the proportion of the population in each river basin that are expected to be affected by coastal flooding in an average year.	This indicator is calculated by the World Resources Institute.[13]
Hurricane	Hurricane Index	The hurricane index is a measure of the historical frequency and intensity of hurricane, typhoon and cyclone activity by location. The index is calculated based on historical hurricane data compiled by the US National Oceanic and Atmospheric Administration.[14]	Trucost calculated the hurricane index based on historical hurricane activity data from 2000 to 2019 using a 1x1 degree grid map (approx. 110x110km at the equator). The index is calculated by multiplying the number of hurricanes transiting each map grid cell by the intensity (category) of each hurricane and a temporal weight designed to overweight more

[12] Ibid.
[13] Ibid.
[14] NOAA. 2019. NOAA Historical Hurricane Tracks. [Online]. Available: https://oceanservice.noaa.gov/news/historical-hurricanes/.

Indicator	Analysis Metric	Description	Trucost Analysis
			recent hurricanes (i.e., 2019 has the highest weight and 2000 the lowest).[15]

[15] Ibid

Data Standardization/Calculation

Analytical Approach

The Trucost Physical Risk data analysis is based on five key analytical steps:

1. Climate Hazard Mapping

Trucost has assembled models and datasets representing the projected (or historical) absolute risk of seven discrete climate change hazards globally, across three climate change scenarios and three time periods, to produce global climate change physical hazard maps. Each indicator, scenario and time period is represented as a raster map with cell values representing the absolute risk indicator value.

2. Physical Asset Geolocation and Corporate Ownership Mapping

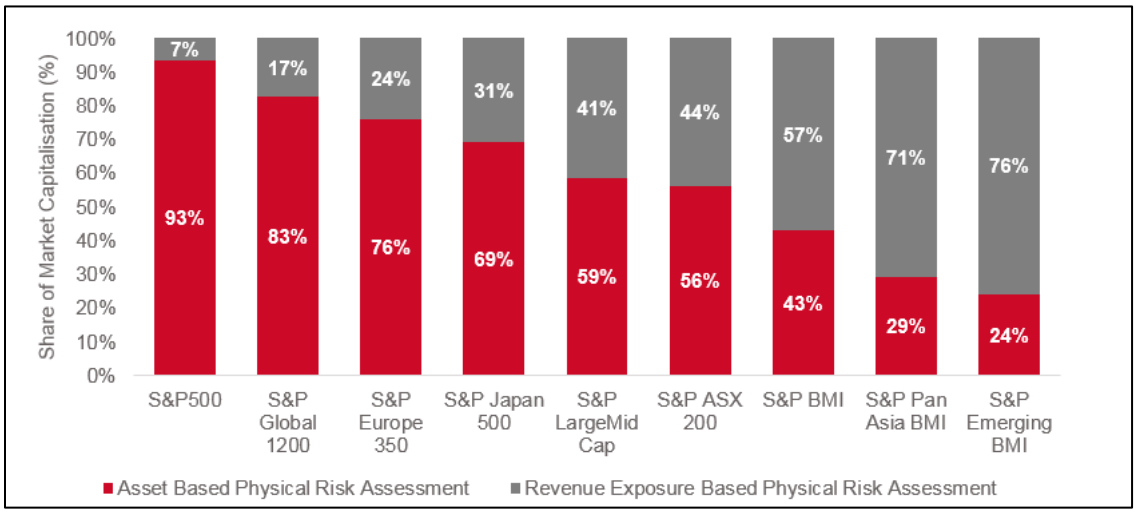
Trucost has established a database of physical asset locations and characteristics mapped to corporate entities and to ultimate parent entities across all regions and sectors.

The table below presents a summary of key asset-level data sources included in the Trucost dataset:

GICS Sector	Asset Count (approx.)	% of Total Asset Count	Data Sources
Consumer Staples	13,000	3%	• S&P MI Real Estate Database • S&P MI Metals and Mining Database • S&P MI Power Plants Database • S&P MI Bank Branches Database • Numerous regulatory databases maintained by national governments
Utilities	27,000	6%	
Materials	21,000	5%	
Industrials	44,000	11%	
Other	47,000	11%	
Health Care	7,000	2%	
Consumer Discretionary	20,000	5%	
Energy	11,000	3%	
Real Estate	95,000	23%	
Financials	128,000	31%	
Information Technology	6,000	1%	

Assets are mapped to corporate owners (or lessees) and ultimate parent identifiers in the S&P Capital IQ database using string matching techniques to enable efficient linking to financial and other market datasets in the S&P Global databases.[16]

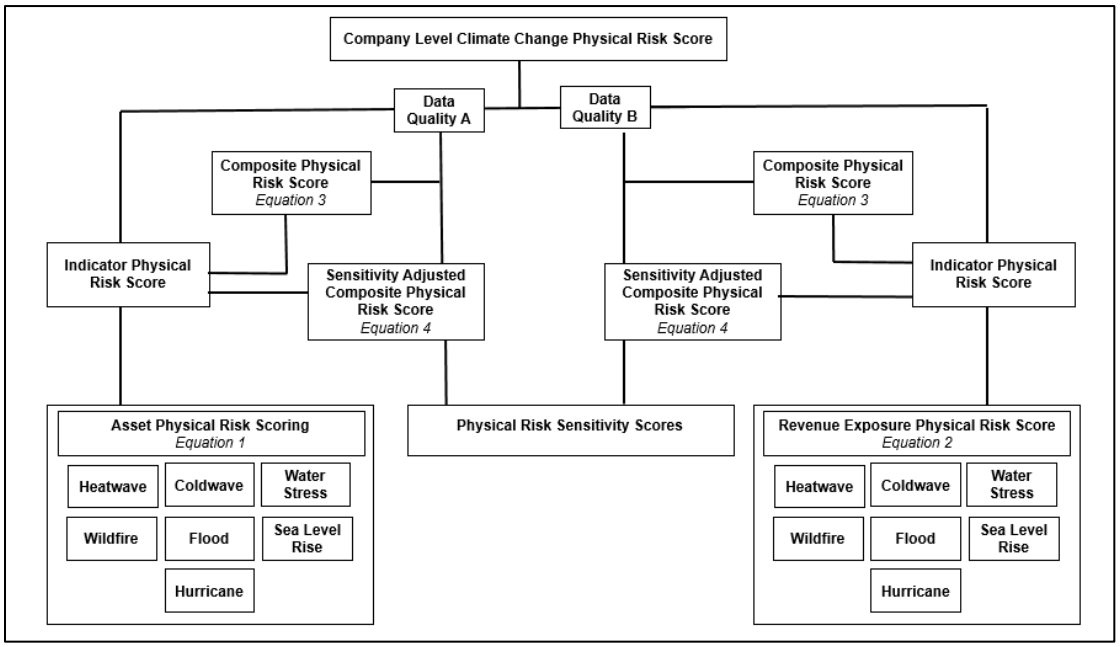
The figure below presents coverage of selected S&P Global indices and the Trucost CorePlus universe with asset-based and revenue exposure-based physical risk scores as of November 2019:



[16] The Trucost asset database will be continually expanded to integrate new asset-level datasets sourced within S&P Global and externally.

3. Asset- and Company-Level Physical Risk Scoring

The figure below presents an overview of company-level physical risk score calculations:



The Trucost physical risk assessment model assigns risk scores from 1 (lowest risk) to 100 (highest risk) to each asset in the database based on location within the climate change hazard maps described in Step 1. The physical risk score is intended to represent the relative level of risk for each indicator at each location relative to global conditions across all scenarios and time periods. Physical risk metric values are normalized to scores based on the formula described in Equation1.

Equation 1: Climate Change Physical Risk Score Normalization

$$S_{a,i,s,y} = (100 - 1) \times \left[\frac{R_{a,i,s,y} - R_{min,i}}{R_{max,i} - R_{min,i}} \right] + 1$$

Where:

$S_{a,i,s,y}$	is the physical risk score for asset (a) for climate change physical risk indicator (i) in scenario (s) and time period (y)
$R_{a,i,s,y}$ in	is the absolute risk metric value for asset (a) for climate change physical risk indicator (i) scenario (s) and time period (y)
$R_{min,i}$	is the minimum absolute risk metric value on land across all scenarios and time periods for indicator (i)
$R_{max,i}$	is the maximum absolute risk metric value on land across all scenarios and time periods for indicator (i)

Asset-level physical risk scores are aggregated to company-level risk scores as an equal weighted average of all assets mapped to the company of interest. Activity

information at the asset level (such as revenue or production) is available for selected asset datasets (e.g., power generation, metals and mining) and can be used to construct a weighted average company physical risk score on a bespoke basis upon request.

4. Revenue Exposure Based Physical Risk Estimation

The Trucost Climate Change Physical Risk analysis covers the Trucost CorePlus universe of over 15,000 listed companies. Since disclosure of asset-level information is variable, Trucost has developed a methodology for the estimation of physical risk exposure in the absence of asset-level data. As described in Equation 2, in the absence of sufficient asset-level data, physical risk is estimated based on the company headquarters location (weighted at 20%), company revenue share by country and the average physical risk level in each country (weighted at 80%).

Equation 2: Revenue Exposure Based Physical risk Estimation

$$S_{i,s,y} = S_{hq,i,s,y} \times 20\% + \left[80\% \times \sum_{c=1}^{n} Rev_c \times R_{c,l,s,y} \right]$$

Where:

$S_{i,s,y}$	is the physical risk score for a company for climate change physical risk indicator (i) in scenario (s) and time period (y)
$S_{hq,i,s,y}$	is the physical risk score for the company headquarters (hq) for climate change physical risk indicator (i) in scenario (s) and time period (y)
Rev_c	is the company revenue share generated in a country (c)
R_c	is the country average physical risk score for climate change physical risk indicator (i) in scenario (s) and time period (y)

5. Composite Score Calculation

The composite score is intended to provide a combined measure of company exposure to all seven climate change physical risk indicators. Two forms of the composite score are presented in the analysis:

- **Composite Physical Risk Score:** An equal weighted additive combination of the company physical risk score on each indicator for a given scenario and year.

  Equation 3: Composite Physical Risk Score Calculation

$$C_{x,s,y} = -99 \times 0.5^{((SUM_{x,s,y} \times 0.01) + 100)}$$

Where:

$C_{x,i,s,y}$	is the Composite Physical Risk Score for company (x) in scenario (s) and time period (y)
$SUM_{x,i,s,y}$	is the sum of indicator physical risk scores for company (x) in scenario (s) and time period (y)

- **Sensitivity Adjusted Composite Physical Risk Score:** An additive combination of the company physical risk score on each indicator for a given scenario and year, multiplied by the corresponding sensitivity scores representing the relative sensitivity of the company to each physical risk indicator. The Sensitivity Adjusted Composite Physical Risk Score is calculated as described in Equation 4.

  Equation 4: Sensitivity Adjusted Composite Physical Risk Score Calculation

$$SC_{x,s,y} = -99 \times 0.25^{((SUMP_{x,s,y} \times 0.0001) + 100)}$$

Where:

$SC_{x,i,s,y}$ is the Sensitivity Adjusted Composite Physical Risk Score for company (x) in scenario (s) and time period (y)

$SUM_{x,i,s,y}$ is the sum product of indicator physical risk scores and indicator sensitivity scores for company (x) in scenario (s) and time period (y)

Trucost calculates physical risk sensitivity weights by linking each form of physical risk to a set of tangible business impacts and a metric that can be measured at the company level to reflect the relative sensitivity of each company to each risk indicator and its impacts.

The table below describes the sensitivity weights applied in the calculation of the sensitivity adjusted composite physical risk score:

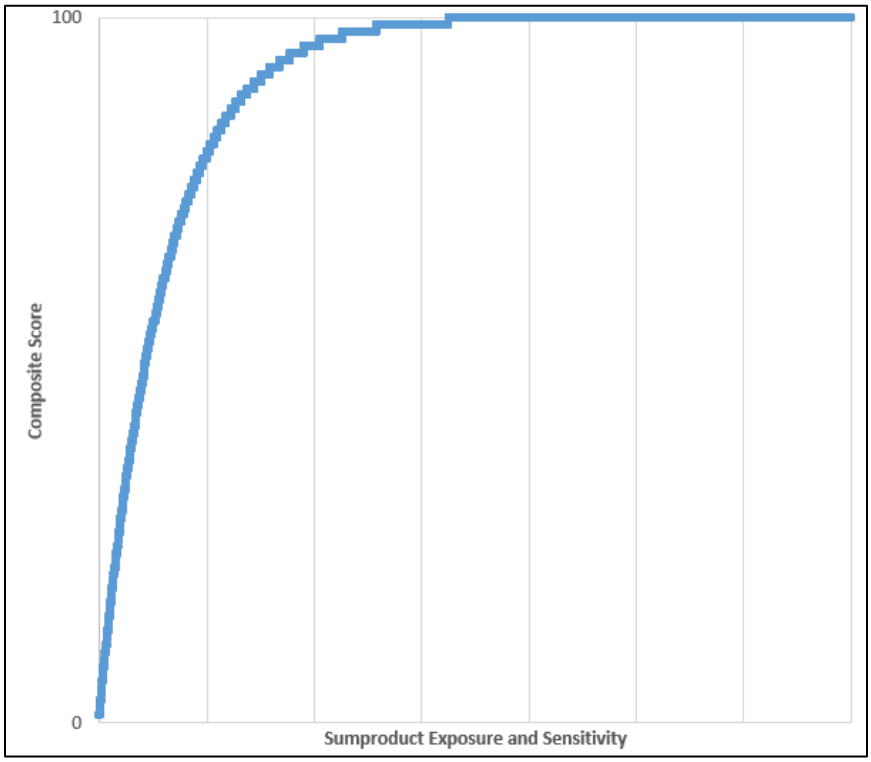
Indicator	Key Business Impacts	Sensitivity Key Performance Indicator (KPI)	Rationale
Drought	• Input Scarcity • Increased Operating Expenses • Stranded Assets	• Water Intensity (Direct and Indirect)	Businesses with high water dependency (direct or indirect) are more likely to be impacted by water scarcity.
Flood (Rivers and Coastal) Wildfire Hurricane	• Asset Impairment • Lost Inventory • Production Disruption • Critical Infrastructure Damage	• Capital Intensity	Businesses with high capital intensity are more likely to be impacted by physical damage created by floods, wildfire and severe storms.
Heatwave Coldwave	• Productivity Losses	• Labor Intensity	Businesses with high labor intensity are more likely to be impacted by the productivity consequences of heatwave and coldwave.

For example, companies with high water dependency are assumed to be more severely impacted by the physical consequences of water stress which may result in

disrupted production due to restricted water access or increased operating expenditure for water purchases. Similarly, companies with high capital intensity are assumed to be more dependent on physical assets and inventory and thus more sensitive to asset impairment by physically destructive physical risks, such as flood, wildfire, and hurricane.

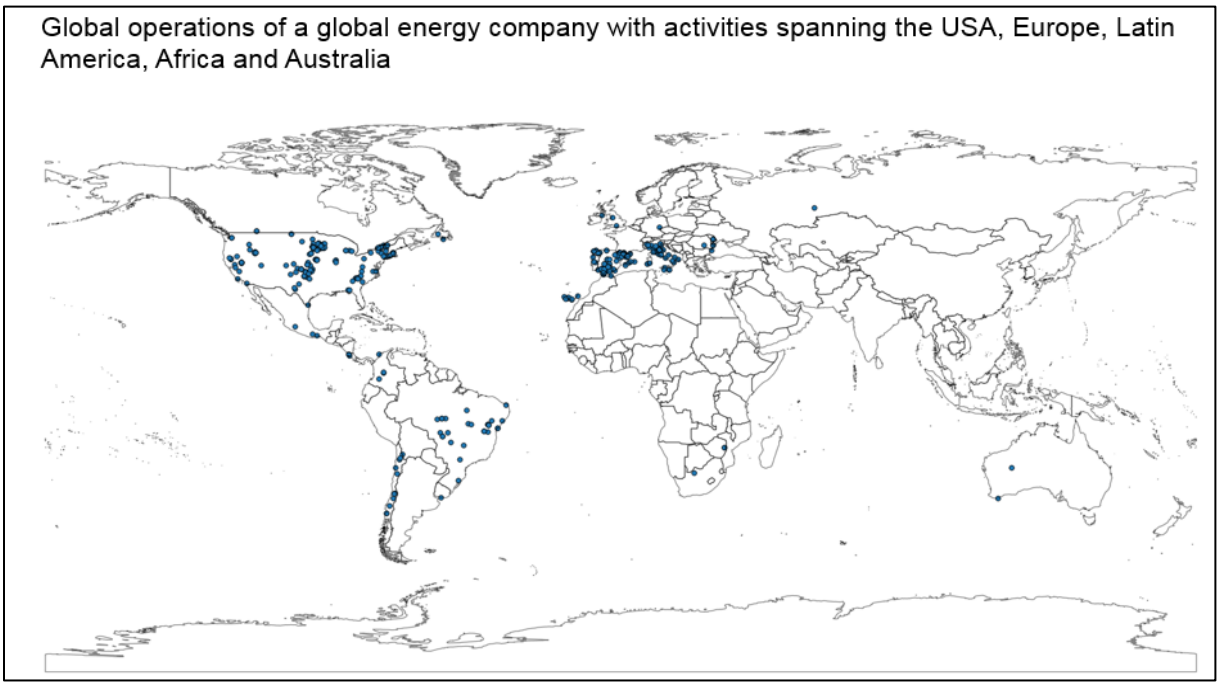
Exposure to each physical risk indicator is assumed to be additive since each form of physical risk may have unique consequences for the operations of a business. Sensitivity weights are applied as a multiplier to physical risk exposure scores with the final composite score calculated based on a logarithmic curve designed to amplify high indicator and sensitivity scores in the final composite score. This approach avoids a limitation of a simple or weighted average composite score in which high risk exposure (and sensitivity) on a single physical risk indicator is obscured in the final composite score by low risk exposure (and sensitivity) on all other indicators.

The figure below presents the Trucost Physical Risk Composite Score Aggregation:



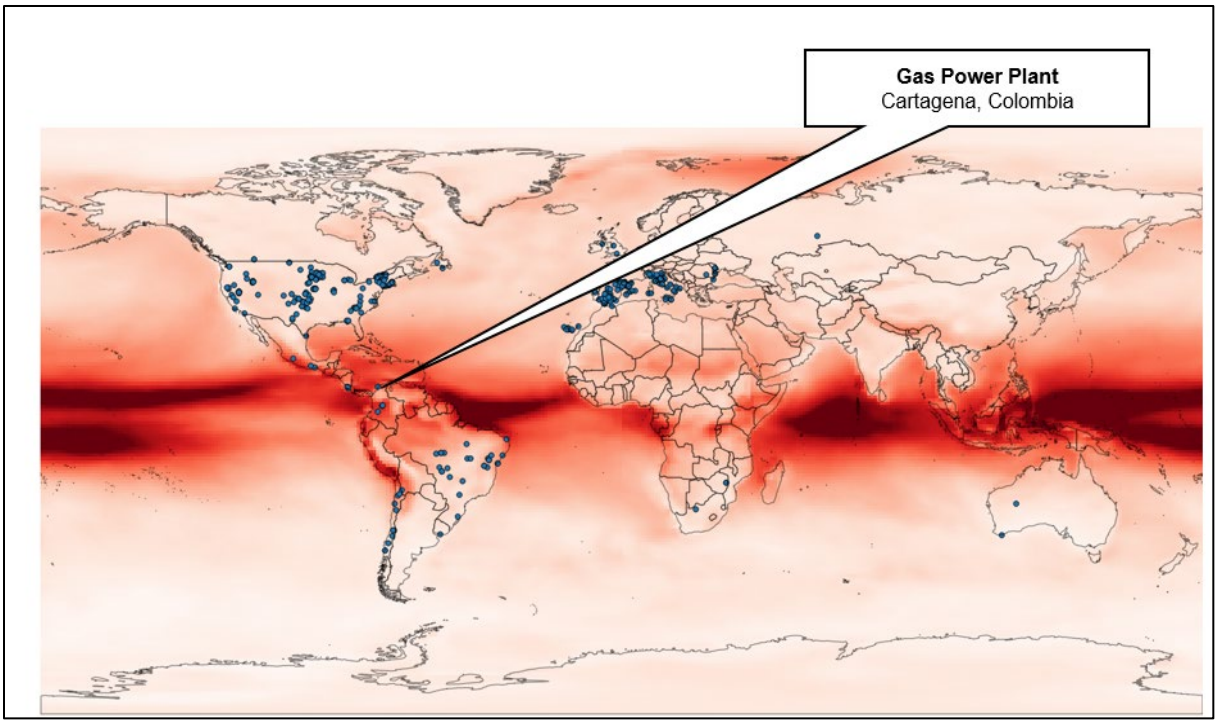
Worked Example: Scoring Asset-Level Risk

Asset Distribution for a Global Energy Company (slide 1)



Source: Trucost analysis (2019). For illustrative purposes only.

Example Asset Analysis (slide 2)



Source: Trucost analysis (2019) based on CMIP5 and S&P Global asset data. For illustrative purposes only.

Example Asset Analysis: Asset Scoring*

Asset Example: Gas Power Plant

Location: Cartagena, Colombia

Latitude/Longitude: 10.42504978, -75.53836823

Step 1: Overlay Asset Locations on Climate Hazard Map:

Geospatial analysis is used to overlay asset locations on a climate hazard map. In this case the hazard map represents heatwave risk, defined as the expected number of heatwave days per annum under a high climate change scenario in 2050.

Step 2: Sample Hazard Level at Asset Location

Climate hazard data is mapped in the form of spatial grids with estimates of the number of heatwave days in each grid cell. Assets are assigned a heatwave risk estimate based on the risk level of the cell in which it is located.

Step 3: Score Normalisation

Asset-level scores are normalised relative to the range of hazard levels for each indicator globally to enable simpler comparison of the risk exposure of multiple assets, and the risk level of any asset relative to global conditions. The following normalisation formula is applied to score asset-level risk on a scale of 1 (lowest risk) – 100 (highest risk).

Score = (100 – 1) * ((X – Min) / (Max – Min)) +1

Where:

X is the site level hazard value

Min is the global minimum hazard value

Max is the global maximum hazard value

*Source: Trucost analysis (2019). For illustrative purposes only.

Example Asset Analysis: Worked Example*

Asset Example: Gas Power Plant

Location: Cartagena, Colombia

Latitude/Longitude: 10.42504978, -75.53836823

Step 1: Overlay Asset Locations on Climate Hazard Map:

See slide 2 above.

Step 2: Sample Hazard Level at Asset Location

Hazard Value: 202 heat waves days per annum

High Climate Change Scenario, 2050

Step 3: Score Normalisation

Asset Physical Risk Score = 202 heat wave days per annum

Min = 6 heat wave days per annum

Max = 319 heat wave days per annum

Heatwave Physical Risk Score = (100 – 1) * ((202 – 6) / (319 – 6)) + 1

Heatwave Physical Risk Score = 63 / 100

*Source: Trucost analysis (2019). For illustrative purposes only.

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FAQs

State of climate change physical risk information

What is the state of climate change physical risk information?

Much of the climate information available to investors ignores the physical impacts of climate change. Trucost's suite of climate data and methodology set the standard in mitigating the information gap by providing the tools and metrics to conduct climate risks analysis. Trucost's climate data and risk analysis have been specifically expanded to help financial institutions align with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD), an initiative by the Financial Stability Board (FSB). Trucost has mapped the location of assets of over 15,000 global companies and explored how their assets might be impacted under various climate policy scenarios.

Challenges to the Trucost Physical Risk methodology

What are the challenges to the Trucost Physical Risk methodology?

As part of our practice to continuously monitor and improve our data set, we will be looking to address the following:

Modelling Uncertainty: The climate models underpinning the physical risk analysis are complex and subject to uncertainty. Trucost has sought to mitigate this uncertainty by basing the physical risk assessment on averages of the output of multiple CMIP5 GCMs.

Asset Location Uncertainty: The Trucost physical risk assessment incorporates a range of asset location datasets, some of which are actively managed and updated regularly, whereas others are updated less frequently. Consequently, it is possible that the database does not reflect changes in asset ownership and activity that have occurred in the recent past. Trucost has sought to mitigate this uncertainty by limiting data sourced from historical datasets to the past three years.

Spatial Resolution: Trucost has sought to integrate climate modelling at sufficient spatial resolution to enable a robust estimation of the physical risk exposure, however this analysis could be enhanced in the future through the integration of regional downscaled climate models where available.

Company Score Aggregation: Due to data limitations, it is not currently possible to reliably assign weights to each asset based on the economic value or activity level of each asset when calculating the company average physical risk score. Consequently, all assets owned or leased by a company are equal weighted in the calculation of the company physical risk score. This may result in the over or under weighting of assets within a company portfolio relative to the true value or significance of each asset to the operations of the company.

Sensitivity Framework: The sensitivity weighting framework is designed to weight the seven physical risk indicators based on the expected sensitivity of individual companies

to each indicator. The framework will be enhanced in the future to better reflect the financial materiality of different forms of physical risk to companies across sectors and regions.

Physical and regulatory transition risks facing companies

What is the interplay between regulatory transitional risks and physical risks under alternative climate change scenarios?

In a report that was released in November 25, 2019, Trucost Climate Change Physical Risk analytics evaluated 15,000 companies representing 99% of global markets. The study found wildfires, heatwaves and hurricanes, linked to increasing global temperature, are the greatest risk to physical assets. Further revealing, almost 60% of companies in the S&P 500® and more than 40% companies in the S&P Global 1200 have physical assets which are at high risk of climate change impacts. Find the full report here: Understanding Climate Risk at the Asset Level: The Interplay of Transition and Physical Risks.

Revision History

The changes made to this document include the following:

Version	Date	Changes
1.0	08/05/2020	Initial version