Worldly Axion Methodology

An overview of the data sources, methods, and risk categories used within the Worldly Axion product.

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worldly

Supply Chain Intelligence

Contents

Note

When production volume allocation is enabled, all facility output metrics — such as carbon intensity, total emissions, and total water use — will reflect only the portion of facility output allocated to your organization. If you have not allocated production volume, then the metrics will show 100% of the facility output metrics.

Carbon

Data Used

Projected Future Carbon Prices (projected $ cost per Tonne CO2e) are taken from the International Energy Agency (IEA) and Network for Greening the Financial System (NGFS) modelled datasets. These taxes are calculated using Global Change Models to simulate what the expected charge per tonne of CO2e would be needed in order to enact carbon mitigation required to meet the stated limitation to global warming. These scenarios are:

NGFS Scenarios

- Net Zero 2050 - Net Zero 2050 limits global warming to 1.5°C through stringent climate policies and innovation, reaching global net zero CO2 emissions around 2050. This scenario assumes that ambitious climate policies are introduced immediately. Carbon Dioxide removal (CDR) is used to accelerate the decarbonisation but kept to the minimum possible and broadly in line with sustainable levels of bioenergy production. Net CO2 emissions reach zero around 2050, giving at least a 50 % chance of limiting global warming to below 1.5 °C by the end of the century, with limited overshoot (< 0.2 °C) of 1.5 °C in earlier years. Physical risks are relatively low but transition risks are high.
    - Nationally Determined Contributions - Nationally Determined Contributions (NDCs) includes all pledged policies even if not yet backed up by implemented effective policies.This scenario assumes that the moderate and heterogeneous climate ambition reflected in the conditional NDCs at the beginning of 2024 continues over the 21st century (low transition risks). Emissions decline but lead nonetheless to 2.3 °C of warming associated with moderate to severe physical risks. Transition risks are relatively low.
    - Current Policies - Current Policies assumes that only currently implemented policies are preserved, leading to high physical risks. Emissions grow until 2080 leading to about 3 °C of warming and severe physical risks. This includes irreversible changes like higher sea level rise. This scenario can help central banks and supervisors consider the long-term physical risks to the economy and financial system if we continue on our current path to a “hot house world”.

More information on the NGFS Scenarios is available here.

IEA Scenarios

- Stated Policies (SPS) - The Stated Policies Scenario (STEPS) is designed to provide a sense of the prevailing direction of energy system progression, based on a detailed review of the current policy landscape.

- Announced Pledges (APS) - The Announced Pledges Scenario (APS), introduced in 2021, illustrates the extent to which announced ambitions and targets can deliver the emissions reductions needed to achieve net zero emissions by 2050. It includes all recent major national announcements as of the end of August 2024, both 2030 targets and longer-term net zero or carbon neutrality pledges, regardless of whether these announcements have been anchored in legislation or in updated Nationally Determined Contributions.
- Net Zero Emissions - Describes a pathway for the global energy sector to reach net zero CO2 emissions by 2050 by deploying a wide portfolio of clean energy technologies, without offsets from land-use measures. Decisions about technology deployment driven by costs, technology maturity, market conditions, available infrastructure and policy preferences.

For decarbonization over time, we additionally use historical observations of grid mix from EMBER. These allow us to project how "dirty" the facility's local electricity grid is. Projections for future grid mix are taken from the NGFS dataset. These data sources are integrated into the Emissions Projections to show how much a national grid has already done to decarbonize, and how switching to electricity can increase future facility decarbonization through background cleaning of the grid.

Data for the country-level availability of EACs and RECs is taken from https://recs.org.

KPI Metric Definitions

Carbon Key Performance Indicators are provided on cumulative data from all reported and shared FEM reports facilities have provided. Below is the set of Carbon KPI metrics provided with their calculation:

Total Emissions
Total reported emissions, including refrigerants, across all selected facilities, measured in kilograms of CO_2 equivalent ($kgCO_2e$).

Carbon Intensity
A measure of how many kilograms of carbon dioxide equivalent are released per one megajoule of energy consumed. Facility carbon intensity metrics vs portfolio / fac type / other carbon intensity calc explainer HERE

% Energy Sourced From On-Site Renewable Electricity
The percentage of total energy consumed that comes from onsite renewable electricity sources.

% Energy Sourced From Purchased Renewable Electricity
The percentage of total energy consumed that comes from purchased renewable electricity sources.

% Energy Sourced from Direct Coal Use
The percentage of total energy derived from on-site coal use.

% Carbon Reduction Targets Set
The percentage of facilities that have set a carbon reduction target. Note that the KPI does not distinguish on the level of reduction targeted nor the facility's initial baseline emission volume.

Hotspot Data Overview

Carbon hotspots provide the ability to further explore carbon usage, efficiency, and transition plans at the regional and facility level. Below is a breakdown of the different aspects of the Carbon Hotspot Page.

1. Regional Hotspots Section

A breakdown of key metrics averaged at the country scale. The metrics presented are:

Average Carbon Intensity
The amount of CO2e (kg) produced per MJ of energy used averaged at the country scale.

Coal Usage Percentage
Energy usage from coal divided by total energy usage averaged at the country scale.

Facility Renewable Energy Usage as a percentage
Energy usage from on-site and purchased renewable electricity sources divided by total energy usage averaged at the country scale

Percentage of facilities with carbon targets
Percentage of facilities within the country with a declared carbon target irrespective of the magnitude of proposed reduction nor initial emissions volume.

Percentage of Facilities with Energy Attribute Certificates or Renewable Energy Certificates
Percentage of facilities using certificates that prove the purchase of renewable electricity, even if the power is delivered via the conventional grid.

Number of Facilities
The number of facilities located in each country displayed in the table.

Carbon Price Emissions Trading Systems (ETS) data
Taken from The World Bank Dashboard (see Data Used)

Current Grid Renewables/2030 Grid Renewables
For decarbonization of the grid over time, we additionally use projections in grid mix. These allow us to project what proportion of the national electricity grid will be sourced from renewables at a given time.

Grid Carbon Intensity
The amount of CO2e (kg) produced per MJ by the country's electricity grid based on the mix of fuel sources on the national grid.

EACs/RECs available
Whether these are available to facilities in a given country.

2. Electricity Grid Mix

A breakdown of the fuel sources making up each country's electricity grid taken from the EMBER dataset. For each country the proportion of total grid energy coming from the following sources is provided:

- Bioenergy
- Coal
- Gas
- Hydroelectric
- Nuclear
- Solar
- Wind
- Other Fossil Fuels inc. Oil
- Other Renewable Sources inc. Geothermal

Selecting a specific country allows for a year-to-year breakdown of the historical change in the grid mix from 2000 to the present day.

3. Overall Emissions Profile

For an organization, we compare their performance (My Suppliers) along different carbon relevant metrics to the global benchmark (All Suppliers). Note that selecting page filters, such as country, factory type, or product category, will likewise filter this analysis to the suppliers that match those criteria and work with your organization; similarly, the comparison to All Suppliers will have the same set of filters applied.

The metrics presented on the chart have different scales, given that some are percentages, some are ratios, and some are cumulative sums of quantities. For visualization purposes, each metric is presented as the ratio between My Suppliers and All Suppliers. For example, if the Carbon Intensity of My Suppliers is double that of the benchmark All Suppliers, the point on the spider chart will be twice as large. Values are then normalized to fit on a 0 - 5 scale, with radar points closer to the centre indicative of lower values (and vice versa.) As such, interpretation of the plot should not be done across different metrics, but rather as an analysis of the relative performance of an organization across all metrics compared with all suppliers. The metrics presented are:

Carbon Intensity
The amount of CO2e (kg) produced per MJ of energy used averaged at the organization scale.

Electricity Onsite renewables
Percentage of total energy usage sourced from on-site renewables

Electricity Purchased renewables
Percentage of total energy sourced from purchased renewables

Coal Use
Percentage of total energy sourced from coal

Target Set
Percentage of facilities that have set a carbon reduction target irrespective of the magnitude
of reduction nor the baseline emission volume of each facility.

EACs / RECs Used
Percentage of facilities which presently use Energy Attribute Certificates (EACs) or Renewable Energy Certificates (RECs) as of their last FEM report.

4. Emission Distribution

Total GHG emissions broken down by fuel source are provided at the country, facility type, or production type categorization level. A breakdown of proportional contribution to emissions across the entire reporting supply chain is also provided. The energy sources shown are:

- Biofuel direct
- Coal direct
- Gas direct
- Oil direct
- Other direct sources
- Electricity Indirect
- Purchased Renewables Indirect
- Steam Indirect

In these plots, direct refers to any emissions that are directly attributable to the facility and its direct processes (i.e. the facility's Scope 1 emissions), with indirect emissions akin to Scope 2 emissions. For full details on fuel sources and their grouping, refer to the Glossary.

5. Facility Hotspots

Different carbon-based metrics are provided at a supplier level to allow cross-referencing and a deeper interrogation of the data. Metrics available are:

Total emissions (kgCO2e)
The total reported GHG emissions by the facility from all sources.

Carbon Intensity (kg/MJ)
The amount of CO2e produced (kg) per MJ of energy consumed by the facility.

Coal Use %
The percentage of energy used by the facility that comes from coal sources.

Renewable Energy %
The percentage of energy used by the facility that comes from all renewable sources (both on-site and purchased)

Total production (kg)
The total production volume of facilities that report in kg, including Finished Product Processing, Component/sub-assembly Manufacturing, Material Production, Raw Material Processing and Raw Material Collection & Bulk Refining

Total production (pc/pair)
The total item production volume of facilities that report in pieces / pairs including Finished Product Assemblers.

Advanced filters are also provided to select subsets of facilities based on specific energy usage or policies. Namely:

On-site Renewables
Green dots highlight facilities that do use on-site renewable energy sources, red dots show facilities that do not.

Purchased Renewables
Green dots highlight facilities that purchase renewable energy, red dots mark facilities that do not.

Coal Phase Out Plan
Green dots highlight facilities that have a coal phase out plan, red dots mark facilities that do not. Note that as not all facilities use coal energy, a coal phase out plan may not be relevant for all facilities. We recommend analysing this information with either the X or Y axis set to “Coal Use %” for better insights.

Target Set
Green dots highlight facilities that have stated an emissions reduction target, red dots mark facilities that have not.

6. Facilities Table

Each supplier to the organization is presented in the facilities table. For each facility, we provide:

Carbon Intensity
The amount of CO2e produced (kg) per MJ of energy consumed

Coal Usage
The percentage of total energy usage that is sourced from coal

Renewable Usage
The percentage of total energy usage that is sourced from direct or indirect renewables
Carbon Target Set

EACs/RECs Used
Whether the facility uses either type of Energy Certificate available. For more information please refer to the Glossary.

Facilities Page Summary Table; Carbon Ratings

A Carbon rating is provided for each facility within the Summary Table, rated Very Low to Very High. These ratings are calculated based on the amount of CO2e emitted by the facility, measured in kilograms, per Mega Joule of energy used by the facility. This metric is used elsewhere and defined as the carbon intensity of a facility:

Risk Rating	Carbon Intensity Thresholds (kg/MJ)
Very Low	[0 - 0.06)
Low	[0.06 - 0.09)
Medium	[0.09 - 0.12)
High	[0.12 - 0.15)
Very High	>= 0.15

Energy

Data Used

For scenarios, energy and emissions data is taken from IEA modelled datasets including Stated Policies (SPS), Announced Pledges (APS) and Net Zero Emissions (NZE). This data gives a cost (in $) per tonne of CO2e emissions and per kWh of energy consumed and grid electricity data at the country level. For countries that do not have pricing data, a continent-average is provided. These values are multiplied by the emissions and energy totals (by source) to give projected costs by source.

For decarbonization over time, we additionally use projections in grid mix (https://ember-energy.org/data/yearly-electricity-data/) These allow us to project how "dirty" the facility's local electricity grid is. This data is integrated into the Emissions Projections to show how switching to electricity can increase decarbonization through background cleaning of the grid.

Data for the country-level availability of EACs and RECs is taken from https://recs.org.

KPI Metric Definitions

Energy Key Performance Indicators are provided on cumulative data from all reported and shared FEM reports shared by facilities. Below are KPI metrics provided:

Total Energy Use
Total energy consumed by the facility, including electricity, fossil fuels, and other energy types provided in MJ.

Energy intensity per kg and per piece/pair
Energy consumed per unit of production output provided in MJ/kg. for process-based facilities. Facilities with total energy consumption at or below 38,574 MJ are excluded to remove outliers and avoid skewing results.

Energy intensity per piece/pair
Energy consumed per unit of production output, measured in MJ/piece-pair for final product assemblers. Facilities with total energy consumption at or below 38,574 MJ are excluded to remove outliers and avoid skewing results.

% Energy Sourced From Electricity
The percentage of energy consumed by the facility, which is provided from electricity, including from grid and on-site sources. For a full breakdown of fuel sources, please refer to the Glossary.

% Energy Sourced From Fossil Fuels
The percentage of energy consumed by the facility, which is sourced from fossil fuels (e.g. natural gas, coal, diesel).

% Energy Sourced From Renewables
The percentage of energy consumed by the facility, which is sourced from renewable sources, including on-site solar and purchased renewables.

% Energy Sourced From Direct Coal Use
The percentage of facility energy derived specifically from onsite coal. Coal usage is often associated with high carbon intensity.

% Energy Targets Set
Percentage of facilities that have formally set goals to reduce their energy consumption or improve efficiency.

Hotspot Data Overview

1. Regional Hotspots

A breakdown of key energy metrics averaged at the country scale. These provide insights on the mix of fuel sources currently used and how they contribute to Energy Intensity, as well as further details on energy transition options and projections. Below is a breakdown of the different aspects of the Energy Hotspot Page.

Average Energy Intensity per kg and per piece pair
The amount of energy used to produce 1 kg or 1 piece pair per facility averaged at the country scale

Percentage of facilities that use fossil fuels
The percentage of energy consumed by the facility, which is sourced directly from fossil fuels (e.g. natural gas, coal, diesel).

Percentage of facilities that use renewable energy
The percentage of energy consumed by the facility, which is sourced from renewable sources, including on-site solar and purchased renewables.

Percentage of electricity used
The percentage of total energy consumption that comes from electricity (both grid-supplied and on-site generated).

With EAC / REC
The proportion of facilities that report using Energy Attribute Certificates (EACs) or Renewable Energy Certificates (RECs) to claim renewable electricity use.

Number of facilities
The number of facilities broken down by country

Current Grid Renewable/2030 Grid Renewables
For decarbonization of the grid over time, we additionally use projections in grid mix (see Data Used). These allow us to project how "dirty" the facility's local electricity grid is. This data is integrated into the Emissions Projections to show how switching to electricity can increase decarbonization through background cleaning of the grid.

Current Grid Coal/2030 Grid Coal
As above but for coal

Renewable Energy Procurement Maturity[1]:
A rating out of four is calculated for each country, illustrated with a correspondingly filled circle, based on availability and corporate use of renewable energy procurement mechanisms in the country, taken from RE100 (2024).

Ratings are as follow:

- Full Circle: Multiple procurement options available and in use (PPAs, contracts with suppliers, EACs)
- 2/3 Circle: EACs in common use by corporates; other procurement types not widely available or adopted
- 1/3 Circle: EACs available but not in common use or recognized by companies
- Empty Circle: Options largely unavailable or no data for market

2. Electricity Grid Mix

Energy mix for electricity is broken down by fuel source and is provided at the country, facility type, or production type categorization level. A breakdown of proportional contribution to emissions across the entire reporting supply chain is also provided. The energy sources shown are:

- Bioenergy
- Coal
- Gas
- Hydroelectric
- Nuclear
- Other Fossil Fuels
- Other Renewable Sources
- Solar
- Wind

A breakdown of each fuel source component is provided in the Glossary.

3. Grid Electricity Price Trends

Projected trends in grid electricity prices across countries from 2025 to 2030 are shown in US dollars per megajoule ($/MJ). This data is generated with IEA price projections using the IEA energy price baseline.

4. Overall Energy Profile

For an organization, we compare their performance (My Suppliers) along different energy relevant metrics to the global benchmark (All Suppliers). Metrics can be viewed at country level, for a specific factory and/or production process for your organization, or for the entire set of suppliers.

The metrics presented on the chart have different scales, given that some are percentages, some are ratios, and some are cumulative sums of quantities. For visualization purposes, each metric is presented as the ratio between My Suppliers and All Suppliers. Each metric is then normalized to fit on a 0 - 5 scale, with radar points closer to the centre indicative of lower values (and vice versa.) As such, interpretation of the plot should not be done across different metrics, but rather as an analysis of the relative performance of an organization across all metrics compared with all suppliers. The metrics presented are:

Energy Intensity per kg and per piece pair
Energy consumed per unit of production output provided in MJ/kg and MJ/pcpr

Electricity, Fossil, Coal and Renewable Use
The average % of each fuel source in the suppliers energy mix

Energy Target Set
The percentage of suppliers who have set an energy target

Coal Ratio Target
The percentage of facilities that use coal and do not have a phase out plan. Note that for organizations where all facilities do not report coal usage, this value will be zero. Higher values indicate that a higher proportion of facilities which presently use coal do not have plans to eliminate coal usage, but does not give a direct indication of how many facilities presently use coal. This information is provided in the facility breakdowns.

EACs or RECs used
The percentage of suppliers who are currently utilising EACs / RECs

5. Energy Usage

For an organization we look at their total reported energy usage across their facilities grouped by country, facility and production process levels. This information is displayed by Total Energy Usage in MJ. A breakdown of proportional contribution to emissions across the entire reporting supply chain is also provided in % contribution by both Direct (Supplier Scope 1) and Indirect (Supplier Scope 2) categories. Fuel sources are grouped as the following:

- Oil
- Coal
- Gas
- Biofuel
- Non-renewable Electricity
- Renewable Electricity
- Other

A full breakdown of the fuel groupings are given in the Glossary.

6. Facility Hotspots

Different energy-based metrics are provided at a supplier level to allow cross-referencing and a deeper interrogation of the data. For Energy Intensity, Renewable Thermal Energy Intensity, Non-Renewable Thermal Energy Intensity, and Electrical Energy Intensity, we measure these based on the maximum production use of each facility (either reported in piece/pair or kilograms.) For facilities that produce items measured in both kilograms and pieces/pairs, this methodology means that intensity metrics are calculated using only the maximum reported quantity in either category from the facility. Metrics available are:

Total energy use (MJ)
Total energy use of a facility

Total production (kg)
The total production volume of a facility

Total production (pc/pair)
The total item production volume of a facility

Energy Intensity (MJ/unit)
A measure of how much cumulative energy is used by the facility per produced unit

Renewable Thermal energy intensity (MJ/unit)
A measure of how much renewable thermal energy is consumed per produced unit from the facility

Non-Renewable Thermal energy intensity (MJ/unit)
A measure of how much non-renewable thermal energy is consumed in total produce goods items

Electrical energy intensity (MJ/unit)
A measure of how much electrical energy, from both renewable and non-renewable sources, is consumed in total produce goods items

Percentage of Fossil Fuel Use in Energy Mix

Percentage of Coal Use in Energy Mix

Percentage of Electricity Use in Energy Mix

Percentage of Renewable Energy in Energy Mix

Advanced filters are also provided to select subsets of facilities based on specific energy usage or policies. Namely:

On-site Renewables
Green dots highlight facilities that have reported use of on-site renewable energy sources and reported a non-zero quantity of renewable energy usage, red dots show facilities that have not.

Purchased Renewables
Green dots highlight facilities that purchase renewable energy, red dots mark facilities that do not.

Coal Phase Out Plan
Green dots highlight facilities that have a coal phase out plan, red dots mark facilities that do not. Note that as not all facilities use coal energy, a coal phase out plan may not be relevant for all facilities. We recommend analysing this information with either the X or Y axis set to “Coal Use %” for better insights.

Target Set
Green dots highlight facilities that have stated an emissions reduction target, red dots mark facilities that have not.

Industry Program
Green dots highlight facilities that are part of an industry program, red dots mark facilities that have not.

7. Facilities Table

Each supplier to the organization is presented in the facilities table. For each facility, we provide:

Carbon Intensity
The amount of CO2e produced (kg) per MJ of energy consumed

Fossil Fuel, Renewable and Electricity Usage in percentage of total energy consumption
The percentage of a facility's energy mix made up by each category shown in the table

Whether EACs / RECs are used
Shows whether the selected facility is using an EAC or REC

Facilities Page Summary Table; Energy Ratings

An Energy rating is provided for each facility within the Summary Table, rated Very Low to Very High. These ratings are calculated based on the energy used to create one unit per facility. For facilities that produce items measured in both pieces/pairs and kilograms within the FEM, the energy rating is calculated using the most-produced metric per facility (either the total pieces/pairs or the total kilograms produced.)

Risk Rating	Energy usage (MJ per unit)
Very Low	[0 - 0.01)
Low	[0.01 - 0.05)
Medium	[0.05 - 0.1)
High	[0.1 - 0.15)
Very High	>= 0.15

Water

Data Used

Water stress and water demand ratings are taken from the World Resource Institute Aqueduct V4 dataset, which is specifically mentioned in EFRAG's E3 guidance document. A full description of the model and methodologies used to create Aqueduct insights is available via their website.

Water stress and water demand data is available at the Pfafsteller-6 water basin level. Within Worldly Axion, data is provided for the "middle of the road" climate scenario and for the epochs covering 2025 and 2030. Output scores are nondimensional and range from 0 to 5 with higher values indicating higher risk. Two variables from the Aqueduct dataset are provided:

- Water Demand

The maximum potential water required to meet sectoral demands. Sectoral water demand includes domestic, industrial, irrigation and livestock. Higher values are indicative of greater water demand within the water basin.

- Water Stress

An indicator of competition for water resources, informally defined as the ratio of demand for water by human society divided by available water. Higher values are indicative of greater water stress within the water basin.

Note that water demand and water stress are normalised on their own scales within Aqueduct. As such, a water stress score of 2 does not directly correspond to a water demand score of 2. They are relative scores for each stress factor to be considered independently. Water data from Aqueduct is not available everywhere. For example, arid and low water use regions (such as deserts, large parts of the Arabian Peninsula, and regions of southwest USA) are treated separately to water basins with higher water availability and/or demand. In these regions, we do not present the Aqueduct water stress and water demand scores.

Additionally, meteorological drought projections are calculated using the 6-monthly standardized precipitation index metric (SPI6). SPI6 is a measure of how much rainfall has fallen over an area relative to historical norms. SPI6 gives an indication of hydrological drought risk which relates to water availability within a region. SPI6 is calculated using precipitation data which are taken from the Coupled Model Intercomparison Project v6 climate projections. Given the high interannual variability of precipitation, SPI6 values are presented as the minimum SPI6 score across a time period, either up to 2025 or up to 2030. Within Worldly Axion, SPI6 data is available for the middle of the road climate scenario.

The Worldly Axion platform provides water exposure and water vulnerability scores for each facility. Water exposure is calculated using only spatiotemporal drought and water stress/demand data, while water vulnerability measures the facility's ability to endure periods of low water availability and its impact on the local community.

Water Exposure[1]

Water exposure is calculated from water stress, water demand, and SPI6 using the following formula:

Water exposure \= 0.2 x (*water stress* + *water demand* + 3 x *SPI6*)

For this calculation, all variables are normalized to the same 0-5 scale. If water stress and water demand scores are not available (for example due to a facility being located in an arid, low water use region), water exposure score reverts to the SPI6 score. As a result, arid regions may appear at a higher rating.. Five categories of water exposure risk are provided:

Water Exposure Risk Category	Water Exposure Risk Coefficient Values
Very low	[0 - 1)
Low	[1 - 2)
Medium	[2 - 3)
High	[3 - 4)
Very high	[4 - 5]

Water Vulnerability

Water vulnerability is a measure of how much water a facility uses, how efficient its water usage is, and where the water used is sourced from. Water vulnerability is calculated from the following four metrics:

- Water usage score

Normalized distribution score of how much absolute water a facility uses compared to a global benchmark dataset. Value set between 0 - 1 with higher values indicating higher water usage.

- Water Intensity score

Normalized distribution score of how much absolute water a facility uses per object provided compared to a global benchmark dataset. Value set between 0 - 1 with higher values indicating lower water efficiency.

- Percentage of water used that comes from freshwater sources
- Percentage of water used that is not recycled water

If a facility does not use water in production, its water vulnerability is automatically defined as "very low". If a facility does not provide the information needed to calculate the above metrics, then it is given a vulnerability score of "no response."

The water vulnerability score is calculated as the unweighted mean of the four above scores; the first two are percentile ranks vs all facilities, the last two are the facility's own raw ratios (% freshwater and % non-recycled). The water vulnerability risk category given is based on a benchmark set of facilities. For the benchmark set of facilities, we calculate their water vulnerability scores, and take the 20th, 40th, 60th, and 80th percentiles in order to make the category limits as such:

Water Vulnerability Category	Water Vulnerability Score
Very Low	[0 - 20th percentile or water not used in production)
Low	[20th percentile - 40th percentile)
Medium	[40th percentile - 60th percentile)
High	[60th percentile - 80th percentile)
Very High	[80th percentile - 100]

KPI Metric Definitions

Water Key Performance Indicators are provided on cumulative data from all reported and shared FEM reports facilities have provided. Below is the set of water KPI metrics provided with their calculation:

Total water use
The total volume of water in liters used across all facilities. Includes all sources and uses, and also facilities that do and do not use water in production.

Water intensity per kg and per piece/pair
The amount of water used per unit of production. Calculated as total water use divided by total production volume (measured in both kilograms and pieces/pairs). Higher values may indicate greater water dependency per item produced, although domestic and production water usage are not reported separately.

% Water Sourced from Recycled/Reused Sources
The percentage of total water used which comes from recycled or reused sources within the facility. Higher recycled water usage helps facilities reduce freshwater demand, and the facility's water footprint during times of drought.

% Water From Withdrawn Sources
The percentage of total water used which comes from freshwater sources, including municipal bluewater, municipal unknown water, and groundwater. Higher freshwater usage percentages indicate potential higher risk during times of drought.

% Water Reduction Targets Set
The percentage of facilities that have stated bluewater reduction targets to manage or reduce bluewater consumption as of the FEM reporting year selected.

% Facilities in High Exposure Regions
The proportion of facilities located in regions with high or very high baseline water stress risk and/or drought risk (taken from Aqueduct v4 and SPI6), indicating greater potential operational risk due to regional-level water scarcity.

% Facilities With High Water Vulnerability
The percentage of facilities that have high or very high vulnerability to periods of high water exposure risk. Facilities that use relatively more water in production, and/or have lower proportional recycled water usage will have higher vulnerability.

% Facilities in High Water Stress Regions by 2030
The percentage of facilities expected to be in high or very high water stress regions by 2030.

Hotspot Data Overview

1. Regional Hotspots

A breakdown of key water stress metrics averaged at the country scale. Below is a breakdown of the different aspects of the Water Hotspot Page.

- Water Intensity (calculated both as water used per kg and water used per piece/pair)
- Percentage of facilities that use water in production
- Percentage of water used from withdrawn sources
- Percentage of facilities with water reduction targets
- Percentage of facilities with high baseline water stress
- Percentage of facilities with high projected water stress
- Percentage of facilities projected to be in a high risk drought region within the next 12 month
- Percentage of facilities projected to be in a high risk drought region at any point up to 2030

Regional projections are derived by taking the share of located facilities with an exposure score of **>= 3**, computed for the near-term (**< 1 year**, SPI-driven) and **2030-projected** inputs.

2. Overall water usage and stress

For an organization, we compare their performance (My Suppliers) along different water-stress relevant metrics to the global benchmark (All Suppliers). Note that selecting page filters, such as country, factory type, or product category, will likewise filter this analysis to only be provided on that subset of your organization, and of the set of all suppliers.

- Water Intensity (calculated both as water used per kg and water used per piece/pair)
- Percentage of water usage that comes from recycled/reused sources
- Percentage of water usage that comes from withdrawn sources
- Percentage of facilities that have a water reduction target in place
- Percentage of facilities with high vulnerability
- Percentage of facilities with high exposure
- Percentage of facilities projected to face high water stress by 2030

3. Water Usage Breakdown by region/facility type

Facility-level water usage values are grouped at the country, facility-type, or production/process level and presented by the water source. Additionally the organization-wide distribution of water sources is presented.

4. Disruption Risk

Filled area chart showing the breakdown of all facilities categorised by their exposure and vulnerability scores. See above for classification of water exposure and water vulnerability scores.

5. Facilities Table

Each supplier to the organization is presented in the facilities table. For each facility, we provide key metrics within the following categories:

Exposure

- SPI6: A measure of meteorological drought, rated low to high. A high SPI-6 rating indicates higher chance of drought. For further details, refer to the Glossary
- Water Stress: Water stress ratings are taken from the World Resource Institute Aqueduct V4 dataset. Water Stress is an indicator of competition for water resources, informally defined as the ratio of demand for water by human society divided by available water. Higher values are indicative of greater water stress within the water basin.
- Water Demand: Water demand ratings are taken from the World Resource Institute Aqueduct V4 dataset. Water Demand is a measure of the maximum potential water

required to meet sectoral demands. Sectoral water demand includes domestic, industrial, irrigation and livestock. Higher values are indicative of greater water demand within the water basin.

- Exposure: Water Risk Exposure is a weighted combination of SPI-6, Water Stress and Water Demand scores providing a holistic score of potential water risk to facilities within each water basin. Given greater temporal variability of SPI-6 data compared to Aqueduct projections, greater weighting is given to SPI-6 compared with both water stress and water demand.

Vulnerability

- Water in Production: Whether the facility uses water in production, (NB also appears in Usage and Tracking selection).
- Total Water: Cumulative water reported by the facility from all sources including production and domestic use.
- Water Demand: Aqueduct v4 water demand score provides regional context.
- Water Intensity: How much water the facility uses to create one unit
- Freshwater Use Percentage: The percentage of water used by the facility that comes from freshwater sources
- First Use Water Percentage: The percentage of water used by the facility that does not come from recycled/reused sources

Usage and Tracking

- Water in Production: Whether the facility uses water in production (NB, also appears in Vulnerability selection).
- Groundwater Usage
- Water Use Tracking: Whether the facility tracks its water consumption.

Targets

- Bluewater Targets: Whether the facility has any bluewater reduction targets irrespective of their magnitude.
- Greywater Targets: Whether the facility has any greywater reduction targets irrespective of their magnitude.
- Bluewater Baseline Set: Whether the facility has stated a bluewater baseline total for target setting.

Planning

- Improvement Plan: Whether the facility has stated a plan to improve its water usage.
- Reduction Plan: Whether the facility has stated a plan to reduce its bluewater usage.

- Groundwater Elimination Plan: Whether the facility has a plan to eliminate groundwater usage entirely.
- Demonstration of Progress: Whether the facility can demonstrate progress towards reducing its bluewater usage.

Facilities Page Summary Table; Water Ratings

A Water rating is provided for each facility within the Summary Table, rated Very Low to Very High. These ratings are calculated using water risk exposure data and thresholds as described in the Water Exposure methodology section above

Heat Stress

Data Used

Historical and future daily maximum temperature and relative humidity data are taken from the Coupled Model Intercomparison Project v6 climate projections. These variables are used to calculate daily maximum humidex - a measure of human felt heat stress for indoor working that does not incorporate wind speed or sun intensity. The number of days per year where humidex exceeds three workplace-relevant thresholds are retained:

- Days with humidex over 35 - indicative of heat discomfort for workers,
- Days with humidex over 40 - indicative of heat stress risk for workers
- Days with humidex over 45 - indicative of heat stroke risk for workers.

These values correspond to occupational health advice e.g. from the Canadian Centre for Occupational Health and Safety. Humidex can be approximated to effective wet bulb globe temperature (WBGTe). The approximate comparisons are:

Humidex Value	WBGTe value
35	24-25°C
40	26.1°C
45	29.1°C

WBGTe is most applicable when effects of direct sunlight, shading and wind cooling/warming are impacting people. Within the majority of facilities, it is expected that these measures are controlled through the fact that work occurs within a physical structure. As such, humidex provides a more directly relevant metric of human-felt heat stress within the context of apparel manufacturing. Data are available for SSP1-2.6, SSP2-4.5, and SSP5-8.5, and averaged across three time periods; 2025-2030, 2030-2035 and 2035-2040. See the Glossary for further definitions of the different scenarios used.

Heat Exposure[1]

In addition to raw humidex values, the amount of additional hours at risk due to heat related-presenteeism are calculated. Presenteeism is calculated as the measure of the proportion of potential maximum work capacity at risk due to heat-related reductions in productivity. Calculating hours at risk for certain humidex levels is done through aggregating changes in the physical work capacity. Presenteeism risk coefficients are then produced as a number between 0 and 1 of the potential fractional reduction in work - for example, a presenteeism score of 0.05 indicates that about 5% of maximum work capacity could be lost due to heat related issues.

Presenteeism scores are an indication of work capacity risk for a general worker performing a non-automated task. Additional co-stressors (such as age, health related issues, the availability of regular breaks, or the type of work being performed) can elevate or reduce this risk.
A facility's Heat Exposure score is calculated using Presenteeism risk coefficients. Five categories of heat exposure risk are provided:

Heat Exposure Risk Category	Presenteeism Risk Coefficient Values
Very low	[0 - 0.01)
Low	[0.01 - 0.025)
Medium	[0.025 - 0.05)
High	[0.05 - 0.1)
Very high	[0.1 - 1.0]

Heat Vulnerability
For each facility a *heat vulnerability score* is also provided. A Heat Vulnerability score is defined as a measure of how much or how little the facility is able to reduce the heat stress based on information the facility has provided via the FEM report. Climate control provides one of the most effective measures to reduce heat stress and can be reported within the FEM. Other potential reduction factors (regular breaks, changing shift patterns during heat waves etc.) are not reported and thus not evaluated. With climate control, presenteeism risk can be reduced or entirely eliminated if the facility is kept at an optimal working climate. However, without climate control, the facility is fully exposed to the ambient temperatures. Heat vulnerability scores therefore are categorized as:

Does the facility state that it has climate control?	Heat Vulnerability Score
Yes	Very low
No	Very high

KPI Metric Definitions

Heat Stress Key Performance Indicators are provided on cumulative data across all facilities who share reporting information with the organization. KPIs are based on climate data for the year 2025 and for the climate scenario ssp2-4.5. Below are KPI metrics provided:

% Facilities in Very High Exposure Regions
The percentage of all facilities that have a presenteeism score of equal-to-or-greater-than 0.1
irrespective of whether they have climate control.

% Facilities in High Exposure Regions
The percentage of all facilities that have a presenteeism score of equal-to-or-greater-than 0.05 irrespective of whether they have climate control.

% Facilities With Climate Control
Taken directly from responses to the FEM questionnaire (FEM REFID airsourceaircon)

Estimated Productivity Loss Without Climate Control
The weighted average (based on number of employees per facility) of presenteeism scores across all facilities assuming no effective climate control.

Hotspot Data Overview

A breakdown of key heat metrics averaged at the country scale with the ability to further highlight facilities at particular risk. These provide insights on the exposure and vulnerability factors experienced by facilities as well as the potential risk to production and labour force. Heat Stress values can be explored for the three different climate scenarios and three different time periods upon which data are provided. Below is a breakdown of each analysis presented on the Heat Stress Hotspot page.

1. Regional Hotspots

A breakdown of key metrics at the country scale. The metrics presented are:

Percentage of facilities with climate control
The percentage of facilities that have stated in their FEM report for the year selected that they have air conditioning or climate control.

Production Volume (both in kg and piece/pair)

Number of Workers
The total number of employees across all facilities within a country.

Number of Facilities
The total number of facilities within a country.

Average number of heat stress days
Average number of days in a year where humidex exceeds 40 across all facilities within each country

Average number of heat stoke days
Average number of days in a year where humidex exceeds 45 across all facilities within each country

Average number of heat discomfort days
Average number of days in a year where humidex exceeds 35 across all facilities with each country

2. Overall Heat Stress

For an organization, we compare their performance (My Suppliers) along different heat stress relevant metrics to the global benchmark (All Suppliers). Note that selecting page filters, such as country, factory type, or product category, will likewise filter this analysis to only be provided on that subset of your organization, and for the like set of all suppliers.

The metrics presented on the chart have different scales, given that some are percentages, some are ratios, and some are cumulative sums of quantities. For visualization purposes, each metric is presented as the ratio between My Suppliers and All Suppliers. Each metric is then normalized to fit on a 0 - 5 scale, with radar points closer to the centre indicative of lower values (and vice versa.) As such, interpretation of the plot should not be done across different metrics, but rather as an analysis of how an organization performs across all metrics compared with all suppliers. The metrics presented are:

Facilities with high heat stress exposure
The percentage of all facilities that have a presenteeism score of equal-to-or-greater-than 0.05 irrespective of whether they have climate control.

Facilities with very high heat stress exposure
The percentage of all facilities that have a presenteeism score of equal-to-or-greater-than 0.1 irrespective of whether they have climate control.

Facilities with climate control
The percentage of facilities that have stated in their FEM report for the year selected that they have air conditioning or climate control.

3. Heat Stress Exposure Breakdown by region/facility type

The distribution of facility-level heat stress exposure scores calculated are grouped at the country, facility-type, or production/process level. Additionally the organization-wide distribution of very-low to very-high heat exposure scores is presented.

4. Facility Hotspots Scatter Chart

Different heat stress metrics are provided at a supplier level to allow cross-referencing and a deeper interrogation of the data. Metrics available are:

- Number of Workers

- Production Volume (kg)
- Production Volume (pieces and pairs)
- Heat Stroke Warning Days

Advanced filters are also provided to select subsets of facilities:

Climate Control
Green dots highlight facilities that have climate control, red dots show facilities that do not.

Risk Level
Analysis can also be filtered to just the facilities where a specific heat stress risk level is calculated.

5. Facilities Table

Each supplier to the organization is presented in the facilities table. For each facility, we provide:

Number of heat discomfort days per year
The number of days per year when humidex exceeds 35

Number of heat stress warning days per year
The number of days per year when humidex exceeds 40

Number of heat stroke warning days per year
The number of days per year when humidex exceeds 45

Heat Exposure Score
As calculated and described in the methodology section

Heat Vulnerability Score
As calculated and described in the Data Used section

Whether or not the facility has climate control

Facilities Page Summary Table; Heat Ratings

A Heat rating is provided for each facility within the Summary Table, rated Very Low to Very High. These ratings are equivalent to the heat exposure scores presented in the heat stress hotspot section.

Extreme Events

Data Used

Extreme events provides an overview of three of the most commonly damaging physical risks:

- Riverine Flood Risk
- Wildfire Risk
- Extreme Wind Risk

A description of how each risk is calculated is provided below.

Riverine Flood Risk[1]
Historical and future precipitation data are taken from the Coupled Model Intercomparison Project version 6 (CMIP6) dataset. Daily rainfall data are converted into surface runoff estimates and used as inputs in the CAMA v4.0 flood model. This model provides a projection of maximum flood depth over a region for each day of the year. Riverine exposure risk is then calculated as the probability of a damaging flood event occurring multiplied by the potential damage that such a flood event could cause taken from the damage curves presented in the European Commission Joint Research Centre technical report (Huizinga et al. 2017.) The resulting riverine flood exposure score is a damage coefficient between 0 and 1 representing the projected maximum value at risk of the facility.

Fire Risk[1]
Historical and future fire weather index climate data are taken from the Coupled Model Intercomparison Project version 6 (CMIP6) dataset. These are subsequently used to calculate the probability of environmental conditions being present to promote the development of damaging wildfires. Probabilities of fire ignition in the proximity of a facility are taken from the Earth System Science Data Global Fire Atlas based on 16 years of historical satellite observations. Given that the majority of wildfires are either controlled or due to human interaction, we take the probability of a fire occurring in a given region as constant year-on-year.

Fire Vulnerability damage curves are taken from the Potential Vulnerability Index (PVI), which incorporates characteristics of a building into how damaged it would be by a fire of a given intensity. Fire Exposure risk is calculated as the product of the probability of a fire igniting, the probability of environmental variables promoting wildfire development, and the projected damage to a facility should a wildfire occur. The resulting wildfire exposure score is a damage coefficient between 0 and 1 representing the projected maximum value at risk of the facility.

Extreme Wind Risk[1]

Historical and future climate data are taken from the Coupled Model Intercomparison Project version 6 (CMIP6) dataset. Daily maximum wind gust values are downscaled to project the daily maximum 3-second wind gust speeds. For each year, we calculate the probability that the 99th percentile daily 3-second wind gust maximum exceeds a critical threshold that could cause damage to a strong brick building.

Wind Exposure Risk is then calculated as the product of the probability of a damaging wind event occurring multiplied by the projected damage such an event would cause. The resulting extreme wind exposure score is a damage coefficient between 0 and 1 representing the projected maximum value at risk of the facility.

Individual Event Risk Categories[1]

Risk categories are provided for riverine flood exposure, wildfire exposure and extreme wind exposure. The risk exposure is categorised from the exposure scores described above as follow:

Exposure Category	Exposure Score
Very low	[0 - 0.01)
Low	[0.01 - 0.025)
Medium	[0.025 - 0.05)
High	[0.05 - 0.1)
Very High	[0.1 - 1]

Combined Event Risk Categories[1]

As well as providing risk scores for individual extreme events, the cumulative risk to a facility is provided using combined event risk. Here the assumption is provided that each extreme event risk is independent, to provide a total risk across riverine flooding, wind, and fire:

Exposure Category	Combined Exposure Score
Very low	[0 - 0.01)
Low	[0.01 - 0.025)
Medium	[0.025 - 0.05)
High	[0.05 - 0.1)
Very High	[0.1 - 1]

KPI Metric Definitions

Extreme Events Key Performance Indicators are provided on cumulative data across all facilities who share reporting information with the organization. KPIs are based on climate data for the year 2025 and for the climate scenario ssp2-4.5. Below is the set of Extreme Events KPI metrics provided with their calculation:

% Facilities in Very High Flood Risk Regions
The percentage of facilities whose flood exposure score is greater than or equal to 0.1 across the organization

% Facilities in High Flood Risk Regions
The percentage of facilities whose flood exposure score is greater than or equal to 0.05 across the organization

% Facilities in Very High Wildfire Risk Regions
The percentage of facilities whose wildfire exposure score is greater than or equal to 0.1 across the organization

% Facilities in High Wildfire Risk Regions
The percentage of facilities whose wildfire exposure score is greater than or equal to 0.05 across the organization

% Facilities in Very High Extreme Wind Risk Regions
The percentage of facilities whose extreme wind exposure score is greater than or equal to 0.1 across the organization

% Facilities in High Extreme Wind Risk Regions
The percentage of facilities whose extreme wind exposure score is greater than or equal to 0.05 across the organization

Hotspot Data Overview

A breakdown of key extreme events metrics averaged at the country scale with the ability to further highlight facilities at particular risk. These provide insights on the exposure factors experienced by facilities as well as the potential risk to production. Extreme event values can be explored for the three different climate scenarios and three different time periods upon which data are provided. Below is a breakdown of each analysis presented on the Extreme Events Hotspot page.

1. Regional Hotspots

A breakdown of key metrics at the country scale. The metrics presented are:

Percentage of facilities with high wildfire risk
The percentage of facilities whose wildfire exposure score is greater than or equal to 0.05

across the organization averaged at the country scale

Percentage of facilities with high extreme wind risk
The percentage of facilities whose extreme wind exposure score is greater than or equal to 0.05 across the organization averaged at the country scale

Percentage of facilities with high riverine flood risk
The percentage of facilities whose riverine flooding exposure score is greater than or equal to 0.05 across the organization averaged at the country scale

Percentage of facilities with a historical fire ignition in their proximity
The percentage of facilities that have had a fire ignite within their surrounding areas during the Global Fire Atlas historical database

2. Overall Extreme Events

For an organization, we compare their performance (My Suppliers) along different extreme event-relevant metrics to the global benchmark (All Suppliers). Note that selecting page filters, such as country, factory type, or product category, will likewise filter this analysis to only be provided on that subset of your organization, and of the set of all suppliers.

For visualization purposes, each metric is presented as the ratio between My Suppliers and All Suppliers. Each metric is then normalized to fit on a 0 - 5 scale, with radar points closer to the centre indicative of lower values (and vice versa.) As such, interpretation of the plot should not be done across different metrics, but rather as an analysis of how an organization performs across all metrics compared with all suppliers. The metrics presented are:

Percentage of facilities with very high flood risk
The percentage of facilities whose flood exposure score is greater than or equal to 0.1 across the organization

Percentage of facilities with high flood risk
The percentage of facilities whose flood exposure score is greater than or equal to 0.05 across the organization

Percentage of facilities with very high wildfire risk
The percentage of facilities whose wildfire exposure score is greater than or equal to 0.1 across the organization

Percentage of facilities with high wildfire risk
The percentage of facilities whose wildfire exposure score is greater than or equal to 0.05 across the organization

Percentage of facilities with very high extreme wind risk
The percentage of facilities whose extreme wind exposure score is greater than or equal to 0.1 across the organization

Percentage of facilities with high extreme wind risk
The percentage of facilities whose extreme wind exposure score is greater than or equal to 0.05 across the organization

3. Extreme Events Exposure Breakdown by region/facility type

The distribution of the facility-level flood, fire, and wind exposure scores calculated are grouped at the country, facility-type, or production/process level. Additionally, the organization-wide distribution of very-low to very-high combined extreme event exposure scores is presented. This chart displays the combined maximum value at risk across all three extreme event types treating the events as independent.

4. Facilities Table

Each supplier to the organization is presented in the facilities table. For each facility, we provide:

- Riverine Flood Risk
- Wildfire Risk
- Extreme Winds Risk
- Whether the facility is near a historical fire ignition point

Facilities Page Summary Table; Extreme Event Ratings

An Extreme Event rating is provided for each facility within the Summary Table, rated Very Low to Very High. These risk ratings are calculated based on the combined exposure risk of a wildfire, flood or wind event resulting in damage to the facility and thresholds are shown in the Combined Risk table above.

Scenario Planning

The scenario page allows for exploration of how different organization-level decarbonization actions will impact overall projected energy use, carbon emissions, and projected carbon cost.

Data Used

NGFS Scenarios

- Net Zero 2050 (NZ2050) - Net Zero 2050 limits global warming to 1.5°C through stringent climate policies and innovation, reaching global net zero CO2 emissions around 2050. This scenario assumes that ambitious climate policies are introduced immediately. Carbon Dioxide removal (CDR) is used to accelerate the decarbonisation but kept to the minimum possible and broadly in line with sustainable levels of bioenergy production. Net CO2 emissions reach zero around 2050, giving at least a 50 % chance of limiting global warming to below 1.5 °C by the end of the century, with limited overshoot (< 0.2 °C) of 1.5 °C in earlier years. Physical risks are relatively low but transition risks are high.
    - Nationally Determined Contributions (NDCs) - NDCs includes all pledged policies even if not yet backed up by implemented effective policies.This scenario assumes that the moderate and heterogeneous climate ambition reflected in the conditional NDCs at the beginning of 2024 continues over the 21st century (low transition risks). Emissions decline but lead nonetheless to 2.3 °C of warming associated with moderate to severe physical risks. Transition risks are relatively low.
    - Current Policies (CP) - Current Policies assumes that only currently implemented policies are preserved, leading to high physical risks. Emissions grow until 2080 leading to about 3 °C of warming and severe physical risks. This includes irreversible changes like higher sea level rise. This scenario can help central banks and supervisors consider the long-term physical risks to the economy and financial system if we continue on our current path to a “hot house world”.

More information on the NGFS Scenarios is available here.

IEA Scenarios

- Stated Policies (SPS) - The Stated Policies Scenario (STEPS) is designed to provide a sense of the prevailing direction of energy system progression, based on a detailed review of the current policy landscape.
    - Announced Pledges (APS) - The Announced Pledges Scenario (APS), introduced in 2021, illustrates the extent to which announced ambitions and targets can deliver the emissions reductions needed to achieve net zero emissions by 2050. It includes all

recent major national announcements as of the end of August 2024, both 2030 targets and longer-term net zero or carbon neutrality pledges, regardless of whether these announcements have been anchored in legislation or in updated Nationally Determined Contributions.

- Net Zero Emissions - Describes a pathway for the global energy sector to reach net zero CO2 emissions by 2050 by deploying a wide portfolio of clean energy technologies, without offsets from land-use measures. Decisions about technology deployment driven by costs, technology maturity, market conditions, available infrastructure and policy preferences.

For decarbonization over time, we additionally use historical observations of grid mix from EMBER. These allow us to project how "dirty" the facility's local electricity grid is. Projections for future grid mix are taken from the NGFS dataset. These data sources are integrated into the Emissions Projections to show how much a national grid has already done to decarbonize, and how switching to electricity can increase future facility decarbonization through background cleaning of the grid. All data set references can be found at the end of this document.

Variables

In addition to the external carbon and energy datasets referenced above, the facility baseline data shown comes from the FEM Assessment of the selected year (defaulted as the most recent year). If required, previous FEM Assessment years can be selected using the main filters on the left.

Adjusting any of the variables will stack the resulting changes on top of the facility baseline data and each other. The exception to this is for including Facility Targets and making changes to Energy Efficiency / Energy Mix parameters, which are available as either / or but can not be combined Full details are provided in each specific variable section below.

1. Projection Scenarios

This section enables you to model scenarios based on production volume share and change (growth or decline) over time as well as projected grid decarbonization rates based on future scenarios. You can select a target year by which these changes will take place. Each of the variables that can be modeled are explained in more detail below.

Share of production
Determines the aggregate percentage of facility output that is sourced to the user across all facilities within the page-wide selections. This share of production is factored into the projections and applied evenly across all selected facilities. Changing the share of production will not change carbon intensity as it does not change the emissions per unit of energy used, but this will affect the total energy use and total emissions.

Production volume change
The percentage by which the user wants to increase or decrease production (or sourcing) volume in aggregate across all facilities within the page-wide selections. This value will be added in linear increments up to the target percentage in the target year selected with the annual increase calculated from the baseline year (i.e. the FEM assessment year selected.) Changing only production volume will not change carbon intensity as it does not change the emissions per unit of energy used, but this will affect the total energy use and total emissions. Additionally, production volume changes are made with the assumption that facilities will have capacity to meet the change in production and are applied evenly across all selected facilities.

Grid decarbonization
For each facility, we use their total grid electricity usage and their national grid decarbonization rates (taken from NGFS Scenarios) to project how much the emissions of the facility would change based on the background effect of changes in national decarbonization (e.g. a national grid eliminating coal usage.) The grid decarbonization scenarios can be selected from the following options (full details are available in the Glossary):

Low Emissions / Net Zero 2050 Aligned; uses NGFS NZ2050
Moderate Emissions / Policy Progress; uses NGFS NDCs
High Emissions / Limited Progress; uses NGFS CPs

Applying grid decarbonization to the scenario plan will change the emissions produced from grid electricity, and so change carbon intensity for any facility(s) that use non-renewable electricity.

2. Facility emissions targets

For each facility, we use the latest benchmark data and stated carbon reduction targets provided (if available). If a facility has provided a carbon reduction percentage, and a target year for that reduction, a linear reduction between the baseline year and the target year is provided.

Toggling on facility emissions targets will restrict the user from exploring changes in energy efficiency or energy mix in the present version to avoid double counting since it is assumed that the facility will be taking action to improve efficiency and/or energy mix to achieve their targets.

3. Energy efficiency

The percentage by which a user wants to increase or decrease the amount of energy required to meet the current amount of production at each facility as an aggregate across all facilities within the page-wide selections by the target year (selected via the section dropdown). Positive values are indicative of a decrease in the amount of energy required (an increase in efficiency.) Changes to energy efficiency are applied linearly up to the target year, with the annual increase calculated from the baseline year (i.e. the FEM assessment year selected.)

Changing energy efficiency alone will not change carbon intensity as the fuel mix ratio, and the amount of energy used by each facility relative to each other facility will not change. Adjusting energy efficiency will restrict the user from exploring facility targets.

4. Energy Mix

The average fuel mix across all facilities within the page-wide filters is presented as the current fuel mix. The user can then select a desired aggregate fuel mix by the target year (selected via the drop down menu). This fuel mix will be applied across the total amount of energy consumed across all facilities, rather than at the facility level. Changes in fuel percentage by source are applied linearly up to the target year, with the annual increase or decrease calculated from the baseline year (i.e. the FEM assessment year selected.) Adjusting energy mix will restrict the user from exploring facility targets. The impact energy mix changes on emissions are calculated using the emissions factors for the fuel source and facilities selected. For 'Other' fuel sources, emissions are projected using weighted average emissions factors of any 'Other' fuel sources not listed in the scenario planning options and present for the selected facilities.

Energy mix values can be provided with up to 2 decimal place precision; the user can use the "apply the difference to make 100%" buttons to add any remainder to a specific fuel source. The energy mix has to sum to 100% to apply the changes (by selecting 'Update Charts' button). The user can also reset each energy source to the baseline (by using the 'Reset to Current' button) or reset all of them with the 'Reset All' button.

Data Overview

Projections based on the selected combinations of variables above are presented in two categories; Emissions and Energy and Transition Risk Scenario. The data sets available are as follows:

1. Emissions and Energy

Total Emissions
Total projected reported emissions across all selected facilities, measured in kilograms of CO_2 equivalent ($kgCO_2e$). This is broken down by major fuel source groupings, which are further defined in the Glossary.

Carbon Intensity
A measure of how many kilograms of carbon dioxide equivalent are released per one megajoule of energy consumed under the selected projection metrics. This can be viewed as an overall figure for all data sets selected, or broken down by country, facility type or product category.

Total Energy Use
Total projected energy consumed by the facility(s) provided in billions MJ. This is broken down by major fuel source groupings, which are further defined in the Glossary.

2. Transition Risk Scenario

Carbon Cost Scenario and Cost Passthrough
Selecting a scenario from the dropdown will set the carbon price for future projections based on IEA models as follows:

Low Emissions / Net Zero 2050 Aligned; uses IEA NZ2050
Moderate Emissions / Policy Progress; uses IEA APS
High Emissions / Limited Progress; uses IEA SPS

The carbon cost scenario will be combined with the emissions scenario selected within the Projection Scenarios section to produce the total carbon cost data. Specifically, the grid decarbonization scenario affects carbon intensity and emissions projections while the carbon cost scenario affects the carbon price. Together, they inform the future projected carbon costs.

Additionally, here you can adjust the % of supplier costs that will be passed through to you using the slider.

Projected Carbon Cost
Projected carbon costs given in US$, broken down by country.

Projected carbon price by country
The modelled per-tonne carbon tax in US$, broken down by country.

Glossary of Terms

This section provides an overview of the content-specific technical terms and abbreviations used in the methodology document.

General

CMIP6
The Coupled Model Intercomparison Project Phase 6 is a global collaboration that provides climate model simulations for future projections. These models underpin multiple risk categories in this methodology, from flood risk to heat exposure.

How Scope 1 and Scope 2 Emissions are used in this data
Any references to Scope 1 & 2 emissions within the data are related to the emissions of your suppliers - not your own company emissions. For the interpretation of data provided through Worldly Axion, the appropriate definitions are as follows:

- Scope 1: Direct supplier facility emissions (e.g., fuel use).
- Scope 2: Indirect supplier emissions from purchased electricity or heat.

Fuel Source Groupings
Here we include a breakdown of the fuel source groupings used in the Worldly Axion platform insights

Fuel Source Name	Fuel Sources Included
Oil	Oil, Petrol, Diesel
Coal	Coal, Coal Slurry
Gas	Propane, LPG, LNG, CNG, Natural Gas
Fossil Fuels	All sources included in Oil, Coal, and Gas
Non-renewable Electricity	Purchased Electricity, District Heating, Chilled Water
Renewables	Solar (PV + Thermal), Wind, Hydrogen, Geothermal, Hydro, Microhydro
Biofuel	Biodiesel, Biomass inc. wood, and generated, Biogas, Ethanol
Renewable Electricity	Purchased Renewable Electricity
Other	Fabric Waste, Purchased Steam

Fuel Source Name	Fuel Sources Included
Non-renewable thermal energy	Purchased Chilled Water, Coal, Diesel, Oil, LPG, LNG, Natural Gas, Petrol/Gasoline, Propane, Purchased Steam, Purchased District Heating, CNG, Coal-Water Slurry, Fabric Waste, Ethanol, and Non-Renewable Hydrogen
Renewable thermal energy	Biodiesel, Biomass, Biogas, Renewable Hydrogen

Scenarios

Scenario Mapping

Three scenario options are available within Axion:

- Low Emissions / Net Zero 2050 Aligned: A world that transitions to a Net Zero aligned future by 2050
- Moderate Emissions / Policy Progress: Moderate policy progress with some action taken to decarbonize
- High Emissions / Limited Progress: A high-emissions world, with limited policy implementation and action taken to decarbonize

Each of these scenarios maps to a specific SSP, IEA and NGFS dataset as follows:

Axion Scenario	Scenarios Included
Low Emissions / Net Zero 2050 Aligned	SSP1-2.6, NGFS NZ2025, IEA NZE
Moderate Emissions / Policy Progress	SSP2-4.5, NGFS NDCs, IEA APS
High Emissions / Limited Progress	SSP5-8.5, NGFS CPs, IEA SPS

The SSP, IEA and NGFS datasets are used for each category as follows:

Category	Scenarios Used
Carbon	NGFS & IEA
Energy	NGFS & IEA
Water	SSPs
Heat	SSPs
Extreme Events	SSPs

SSP Scenarios (Shared Socioeconomic Pathways)
Shared Socioeconomic Pathways (SSPs) are scenarios of projected socioeconomic global changes up to 2100.They are used to derive greenhouse gas emissions scenarios with different climate policies.

- SSP1-2.6: Sustainability – Taking the Green Road (Low challenges to mitigation and adaptation.) This scenario has an estimated warming of 1.8 C by 2100.
- SSP2-4.5: Middle of the Road (Medium challenges.) This scenario has an estimated warming of 2.7 C by 2100.
- SSP5-8.5: Fossil-fueled Development – Taking the Highway (Very high challenges.) This scenario has an estimated warming of 4.4 C by 2100.

These scenarios are used to project different climate futures based on potential societal developments. Within Axion, they are used for all physical risk metric projections with the exception of SSP2-4.5 for Water data.

NGFS Scenarios

- Net Zero 2050 (NZ2050) - limits global warming to 1.5°C through stringent climate policies and innovation, reaching global net zero CO2 emissions around 2050. This scenario assumes that ambitious climate policies are introduced immediately. Carbon Dioxide removal (CDR) is used to accelerate the decarbonisation but kept to the minimum possible and broadly in line with sustainable levels of bioenergy production. Net CO2 emissions reach zero around 2050, giving at least a 50 % chance of limiting global warming to below 1.5 °C by the end of the century, with limited overshoot (< 0.2 °C) of 1.5 °C in earlier years. Physical risks are relatively low but transition risks are high.
    - Nationally Determined Contributions (NDCs) - includes all pledged policies even if not yet backed up by implemented effective policies.This scenario assumes that the moderate and heterogeneous climate ambition reflected in the conditional NDCs at the beginning of 2024 continues over the 21st century (low transition risks). Emissions decline but lead nonetheless to 2.3 °C of warming associated with moderate to severe physical risks. Transition risks are relatively low.
    - Current Policies (CP) - assumes that only currently implemented policies are preserved, leading to high physical risks. Emissions grow until 2080 leading to about 3 °C of warming and severe physical risks. This includes irreversible changes like higher sea level rise. This scenario can help central banks and supervisors consider the long-term physical risks to the economy and financial system if we continue on our current path to a “hot house world”.

More information on the NGFS Scenarios is available here.

IEA Scenarios

- Stated Policies (SPS) - designed to provide a sense of the prevailing direction of energy system progression, based on a detailed review of the current policy landscape.
  - Announced Pledges (APS) - introduced in 2021, illustrates the extent to which announced ambitions and targets can deliver the emissions reductions needed to achieve net zero emissions by 2050. It includes all recent major national announcements as of the end of August 2024, both 2030 targets and longer-term net zero or carbon neutrality pledges, regardless of whether these announcements have been anchored in legislation or in updated Nationally Determined Contributions.
  - Net Zero Emissions - describes a pathway for the global energy sector to reach net zero CO2 emissions by 2050 by deploying a wide portfolio of clean energy technologies, without offsets from land-use measures. Decisions about technology deployment driven by costs, technology maturity, market conditions, available infrastructure and policy preferences.

Carbon & Energy

EAC / REC (Energy Attribute Certificate / Renewable Energy Certificate)
A certificate representing one MWh of renewable electricity generated. Facilities may use EACs or RECs to claim use of renewable energy even if not generated on-site.

PPA (Power Purchase Agreement)
A long-term contract to buy electricity directly from a renewable energy provider, often at fixed rates.

Grid Mix
The breakdown of energy sources (coal, solar, wind, etc.) used to generate a country's electricity. Critical for calculating grid carbon intensity.

Water

Water Stress
A measure of how much water is used compared to how much is available in a region. High stress means high competition and potential scarcity.

SPI6 (Standardized Precipitation Index – 6 month)
A drought indicator comparing rainfall over a 6-month period to historical norms. Used to assess water availability and risk of meteorological drought.

Aqueduct Dataset (WRI)
Developed by the World Resources Institute, this dataset models global water risk based on water stress, demand, and other hydrological variables.

Water Source Groupings
Here we include a breakdown of the water source groupings used in the Worldly Axion platform insights

Water Source Name	Water Sources Included
Municipal Blue	Municipal Blue
Municipal Grey	Municipal Grey
Municipal Unknown	Municipal Unknown
Ground	Ground
Site Recycled	Recycled, Reused, Internal Waste, Waste, Condensed
Other	Surface, Rain, Sea
Withdrawn water	Municipal Blue, Municipal Unknown, Ground
Fresh water	Municipal Blue, Municipal Unknown, Ground, Rain

Heat

Humidex
An index combining temperature and humidity to reflect how hot it feels to the human body. Used here to model indoor heat stress in manufacturing settings.

WBGTe (Wet Bulb Globe Temperature – effective)
A more comprehensive heat stress metric that also accounts for wind and sunlight. It's typically used for outdoor work but less applicable indoors.

Presenteeism
An estimate of productivity loss due to heat stress. A score of 0.05 means workers may experience a 5% reduction in capacity due to excessive heat.

Extreme Events

CAMA (Catchment-based Macro-scale Flood Model)
A model used to estimate riverine flood risk by calculating runoff and flood depth based on rainfall data.

Fire Weather Index (FWI)
A metric used to estimate wildfire risk by analyzing temperature, humidity, wind speed, and precipitation.

Global Fire Atlas
A dataset mapping global wildfire ignition and spread using satellite data. It provides historical fire ignition probabilities near facilities.

3-Second Wind Gust
A measure of peak wind speed over a three-second interval, used in modeling wind risk to buildings and infrastructure.

External Data Sets Referenced

General

CMIP6 – Coupled Model Intercomparison Project Phase 6
Used throughout for projecting climate-related risks such as temperature, precipitation, drought, and extreme weather.
https://wcrp-cmip.org/cmip-phases/cmip6/

Carbon & Energy

International Energy Agency (IEA) Climate Scenarios
Used for projected carbon prices and energy-related cost modelling
(https://www.iea.org/reports/world-energy-outlook-2024)

National Greening of the Financial System (NGFS)
Used for projected carbon pricing
https://www.ngfs.net/ngfs-scenarios-portal/

World Bank Carbon Pricing Dashboard
Used for emissions trading system (ETS) data.
https://carbonpricingdashboard.worldbank.org

EMBER Energy Grid Data
Used for historical and projected electricity grid mix and carbon intensity.
https://ember-energy.org/data/yearly-electricity-data/

EAC/REC Availability
Data for the country-level availability of EACs and RECs is taken from https://recs.org and https://www.there100.org/.

Water

WRI Aqueduct Water Risk Atlas (v4)
Used for water stress and demand projections.
https://www.wri.org/applications/aqueduct/water-risk-atlas
Aqueduct 4.0 Methodology

EFRAG ESRS E3 (European Sustainability Reporting Standards)
Aqueduct dataset noted as relevant source in this standard.
https://www.efrag.org/sites/default/files/sites/webpublishing/SiteAssets/ED_ESRS_E3.pdf

Heat Stress & Occupational Health

Canadian Centre for Occupational Health and Safety (CCOHS)
Guidance on humidex values and associated heat stress risks.
https://www.ccohs.ca/oshanswers/phys_agents/humidex.html

NIH / PubMed Central – Heat and Productivity Study
Used for correlating humidex to productivity loss (presenteeism).
https://pmc.ncbi.nlm.nih.gov/articles/PMC8213606/

Extreme Events

CAMA v4.0 – Catchment-based Macro-scale Flood Model
Used to estimate riverine flood exposure from surface runoff and precipitation (from CMIP6).

JRC Damage Curves (European Commission Joint Research Centre)
Used to estimate potential flood damage.
Huizinga et al. (2017)

Global Fire Atlas – Earth System Science Data
Used for wildfire ignition probabilities based on satellite data.
https://earthsystemscience.org

End Note Reference

1. Based on Earthena AI methodologies