

A close-up photograph of a seashell, showing its intricate, wavy ridges in shades of light orange and cream. The shell is positioned diagonally across the upper half of the page.

Clarity AI - Sovereign Implied Temperature Rise (ITR)

Methodology Document

Version 1.0, September 2026

Version History

Methodology Name:	Sovereign Implied Temperature Rise (ITR) methodology
Version Number:	Version 1.0
Version Date:	September 2026
Changes to the previous version:	Not applicable, initial version

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Overview

This methodology defines Clarity AI's approach to calculating the Implied Temperature Rise (ITR) for sovereigns. The ITR gives investors and other users a way to compare countries on their climate trajectory, considering alignment with climate-related targets such as the Paris Agreement.

The ITR translates a country's emissions trajectory into a temperature figure: the global temperature outcome by the end of the 21st century that would result if the whole world's emissions changed at the same pace as that country's. It is not a forecast of actual future warming, but a relative benchmark that puts every country's decarbonization pace on the same scale to enable a comparison, an approach inherent to ITR methods.

The calculation compares a country's projected change in production emissions (Scope 1) between 2019 and 2030 against the emissions pathways modeled by the Intergovernmental Panel on Climate Change (IPCC) for specific global temperature outcomes (e.g. 1.5°C, 2°C, and 3°C). Each pathway sets out the emissions reduction the world would need to achieve globally to stay within that temperature outcome. The country is assigned the temperature of whichever pathway its own emissions trajectory most closely aligns to.

Glossary of Terms

Term	Definition
Implied Temperature Rise (ITR)	A forward-looking metric expressing the global temperature outcome by the end of the century implied if worldwide greenhouse gas emissions changed at the same pace as those of the entity being assessed.
Greenhouse Gas (GHG)	A gas that traps heat in the Earth's atmosphere, contributing to global warming; examples include carbon dioxide (CO ₂), methane (CH ₄), and nitrous oxide (N ₂ O).
Scope 1 Emissions	Direct, production-based greenhouse gas emissions generated by an entity, used in this methodology as the basis for projecting a country's future emissions trajectory.
Emissions Pathway	A modelled global emissions trajectory associated with a defined probability of limiting warming to a specific temperature level, against which a country's projected emissions change is benchmarked.
Fair-Share Considerations	An operational framework in climate policy and ESG evaluation that assesses a nation's climate targets against its proportional responsibility for global decarbonization. This allocation is calculated using equity indicators—primarily historical emissions (cumulative contribution to global warming) and capability (economic capacity/GDP per capita to fund mitigation)—to determine whether a country's targets align with its fair contribution to limiting global warming to 1.5°C or 2°C under the Paris Agreement.

IPCC AR6 (Sixth Assessment Report)	The Sixth Assessment Report of the Intergovernmental Panel on Climate Change, setting out the greenhouse gas reduction pathways and associated global warming outcomes used to derive Clarity AI's ITR benchmarks.
Temperature Alignment	The process of assigning a country the temperature outcome (e.g. 1.5°C, 2°C, 3°C) associated with the IPCC emissions pathway that most closely matches its own projected emissions trajectory.
Precautionary Principle	The convention that when there's uncertainty in how to score an entity's climate alignment, the methodology should default to the more conservative (i.e., worse/hotter) outcome rather than assuming the best case.
Shared Socioeconomic Pathways (SSPs)	A set of five scenarios (SSP1 to SSP5) used by the IPCC that describe alternative future developments in population, economic growth, technology and policy, ranging from sustainable development (SSP1) to fossil-fuel-intensive growth (SSP5). In IPCC AR6, each scenario is labelled with its pathway number and the level of warming pressure it reaches by 2100 (e.g., SSP1-1.9 is the sustainable-development pathway with very low warming pressure). This methodology uses SSP1-1.9, SSP1-2.6, SSP2-4.5 and SSP3-7.0 as reference points for its temperature benchmarks.
Nationally Determined Contributions (NDCs)	The self-defined greenhouse gas reduction targets submitted by countries under the Paris Agreement, reflecting national climate mitigation commitments.
Rate-of-Reduction Approach	An approach to temperature scoring under which every country in scope is assumed to reduce emissions at a uniform pace going forward, without adjustment for fair-share or historical-responsibility considerations.
Land Use, Land-Use Change and Forestry (LULUCF)	A greenhouse gas inventory category covering emissions and removals from activities such as deforestation, afforestation, cropland management, and forest management.
Emissions Database for Global Atmospheric Research (EDGAR)	A global emissions database, developed by the European Commission's Joint Research Centre, providing independent, harmonized estimates of greenhouse gas and air pollutant emissions by country, sector, and year.
Ordinary Least Squares (OLS)	A standard statistical method for fitting a linear regression line to a set of data points, by minimizing the sum of the squared differences between observed values and the values predicted by the line.

1. Analytical Framework

1.1. Methodology Overview

The Sovereign ITR methodology estimates the global temperature outcome implied if worldwide greenhouse gas emissions changed at the same pace as a given country's emissions. A lower outcome (e.g. 1.5°C) means the country's trajectory matches a pathway consistent with steep, rapid emissions cuts, while a higher outcome (e.g. 3°C or 4°C) means it matches a pathway where global emissions keep rising or fall only slightly.

The purpose of the rating is to assess whether a country's emissions are declining at a pace consistent with the temperature goals of the Paris Agreement. Absolute emissions figures alone do not allow for this assessment: countries differ significantly in size, emissions levels and direction of change. Expressing each country's projected trajectory as an implied temperature places all countries on a common scale, referenced directly to the Paris Agreement goals of limiting warming to well below 2°C and pursuing 1.5°C. Scores should be interpreted as follows:

- A score of 1.5°C to 2°C indicates a trajectory consistent with the Paris Agreement's temperature goals.
- A score above 2°C indicates that the country's emissions are declining too slowly, or are increasing, relative to those goals.
- Higher scores indicate a greater gap between the country's trajectory and a Paris-aligned pathway.

Rated entities: This methodology applies to sovereign and sub-sovereign entities. The scope of this methodology is limited to entity-level assessments; it does not independently rate or assign distinct ESG ratings to individual financial instruments, debt instruments, or financial products issued by these entities. Wherever a rating is shown at the level of financial instruments, it reflects the underlying issuer-level rating. Clarity's AI Sovereign ITR framework scores every OECD Member, OECD Key Partner¹, or OPEC Member State for temperature alignment, representing around 78% of annual world emissions.

Rating scale: The rating is a discrete scale with nine possible values: 1.5°C, 1.75°C, 2.0°C, 2.25°C, 2.5°C, 2.75°C, 3.0°C, 3.5°C and 4.0°C. 1.5°C is the best possible score and 4.0°C the worst. Countries whose trajectory falls outside this range are capped at either end.

Each country is assessed against a fixed set of thresholds derived from IPCC AR6 global emissions pathways. Countries are not ranked against one another. Two countries with the same projected trajectory always receive the same score, and every country can in principle achieve 1.5°C.

The rating does not assess financial risk to the sovereign, or whether a country is meeting its stated climate targets (Nationally Determined Contributions).

The methodology follows these steps:

1. **Establish reduction benchmarks.** Using the IPCC's Sixth Assessment Report (AR6), Clarity AI derives the emissions reduction the world would need to achieve by 2030

¹ Key Partners are Brazil, China, India, Indonesia, and South Africa, as defined by the OECD. List available here: <https://www.oecd.org/en/about/members-partners.html> (accessed July 2026).

(relative to 2019) to stay within each of several temperature outcomes defined by the IPCC (1.5°C, 2°C, 2.5°C, 3°C, and 4°C – see table 1 in Section 1.2. Methodology Details).

2. **Calculate the country's actual trajectory.** For each country in scope, Clarity AI projects the change in production-based (Scope 1) emissions² between 2019 and 2030, based on its historical emissions data.
3. **Determine the country's classification.** The country's projected change is compared against the benchmark table from step 1, and it is assigned the temperature outcome of the closest matching pathway, applying the precautionary principle where its trajectory falls between two pathways.

This approach and its components — the climate benchmarks, emissions projections, and temperature-alignment methodology — are described in detail in Section 1.2. Methodology Details below.

Our ratings are a combination of rules-based and analyst-driven assessments. When human analysts are involved, structured scoring guides that codify what to look at, what evidence counts, and how to translate that evidence into a rating, are used to ensure assessment consistency. Our ratings are updated and made available to users at regular intervals through our platform or other delivery mechanisms. A change in an entity's rating occurs if new information becomes available or if there is a material change to the methodology.

1.2. Methodology Details

1.2.1. Deriving the climate benchmarks

We derive the percentage change thresholds and associated temperatures from the IPCC's Sixth Assessment Report (AR6)³, which lists greenhouse gases and warming characteristics of different mitigation pathways. [See table 3.2 in the AR6 report, page 330⁴.](#)

The temperature levels used (1.5°C, 2°C, 2.5°C, 3°C, and 4°C) correspond to four IPCC AR6 Shared Socioeconomic Pathways, SSP1-1.9, SSP1-2.6, SSP2-4.5, and SSP3-7.0. To add granularity, we interpolate the percentage change thresholds for intermediate temperatures between the IPCC scenarios (1.75°C, 2.25°C, 2.75°C, 3.5°C), shown below:

² Sovereign Scope 1 (territorial) emissions capture all greenhouse gases emitted directly within national borders, such as energy production, industry, transport (excluding international aviation and shipping), agriculture, and waste. The corporate GHG scope framework does not map cleanly onto sovereign accounting; territorial emissions serve as the standard UNFCCC baseline, measured with high consistency. Scope 3 (consumption-based/imported) emissions rely heavily on estimation and indirect attribution, introducing significant uncertainty that makes it harder to assess a country's decarbonization performance.

³ IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA. doi:10.1017/9781009157926

⁴ As of September 2026, AR6 remains the IPCC's most recent full assessment report. The IPCC's Seventh Assessment Report (AR7) is in progress but not expected to be finalized until 2028–2029.

Table 1. Mapping of IPCC AR6 Illustrative Scenarios to Global Warming Levels and Implied 2030 GHG Emissions Reductions (relative to 2019)

Adapted from IPCC AR6 WGIII (2022), Table 3.2.

IPCC Scenario description	Scenario name	Projected global warming level	2030 GHG emissions reductions from 2019 ⁵
Limit warming to 1.5°C (>50%) with net zero GHGs ⁶	SSP1-1.9	1.5	41%
<i>Interpolation</i>	NA	1.75	34%
Limit warming to 2°C (>67%) with action starting in 2020	SSP1-2.6	2.0	27%
<i>Interpolation</i>	NA	2.25	17%
Limit warming to 2.5°C (>50%)	IPCC	2.5	6%
<i>Interpolation</i>	NA	2.75	4%
Limit warming to 3°C (>50%)	SSP2-4.5	3.0	2%
<i>Interpolation</i>	NA	3.5	-5%
Limit warming to 4°C (>50%)	SSP3-7.0	4.0	-11%

1.2.2. Source Data & Emissions Projection Overview

We use the following data source for historical Scope 1 country emissions: EDGAR - Emissions Database for Global Atmospheric Research⁷. This source was chosen after reviewing alternative emissions datasets, based on data coverage, timeliness, and the transparency of the estimation model and underlying methodology. Further details on this decision are outlined in [Section 3.1](#).

For each country in scope, we take its historical emissions series starting from 2015, the year the Paris Agreement was adopted, and project what its emissions level would be in 2030 by extrapolating the trend in that data using regression analysis (details described in Section 1.3, Quantitative Models).

⁵ The thresholds in Table 1 are median values across IPCC AR6's modeled pathways for each warming category; the underlying scenario ranges are wide (e.g., the 1.5°C category spans roughly 34–60% reduction by 2030 versus a 41% median), so results in category boundaries should be treated with appropriate caution.

⁶ This scenario description, and the ones below, are the shorthand used by the IPCC AR6 to describe the warming scenarios. The temperature is the pathway's assessed warming outcome, the percentage in parentheses is the likelihood of staying within that temperature given climate system uncertainty, and the final phrase, when applicable, describes when the pathway reaches net-zero GHGs.

⁷ EDGAR (Emissions Database for Global Atmospheric Research) Community GHG Database, a collaboration between the European Commission, Joint Research Centre (JRC), the International Energy Agency (IEA), and comprising IEA-EDGAR CO₂, EDGAR CH₄, EDGAR N₂O, EDGAR F-GASES version EDGAR_2024_GHG (2024) European Commission, JRC (Datasets) Accessible: https://edgar.jrc.ec.europa.eu/dataset_ghg80.

We then calculate the percentage change between this projected 2030 figure and the country's actual 2019 emissions level. 2019 and 2030 are used as the reference years because they are the base and horizon years defined by the IPCC AR6 pathways, which specify required emissions reductions in 2030 relative to 2019. This alignment lets us compare a country's own projected trajectory directly against the GHG reduction benchmarks to determine its temperature alignment.

1.2.3. Determining the temperature alignment of a country

We compare the country's change in emissions to the scenarios' implied global reductions. For example, a country with a projected change of 27% is assigned a 2°C temperature score.

If a value falls between two temperature outcomes (for example, a 20% reduction falls between 2.0 and 2.25), we follow the precautionary principle and assign the higher temperature score. We assign temperature scores on a scale from 1.5 to 4°C with intervals of 0.25°C up to 3°, and an interval of 0.5° between 3-4°. Countries whose projected emissions change falls outside this range are capped at 1.5°C or 4°C, the lowest and highest scores the methodology assigns.

1.2.4. Example

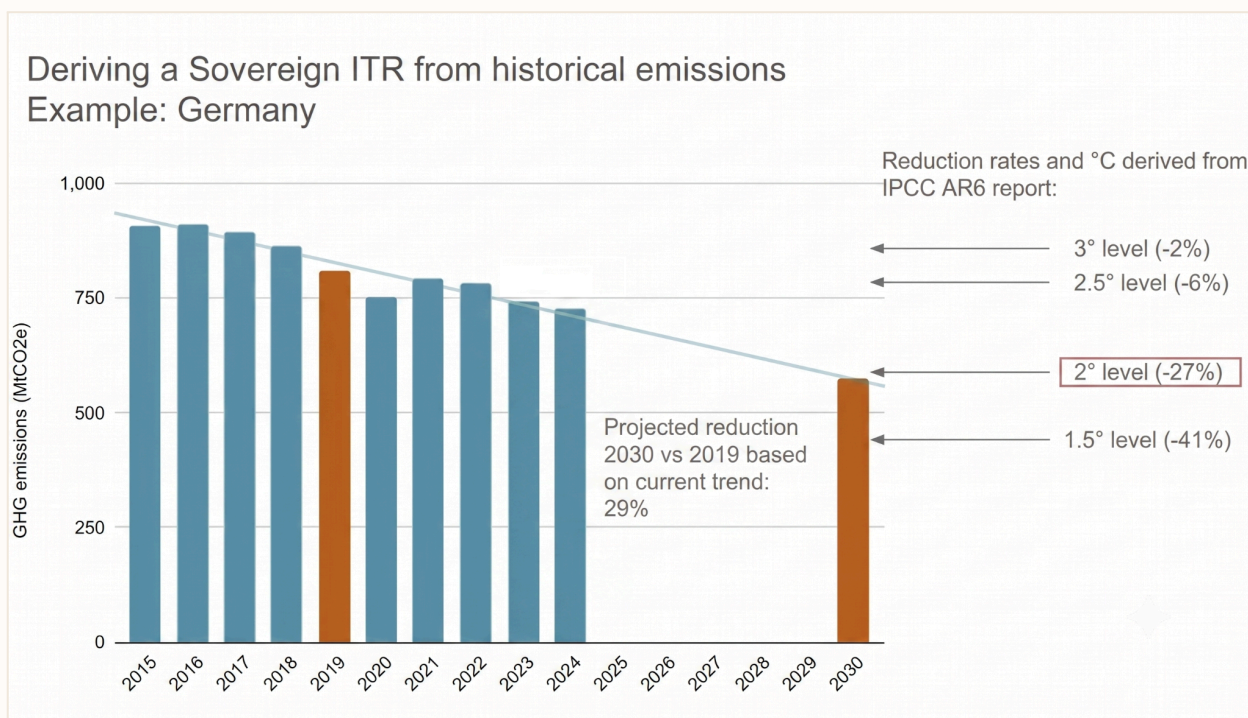
Determining the temperature alignment of Germany

The IPCC AR6 report states that, to limit global warming to 1.5°C with a greater than 50% probability and achieve net zero greenhouse gas (GHG) emissions, global emissions in 2030 must be 41% lower than in 2019. To achieve 2°C warming, global emissions must be 27% lower than in 2019.

To determine Germany's ITR, we first project its level of GHG emissions in 2030 based on historical data starting from 2015. We then calculate the percentage change in emissions between 2019 and the projected 2030 level (in this case, minus 29%⁹). This change is compared to the IPCC's required reduction for different temperature outcomes to determine the country's ITR. As Germany's implied reduction rate is lower than what is required under a 1.75° scenario but higher than what is required under a 2° scenario, the country's ITR is set at 2°C.

⁸ We use finer granularity (0.25°C) between 1.5°C and 3°C because this range spans the IPCC's named scenario categories and the Paris Agreement's targets, allowing the methodology to distinguish meaningful differences in climate ambition. Beyond 3°C, a country is already well outside any Paris-aligned pathway, so a coarser 0.5°C interval is sufficient without implying false precision.

⁹ The ITR of Germany was calculated as of 2024. The country's ITR may change as more recent data is considered in the regression.



1.2.5. Country Universe

Clarity AI determines eligibility for sovereign temperature scoring using a systematic selection process. A country is included in the rating universe if it meets all of the following criteria:

- 1. Categorization & Responsibility:** The country is an OECD Member, OECD Key Partner¹⁰, or OPEC Member State, ensuring focus on entities with high current or historical emissions responsibility. Developing nations outside these groups are intentionally excluded to avoid unfair scoring penalties.
- 2. Data Availability & Integrity:** Complete, uninterrupted historical Scope 1 emissions data (excluding LULUCF) is available from EDGAR across the entire required historical assessment window (2015 to the most recent reported year).
- 3. Global Emissions Representation:** The country's emissions contribute to the universe representing a critical mass (~78%) of global annual production emissions¹¹.

Based on these criteria, Clarity AI currently scores **52 countries** for temperature alignment. The country's universe and data availability requirements are reviewed periodically to accommodate updates to OECD/OPEC memberships and international emissions reporting standards. Industry classification standards are not applicable to this methodology, as sovereigns are not mapped to industries.

¹⁰ Key Partners are Brazil, China, India, Indonesia, and South Africa, as defined by the OECD. List available here: <https://www.oecd.org/en/about/members-partners.html> (accessed July 2026).

¹¹ This figure was calculated using EDGAR data by summing Scope 1 emissions for OECD Members, Key Partners, and OPEC member states, then dividing that total by global Scope 1 emissions, resulting in a proportion of 77.56%.

1.3. Quantitative Models

The Sovereign ITR methodology relies on a linear regression (Ordinary Least Squares) trend projection, used to project a 2030 emissions estimate based on the country's historical Scope 1 emissions.

- *Model selection:* OLS linear trend regression was selected after an analysis of different potential approaches. Due to the limited number of historical annual observations available per country, more complex models were deemed less suitable.
- *Inputs:* Annual country-level Scope 1 emissions (excluding LULUCF)¹², sourced from EDGAR. No other explanatory variables, such as GDP, population, or policy changes, are used; the model considers emissions as a simple function of time.
- *Model specification:* A univariate OLS regression is fitted to the historical annual emissions values, with year as the independent variable and emissions level as the dependent variable. The fitted trend line is then extrapolated to estimate the emissions value at year 2030.
- *Output:* A projected 2030 Scope 1 emissions level per country. This estimate is then compared to the country's actual 2019 emissions to derive a percentage change, which is mapped to a temperature outcome using the climate benchmark thresholds described in Section 1.2.
- *Model limitations:* The model does not incorporate national emissions-reduction targets (NDCs) or current policy trajectories, and by design assumes a continuation of each country's historical trend. These limitations are addressed further in Section 5 - Assumptions & Limitations.

2. Rating Product Specifics

2.1. Materiality Objectives & Dimensions

The Sovereign ITR is a single-materiality (impact-only) rating. It compares a country's projected 2030 emissions trajectory against the global reduction pathways needed to limit warming to specific temperature outcomes, and assigns the country the corresponding implied temperature rise. It does not assess financial risk to the sovereign.

2.2. Factor Scope & Specific Issues

This rating covers a single environmental (E) factor: climate change. It does not assess Social or Governance factors and is not an aggregated E+S+G rating. The specific issue covered is temperature alignment of national governments, expressed as an implied temperature rise consistent with a country's historical Scope 1 emissions trend.

¹² Scope 1 emissions excluding LULUCF is used because LULUCF emissions and removals carry greater measurement uncertainty than fossil fuel and industrial emissions, and countries account for them in widely varying ways. It is therefore common practice in emissions databases and climate methodologies to exclude LULUCF from core emissions trend analysis, to avoid this uncertainty and accounting variation distorting the underlying trajectory.

2.3. Key Performance Indicators (KPIs)

KPI	Description
Historical Scope 1 emissions (excl. LULUCF), 2015 - present year	Annual country-level GHG emissions from EDGAR, used as the regression input
Projected 2030 Scope 1 emissions (excl. LULUCF)	OLS-projected emissions level for 2030
% change, 2030 projected vs. 2019 actual	Derived metric used to map the country onto the climate benchmark table
Implied Temperature Rise (°C)	Final output metric — the country's temperature score

The methodology is not a composite/weighted index. A single input metric (Scope 1 emissions excl. LULUCF) flows through the regression and lookup table to a single output for each rated sovereign.

2.4. Weighting & Aggregation Logic

Not applicable. This is not an aggregated rating, and no weighting is applied across multiple indicators. The output is derived from a single emissions metric through the regression and benchmark-matching process described in Section 1 – Analytical Framework.

2.5. Alignment with EU Reporting Standards

This methodology corresponds to a single CSRD topic: Climate Change - Mitigation (Scope 1, 2, and 3 emissions) and covers Scope 1 emissions (excluding LULUCF) only.

2.6. Assessment Model

The rating is expressed on a categorical scale where each country is assigned one of a fixed set of temperature outcomes (in °C). Scoring thresholds are derived directly from IPCC AR6 illustrative mitigation pathways (and interpolated intermediate points, as explained in Section 1. Analytical Framework), each associated with a required 2030 global emissions reduction vs. 2019. A country's own projected emissions change is matched against this fixed threshold table. The assessment does not assign scores on a relative basis against peers.

2.7. International Agreement Alignment

Relevant agreement: The Paris Agreement (2015) and the IPCC's Sixth Assessment Report (AR6), which operationalizes the Paris Agreement's temperature goals into quantified global emissions pathways.

Relevance: The methodology's entire benchmark structure (Section 1.2.) is built directly on IPCC AR6 pathways corresponding to the Paris Agreement's 1.5°C/well-below-2°C temperature goals.

Commitment assessment: The rating does not assess whether a country has made or is meeting a formal Paris Agreement commitment (e.g., its NDC). It measures actual historical emissions trends extrapolated forward, independent of stated national targets or pledges.

2.8. Scientific Evidence

We prioritise aligning our methodology and selecting metrics in accordance with science-based standards. Where such scientific standards are lacking, we rely on recognised industry standards and best practices wherever possible. Any gaps or ambiguities in standards are addressed on the basis of scientific findings from reputable publications.

This methodology is built upon the IPCC's Sixth Assessment Report (AR6), using its illustrative mitigation pathways as the sole source of the temperature/emissions-reduction relationships underlying the rating.

We have also selected a data source, EDGAR, that is explicitly recognized by the IPCC guidelines as an independent dataset suitable for verifying national inventories. EDGAR is maintained by the Joint Research Centre (JRC) of the European Commission and is built on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, the same framework governments use for their own official emissions reporting. It applies a consistent methodology and default emission factors across all countries, supporting comparability between them.¹³

The methodology is based on:

- IPCC Sixth Assessment Report (AR6), Working Group III — specifically the illustrative mitigation pathways (SSP1-1.9, SSP1-2.6, SSP2-4.5, SSP3-7.0) and their associated 2030 global emissions reduction requirements relative to 2019, used to construct the climate benchmark table in Section 1.2.
- Intermediate temperature points (1.75°C, 2.25°C, 2.75°C, 3.5°C) are interpolated by Clarity AI between adjacent IPCC pathway data points, as no official IPCC-modeled pathway exists at those exact levels.

3. Data Sourcing & Quality

3.1. Data Sourcing

The Sovereign ITR methodology relies on a single public data source: EDGAR (Emissions Database for Global Atmospheric Research), maintained by the European Commission's Joint Research Centre. EDGAR provides independent estimates of greenhouse gas emissions by country, sector, and year¹⁴. Estimates are calculated using country-level activity data paired with IPCC emission

¹³ For more detail on EDGAR's methodology, see the official documentation at <https://edgar.jrc.ec.europa.eu/>, and for a peer-reviewed assessment of its uncertainty and methodology, see Solazzo et al. (2021), "Uncertainties in the Emissions Database for Global Atmospheric Research (EDGAR) emission inventory of greenhouse gases," Atmospheric Chemistry and Physics, <https://acp.copernicus.org/articles/21/5655/2021/>.

¹⁴ EDGAR's methodology is documented at <https://edgar.jrc.ec.europa.eu/methodology>. Emissions are computed following a consistent IPCC-based approach, combining country-level activity data with sector-specific emission factors, which allows comparability across countries.

intensity factors. Data is distributed annually to Clarity AI and subsequently incorporated into the assessment.

Alternative sources considered included emissions data published by the Organisation for Economic Co-operation and Development (OECD) and the United Nations Framework Convention on Climate Change (UNFCCC).

- OECD emissions data are published with a longer delay than EDGAR data, which would reduce the timeliness of the rating.
- UNFCCC data are self-reported by national governments, and only developed countries are required to submit complete annual inventories. This would result in incomplete coverage of the rating universe.

EDGAR was selected because it provides independent, annually updated emissions estimates for all countries. Developed by the European Commission's Joint Research Centre, EDGAR estimates each country's emissions using the same IPCC-based methodology and the same international data sources, ensuring consistent treatment of all countries in the universe.

Clarity AI receives EDGAR data with a one-year lag, i.e., receiving 2025 data at the end of 2026. This is consistent with EDGAR's stated minimum "t-1" delay, driven by its reliance on underlying national and international statistics (e.g., energy and industrial activity data) that take time to compile and finalize.¹⁵ Data is incorporated into the sovereign ITR calculation as soon as it becomes available.

3.2. Data Quality & Reliability

We operate a structured data quality control framework applied at each stage of the data ingestion, processing, and release process. The framework covers pre-release validation of raw data, validation of ratings, a defined remediation process, and a policy for the revision of historical data.

For rule-based ratings, prior to each data release, we perform a validation of the candidate raw data dataset proposed for release. The validation covers all metrics in scope for the release. Illustrative examples of the checks applied include:

Coverage checks: unexpected losses in metric, provider, or entity coverage relative to the prior release are investigated. Losses affecting priority metrics are treated as release blockers;

Value range checks: data points are verified against pre-defined acceptable ranges for each metric. Points outside those ranges are flagged for review;

Absolute value change checks: individual data point values are compared between the candidate release and the version in production. Unexpected deviations are flagged for review;

Historical series consistency: Z-scores are calculated per metric for each entity across all available years. Year-on-year changes are also monitored, with large deviations between consecutive years triggering a flag on both affected data points;

¹⁵ See <https://edgar.jrc.ec.europa.eu/> and Crippa et al. (2025), "Global up-to-date emissions using the EDGAR Fast-Track methodology," Scientific Data, <https://www.nature.com/articles/s41597-025-04806-2>, which describes EDGAR's approach to computing emissions "up to the most recent year" with minimum delay.

Related metrics consistency: internal consistency across logically related metrics is verified, for example, by checking that the sum of component values does not exceed the corresponding total;

Policy metric checks: transitions in policy values are monitored, with particular attention to losses of previously reported policies. Data points inconsistent with the prevailing industry profile are subject to sample-based review.

All blocked data points are documented and tracked in dedicated tickets. Issues that cannot be resolved within the validation window are discussed on a case-by-case basis. Following raw data validation, relevant experts perform additional product-level checks on ratings, and approve the ratings.

For human analyst based ratings we track human input and require additional approvals for high stake calls.

3.3. Data Revision Policy

Clarity AI sources data directly from EDGAR. If EDGAR data revises previous figures, these figures will subsequently be reviewed in our data validation processes and included in the methodology, as appropriate.

3.4. Missing Data & Estimations

Clarity AI does not estimate or impute missing historical emissions data. Instead, a country is only included in the Sovereign ITR universe if it has complete Scope 1 emissions data (excluding LULUCF) from EDGAR for every year from 2015 to up until the most current year, with no gaps. Countries that do not meet this completeness requirement are excluded from scoring entirely, rather than estimated.

The methodology uses a linear regression (OLS) model to project each country's 2030 emissions level from its historical data trend (see Section 1.3., Quantitative Models), but it never estimates missing or historical data.

3.5. Handling of major new information

Clarity AI incorporates new sovereign emissions data from EDGAR on an annual basis following the EDGAR data release cycle. The valid time horizon of the rating is one year, which corresponds to the annual update of EDGAR data. Scenario pathways are updated following the release of new Assessment Reports by the IPCC. A change in an entity's rating occurs if new information becomes available, if an identified data error is remedied, or if there is a material change to the methodology.

4. Artificial Intelligence (AI) Usage

4.1. Methodology Implementation

The Regulated Entity integrates AI-assisted software development tools to facilitate the translation of approved ESG rating methodologies into production-ready code. In this capacity, AI functions as an engineering support tool to optimize efficiency and code quality by assisting with

logic drafting, unit test generation, refactoring, and the systematic identification of potential edge cases or implementation defects.

AI is not deployed as an autonomous decision-maker; it does not independently define or modify rating methodologies. All methodology design, regulatory interpretation, and final deployment decisions remain the sole responsibility of our engineers and methodology owners, governed by established review protocols.

The integration of AI into methodology implementation introduces specific risks, including potential misinterpretation of requirements, subtle calculation errors, or the creation of technical debt through unmaintainable logic. Furthermore, there is a risk of over-reliance leading to insufficient independent validation or reduced traceability if implementation decisions are not rigorously documented and peer-reviewed.

These implementation risks are systematically mitigated through our standard software development lifecycle (SDLC) and rigorous engineering controls.

Human Accountability and Review: All AI-assisted implementations are fully owned and validated by Clarity AI engineers. AI tools are prohibited from approving code or deploying changes. Every methodology-related code change undergoes mandatory peer review to ensure correctness against approved requirements, architectural consistency, and data integrity.

Testing and Validation: AI-assisted code must adhere to a comprehensive testing pyramid, including unit tests for specific calculations, integration tests for data pipelines, and regression tests to ensure historical stability. Deterministic logic is validated against predefined test cases and controlled datasets to confirm the implementation aligns with the intended methodology behavior.

Good Engineering Practices: We apply standardized MLOps and engineering safeguards, such as version control, continuous integration, and static analysis. By enforcing small, reviewable pull requests and clear ownership of code changes, we maintain high standards of transparency and allow for the rapid rollback of production changes if anomalies are detected.

Traceability and Governance: Every technical implementation is transparently linked back to its underlying methodology documentation and acceptance criteria. AI-generated suggestions are only promoted if they are traceable to approved inputs, ensuring that AI remains a constrained tool within our broader methodology governance framework.

4.2. Data Collection

Data is directly sourced from a third party provider, EDGAR. There is no use of AI in the data collection for sovereign ITRs.

5. Assumptions & Limitations

5.1. Key assumptions

- We assume that a country's historical Scope 1 emissions trend is a reasonable basis for projecting its 2030 emissions level.

- We assume that comparing a country's projected emissions change against global IPCC pathways — which are modeled at the level of total global emissions — is a meaningful way to assign an individual country's implied temperature contribution, even though no single country's actions alone determine global temperature outcomes. This is an approach inherent to ITR methodologies, where the outcomes are intended to be used as a common scale for comparing countries' trajectories rather than a precise forecast.
- We assume that an absolute (non-normalized) change in emissions is a valid basis for comparison across countries, regardless of a country's stage of economic development.
- Where a country's projected emissions change falls between two benchmark thresholds, we assume it is more prudent to assign the higher (less ambitious) temperature score rather than the lower one, in line with the precautionary principle.

5.2. Limitations in Data Sources

The data source used for the Sovereign ITR Methodology has the following limitations:

- The methodology relies on a single third-party data source (EDGAR) for country-level Scope 1 emissions, rather than triangulating estimates across multiple providers. EDGAR was selected because it applies a consistent, IPCC-aligned methodology across all countries, supporting comparability between them. However, this single-source reliance means any systematic bias or error in EDGAR's own methodology would carry into the rating.
- Similarly, we are limited by the country and year coverage provided by EDGAR. Gaps in reported data points are not filled by other providers and may mean that a country is excluded from the assessment.
- EDGAR's historical data is also subject to periodic revision as underlying national and international statistics are updated or corrected, meaning a country's past emissions figures, and by extension, its projected trajectory, can shift between one EDGAR release and the next, even without any real-world change in that country's emissions. In any case, 90% of the changes in temperature rating due to year updates correspond to a single band shift (e.g., 1.75°C to 1.50°C), and most countries reduce their temperature rating as more information becomes available.
- EDGAR's sectoral coverage also excludes Land Use, Land Use Change and Forestry (LULUCF). This means the methodology does not capture emissions or removals associated with deforestation or land-use change — a potentially significant omission for countries where LULUCF represents a large share of total emissions (e.g., countries with substantial deforestation activity), for whom the rating may not fully reflect their true climate impact.

5.3. Limitations in Methodologies and Models

The Sovereign ITR Methodology is subject to the following limitations:

- The methodology currently looks at historical emissions of a country without taking into account its targets (Nationally Determined Contributions) or current policies that may lead to future reductions. As such, our projections may overestimate future emissions levels.
- Our methodology is based on a rate-of-reduction approach and does not take into account fair-share considerations or the historical responsibility of certain countries for depleting the global carbon budget early. Instead, we assume that every country in our universe needs to reduce emissions at the same pace going forward. In this context, it should be mentioned that we do not currently score low-emitting and many developing countries, in order to avoid unfair penalties associated with high temperature scores. As a result, our methodology does not cover all countries included in standard emerging market bond indices.
- Projecting future emissions using a linear trend assumes that a country's rate of emissions change continues at a constant pace. It does not capture non-linear effects such as policy inflection points, economic shocks, global events such as the COVID pandemic, or accelerating/decelerating decarbonization.
- The selection of a linear regression model also has limitations. Linear regressions based on a limited historical time series carry statistical uncertainty. Noisier historical data (e.g., volatile year-to-year emissions) would produce a less reliable 2030 estimate than smoother, more consistent series.
- The methodology uses production-based (Scope 1) accounting, which measures emissions generated within a country's borders rather than emissions associated specifically with consumption. This means countries that import manufactured goods can appear to have a more favorable trajectory than their full consumption footprint would suggest, while countries with substantial export-oriented manufacturing may appear less favorable, independent of their domestic climate policy. This is a well-documented limitation of production-based sovereign climate metrics generally, not specific to this methodology.
- Finally, the methodology currently covers ITRs only for the year 2030. As this date nears, the current emissions level will be an even stronger indicator for the 2030 temperature. This consideration is not captured in the methodology currently. Future iterations of the methodology can consider including further out projections, such as ITR for 2050.

6. Methodology Governance

6.1. Governance Process Overview

The Regulated Entity maintains a robust methodology governance framework designed to ensure that all rating methodologies remain independent, rigorous, systematic, and impartial. To uphold these core principles, the Regulated Entity subjects its methodologies to a structured development, review, and approval process overseen by dedicated internal governance bodies, in line with our ESG Ratings Governance Policy.

Methodologies are reviewed on a regular basis and at least annually to verify that they remain fit for purpose. Emerging regulatory requirements, and market trends are considered in those reviews. Reviewed methodologies are subject to a peer review and mandatory final approval by the Methodology Committee before any update can be deployed.

Changes to existing methodologies are applied across the entire rated universe, including corporate, financial instruments, or sovereign scores, where applicable. When a methodology modification is deemed material, an impact assessment is conducted prior to the scheduled release.

The Regulated Entity is committed to transparent communication to users and rated entities, and makes information about its methodologies publicly available.

Users, rated entities and other stakeholders may submit their feedback in respect of published methodologies via the existing communication channels.

6.2. Engagement Process

The methodology is applied to the assessed universe on an unsolicited basis. Rated items do not participate in the assessment process. Once the rating is issued, rated entities can access Clarity AI's platform for free to review it, including the underlying data used to calculate the rating, and to submit complaints in case there are any errors.

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