

CLIMATE SCOPE 1.5

The Clean Energy Country
Competitiveness Index



SECTION 5. METHODOLOGY

Climatescope seeks to bring quantitative rigor to the basic question of what makes a country attractive for clean energy investment, development, and deployment. It seeks to answer this by collecting as much relevant data as possible, then organizing it in a manner that is both easy to consume and empowers users to gain key insights.

Climatescope ranks countries on their past, present, and future ability to attract investment for clean energy companies and projects. Clean energy is defined as biofuels, biomass & waste, geothermal, solar, wind and small hydro (up to 50MW). While a number of Climatescope nations have historically embraced large hydro generation to meet local power needs, this study focused exclusively on newer sources of low-carbon generation, both because they are often technologically cutting edge and because they can generally be deployed far faster than large hydro projects, which can take years or even decades to commission. By comparison, wind projects can be sited and erected in as little as two to three years. Utility-scale solar photovoltaic projects can be constructed in as little as six months and distributed photovoltaic systems can be added to rooftops in a day or less. In short, these technologies are poised to make – and in many cases are already making – near immediate impact on energy supply and access in the developing world. Climatescope sought to assess how ready these countries are to embrace them.

In this 5th edition, the project includes three new Middle East and North Africa (MENA) countries: Egypt, Jordan and Lebanon.

Climatescope's index once again consists of four overarching parameters. Beneath these parameters are 50 data inputs, or indicators. Some indicators consist of a single data input but many consist of multiple data points that have been synthesized into a single figure. Each indicator counts toward a country's final score but these are not weighted equally. Scores range from 0 to a maximum of 5. The final score a country receives under Climatescope is determined by a weighted combination of its four parameter scores. For 2016, the weighting of these parameters remains as it was in 2015:

- Enabling Framework Parameter I – 40%
- Clean Energy Investment and Climate Financing Parameter II – 30%
- Low-carbon Business and Clean Energy Value Chains Parameter III – 15%
- Greenhouse Gas Management Activities Parameter IV – 15%

The entire Climatescope model can be viewed at www.global-climatescope.org where users are encouraged to adjust the parameter weightings according to their priorities and download the aggregate data available.

ACCOUNTING FOR LESSER DEVELOPED NATIONS THROUGH THE “OFF-GRID FOCUS” METHODOLOGY

As in 2015, Climatescope 2016 assessed nations ranging from lowest income to those firmly considered “middle income”. As a result, Climatescope 2016 once again includes a special, augmented “off-grid focus” methodology that includes seven special indicators, with weightings adjusted in the model accordingly. These indicators were taken into account alongside the other “on-grid” indicators for a sub-set of 23 Climatescope nations: 18 in Africa, one in Latin America and Caribbean, and four in Asia. The goal of the off-grid effort is to level the playing field so that all countries can be compared in the fairest possible manner against one another in a single 58-country list. In addition, visitors to www.global-climatescope.org can examine the specific off-grid focus indicators in detail if they choose and compare in isolation the 23 nations that were

assessed using this methodology. To determine which countries are assessed using the off-grid focus methodology, a 0-5 scoring system was once again applied. Five factors contributed at different weightings to this score; those that score a 2.5 or higher are considered “off-grid focus countries”.

Factor: Electrification rate Question: What percentage of a country’s population is not currently connected to the power grid? Criteria/score: A country with a low enough proportion connected received a score of 2. Data source: International Energy Agency

Factor: Number of national power outages Question: How many power outages did the country experience in the most recent year for which there is complete data? Criteria/score: A country with a sufficiently large enough number of outages scored 1. Data source: World Bank

Factor: Duration of outages Question: What was the average length of time a typical grid outage lasted? Criteria/score: A country where outages lasted sufficient durations scored 1. Data source: World Bank

Factor: Power transmission losses Question: What are the typical line losses? Criteria/score: A country where transmission losses exceeded a certain threshold scored 0.5. Data source: World Bank

Factor: Human Development Index Question: How is the country classified in the UNDP’s HDI? Criteria/score: A country classified “Low Development” scored 0.5. Data source: UNDP

The off-grid focus methodology’s additional indicators were specifically designed in consultation with outside experts to assess conditions in developing nations. These indicators fell under Climatescope’s first three parameters but had no impact on Greenhouse Gas Management Activities Parameter IV. They were:

- Distributed energy regulatory frameworks: How well does a country’s local market structure facilitate off-grid or small-scale development of projects?
- Energy access policies: What local policies exist specifically to spur off-grid activity?
- Average local kerosene and diesel prices: How high are these prices and how attractive do they make potential alternative (cleaner) sources of generation?
- Population using solid fuels for cooking: How many citizens would potentially value alternative fuel sources to cook?
- Distributed clean energy value chains: What local mini-hydro and mini-wind equipment makers, mini-photovoltaic systems providers, and other similar types of players exist in-country?
- Distributed clean energy service providers: What local retailers, pay-as-you go facilitators, insurance providers, and others specializing in off-grid and small-scale clean energy services are in-country?

For 2016, the Climatescope methodology for off-grid countries was refined, building on the experience acquired in the previous editions of the index. In addition, six barriers specific to off-grid countries focusing on the challenges to the importing and retailing of off-grid renewable technology products were introduced.

SCORING APPROACHES

Scoring approaches employed in the first four editions of Climatescope were also used for this 2015 edition. These include:

- Indexing – The Climatescope index is based entirely on a 0-5 scoring system, with 5 representing the highest possible score. Using the indexing approach, the country with the maximum output for a given indicator, after levelization in most cases, received the highest score in the index (5).

All other countries’ outputs were mapped relative to the maximum score. This approach was employed on quantitative indicators such as clean energy installed capacity, clean energy

investment and electrification rate. For growth rates, benchmark maximum high score scores were capped at 150% to avoid extremely high rates (e.g. where a small country has added a single, significant project onto a very low base) impacting all nations unfairly.

- Tiering – In other cases, country indicator scores were tiered into predefined quintiles. For example, in the case of the clean energy policies indicator, tiering was used and countries were placed in different quintiles depending on the perceived policy ambition or effectiveness of their clean energy policy framework.

This methodology is better suited than indexing for qualitative assessments such as rating the ease of carbon offset project development. Tiering was also used in cases when the quantitative outputs are based on limited data.

- Simple counting – Some indicators were simply binary and thus countable. In such cases, the country either received a 0 or a 5 score. For instance, one indicator simply sought to take into account whether countries have rural electrification programs using clean energy sources. Those that did received scores of 5. Those that did not received scores of zero.

5.2. ENABLING FRAMEWORK

The Enabling Framework parameter encompasses fundamental structures and market conditions typically required for a given country to attract investment and interest from financiers, project developers, or independent power producers looking to develop new low-carbon projects, companies or manufacturing facilities. It also takes into account how amenable such structures are to the deployment of distributed generation capacity, such as mini-grids, or residential wind or solar systems.

A welcoming enabling framework is one where: a comprehensive, effective and stable set of rules are in place; the power market structure encourages and adequately rewards new market entrants; the private and public sectors foster universal access to clean and sustainable energy in rural or isolated communities; clean energy penetration of the power and primary energy matrices is ever increasing; adequate price signals are available; and growing demand for power and rapid electrification combine to create a substantial market.

A total of 18 indicators serve as the inputs into Parameter I. These fall into four categories: Policy and Regulation, Clean Energy Penetration, Price Attractiveness, and Market Size Expectation. Each category contributed with varying weights to the overall Enabling Framework parameter score. Scoring for Parameter I is completed with 5 indicators applied exclusively to countries which were assessed under the off-grid focus methodology.

POLICY & REGULATION

The Policy and Regulation category includes four specific indicators for all nations in the survey: clean energy policies, power sector structure, clean energy rural electrification, and policy barriers. For nations assessed under the off-grid focus methodology, the scope of the policy barriers was extended and two additional indicators were taken into account: distributed regulatory framework and energy access policies.

CLEAN ENERGY POLICIES

For the 2016 Climatescope, a comprehensive search for relevant policies was undertaken by examining primary source documents and conducting interviews with local policy-makers. In the end, the number of policies being tracked by BNEF for these nations in its online database expanded to 838 from 599 (all are accessible via www.global-climatescope.org). Policies were then divided by type: (1) energy target (2) feed-in-tariff/price premium, (3) auctions, (4) biofuels

blending mandate, (5) debt/equity incentive, (6) tax incentive, (7) utility regulation and (8) net metering.

A review panel consisting of 42 external energy policy experts was then convened to assess the policies. Each expert was assigned the task of examining and scoring a set number of policies of specific types across multiple countries. At no point were panelists asked to assess a country's overall policy framework. This was intended to reduce any potential national bias a panelist might have toward a certain country.

External experts were assigned to review policies for each of the eight clean energy policy types. The experts were asked to take into account six cross-cutting factors when judging a specific clean energy policy. Each panelist was assigned to a specific policy type based on his or her area of expertise, and the panelist then reviewed and scored those policies. For each policy they reviewed, expert panelists assigned "high", "medium" or "low" scores corresponding to the six cross-cutting factors. The high, medium, and low scores were then translated into numerical values of five, three and one, respectively. Participation was done remotely and all scores were submitted electronically. In the end, each of the policies was reviewed by at least three expert panelists. Each policy then received a "raw" policy score – the average score for each of the cross-cutting factors given by all experts assigned to judging the policy in question. From these scores, an overall raw clean energy policy score per country was derived by adding the scores assigned by panelists.

In cases where a country did not have a specific type of policy, it received no score. For instance, 18 Climatescope nations have net metering laws and thus received scores for those. The other 40 nations without such policies received no net metering score. Thus countries that have established policies in a given area were rewarded while those that have not were, in effect, penalized. A policy "equalizer" consisting of two subcomponents – comprehensiveness and political risk – was included in the methodology. Comprehensiveness was defined as the level of completeness of a country's overall policy framework – the number of different policy types it has vis-à-vis its peers. The comprehensiveness metric was obtained by assigning each country a relative score based on how many policies were available in that country out of a possible maximum of eight. Scores were then benchmarked against one.

The World Bank's Worldwide Governance Indicators (WGI) 2015 index was used to address the question of political risk. This index covers six overarching political and country risk-related factors – voice and accountability, political stability and absence of violence, governance effectiveness, regulatory quality, rule of law, and control of corruption. The six components of the WGI score were averaged to obtain the final political risk metric. The political risk subcomponent score was then added to the comprehensiveness score rank to derive a final policy equalizer per country. A nation's equalizer was then multiplied by its raw country policy score to derive a final clean energy policy score. It should be noted that in the cases of the Indian states, the overall policy scores for India was applied.

POWER SECTOR STRUCTURE

A fundamental assumption underlies the power sector structure indicator: a liberalized power market is more conducive to attracting investment in renewable energy development than a tightly controlled market. This indicator seeks to gauge the degree of liberalization in a country's power market.

To derive the power sector score, 15 specific questions were asked about a country's power market, with possible scores of low, medium, and high per question with a maximum possible score for any country of 5. As these questions were relatively non-qualitative, Bloomberg New

Energy Finance conducted primary research on the power market structures for all 64 countries, states and provinces and assigned the scores on each question for each.

DISTRIBUTED ENERGY REGULATORY FRAMEWORK

Climatescope examined some of the core regulatory characteristics related to enabling off-grid, mini-grid and small power project activity. This was done through a series of 17 questions posed about each off-grid focus country. These were answered by BNEF analysts after consultations with local officials and private market players. Countries received a score on each question. The total score was benchmarked among the off-grid focus countries to derive a score for this indicator.

CLEAN ENERGY RURAL ELECTRIFICATION

The third indicator in the Policy & Regulation category of Parameter I assesses the efforts of nations to expand access to power to the rural poor using clean energy technologies. This also applied to previous years and thus formed part of the score for all countries. Scoring on this indicator was binary: countries with rural electrification programs that promote clean energy received a 1 while others received a 0.

ENERGY ACCESS POLICIES

The energy access policies indicator was applied only to countries analyzed under the off-grid focus methodology. Like the distributed energy regulatory framework indicator discussed above, this indicator relied on a series of 14 questions BNEF analysts asked about individual nations and answered after local consultation. All but three of these were scored in a manner similar to the approach used for the distributed energy regulatory framework indicator. Two questions simply looked at the amount an individual government has budgeted for its rural electrification program and one of question looked at the base upfront cost for a new grid connection for a household near the grid.

POLICY BARRIERS

The trade barrier indicator for all countries was based on data from the World Trade Organization on the average import duties levied by each Climatescope country on a range of clean energy products. These covered nine categories of products across the solar, wind and hydro value chains: inverters, solar lanterns, PV cells and modules, wind towers (of iron or steel), wind turbine blades, wind gearboxes, wind and hydro generators, hydraulic turbine parts. The duties were averaged by sector and then benchmarked against the other countries on the index. Lower overall duties achieved higher scores on the indicator, as higher duties raise the cost of bringing clean technology into the country and contribute to making growth in these sectors harder. In 2016, the barrier indicator was expanded for off-grid countries with six new elements: the presence of diesel or kerosene subsidies; the import duty and VAT rate charged for off-grid products and how they compare to those for other energy carriers; and the presence of other barriers to the retail and import of off-grid products.

CLEAN ENERGY PENETRATION

This category consists of six distinct indicators that seek to measure shares of clean energy installed capacity, shares of clean energy generation and levels of biofuels production, as well as the associated growth rates for each. Again, note that our definition of clean energy here does not include large hydro (50MW or greater), nor does it include nuclear power. These indicators are: clean energy installed capacity, growth rate of clean energy installed capacity, clean energy

electricity generation, growth rate of clean energy electricity generation, biofuels production capacity, and growth rate of biofuels production capacity.

Each of the three Indicators related to growth rates contributed 20% to the Clean Energy Penetration category score, and had a net weight of 3.2% toward the overall Climatescope score. Each non-growth energy indicator held a 15% weighting of the category score, with a 2.4% net weight, while the biofuels production indicator held a 10% category weighting, with a 1.6% net weight for the overall Climatescope index.

In 2015, the method for calculating a country's final clean energy capacity rate score was tweaked slightly. Until 2014, this score was derived using the indexing approach (with the highest scorer receiving a 5 and all other nations scored against that country on a graduated basis). Last year, however, the high scorer benchmark was capped at 150%. There was a simple reason for this: one country that prior to 2014 had virtually no clean energy capacity saw a jump in one year of 289%. Having all other countries benchmarked against this 289% would have badly hurt the scores of them all (even nations that had posted otherwise remarkable growth rates of 100% or more). As a result, a cap of 150% was used for this particular benchmarking/indexing exercise. A similar 150% cap on the benchmark was placed on the clean energy electricity generation for the same reason.

Data for all six indicators comprising the clean energy penetration category were derived from primary sources, including websites and publications from energy ministries, power market regulators, system operators and utilities. Whenever possible, 2015 data were employed for Climatescope. Growth rates were calculated based on changes between the latest two years for which data were available.

PRICE ATTRACTIVENESS

The price attractiveness category of indicators takes an accounting of local electricity prices and, in the case of countries being analysed under the off-grid focus methodology, the price of fuels used to power small-scale generators. The general principle: higher priced energy markets are generally more attractive for clean energy development and deployment as clean energy is all the more cost-competitive. In all, BNEF collected data on the following four classes of electricity tariff in every country where it was available:

- Spot – The average price paid in 2015 (or last year when data was available) in the country's liberalized market where electricity is traded
- Residential – The average price paid by citizens
- Commercial – The average paid by "commercial" users as classified locally by regulators
- Industrial – The average paid by "industrial" users as classified locally by regulators

The final price attractiveness score was derived in one of two ways depending on whether a country was assessed under the off-grid focus methodology or not. In the case of those that were not, a combination of the above electricity prices was used to determine a score. In the case of the off-grid focus countries, electricity prices plus the prices of two other sources of fuel were taken into account.

First, for the on-grid focus countries, two electricity prices were used to determine a price attractiveness score: the average spot price in the country and a composite "average retail price". The spot price was derived simply by taking the average seen over the course of a year (all times of day and year included) in a given market. The second was derived by taking the average of the residential, commercial, and industrial prices seen in that country over the prior year to determine the retail price. Each of these scores were then given equal weighting toward the final price attractiveness score. Many countries do not have spot markets for electricity trading, however. In

those countries, the retail price alone was used to determine the price attractiveness score. Finally, for off-grid focus countries, additional fuel sources for distributed power generation and lighting were taken into account: kerosene and diesel. BNEF collected average prices for these fuels on a US dollar per liter basis in 2015. Again, the guiding principle was that higher priced fuel makes a market more attractive for investors as renewables become all the more cost-competitive. BNEF then used the indexing approach to determine 0-5 scores. The country with the highest prices received the highest score (5). All other nations were then benchmarked against that nation.

MARKET SIZE EXPECTATIONS CATEGORY

Markets poised for growth are attractive to clean energy investors. Recent strong growth in power demand, a high percentage of the population without access to reliable electricity, or a high number of citizens reliant on solid fuels for cooking all potential opportunities for clean energy deployment. The Market Size Expectations category sought to measure countries with such characteristics through three indicators, two of which applied to all nations surveyed and one specifically intended to take into account conditions in lesser developed countries.

The clean energy electrification indicator assessed electrification levels in a country. The nation with the lowest such rate was considered the benchmark and received a mark of 5, with all others then receiving scores mapped relative to the maximum. The power demand growth rate indicator examined the last five years of growth in electricity demand in a country, again with countries benchmarked against a high scorer of 5.

Finally, for the off-grid focus countries, the population using solid fuels for cooking indicator employed data collected by the Alliance for Clean Cook Stoves to determine what percentage of a country's population could potentially be served with clean cook stoves or other technology that could allow them to cook using cleaner fuels instead of solid fuels.

5.3. CLEAN ENERGY INVESTMENT & CLIMATE FINANCING

Few investors are comfortable with being the first to invest in a new technology or a new region. To rank a country's ability to attract low carbon investment, it is important to assess its achievements in that regard to date. The Clean Energy Investment and Climate Financing parameter tracks historic investment activity in a given country while laying out financing conditions for future commitments. In all, Parameter II comprises 9 indicators distributed across three categories: Amount Invested, Fund Sources and Cost of Debt. Each of these three categories contributed with varying weights to the overall Clean Energy Investment and Climate Financing parameter score. The green microfinance indicator which was part of the Climatescope methodology in the past was removed in 2016.

AMOUNT INVESTED

The Amount Invested category consists of two indicators related to historic financial commitments to low-carbon companies and projects: cumulative clean energy investment and clean energy investment growth rate. The timeframe used was 2011 to 2015. The category contributes to 51% of the score for this parameter. Data sources employed in the category were drawn from BNEF's proprietary Industry Intelligence database – the world's most accurate database of clean energy and carbon investment activity. The database contains detailed information on funds invested in clean energy projects larger than 1MW and technologies, grants, venture, private equity and corporate finance transactions, and project financing. The Amount Invested methodology follows that employed in Climatescope 2015.

CUMULATIVE CLEAN ENERGY INVESTMENT

The clean energy investment indicator of the Amount Invested category includes four metrics related to the investment type: asset finance, corporate finance, venture capital and private equity investment. All three investment-type metrics were aggregated to derive the total cumulative clean energy investment figure. Data points underlying these metrics are available online for the purpose of external analysis.

Note that the total clean energy investment indicator accounts for cumulative commitments from 2011 through 2015. Investment commitments follow different orders of magnitude because of the variation in the size of the 58 Climatescope countries. Thus, countries were ranked for this indicator based on the value of total clean energy investments as a percentage of GDP to ensure standardization. Once investments were benchmarked by the size of the economy, countries were ranked using the indexing approach. The country with the highest share of cumulative clean energy investment relative to the size of its economy was set as the benchmark with a score of 5; all other country scores were derived based on their relative position to 5.

CLEAN ENERGY INVESTMENT GROWTH RATE

Similarly, the growth rate for the clean energy investment indicator took into account the same five-year period and was based on compound annual growth rates. Scoring was also derived by using the index approach with the country with the highest compound six-year annual growth rate receiving the maximum score of 5. Since 2015, the maximum growth rate used in the indexing is capped at 150%. There was a simple reason for this: one country that prior to 2014 had seen virtually zero clean investment technically saw its growth rate hit 583% in 2014 thanks to a small level of investment in the year. Having all other countries benchmarked against this 583% would have badly hurt them all (even nations that had posted otherwise remarkable growth rates of 100% or more). As a result, a cap of 150% was used for this particular benchmarking/indexing exercise.

FUND SOURCES

The sources of funds category contributed 26% to the Parameter II score. Its two unique indicators – loans grants and local investment by local players – each made up half of the parameter weight and contributed 3% apiece to the overall Climatescope score.

LOANS AND GRANTS

The methodology employed to track loan and grants commitments remained the same as employed in the first four editions of Climatescope. Data were gathered using primary sources and BNEF's proprietary Industry Intelligence database. Standardization was achieved by comparing fund source commitments to GDP. Scoring was determined based on the index approach.

LOCAL INVESTMENT BY LOCAL PLAYERS

Only total new investments were used in the analysis of this indicator. Investment into small distributed projects was not considered. The total investment data for each country was then filtered by investor domicile to derive the dollar amount committed in any given country by investors domiciled in the same country. The score for this indicator was obtained by taking the ratio of dollar amount committed by local players for local projects over total clean energy investment at a national level. The country with the highest ratio received the maximum score of 5 and was considered the benchmark.

Investors were classified by the country in which they are registered in all instances except where a non-governmental agency was deemed to hold a stake of 50% or greater in the ownership structure of the investor. In such cases, the majority stakeholder's domicile was applied. In cases where specific investors in a project could not be identified, the value of the deal was considered to be "unknown" for the purpose of this analysis.

To illustrate the methodology, consider the 2012 \$130m financing of the 100.8MW Satara wind farm in Panama. In this specific transaction only \$41.42m – not the entire financial commitment to the project – was recorded toward the total value of investments by local players for Panama.

COST OF DEBT

Financing conditions in a given country are fundamental for developers and investors alike. The cost of debt category is made up of two indicators related to financing conditions for utility-scale renewable projects or investments into low-carbon manufacturing capacity or firms. These indicators are average cost of debt and average swap rate by country; each contributed equally to the overall category score. Each indicator had a 2.6% net weight toward the overall Climatescope score. Data on the average cost of debt available to project was sourced from the lending interest rate dataset from the World Bank and from information gathered from developers. Where data was not available, the country's central bank rate was used.

This category also included an indicator reflecting swap rates in each of the countries. A swap rate is the borrowing rate between financial institutions and was deemed to be the closest proxy for the cost of debt per country. The country with the lowest swap rate was assigned a score of 5 and all other country scores were determined by indexing their rate to that of the benchmark country. Swap rate data per country were taken directly from the Bloomberg terminal.

5.4. LOW-CARBON BUSINESS & CLEAN ENERGY VALUE CHAINS

A nation's ability to attract capital and accelerate low-carbon energy deployment is partly contingent on how many segments of key value chains it has in place. Parameter III sought to take this into account. It included three indicators, with an additional two indicators related to distributed energy companies for the off-grid focus countries.

SERVICE PROVIDERS

A well-developed local presence of service providers for the low-carbon economy, including firms involved in legal and marketing services, project development and ancillary services is imperative to propel and sustain the development of clean energy. Points were given if the country had at least one provider in each sub-sector. For the off-grid focus countries, a separate indicator for those service providers specifically related to distributed clean energy is taken into consideration.

SECTOR VALUE CHAINS

The clean energy sector value chains indicator tracked the presence of six distinct sector value chains – and their subsectors – in each country, biofuels, biomass & waste, geothermal, small hydro, solar and wind. Combining all segments yielded a maximum possible score of 40 points per country. Nations were awarded 1 point per segment they had in place. A strong manufacturing base is imperative for attracting investment and producing the necessary equipment to help expand clean energy capacity. For the off-grid focus countries, we added a separate indicator for those companies that operate within the distributed clean energy sectors.

FINANCIAL INSTITUTIONS

The financial institutions indicator tracked how many types of financial service providers such as banks, corporate finance institutions, investment funds, impact funds and private equity and venture capital funds invested in the low-carbon sector. Primary research was conducted to assess if at least one of these four types of financial institutions was active in a given country. Each type of lender could receive at most 1 point. Thus 5 points were the maximum for this indicator – a sign that the country has the ability to supply funds needed for the industry to grow. This indicator contributes 25% to the overall Parameter III score.

5.5. GREENHOUSE GAS MANAGEMENT ACTIVITIES

The Greenhouse Gas (GHG) Management Activities parameter aims to assess the status, risk and potential for carbon offset project activity in a given country. Favourable actions and conditions for this parameter included: a solid track record of commissioned Clean Development Mechanism (CDM) or other offset projects; high success rates for projects seeking CDM accreditation; ample opportunities for further offset project development; forward-looking federal or state-level policies or actions aimed at curbing GHG emissions; and progressive actions from private sector players to adopt projects and measures to reduce carbon footprints. A total of 14 unique indicators serve as inputs into Parameter IV. These are arranged into three categories: Carbon Offsets, Carbon Policy and Corporate Awareness. The Carbon Offset category measures what countries have done to develop offset projects and measures their potential to continue into the future. It holds the greatest weight toward the overall Parameter IV score at 40%. The other two categories account for 30% apiece.

CARBON OFFSETS

The Carbon Offsets category comprises three distinct indicators assessing the historic activity of CDM and other offset project types in a given country, the risk projects will fail to gain CDM accreditation or approval, and offset project potential considering existing capacity in each country to support further project development. Each indicator contributes with varying weights in turn to the category, parameter and overall score. Each country's Carbon Offset category score was derived by multiplying a "raw" score for each indicator by that indicator's weighting, then aggregating the three final scores.

HISTORIC ACTIVITY

The historic activity indicator investigates whether a country has CDM projects or other types of voluntary offset projects in place. It also assesses the depth of a country's current project pipeline by tracking sectors covered by these offset projects as well as the volume of current and expected credit issuance.

While several offset project schemes exist, data was gathered from the main three: the UN CDM, the Verified Carbon Standard and the Gold Standard. The data for these three schemes were more comprehensive and reliable than the data available on projects in other programs. Still, the CDM represented the vast majority of projects in place for almost all countries.

Metrics captured for this indicator include the number of credit scheme types, projects and sectors available in each country, and the volume of credits issued or expected to be generated by offset projects. The score awarded for each of these four metrics was binary: a country could receive either 1 or 0. Each metric was categorized as "above or equal average" or "below average" compared with the region as a whole. A country was given a score of 1 for each metric considered above average. The maximum mark a country could obtain for this indicator was therefore four.

For example, Brazil had 409 carbon offset projects, which means 0.00000097 per tonne of CO₂ equivalent in 2013 while the average across all countries was 0.00000141. Thus Brazil received a score of 0 for the metric assessing number of projects because it had a higher CO₂ profile than the average. A separate example: 2,206,277.2 credits were recorded as having actually been issued or expected to have been issued for projects in Chile, which means 0.03 credits per tonne of CO₂ equivalent. Meanwhile, the Climatescope average for this metric was 0.03 credits per tonne of CO₂ equivalent. Thus Chile received a score of 1 for meeting the regional mean.

CDM RISK

The CDM risk indicator assessed the likelihood that CDM offset projects in a given country fail to get commissioned or otherwise fail to gain accreditation or local approval. It also took into account the average processing time for project registration within CDM. Given the limited data available for other offset project types for the purposes of this analysis, CDM project risk was tracked exclusively. The CDM risk indicator incorporated three distinct metrics: (1) the average number of failures per active CDM project, (2) the average number of restarts per CDM project, and (3) the number of days it takes for a project to successfully complete the registration process. The scoring system for the first two metrics – number of project failures and restarts – followed the scoring system used for the metrics in the carbon offsets historic activity indicator. Each country was categorized as above or below average compared with all other Climatescope nations, provinces and states. Above average geographies received 1's and below-average nations received 0's. This calculation was done separately for both the number of project failures and number of project restarts.

The metric assessing CDM registration processing times examined two distinct phases of project development to measure how swiftly or slowly countries moved to bring projects to completion. The metric first took into account phase I, the period from when a project submits a letter to a host country government for approval until when it completes validation, and phase II, the period from when the project moves from validation to when it gets officially registered in the CDM.

The average number of days taken to complete the two phases of the CDM registration process for all Climatescope countries was calculated. From this, an average among all for each phase was then derived. The above/below average scoring system was then applied. If the average number of days taken for projects to be awarded validation for phase I and registration for phase II fell below the regional average, the country in question received a score of 1. Those with above-average durations received a zero. The standard deviations from the first and second phases for each country were then compared with the average standard deviations for each phase across all Climatescope countries, provinces and states. If the standard deviation for phase I fell below the regional average, the country was awarded an additional mark of 1 and vice-versa if it fell above the average. The same process was applied to phase II.

Six was the maximum score a given country could achieve in the CDM risk indicator, comprising the aggregated scores from failures, restarts, phase I duration, phase I standard deviation, phase II duration and phase II standard deviation. The CDM risk indicator has a 25% weighting toward the Carbon Offset category and a 1.5% impact on a country's overall Climatescope score.

POTENTIAL FOR DEVELOPING EMISSION OFFSET PROJECTS

The project potential indicator assessed opportunities for developing emission offset projects in a given country. Carbon intensive economies – those with high emissions per unit of GDP, or those highly inefficient in their use of energy generally – have significant abatement opportunities. This indicator aims to assess the size of this opportunity by examining three metrics:

- Abatement potential from energy efficiency, measured by the energy use per kilogram of oil equivalent per \$1,000 GDP
- Anthropogenic methane emissions
- High global warming potential gas emissions from nitrous oxide (N₂O) and three main types of fluorinated gases hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆) measured by ktCO₂ emissions from 2010.

Each country could receive a 1 or 0 score per metric, allowing a total maximum for this indicator of three points. Using the indexing approach, the country with the maximum output for a given metric received the highest score in the ranking for that metric. All other countries' outputs were mapped relative to the maximum score. The final indicator score was derived by summing the metric scores. This indicator had a 25% impact on the Carbon Offsets category and a 1.5% impact on a country's overall Climatescope score.

CARBON POLICY CATEGORY

The carbon policy category of Parameter IV sought to evaluate public policies and initiatives Climatescope countries have undertaken to reduce greenhouse gas emissions. This category covers four broad but interrelated indicators that answer the following questions:

- Did the country submit an Intended National Determined Contribution (INDC) with emissions reductions targets?
- Does it have a greenhouse-gas (GHG) registry?
- Does it have or is the country planning to develop market-based instruments to cut GHG emissions?
- Is it an "implementing country participant" of the Partnership for Market Readiness (PMR) or has it committed to the Nationally Appropriate Mitigation Action (NAMA) policies and actions?

These four indicators measure if a country has implemented or legislated specific emission reduction policies, and if so, what actions have been undertaken. Each of these indicators contributed a different weight to the overall Carbon Policy category and thus had a varied net weight on the overall Climatescope index.

The INDC emissions reduction target indicator was added in 2016 to reflect on the commitments made by countries at the United Nations Framework Convention on Climate Change meeting in Paris in December 2015. It has the strongest contribution to the carbon policy category score with a weight of 42%. One was the maximum score a country could achieve on this indicator. The mark consisted of two metrics: Business as usual (BAU)/intensity targets and absolute targets. If a BAU or intensity goal is in place, the country obtained a mark of 0.5; if an absolute target has been announced, the country obtained a mark of 1. The GHG country registry indicator accounted for 25% of the Policy category score. The maximum points a country could receive on this indicator was three based on the following: if a country is planning to establish a GHG registry it received 0.5 points, if a country has a voluntary registry in place it got 2 points, and if a country has a mandatory registry in place it got the maximum of 3 points.

The PMR & NAMA indicator was also responsible for 25% of the category score. It incorporates two metrics accounting for three points each: the World Bank's Partnership for Market Readiness (PMR) and the Nationally Appropriate Mitigation Actions (NAMA) registry. If a country is officially an "implementing country participant" of the PMR – a forum for collective innovation and actions to support capacity building to scale up climate mitigation – and has one or more projects under preparation stage, it received 2 points. If the country has at least one project implemented in the programme it received 3 points. Additionally, if the country has at least one NAMA project in the implementation stage it got the maximum of 3 points. If it has one or more projects in the development stage, the country received 2 points.

The GHG market-based instruments was the least significant indicator within this category, with a mere 8% weight. The maximum a country could obtain in this indicator was 1 whereas it received 0.5 points if it has plans to develop an emissions trading system and/or a crediting mechanism.

CORPORATE AWARENESS

Accounting for 30% of the Parameter IV score, the Corporate Awareness category evaluates the level of environmental awareness among companies in a given country. It covers six independent indicators pertaining to voluntary corporate actions, each of which was equally weighted at 17%:

GLOBAL REPORTING INITIATIVE

The GHG Global Reporting Initiative indicator investigated whether companies in a country voluntarily reported their emissions to the Global Reporting Initiative (GRI), using the initiative's online database. The number of companies in Bloomberg's Environmental, Social and Governance (ESG) database was used as a proxy for the total number of companies in a given country. The indicator score was derived by dividing the number of companies reporting to the GRI by the total number of companies in a given country (i.e., those listed in the ESG database). The maximum ratio for the region was obtained by compiling the same dataset across all countries. If the country ratio was greater than the maximum ratio for all, the country received 1 point; if it was lower, it received 0.

PRINCIPLE OF RESPONSIBLE INVESTMENT

The Principles of Responsible Investment indicator assessed how many asset owners in a given country are represented among the signatories of the UN's Principles for Responsible Investment (PRI) – a network of investors working to put into practice the six voluntary and aspirational principles. The PRI database was used to count the number of asset owners, investment managers and professional service partners who signed up to the initiative. The same scoring method used in the GRI indicator was applied to the Principles indicator. The maximum point a country received was 1 if its maximum ratio fell above the maximum ratio for all countries.

ENERGY EFFICIENCY INITIATIVES & EMISSION REDUCTION POLICIES

The energy efficiency initiatives and emission reduction policies indicators each looked at how many companies reported dedicated initiatives based on the Bloomberg ESG database. The number of companies reporting energy efficiency or emission reduction initiatives to Bloomberg's Environment, Social and Governance database (ESG) was counted. The data was leveled by dividing the number of companies reporting these initiatives by the number of active companies in a given country on the Bloomberg terminal. These fields in the Bloomberg terminal are maintained by a team of outsourced vendors, contracted by Bloomberg. The team combs annual reports and sustainability reports, looking for any of the following three indications to determine whether a company is serious about its energy efficiency initiatives: the initiatives merit more than a passing mention in the annual or sustainability report; there is more than one initiative related to energy efficiency; there is numeric metric associated with the initiative (e.g., quantified goal).

CAPACITY BUILDING: ENVIRONMENTALLY FOCUSED BUSINESS TRAINING & THINK TANKS

These two indicators were binary. Primary research was conducted to trace if there was at least one environmentally-focused business training program in place and think tank. The country received the maximum score for each of these indicators if it had one of these entities.

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