FAQ – 2011 WEC Energy Sustainability Index

What is the goal of the Index?
The *Energy Sustainability Index* ("Index") is ambitious. It ranks the energy sustainability performance of WEC member countries by aggregating over 60 data sets of the 90-plus WEC member countries to create a snapshot energy profile for each country.

The goal of the Index is to quantitatively understand country energy performance to provide insights into the relative performance against WEC's energy sustainability dimensions. In doing so, the Index highlights the energy "trilemma" and provides numerous opportunities for discussion on country strengths and weaknesses in energy sustainability.

How is the Index structured?
The Index has two main components:

- Energy performance
- Country context

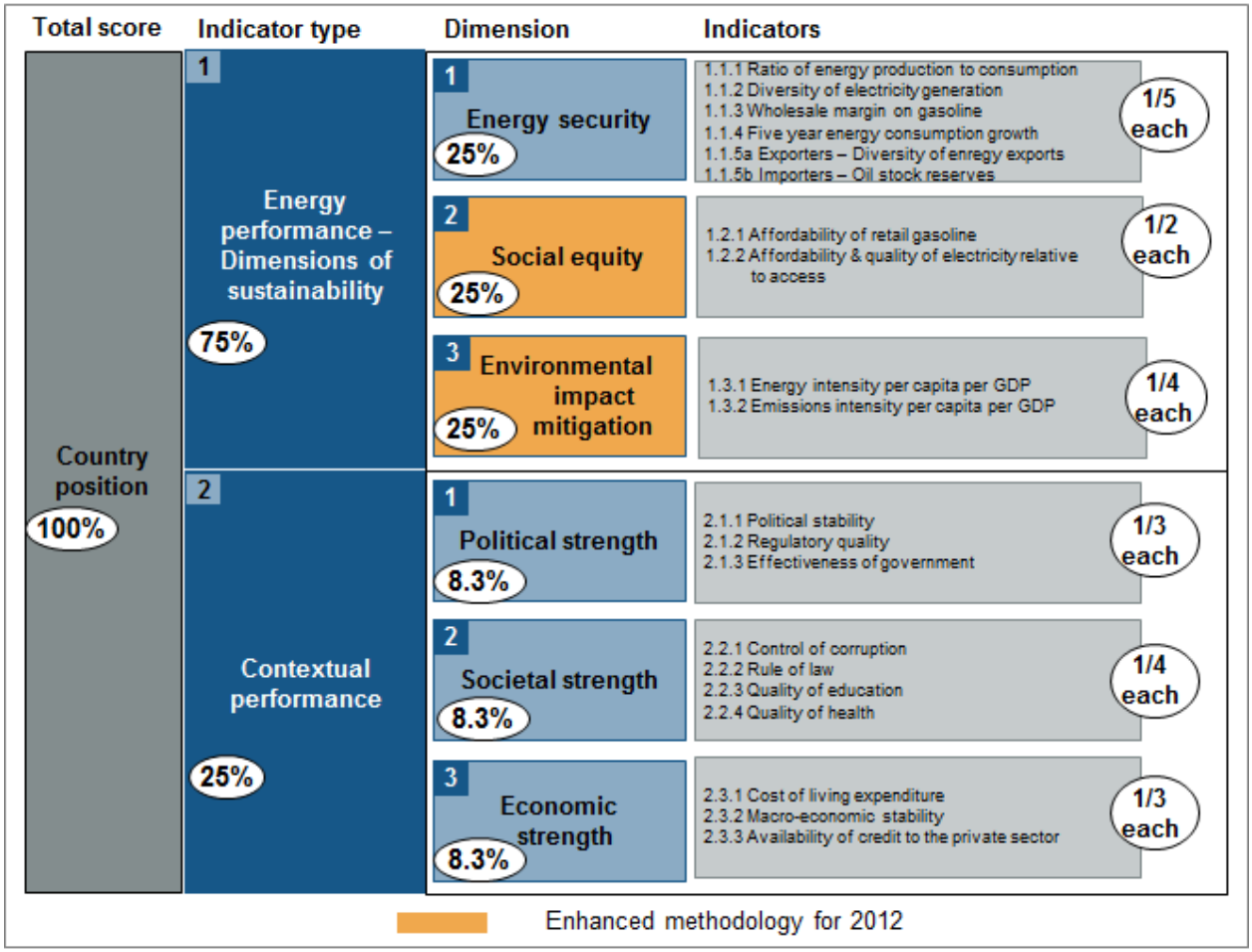
The Index captures energy performance using the three dimensions of the WEC's definition of energy sustainability:

  - Energy security: diversity of energy supply either imported or exported, the ratio of energy production to consumption and others
  - Social equity: accessibility, quality and affordability of energy supply across the population
  - Environmental impact mitigation: emissions and energy intensity, the development of energy supply from renewable and other low-carbon sources

This Index also captures the country context for policy making by examining political, societal, and economic strength. For example, under the economic strength dimension, data points include "Cost of living expenditure" captured by data on the "Cost of housing, water, electricity, gas and other fuels (Int $ MM)" and "Individual consumption expenditure by households (Int $ MM)."

What does the Index say?
The Index shows the aggregate effect of energy policies applied over time in the context of each country relative to the performance of all the countries. Since the Index shows the aggregate effect, it does not identify the effectiveness of a particular policy since each policy interacts with a unique set of policies specific to that country over different periods. It does broadly measure the aggregate outcome of country policies; for example, the level of country CO_2 emissions or the overall use of electricity per capita relative to other countries. To move up in the Index ranking requires a country to improve its performance relative to peer countries

What is the Index based on?
Each country's overall Index ranking is based on 22 underlying indicators across 6 different dimensions – some of which are supported by multiple data sets. For example, the environmental impact mitigation dimension is measured using 4 indicators each of which is supported by multiple data sets. One of the 4 indicators in environmental impact mitigation is "Emissions intensity", which is measured by "Total carbon dioxide emissions from energy consumption (Mega-tonnes)" and considered against GPD, population, industrialization and access to electricity. The figure below provides an overview of underlying indicators and weighting regimes for all six dimensions.



How are indicators selected for the Index?

Indicators were selected because of their high degree of relevance to the research goals and ability to measure and capture key elements of the WEC's definition of energy sustainability. The indicators also exhibit a low correlation – which minimizes the impact of possible double counting of energy performance effects. Finally, it was critical that the indicators could be consistently and readily derived from reputable sources and cover a high proportion of member countries – potential indicators were immediately excluded for low WEC country coverage. The data sources include the International Energy Agency, the US Energy Information Administration, the World Bank, the International Monetary Fund, the World Economic Forum, and others.

How and why was the methodology revised in 2012?

Methodology changes were made to better assess the countries' ability to mitigate their environmental impact and to provide social equity (affordable energy).

Both indicators in the social equity dimension, gasoline prices and household electricity expenditure, are now measured on a per capita level to remove scale effects and to negate inadvertently privileging countries with large populations. In addition, an indicator for "Quality of Electricity supply" is now included in the indicator 1.2.2 which measures affordability and quality of electricity supply. Best scores are now obtained for complete, high quality, and affordable access.

The environmental impact mitigation dimension was modified in two ways to avoid privileging countries very low energy consumption due to limited electricity access. The goal was to rank countries based on their ability to combine economic and social development with environmental

sensitivity. To achieve this, the indicators of energy and emission intensity per capita per GDP were normalized by the percentage of energy access and the level of industrialisation. In addition, a regression-based approach was used to identify those countries that out-perform peer countries for a given level of energy consumption. These countries are likely to be making concentrated efforts to activity mitigate their environmental impact and now receive the highest scores, and vice-versa for underperformers.

What time period does the 2012 Index capture?
Due to constraints on the collection, processing, and dissemination of data the 2012 Index generally reflects data from 2010-2011, but selected data sets may be slightly earlier if more recent data does not exist. Therefore, recent world events that could affect the Index's outcomes are not captured (e.g., turbulence in global nuclear industry due to Fukushima, or the geopolitical unrest in the Middle East). While events can happen swiftly, policies generally take two to three years to become fully implemented and it may take longer for their effects to become evident. Therefore, the Index does not exhibit significant shifts in country rankings from one year to the next due to policy implementation. However, the 2012 Index reflects early impacts of the economic crisis through increased volatility in the economic strength ranking, and further changes are likely to become visible in the next years.

What will affect a country's ranking in the Index?
The Index is weighted in favour of the energy performance versus contextual performance by a factor of 3:1, with the indicators for each dimension carrying equal weight within their axis. Therefore, changes in energy performance will have a greater effect on a country's ranking than contextual dimensions.

Overall, country position is affected by the degree of balance between the three energy performance dimensions. Given the equal weighting of the three energy performance dimensions, countries that exhibit broadly similar scores in these dimensions might typically score better. Although balance between the dimensions does not necessarily imply strong overall performance.

It is also important to note that the Index is relative – that is to say, the position of any one country will depend on the data points of the others. As an example, a country's ranking on the indicator "Diversity of electricity production" will depend on how its diversity (e.g., hydroelectric, nuclear, wind, conventional thermal) ranks against other countries. Put differently, a country's underlying indicator data can remain the same year-on-year but its Index position can move due to changes within other countries.

How can a country move up or down the Index?
Country position can change due to changes in a county's performance or due to the relative changes other countries' performance. For example, a country with broadly unchanged data could move down the Index if other countries in the Index make improvement in those indicators – performance stagnation could impact Index position in the same way as retrograde motion of the energy performance data.

What policies will affect a country's position on the Index?
The Index aggregates many different data points and it is often very difficult to pinpoint how any single policy affects a country's performance on any indicator or overall dimension. Also, factors beyond policies or even outside the country may affect the Index ranking. For example, "Total carbon dioxide emissions per population" could change due to multiple policies implemented over time aimed at reducing CO2 emissions. Technological factors within specific industries (e.g., changes in automotive technology) can also have an impact, and are not directly measured by the Index.

Those factors noted, countries which implement a range of policies resulting in an overall framework that addresses the three aspects of energy sustainability are expected to rank higher on the Index. As such, it is very difficult to answer a question as to why a country moves up or down without understanding the context of every other member country in the Index.

What does the Index reveal?
Detailed Index analysis highlights a few key findings. One, year-on-year changes in country performance are on average relatively small but more likely to occur in the energy performance dimensions. Thus, changes due to energy policies or other contextual factors can take time to implement and show results at a country level.

Two, the Index empirically reveals the "energy sustainability trilemma". Despite clear leaders, few countries manage to perform very well across all three energy dimensions. Currently, many countries achieve stronger performance in two dimensions, suggesting trade-offs between energy sustainability dimensions. For example, some energy exporting countries may lead on social equity (highly affordable and accessible energy) and also on energy security (high energy exports) but may face lower scores on environmental impact mitigation (due to intense energy use). A trade-off between strong affordability and low energy intensity becomes evident as low prices limit incentives to reduce energy consumption and to engage in energy efficiency programs.

What are the limitations of the Index?
The Index cannot capture real-time energy sustainability performance due to the challenges of capturing large volumes of reliable data for a wide range of countries.

The Index cannot isolate the impact of a particular single policy.

The Index provides a relative view of energy performance of all countries simultaneously. The movement of any given country is the effect of its own and every other countries scores and tying the rational of a movement requires commenting on all countries so is therefore not practical.

What questions/ discussion are revealed by the Index?
The Index prompts an analysis of statistical grouping of countries to better understand why some are performing better and others not. The grouping of countries is sometimes obvious and other time requires more analysis to understand why certain groups occur. This leads to further dialog:

a) What is the country's perspective/ priority on energy sustainability?
b) How does the country want to achieve energy sustainability?
c) What is the role of government policies (national, regional, local) in supporting energy sustainability?
d) What policies are appropriate to drive energy sustainability (e.g. raise fuels taxes to encourage energy efficiency or encourage greater use of electric cars)? How do these policies need to evolve over time?
e) What are the situational and contextual barriers the country faces in terms of energy sustainability, and how might these barriers be overcome?
f) How do situational and contextual barriers differ across countries in different stages of their development and how can emerging countries combine social and economic development with environmental sensitivity?