World Energy Trilemma Index | 2019
Monitoring the sustainability of national energy systems
A balanced approach to energy policy

**ENERGY SECURITY**
Reflects a nation’s capacity to meet current and future energy demand reliably, withstand and bounce back swiftly from system shocks with minimal disruption to supplies.

**ENERGY EQUITY**
Assesses a country’s ability to provide universal access to affordable, fairly priced and abundant energy for domestic and commercial use.

**ENVIRONMENTAL SUSTAINABILITY OF ENERGY SYSTEMS**
Represents the transition of a country’s energy system towards mitigating and avoiding potential environmental harm and climate change impacts.

**COUNTRY CONTEXT**
Focuses on elements that enable countries to effectively develop and implement energy policy and achieve energy goals.
NEW! Historical trends from 2000

For the first time this year, the 2019 Trilemma can provide historical trend analysis of energy policy performance by dimension since 2000 on a country by country basis.

This identifies the **top performers** as well as the **best improvers**.
2019 highlights

• There has been a general trend of improving Trilemma performance since 2000
  o 119 countries have improved over the 20-year period has improved overall Trilemma scores
  o only 9 countries have declined
• The rate of improvement in overall Trilemma performance increases as the transition progresses and encourages further policy progress
• The energy transition is increasingly characterised by step-changes in the sustainability dimension - improved performance can have co-benefits with the security dimension

In the past 20-years

119 of

128 countries improved Trilemma performance

while only 9 countries performance declined
2019 Trilemma Index Rankings – Overall Top 10

TOP 10
OVERALL RESULTS

1. Switzerland
2. Sweden
3. Denmark
4. United Kingdom
5. Finland
6. France
7. Austria
8. Luxembourg
9. Germany
10. New Zealand

• The global top 10 is not dramatically different from previous Trilemma assessments – energy policy is stable and does not change much year-on-year
• 10 countries achieve the top AAA balance grade: top quartile performance in every dimension
• Top performers are united by balanced policies across the three dimensions, high baselines/starting points in each indicator and consistent performance in the context of economic growth
• Further improvement among these top performing countries is also more challenging with policy efforts focused on maintaining high and sustainable performance
The top 10 improvers have shown the greatest positive change in Trilemma performance since 2000, with a 30-40% indexed rise in their overall Trilemma performance from the 2000 baseline.

Key drivers of positive change include extended access, increasing electrification and investing in infrastructure.

Reflected here a diversity of positive developments, ranging from small changes significantly boosting to low starting points, to fundamental and rapid transitions of energy systems.
Nicaragua has demonstrated an improving trend in all three dimensions since 2014, illustrating a transition in motion.

China ranks amongst the fastest improvers due to rapid diversification of energy sources.

Kenya’s commitment to rural electrification has led to a 91% Equity index growth since the base year 2000.
New! Country profiles - online

- New country profiles
- Historical trends per dimension
- Trends per indicator
- Performance commentary explaining the scores

For detailed results, scores and historic trends in each dimension, analysis form national stakeholders, and much more, use the online Trilemma Tool: [https://trilemma.worldenergy.org/](https://trilemma.worldenergy.org/)

Key indicators driving the scores in each dimension are presented in the 2019 score (full bar represents 100) and a trend since 2010 (rising, falling, or stable)

Historical Trends for all three dimensions using 2000 as a base year. Each dimension is checked from a base score in the year 2000 to show improvements or declines over time compared to a national baseline.

Country drop down list:
- World Energy Trilemma Index Rank
- Overall Trilemma Score out of 100
- Overall 2019 balance grade. The first letter refers to Energy Security, the second to Energy Equity and third to Environmental Sustainability.

The Trilemma Triangle is a snapshot of the balance of a national energy system.

Commentary on national trends and outlook from Council Member Committee experts

Each country profile can be downloaded as a pdf.

Performance commentary explains the trends observed.

High level country statistics for context, based on World Bank data.
Annex I: Regional highlights
Regional Profiles: Key Challenges

WORLD ENERGY TRILEMMA INDEX 2019: REGIONAL OVERVIEWS

NORTH AMERICA
- Opportunities in the energy transition

EUROPE
- Trilemma challenges of advanced transition

LATIN AMERICA AND CARIBBEAN
- Regional interconnections needed to strengthen trilemma outcomes

ASIA
- Trying to meet rising energy demand and balance the trilemma

MIDDLE EAST AND GULF STATES
- The race to focus on energy diversification is now

AFRICA
- Progress towards sustainable energy for all needs improved institutional capabilities

COUNTRY PERFORMANCE
- TOP 25%
- 25%-50%
- 50%-75%
- BOTTOM 25%
- N/A
Progress towards sustainable energy for all needs improved institutional capabilities

Many African countries are making substantive improvements in energy access but long-standing issues such as grid stability and supply reliability remain. Large disparities in demographics and consumption patterns, in the context of lower economic development has the region in the bottom half of Trilemma rankings.

Cost-effective development of the region’s abundant energy resources along with expanded use of decentralised grids and distributed generation would enable a more reliable energy supply. Top security performers have developed energy resources to meet domestic and export demands. Energy efficiency programmes and increasing deployment of renewables are growing in the continent. Further development, along with improved grid stability and universal access would help Africa improve its Trilemma triangle.
Trying to meet rising energy demand and balance the Trilemma

Trilemma rankings reflect regional diversity, with six of the 24 countries ranking in the top half of the Index, and only New Zealand ranking in the top ten. Despite significant progress in energy equity, the region struggles with energy security as the largest market for energy imports, and energy sustainability as growing demand currently exceeds the ability to rely on renewables to mitigate emissions. To improve trilemma performance, many countries are developing energy plans that include a focus on renewables. Yet challenges remain including outdated infrastructure; a lack of coordinated national energy policies; limited regional integration; trade patterns; an unbalanced distribution of resources and an uncertain global economic situation.
Trilemma Profile: Europe

European countries dominate the top 50 overall Index recognizing Europe’s substantial progress on the energy transition pathway, yet multiple policy challenges remain. The European Union’s current mitigation commitments will not allow it to meet its sustainable energy objectives, whilst further rapid penetration of renewables can be a risk to supply reliability and short-term affordability of energy to citizens. Energy poverty is a concern in Europe, as high prices affect affordability. European countries have focused on increasing diversity of energy sources and supply and interconnection to improve energy security. Modernising and optimising fossil-based infrastructure and integrating new renewable infrastructure will require coordinated efforts to ensure a technology-neutral, level playing field of fiscal policies.
Regional interconnections needed to strengthen Trilemma outcomes

Nine LAC region countries rank in the Trilemma top 50 on environmental sustainability, and show positive trends. However, extreme weather challenges energy security given the region’s high dependence on hydro generation. The region also faces challenges of poor diversification of energy sources, inequality of wealth distribution, and limited utilisation of interconnections and grid infrastructure. A 250% projected rise in electricity usage over the next 40 years highlights the need for large-scale infrastructure development and regional integration to improve energy security and resilience. Energy access is nearly 100% but 30 million people still do not have access to power. Distributed generation can play a key role in improving energy equity in the region.
The time to focus on energy diversification is now

MEGS countries have a range of energy resources and economic diversification, but face common environmental challenges including extreme weather, desertification and water stress. The group is strong in energy access and affordability, but increased diversification of energy generation and innovative solutions need to be adopted to meet rising energy demand and improve energy sustainability. Going forward, renewable and nuclear energy programmes are expected to be deployed throughout the region, improving energy security, system resilience, and environmental sustainability. The easing of energy subsidies, coupled with energy efficiency measures, have slowed the unsustainable growth in energy demand while freeing up some capital for investment in renewable energy infrastructure.
Opportunities in the energy transition

North America has strong energy security based on a long track record of developing abundant and diverse energy resources. Large energy trade flows between the countries enable supply diversity and the redundancy inherent in the continental transmission networks with mutual aid cooperative arrangements. Energy equity is strong and generally remains a relatively low-profile matter in the region. Energy is a critically important and highly-valued component of the North American economies, and the energy transition creates a challenge and a major opportunity. Countries will take diverse pathways given their diversity in environmental policy and also the diversity in policies between national and state or provincial governments in Canada and the United States.
Annex II: Insights from a decade of Trilemma
Dimension insights

ENERGY SECURITY
Reflects a nation’s capacity to meet current and future energy demand reliably, withstand and bounce back swiftly from system shocks with minimal disruption to supplies.
2019 Energy Security Highlights

The most robust and secure systems, able to manage supply and demand effectively, can be found in Sweden, Denmark, and Finland.

Since 2000, the greatest leaps in improving Energy Security have been observed in Malta, Jordan and the Dominican Republic.

Drivers of change include broadening supplier diversity and significant investment in grid stability.

TOP 10 ENERGY SECURITY

1. Sweden
2. Denmark
3. Finland
4. Latvia
5. Canada
6. Angola
7. Ukraine
8. Romania
9. Slovenia
10. Czech Republic

TOP 10 SECURITY IMPROVERS

84% Malta
70% Jordan
62% Dominican Republic
54% Israel
54% Cyprus
49% Tanzania
47% Singapore
41% Uruguay
25% Cameroon
25% Jamaica
2019 Energy Security Highlights

- Diversifying the energy generation mix has led to Security score improvements in Nordic countries

* 2002 and 2019 are the corresponding Trilemma energy security scores for electricity generation data from 2000 and 2017
2019 Energy Security Highlights

• Other drivers of Security performance include strong stock levels; in the case of Malta and Cyprus, these improved in line with EU requirements
Dimension insights

ENERGY EQUITY
Assesses a country’s ability to provide universal access to affordable, fairly priced and abundant energy for domestic and commercial use.
2019 Energy Equity Highlights

Well-endowed or well-connected countries with concentrated populations do well in the Equity dimension.

In Luxembourg, Bahrain and Qatar access to abundant energy is long solved, whilst the price of that energy is highly affordable.

Historical improvement in Equity highlights progress in UN Sustainable Development Goal 7, advancing towards universal access to basic energy needs.

TOP 10 ENERGY EQUITY
1. Luxembourg
2. Bahrain
3. Qatar
4. Kuwait
5. United Arab Emirates
6. Oman
7. Saudi Arabia
8. Netherlands
9. Iceland
10. Singapore

TOP 10 EQUITY IMPROVERS
140% Cambodia
131% Nepal
114% Myanmar
112% Bangladesh
95% Indonesia
91% Kenya
76% Ghana
67% Nicaragua
65% Sri Lanka
64% Ethiopia
2019 Energy Equity Highlights

- Developing countries recorded the strongest improvements in Energy Equity scores due to significantly increased energy access from relatively low baselines, representing major transformations.
2019 Energy Equity Highlights

- Top improving developing countries saw massive improvements in rates of access to clean cooking over the period of 2013 to 2017

Growth in Rate of Access to Clean Cooking (% of Population)

- Top improving countries: Ethiopia, Ghana, Indonesia, Kenya, Myanmar
- Lower income country groups average CAGR (%)
ENVIRONMENTAL SUSTAINABILITY OF ENERGY SYSTEMS

Represents the transition of a country’s energy system towards mitigating and avoiding potential environmental harm and climate change impacts.
2019 Environmental Sustainability Highlights

**TOP 10 ENVIRONMENTAL SUSTAINABILITY**

1. Switzerland
2. Denmark
3. Sweden
4. France
5. Norway
6. United Kingdom
7. Costa Rica
8. Luxembourg
9. Namibia
10. Slovakia

Top performers in Sustainability are on the pathway to decarbonisation and pollution control, in the context of sustainable economic growth.

The top countries in Sustainability are similar to the global top 10 performers. These countries are leading in renewables growth since 2013.

Historical improvement in Sustainability largely represents countries that are rapidly and tangibly decarbonising as the biggest gains can be achieved in this way.

**TOP 10 SUSTAINABILITY IMPROVERS**

- 66% Myanmar
- 65% Qatar
- 62% Poland
- 57% China
- 52% Czech Republic
- 49% Malawi
- 48% Israel
- 46% Ireland
- 46% United States
- 46% Australia
2019 Energy Sustainability Highlights

- Top Sustainability performers also lead increasing low carbon electricity generation since 2013
2019 Energy Sustainability Highlights

• Although China remains the world’s biggest polluter, it is also one of the greatest improvers, making the most tangible steps towards improved sustainability, as can be seen by China’s upward index trends.
Next steps for the Trilemma Index
The evolved 2019 Trilemma

- **Data sources** - Data sources were revised to use the most reliable and up-to-date information available
- **Indicators** - Some indicators were added, while others were removed or reassigned to a different dimension
- **Weighting** - Indicators weights were changed to enhance transparency and ensure a fair distribution of scores across countries
- **Indexation** - Country historical performance is now calculated against a baseline year of 2000 so that it is now possible to identify countries demonstrating long-term improvement, stagnation, or decline. Trilemma’s annual ranking favours wealthy countries and those with large resource endowments, but historical trends now recognise progress against national baselines as well as providing a comparative snapshot against other countries.
Further evolution

• The three dimensions of the Trilemma provide a scalable conceptual framework for analysis
  – Regional or cluster analysis: G20 and ASEAN examples completed
  – National level Trilemma: models without rankings, only score trends, using national level data and tailored indicators: pilots in development
• Policy pathfinding: analysing trends over time can suggest where policy intervention might be best targeted and then to subsequently track its impact
• “Kaizen” – continuous improvement: indicators can be removed and added, with year-on-year ranking becoming less important compared to historic trends and policy gap analysis
Thank you!

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