



WORLD
ENERGY
COUNCIL



YEARS OF
IMPACT

WORLD ENERGY TRILEMMA 2024:

EVOLVING WITH RESILIENCE AND JUSTICE



EXECUTIVE SUMMARY

NOW IN ITS 15TH YEAR, THE WORLD ENERGY TRILEMMA FRAMEWORK IS RECOGNISED AS A VALUABLE TOOL TO NAVIGATE AND ACCELERATE ENERGY TRANSITIONS AROUND THE WORLD

Energy transitions entail profound whole-system changes that transcend the confines of traditional energy frameworks, moving beyond fuel substitution, electrification, decarbonisation of the global system and other technological advancements. Given the intricate interconnectedness of energy with other vital systems, such as industry, agriculture, and urban infrastructure, the transformative impacts of energy transitions extend well beyond the energy sector. Catalysing fairer, faster, and more far-reaching energy transitions requires that more people and diverse communities understand how the choices they make today help shape the energy systems of tomorrow.

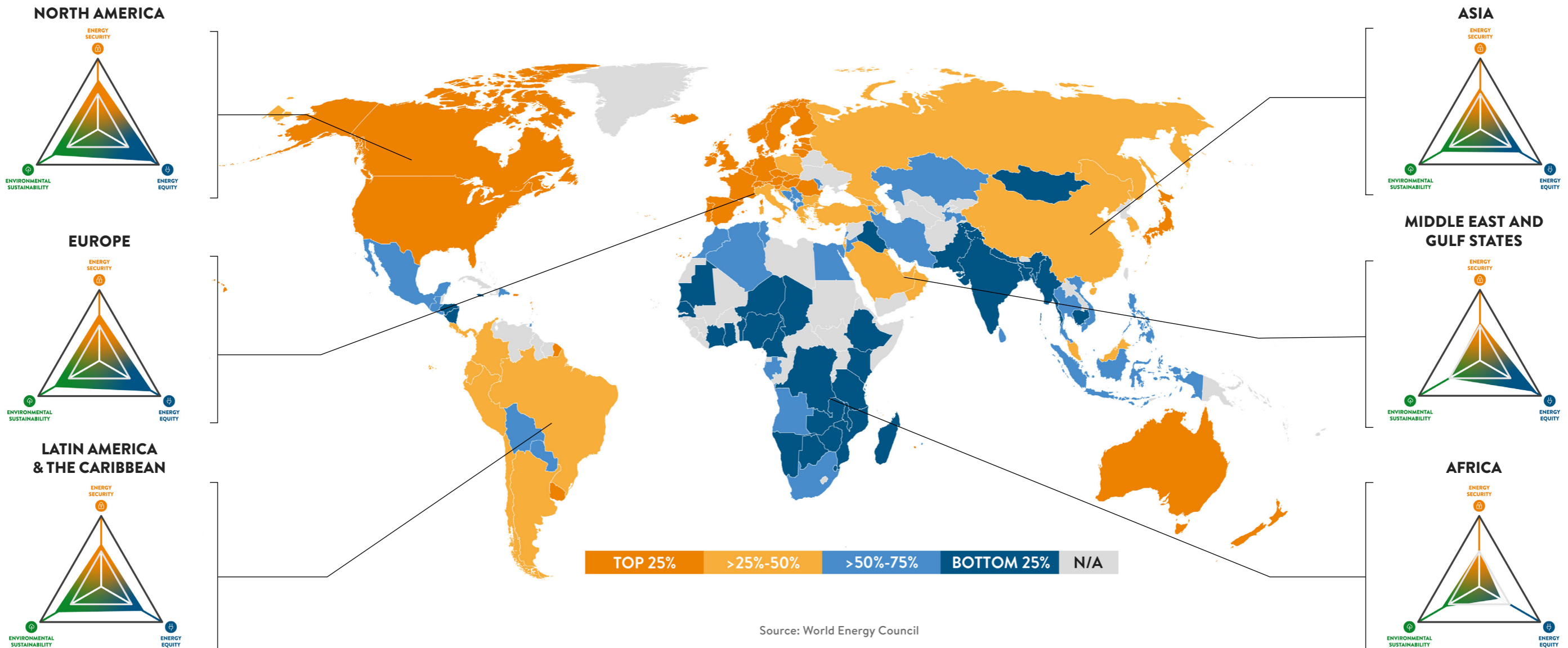
As energy transitions unfold within the broader context of systemic shifts across a spectrum of interdependent systems, they signify a fundamental reorientation of our relationship with energy. This reorientation necessitates significant changes in organisational structures and operations of the energy system.

Now in its 15th edition, The World Energy Council's World Energy Trilemma Report 2024 places significant emphasis on signals from interviews with experts in the community. These experts have used the Trilemma Framework to discuss the implications of post-pandemic recovery and the war against Ukraine within specific regions across the world, with special emphasis on the management of trade-offs among the World Energy Trilemma dimensions of energy security, equity, and sustainability. These regional reports identify both challenges and opportunities as well as the effects of recent crises on energy systems throughout the world and the strategic responses to these crises.

A NEW KIND OF DEMAND-DRIVEN ENERGY SHOCK

While the overall Index scores continue to show European countries among the top performers, the interviews highlight the challenges faced and responses sought to the first consumer-led demand-driven energy shock following the invasion of Ukraine. The bombing of the Nord Stream pipelines, alongside growing geopolitical tensions, starkly exposed Europe's vulnerability due to its heavy reliance on Russian gas, prompting a critical reassessment of energy sources and triggering the demand-driven energy shock. Apart from Hungary, which resisted fully cutting ties with Russia, a majority of European nations decided not to import Russian gas. Other countries stepped up to export more gas or reroute deliveries of LNG to make up for the shortfall, managing to ease the stress on energy security. But while the security dimension of the energy Trilemma was addressed in the short term, there were significant repercussions on energy equity, due to soaring energy prices, as well as on environmental sustainability, due to an increased use of traditional energy sources, including coal.

These impacts on equity and sustainability were experienced in regions across the world, much beyond Europe. While Europe was able to manage the short-term, demand-driven energy shock following the cutting off of Russian supplies, the long-term consequences, coupled with its green only policies, pose a number of risks, including loss of competitiveness, rising input costs, and loss of technological advantage, potentially leading to deindustrialization.



NORTH AMERICA

POWERING THE FUTURE: NORTH AMERICA'S TRILEMMA MANAGEMENT PLAN UNVEILED

North America is addressing its energy trilemma by focusing on infrastructure resilience, community-driven energy equity, and environmental sustainability. The transition towards clean energy is propelled by policies like the Inflation Reduction Act, although challenges such as investment in transmission infrastructure and market vulnerabilities persist. The continent's energy future hinges on balancing affordability, reliability, and sustainability, emphasising the importance of innovative policies and technologies, consumer engagement, and efforts to strengthen the grid against climate-induced disruptions.

EUROPE

NAVIGATING UNCERTAINTY TO MAINTAIN AFFORDABILITY AND TO ENSURE THE RESILIENCE OF ENERGY SYSTEMS IN RESPONSE TO GEOPOLITICAL SHOCKS

Europe is currently reassessing its energy strategy with a new focus on security in relation to affordability and sustainability. In contrast to a continuing reliance on gas, the rapid move towards diversification, particularly in renewables, reveals the tensions between immediate energy needs and long-term environmental goals. Price surges have prompted significant state intervention and electricity market reforms to protect consumers. Europe's challenge lies in balancing renewable integration, grid variability, and technological independence amidst geopolitical and energy sovereignty concerns, while steering towards resilient, self-reliant, and equitable energy systems.

LATIN AMERICA & THE CARIBBEAN (LAC)

FINDING A SOCIO-POLITICALLY APPROPRIATE PATH TOWARDS A RESILIENT AND SUSTAINABLE ENERGY FUTURE

Latin America and the Caribbean face complex energy futures, balancing security, equity, and sustainability amidst climate and political shifts. Subsidies play a crucial role in maintaining affordability, yet disparities and the cost of decarbonization continue to pose significant challenges. The region's reliance on hydro energy underscores the urgency for diverse and sustainable energy sources in the face of rising climate threats. The journey towards a resilient and sustainable energy future is marked by efforts to balance economic disparities, preserve biodiversity, and foster public-private partnerships amidst global energy shifts and the critical need for structural changes.

ASIA

ENSURING CONTINUITY OF ECONOMIC GROWTH WHILE MANAGING A SUSTAINABLE AND FAR-REACHING TRANSITION

Asia's energy transition is marked by robust demand driven by economic growth amidst climate threats and challenges to infrastructure resilience. Striving for energy independence, the region is exploring renewables while grappling with coal dependency. Efforts towards universal electricity access continue in a context of subsidies and other market complexities. Sustainability ambitions are visible in commitments to renewable expansion and electric vehicle adoption, yet balancing economic growth with clean energy transitions poses financing challenges. Asia's path is a multifaceted quest for resilience, clean energy, and sustainable growth, supported by regional cooperation and private investment.

MIDDLE EAST AND GULF STATES (MEGS)

PLACING ENERGY TRANSITION AT THE CENTRE OF AMBITIOUS ECONOMIC DIVERSIFICATION PLANS

The Middle East and Gulf States are at a crossroads, transitioning from traditional oil and gas dominance, critical to maintaining global energy security, to renewable and nuclear energy amidst geopolitical shifts. Already scoring high on energy equity, the region is investing in diverse energy sources and global initiatives to ensure continued access. Ambitious renewable targets and strategic investments mark a move towards sustainability, yet balancing economic diversification with challenges like governance and climate change is increasingly important. The region's journey towards balancing its energy trilemma involves navigating complexities to achieve sustainability and security goals amidst regional tensions.

AFRICA




SECURING RISING DEMAND DESPITE CONTINUOUS CHALLENGES

Africa is confronting a critical phase in its energy development, characterised by rising demand, security challenges, and a transition towards cleaner energy. Despite infrastructure and investment limitations, efforts towards renewable energy adoption and regional integration are gaining momentum. The continent faces a delicate balancing challenge between advancing energy equity, particularly in rural areas, and navigating environmental sustainability amidst increasing renewable investments and oil explorations. Africa's energy landscape is further complicated by geopolitical dynamics, highlighting the importance of upskilling, private sector financing, and institutional leadership for a sustainable future.



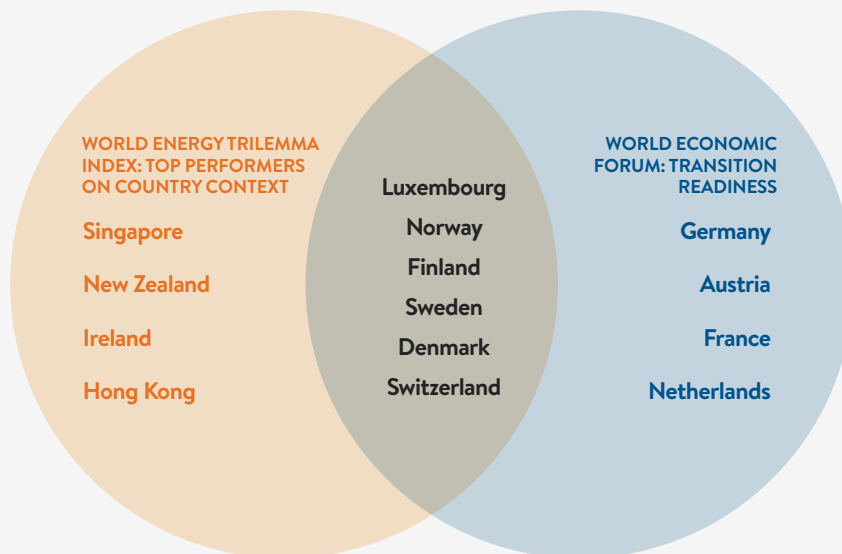
+ Top-performing countries in the World Energy Trilemma Index consistently emerge as leaders across Sustainable Development Goals (SDG) rankings and the World Economic Forum’s (WEF) Energy Transition Index. This underscores their robust performances in energy sustainability, alignment with sustainable development goals, and readiness for energy transition. Nordic countries stand out for their consistent performance across all indices, highlighting their comprehensive approaches to energy sustainability and strong policy frameworks. The high scores of the Nordic countries also reflect their dedication to addressing broader socio-economic and environmental challenges.

Figure 1: Comparing country ranks on the World Energy Trilemma Index, Sustainable Development Goals, WEF Energy Transition Index

COUNTRY			
Denmark	1	3	2
Sweden	1	2	1
Finland	2	1	4
Switzerland	3	15	5
Canada	4	26	19
Austria	5	5	8
France	6	6	7
Germany	7	4	11
Estonia	7	10	10
United Kingdom	8	11	13
Norway	8	7	3

Both the World Energy Trilemma Index and the World Economic Forum’s Energy Transition Index evaluate the strength of an enabling environment for energy transitions. While specific indicators may differ, both indices aim to assess a country’s ability to design and implement effective policy frameworks to support an orderly, just, and inclusive transition. European countries predominantly feature in the top ranks of both the World Energy Council Trilemma Index and the World Economic Forum’s assessment of transition readiness. The Council’s World Energy Trilemma Index includes Singapore and New Zealand among the top performers as well.

Figure 2: Comparing the World Energy Trilemma Index and the WEF’s Energy Transition Index

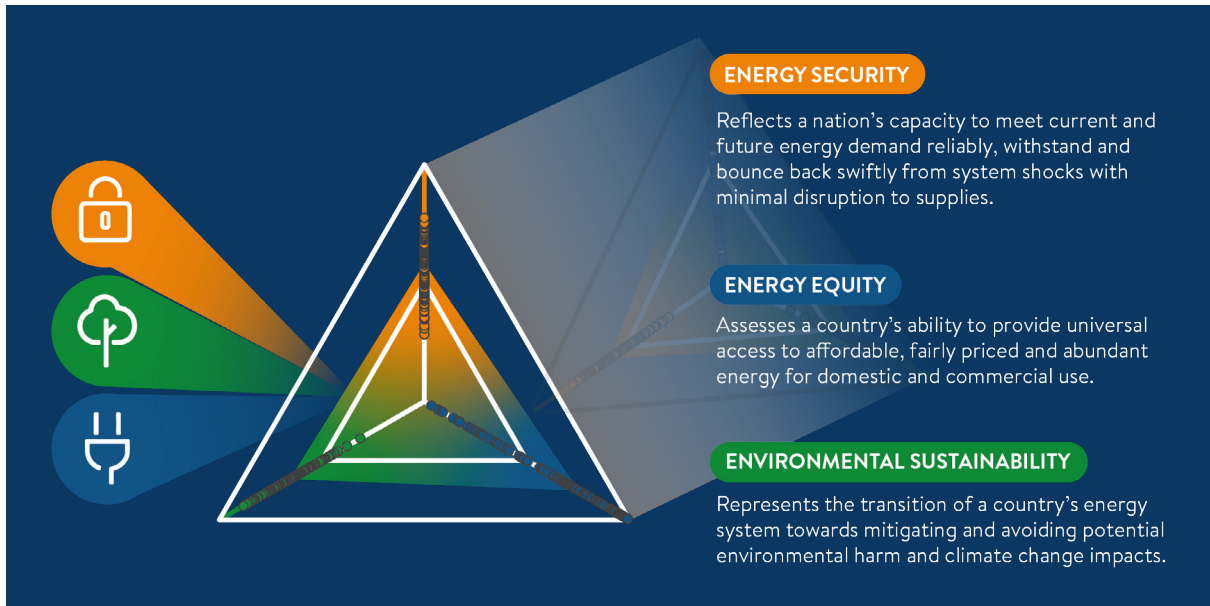




THE WORLD ENERGY TRILEMMA FRAMEWORK

As people navigate through the complex and interdependent structures and operations of diverse energy systems, the World Energy Trilemma Framework serves as a navigation tool, with the World Energy Trilemma Index as the metric of progress. While the Trilemma itself—energy security, equity, and sustainability—helps to guide energy leaders in the management of competing demands, the Trilemma Index tracks and measures integrated energy system performance in 120 countries.

Figure 3: World Energy Trilemma



In addition to reporting the Trilemma Index results, **The World Energy Trilemma Report 2024** includes an overview of the evolving energy system context and what new developments in that context might be significant for each of the Trilemma dimensions. Regional chapters offer highlights describing the diverse ways of managing the Trilemma in response to recent multiple crises. This year the report also captures selected uses of the Trilemma through case studies of how it is driving transformative initiatives in Barranquilla, Colombia, the Baltics, New Zealand, and India.



*“Given today’s combined challenges of climate change, securing reliable supplies of energy, and providing that energy to businesses and households in a just and fair way, there has never been another time when the **World Energy Trilemma** framework has been more useful in helping countries devise balanced and effective energy policies.”*

– Philip Lowe



Image from BBC Humanising Energy



HUMANISING ENERGY

“Humanising Energy” is the World Energy Council’s visionary action-orientated leadership agenda for making energy transitions happen across the world. Energy transitions away from fossil fuels involve complex coordination challenges. Governments, corporations, and civil society must manage an evolving energy Trilemma of security, affordability and environmental sustainability throughout the process of innovating change and with increasing attention to resilience and justice. With the rise of unprecedented events and increasing uncertainty, moving humanity beyond net zero and into a safe operating space requires human creativity and collaboration.

The Council believes the best way to do this is by humanising energy—involving more people and diverse communities in understanding their roles and choices and remaining realistically hopeful about making progress by enabling 100s and 1000s of smaller steps along multiple, diverse pathways. This agenda emphasises the need for societal transformations beyond decarbonization. Simply reducing carbon emissions will not address the complexities of global energy challenges.



| Image from the World Energy Council’s Humanising Energy Series featuring Climeworks (Finland) produced by BBC StoryWorks.



REDESIGNING AND EVOLVING THE WORLD ENERGY COUNCIL TRILEMMA INDEX

Many countries, organisations, and institutions use the World Energy Council Trilemma Framework to inform their energy policies, strategies, and investment decisions. To reflect evolving trends, priorities, and emerging challenges, the Council and its world energy community of leaders and practitioners are committed not only to helping generate regular updates of the Trilemma Index but also to helping refine the Index itself to ensure its ongoing usability as a policy assessment and policy pathfinding tool that supports energy transitions in different contexts.

In 2020 the World Energy Council explored a new concept of energy security – “dynamic resilience.” Dynamic resilience is an integrated approach to risk management that includes adapting to climate change, dealing with physical and digital threats to infrastructure, diversifying energy supply, and coordinating energy systems across barriers. It has assumed even greater urgency now, given recent geopolitical crises, a pandemic, and severe disruptions in the global energy system.

“With humanity under ‘Code Red’ - multiple planetary boundaries exceeded and the growing chance of surpassing the 1.5-degree target set under the Paris agreement, all before the end of this decade - the **World Energy Trilemma** and World Energy Scenarios are more relevant than ever. These critical tools along with the Council’s unique energy community allow us to address not only the ‘why’ and ‘what’ of this energy transition, but also the ‘how to’ and ‘with whom.’”

– Rafael Cayuela Valencia

Figure 4: Dynamic Resilience Framework

