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Does Alternative Renewable Energy *Hit the Mark?*

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Alternative renewable energy sources offer several benefits over traditional fossil fuels, including lower greenhouse gas emissions, improved air quality, and reduced reliance on imported energy. These advantages make renewable energy an attractive option for businesses and governments seeking to reduce their carbon footprint and improve their environmental performance.

Nevertheless, the shift towards renewable energy confronts formidable hurdles. These obstacles encompass substantial initial capital investment and the sporadic availability of certain renewable energy sources. Furthermore, the escalating prevalence of severe weather phenomena worldwide poses a growing threat to electricity provision. Consequently, these factors underscore the imperative of incessantly advancing novel technologies for generating, storing, and disseminating renewable energy. Notably, Sweden recently abandoned its ambitious goal of achieving 100% renewable energy this year (2023) to prioritize the establishment of a robust and resilient energy grid, highlighting the country's commitment to ongoing investments in cutting-edge technologies.

In the face of these formidable obstacles, embracing renewable energy is paramount in our battle against climate change and the pursuit of a carbon-neutral future. Collaborative efforts between businesses and governments are crucial to devise and execute strategies that expedite the transition to renewable energy. These strategies should be well-calibrated and customized to suit the distinct requirements of each market sector, taking into account factors such as geographical location, existing energy infrastructure, and usage patterns. Moreover, it is imperative to consider the size and age of in-country real estate assets across all sectors, including residential, commercial real estate (CRE), industrial, transportation, and utilities. By taking a comprehensive and tailored approach, we can drive meaningful progress towards a sustainable energy landscape.

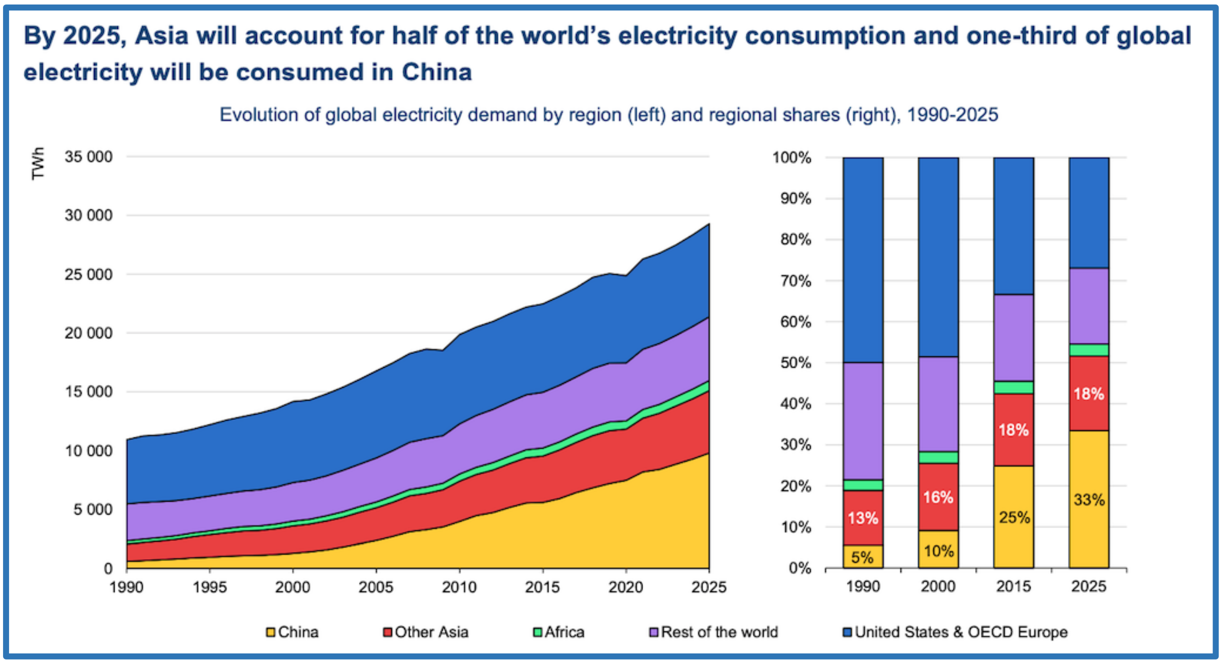
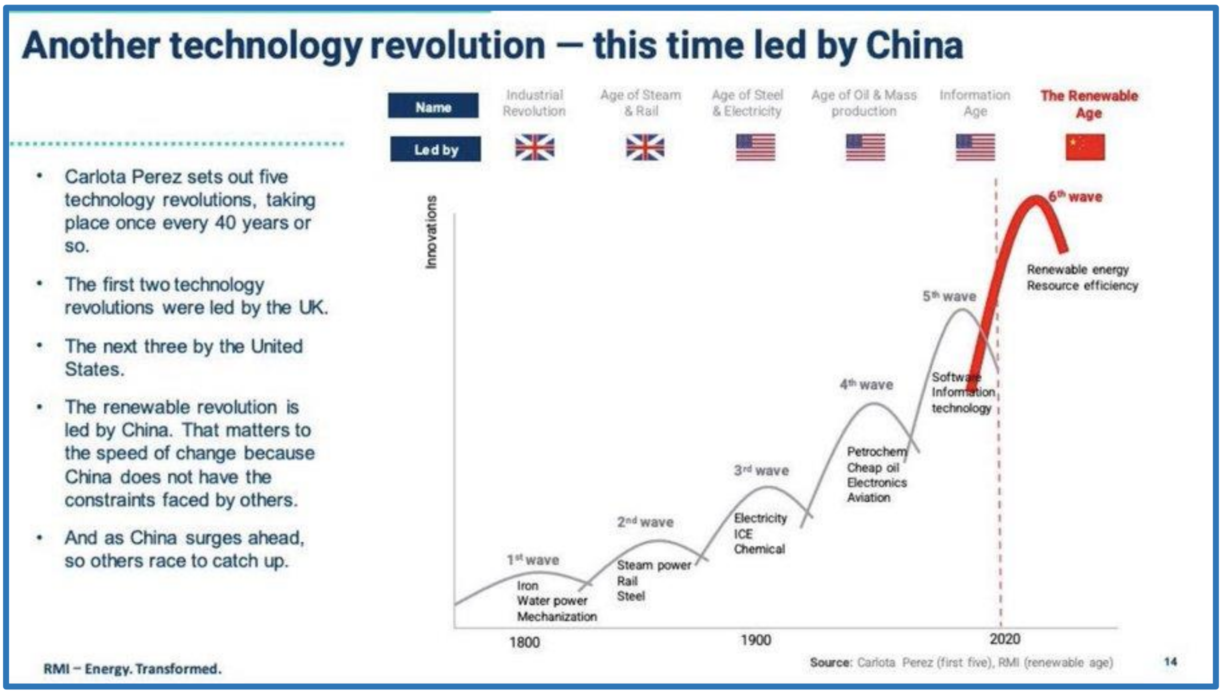


Image: Carbon Brief/IEA.

This article presents a detailed examination of the formidable obstacles encountered by countries worldwide, spanning geopolitical and economic spectrums, as they endeavour to adopt alternative methods of energy generation. It emphasizes the critical importance of combining renewable energy sources with traditional methods as we navigate towards a future characterized by net zero carbon emissions.

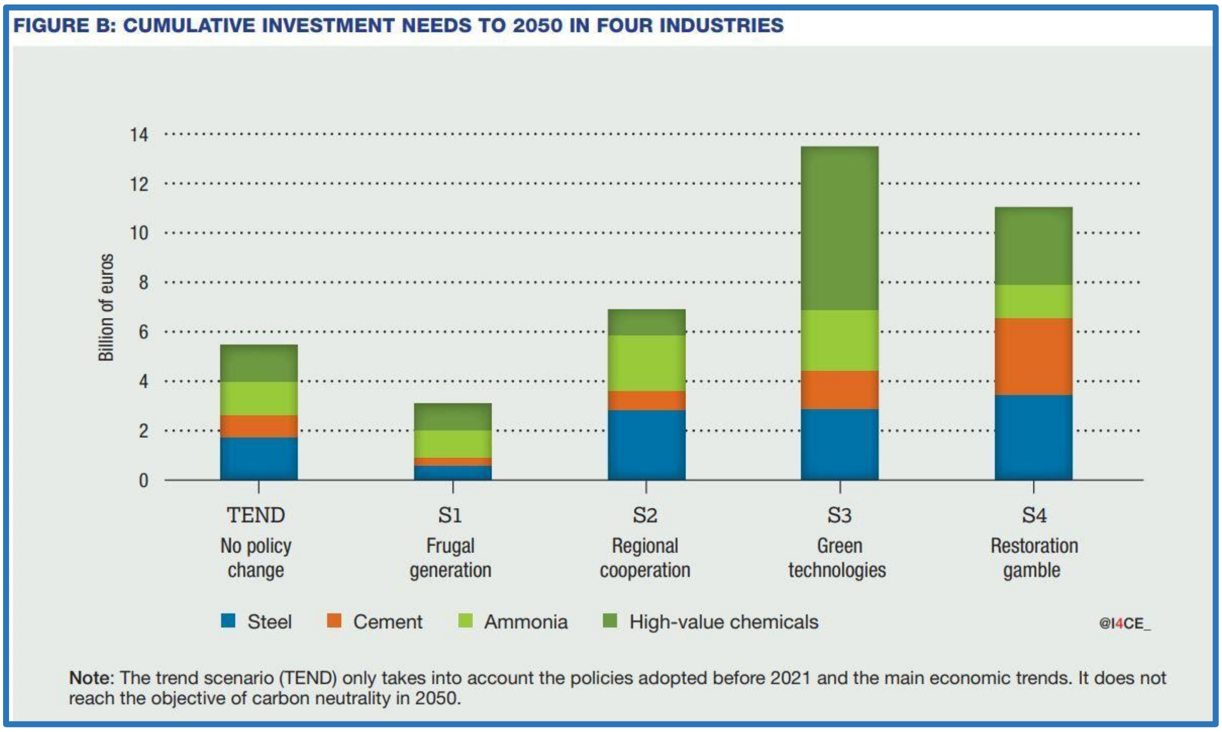


1. Cost

The implementation of alternative energy sources faces a significant hurdle in terms of cost. Despite notable reductions in the price of solar and wind power in recent years, they still remain more expensive than traditional energy sources. This cost disparity poses a substantial barrier to adoption, particularly in countries with limited resources or high energy demands. Countries with lower economic capabilities are often enticed by the lower production costs and electricity generation expenses associated with traditional energy sources like coal and natural gas. Consequently, poorer nations find themselves trapped in a vicious cycle where they pay more for electricity, cannot afford the upfront costs of clean energy, and become locked into fossil fuel projects. Essentially, they endure a triple penalty in the energy transition.

However, the cost of traditional energy sources fails to account for their detrimental environmental and social impacts, including pollution, health consequences, and contributions to climate change. These externalities are often overlooked in the market pricing of fossil fuels, creating a distorted landscape that favours them over renewables. India provides an example of how cost considerations affect the adoption of alternative energy sources. Although India possesses substantial potential for solar and wind power, the country faces obstacles such as high upfront expenses, limited financing options, and challenges in integrating these sources into the grid. As a result, India heavily relies on coal for electricity generation due to its lower cost, despite the associated air pollution and greenhouse gas emissions. This heavy reliance on coal power in India alone is estimated to cause approximately 885,000 premature deaths annually.

Indeed, there exists a range of cost-effective transition technologies that can be harnessed through a hybrid approach, seamlessly integrating renewable energy sources. Michelle McGregor-Smith, co-author, shares her impactful experience with a company that acquired three manufacturing plants in India. Tasked with the crucial mission of equipment upgrading and rationalization, her team meticulously evaluated the energy usage of the manufacturing equipment. By decommissioning the units with the highest energy consumption and retrofitting older equipment with state-of-the-art control systems, the results were profound. The outcome was twofold: a remarkable surge in product yields and a substantial reduction in overall energy consumption. Remarkably, the return on investment (ROI) for implementing these cutting-edge control systems was achieved in less than 12 months. Michelle's success story serves as a powerful testament to the transformative potential of such strategic interventions in driving sustainable energy practices.



Institute for Climate Economics Graph – Investment Needs for Heavy Industries in EU

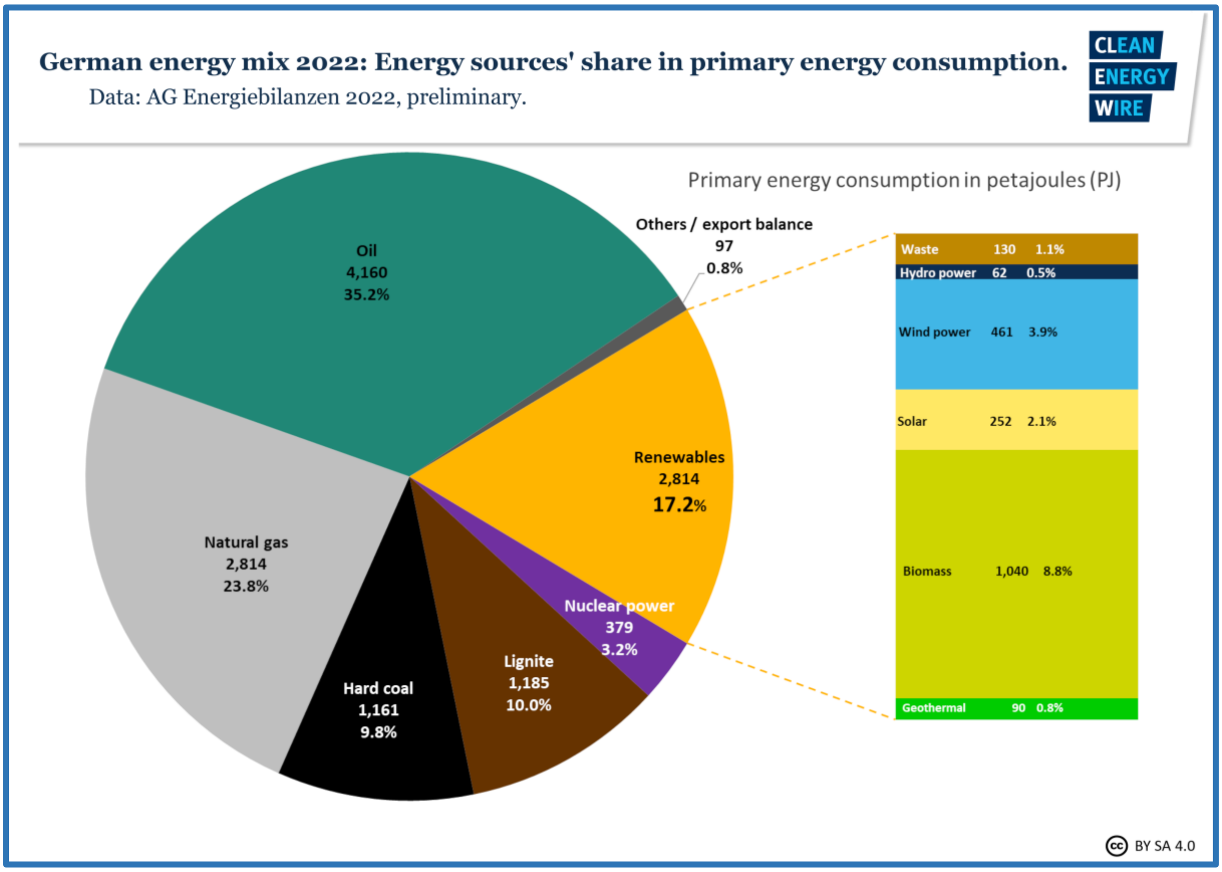
2. Intermittency

The intermittency of alternative energy sources poses another significant challenge. Solar and wind power, being reliant on weather conditions and the availability of sunlight and wind, as well as the varying storage capacity over time, struggle to ensure a consistent and stable supply of electricity from these sources. Guaranteeing a reliable flow of power becomes difficult in the face of these constraints. However, as technology progresses and becomes more commercially viable, there are other emerging clean energy technologies worthy of consideration. In contrast, traditional energy sources, though not burdened by intermittency challenges, come with the trade-off of high emissions and environmental degradation.

One approach to tackle the intermittency challenge is through the utilisation of energy storage technologies like batteries and electrolysers. These storage solutions enable the capture of excess electricity generated by renewable sources for later release as needed. Energy storage not only helps to balance the supply and demand of electricity on the grid but also provides backup power during outages, ensuring a more resilient energy system. However, energy storage technologies are still expensive and require further development and deployment to enhance accessibility and reliability.

Germany provides an example of how intermittency impacts the implementation of alternative energy sources. Despite having a substantial share of renewable electricity, Germany faces challenges such as grid congestion, curtailment, and negative prices resulting from oversupply during periods of high wind or solar generation. To address the intermittency issue, Germany relies on coal and gas plants to provide backup power when renewables are unavailable, consequently increasing both emissions and costs.

It is evident that the successful integration of renewable energy generation and storage necessitates continuous advancements in technology, ensuring reliability and affordability on a global scale. By addressing the intermittency challenge, we can unlock the full potential of alternative energy sources and pave the way towards a more sustainable future.



An additional illustration of a hybrid approach to energy utilisation in a large-scale manufacturing plant is exemplified by a complex constructed in China. During the site selection process, a key criterion was identifying an economically viable district equipped with cutting-edge clean coal technology for electricity generation. In addition, solar panels were implemented to meet the energy requirements of office operations, while daily transportation for the workforce was facilitated through private buses, thereby minimising emissions stemming from conventional fuel sources. This comprehensive integration of multiple energy sources underscores the commitment to environmental sustainability and showcases the potential for hybrid solutions in mitigating the ecological impact of industrial operations.

3. Infrastructure

The implementation of alternative energy sources necessitates substantial infrastructure, encompassing power grids and storage systems. Constructing and maintaining such infrastructure can be a costly and time-consuming endeavour, particularly in regions with limited resources or challenging terrain. In contrast, traditional energy sources benefit from well-established infrastructure that efficiently and reliably delivers electricity to consumers. Leveraging the existing generation, transmission, and distribution power grid is pivotal in streamlining the transition, enhancing efficiency, and optimising costs.

However, it is essential to acknowledge that this infrastructure is often aging and susceptible to risks such as natural disasters, cyberattacks, and sabotage. A comprehensive global analysis is imperative to identify the most vulnerable grids and discern opportunities for strategic replacements. Utilising protech analytical tools can rapidly identify areas of immediate concern year after year, facilitating targeted interventions. Upgrading transmission and distribution networks, bolstering grid management and control systems, and ensuring the interoperability and compatibility of diverse technologies are essential steps in this process.

Integrating alternative energy sources into the existing grid or constructing new grids capable of accommodating them poses a challenge. This necessitates enhancing transmission and distribution networks, strengthening grid management and control systems, and ensuring the harmonious coexistence of various technologies. Moreover, alternative energy sources may require new infrastructure for the transportation and distribution of fuels like biofuels or hydrogen.

An illustrative example highlighting the impact of infrastructure on the implementation of alternative energy sources is evident in China. While China possesses immense potential for wind and solar power, it grapples with challenges such as grid congestion, curtailment, and transmission losses resulting from the mismatch between the location of renewable resources and demand centres. Consequently, China has made significant investments in constructing new grids and interconnectors to improve renewable integration, reduce wastage, and solidify its commitment to a zero-carbon future. Notably, it is crucial for generation to be proximate to energy use to capitalize on the full transmission efficiency.

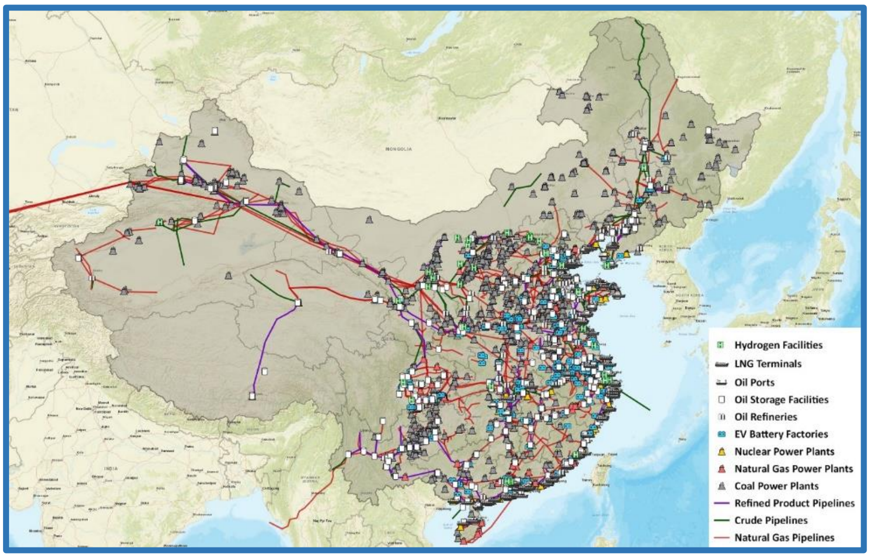


Image: Baker Institute *– Map of China Power Generation by type and transmission network.*

Addressing the infrastructure requirements for alternative energy sources entails a multifaceted approach that encompasses grid upgrades, technology compatibility, and the development of new transportation and distribution networks. By investing in and optimizing these infrastructure components, we can facilitate the seamless integration of alternative energy sources and propel the transition towards a sustainable and resilient energy landscape.

4. Land use:

Implementing alternative energy sources may also have implications for land use and environmental impacts. Some renewable energy technologies, such as solar and wind farms, require large areas of land to generate electricity at scale. This may compete with other land uses, such as agriculture, forestry, or conservation.

Moreover, some renewable energy projects may affect the local ecosystems, biodiversity, and water resources. In comparison, traditional energy sources may have less land requirements but more severe environmental impacts, such as air pollution, water contamination, and greenhouse gas emissions.

Wind and Solar Farm – Mongolia

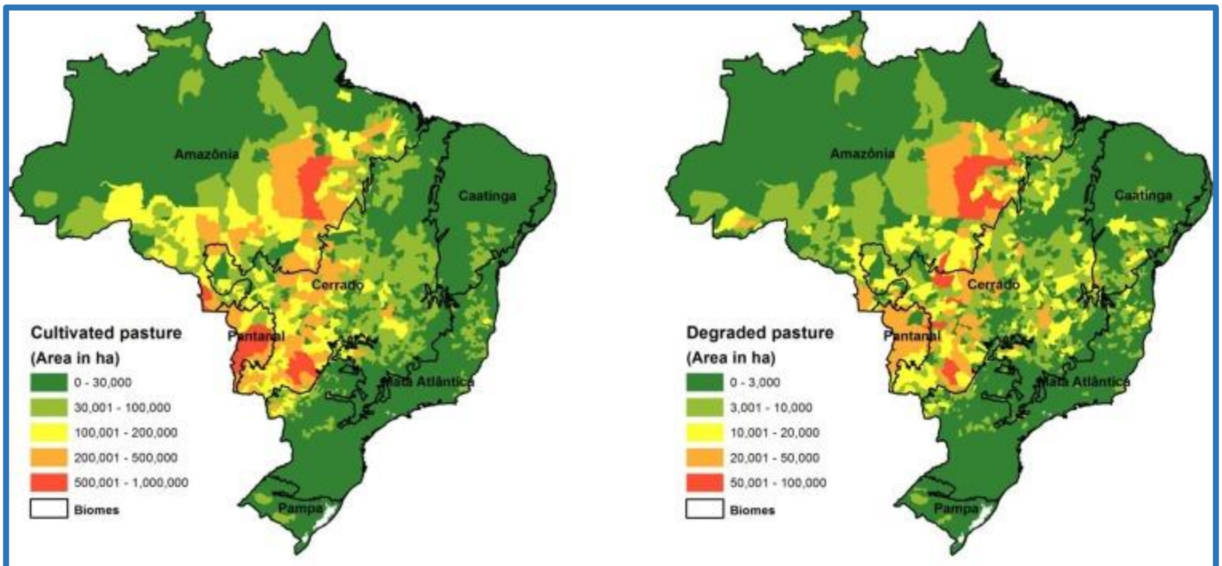
Coal Fired Plant – Inner City – China

Furthermore, it is crucial to acknowledge that certain traditional energy projects can entail contentious issues such as land acquisition, community displacement, and local conflicts.

To overcome the challenges associated with land use, an effective approach involves optimizing the selection and design of renewable energy projects to minimize their environmental and social impacts.

This can be achieved through strategies such as leveraging marginal or degraded lands, co-locating renewable energy installations with other land uses, or integrating renewable energy systems into existing buildings and infrastructure. An example of this integration is the installation of solar panels on the rooftops of large corporate buildings, encompassing office spaces, distribution centres, manufacturing facilities, and extensive parking areas.

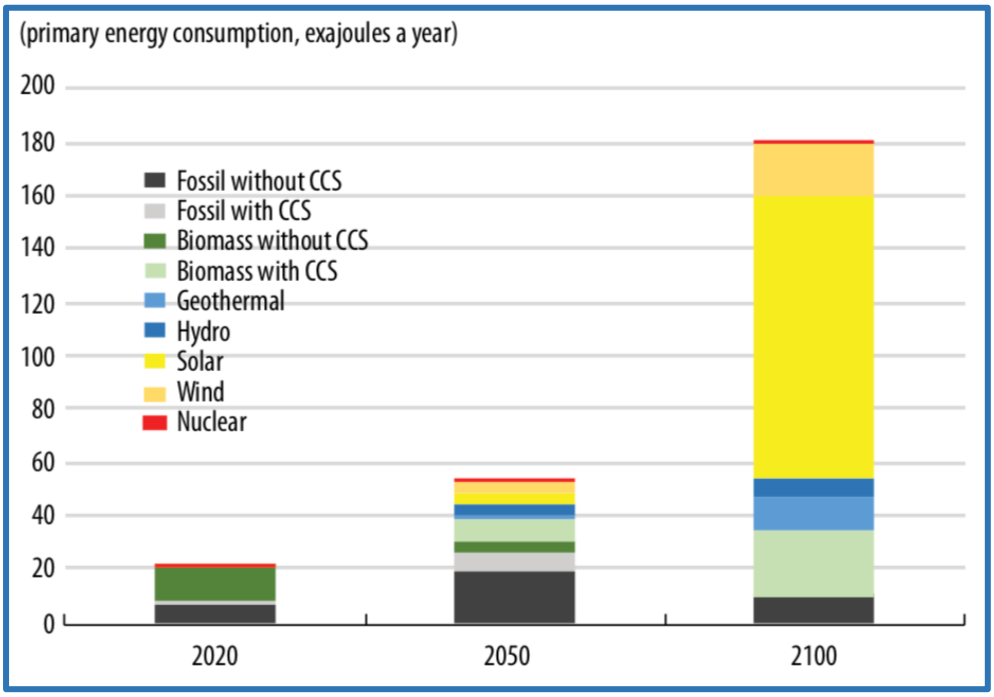
Additionally, certain renewable energy technologies, like residential or commercial rooftop solar panels or small-scale wind turbines, often have minimal land use implications.



Biomes	Degraded Pasture (ha)	Cultivated Pasture (ha)
Amazon	1,795,020	18,434,626
Cerrado	3,160,127	29,851,399
Atlantic Forest	1,268,827	13,222,382
Caatinga	837,466	3,612,435
Pampa	31,045	301,646
Pantanal	3,067	105,349

ScienceDirect.com – Land Use Change and Carbon Debt for Sugarcane Ethanol – Brazil

There are other global regions that offer huge net zero transition opportunities. Africa for example has very limited existing connected power infrastructure. The Continent has great potential for Solar, Wind, and Geothermal and other energy sources, which combined with the most advanced affordable transition strategies and related funding.



***Brookings Institution** – Africa's Renewable Energy Potential*

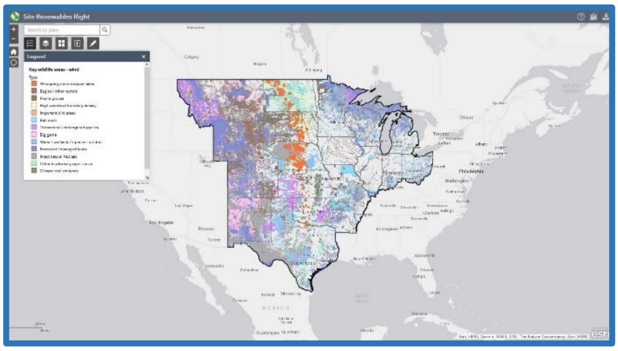
5. Public perception

Implementing alternative energy sources may also face challenges related to public perception and acceptance. Some people may have negative attitudes or opinions towards renewable energy technologies due to various factors, such as lack of awareness, misinformation, aesthetic preferences, or perceived risks or costs. These factors may influence their willingness to support or adopt renewable energy sources in their homes or communities. In comparison, traditional energy sources may have a more positive or neutral public perception, as they are familiar, convenient, and widely available. However, public perception of traditional energy sources may also be influenced by their negative impacts on health, environment, and security.

One of the challenges for alternative energy sources is to increase public awareness and education about their benefits and potential, as well as address the myths and misconceptions that may hinder their acceptance. This may include engaging with various stakeholders, such as consumers, communities, media, policy makers, and investors, to communicate the value proposition and social responsibility of renewable energy sources3.

Additionally, some alternative energy sources may require public participation and involvement, such as community-owned or distributed generation projects. An example of how public perception affects the implementation of alternative energy sources is the case of Denmark, which has a high share of renewable electricity but also faces challenges such as public opposition to wind turbines due to visual and noise impacts. Denmark has adopted policies and practices to enhance public acceptance of wind power, such as participatory planning, local ownership, compensation schemes, and information campaigns.

In the United States there are similar initiatives regarding public opposition to wind turbines, with similar initiatives to work with communities, governments, and wind companies to move toward implementation strategies that account for multi-stakeholder needs. For example, The Nature Conservancy has created a special siting tool "Site Renewables Right." The tool provides an in-depth data overlay of the central United States which focuses on siting renewable energy sources such as solar and wind that focuses on siting renewable energy sources in areas that allow for clean, low-impact power generation that respects both people and wildlife.

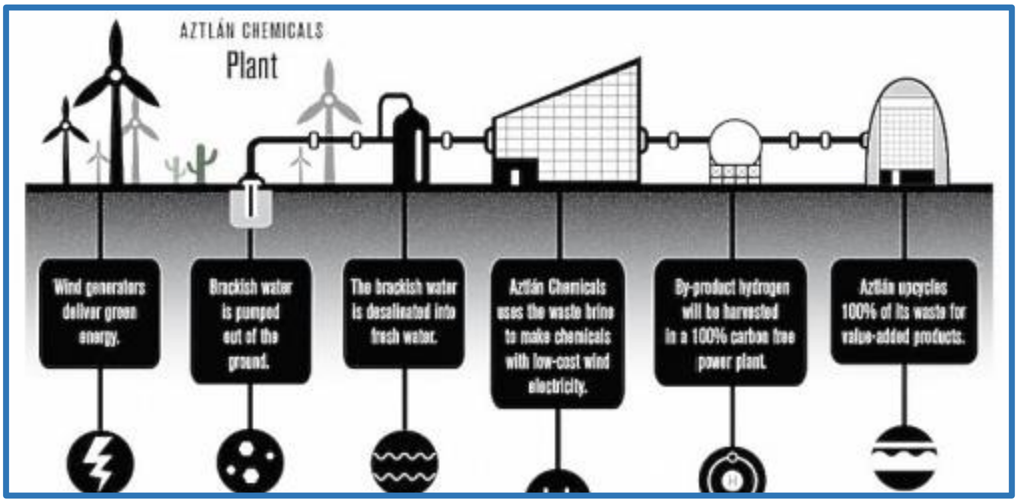


The Nature Conservancy's Site Wind Right Tool for Wind Development for the Central United States

Anti Wind Farm Protesters in Massachusetts, USA

Conclusion

These are some of the main challenges facing countries around the globe for implementing alternative energy generation methods and how they compare to traditional methods. Of course, there may be other challenges or opportunities depending on the specific context and circumstances of each country. However, these challenges are not insurmountable and can be overcame with a blend of appropriate policies, technologies, and actions that support the transition to a more sustainable and resilient energy system.



Energy Post – the Aztlan Chemical Plant example of integrated use of both wind and solar energy.

"As an ESG Consulting and Technology team, we understand the challenges that mid-sized and smaller organizations face when it comes to implementing ESG. We also understand the importance of renewable energy in achieving ESG goals. Our solutions provide these organizations with the tools and resources they need to understand the impact of renewables on their ESG performance, and to make informed decisions about their energy mix and develop strategic transition plans.

In today's competitive marketplace, ESG is no longer just a compliance issue. It is a business imperative. By understanding the impact of renewables on their ESG performance, mid-sized and smaller organizations can gain a competitive advantage and attract new customers. Our solutions provide them with the tools they need to do just that.

If you are a mid-sized or smaller organization that is looking to understand the impact of renewables on your ESG performance, we encourage you to contact us today. We would be happy to discuss your specific needs and how our solution can help you achieve your ESG goals.

Sources: 1. iea.org 2. sap.com 3. Demetrios Papathanasiou, Global Director of Energy and Extractives at the World Bank 4. trvst.world 5. resilience.org 6. pnas.org 7. oilprice.com 8. https://sustainabledevelopment.un.org/

Introduction to the Authors

Michelle McGregor-Smith

Michelle McGregor-Smith is the Managing Principal of a niche sustainable development firm with extensive global enterprise risk and sustainability experience in key business sectors include Manufacturing, Oil & Gas, Specialty Chemical and Construction.

Michelle has successfully led business development and management teams that worked with multi-national companies around the world assessing their ESG/HSSEQ risk gaps, working with internal and external teams on ESG and precursor solution selection, implementations and integration into financial reporting systems. Through the use of leading-edge technology implementations, the organizations were able to not only meet their global reporting requirements, but also create comprehensive risk reduction and capital expenditure plans for each plant, distribution center, office and transportation fleet around the globe for de-carbonization, and energy reduction, waste and water usage reductions. She has also worked with several companies on technology solutions that would enable them to engage with their suppliers to upload their HSSEQ data for engagement with them to achieve key joint HSSE/ESG goals.

Michelle has also worked with and served on the Board of a number of key environmental, health and safety groups around the world with a focus on technology and engineering solutions for the Energy, Chemical, and Industrial sectors. The organizations include the Nature Conservancy, Responsible Care, ICAAMC (HSSE Committee) and The Pennsylvania Environmental Council.

Nadeem Shakoor

Nadeem Shakoor is a sustainability and technology leader with over 30 years of experience in operational risk management and EHS in high hazard industries. His deep understanding of engineering and technology, combined with his passion for sustainability, make him uniquely qualified to help organizations understand and address complex ESG and automation challenges.

Nadeem has a proven track record of success in helping organizations improve their Sustainability and ESG performance. He has worked with some of the world's leading companies to develop and implement ESG strategies that have resulted in significant reductions in greenhouse gas emissions, improved air quality, and increased water efficiency. Nadeem is also a strong advocate for the use of technology to improve sustainability. He believes that technology can be a powerful tool for reducing environmental impact and creating a more sustainable future.

Nadeem is passionate about using his skills and experience to make a positive impact on the world. He believes that sustainability and technology are essential to building a more sustainable future, and he is committed to helping organizations achieve their ESG goals.