BRI Benefits Series

ENERGY SECURITY

This analysis is part of a series of policy briefs on a high-quality, sustainable low-carbon transition in the BRI countries. To view the main policy and other briefs, please visit our webpage. Technical background information regarding the model and scenario(s) used in this analysis are provided in methodological appendix.

Summary

Energy security has increasingly become a key priority for countries. It can refer to stable and low-cost energy supply and access both at the national level and for individual consumers. A low-carbon transition from fossil resources to clean renewable energy tends to have different implications for energy exporters and importers and for consumers across and within countries. To assess the impacts of the low-carbon transition on Belt and Road Initiative (BRI) countries' and consumers' energy security, we measure changes in absolute energy trade value, energy trade value as the % of GDP, and electricity consumption per capita from 2020 to 2050 under a global 1.5°C aligned scenario. Our results suggest that: (1) energy importing countries can lower the dependence on foreign fossil resources and reduce the exposure to market fluctuations in global energy trade; and (2) per capita energy service and electricity consumption improve in all BRI regions under the transition, but large regional variations remain.

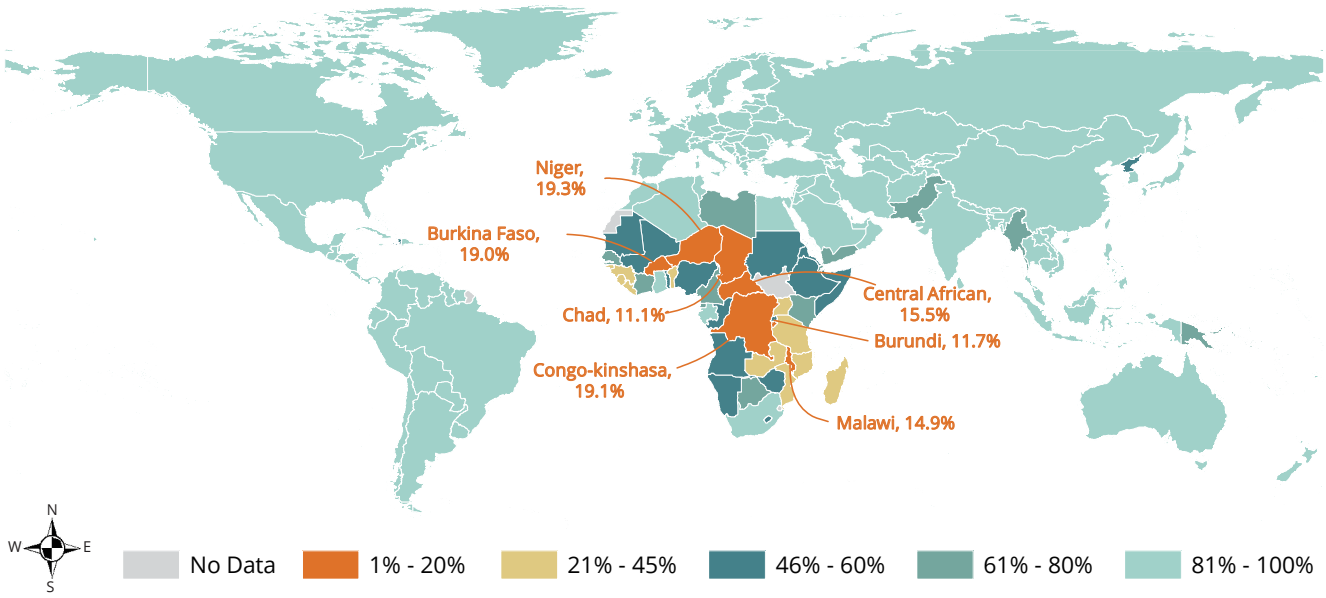
Background and motivation

Energy security can refer to stable and low-cost energy supply and access at both the national level and for individual consumers. At the national level, countries that rely on a high share of energy imports are more exposed to global market fluctuations. While they can strengthen energy security by diversifying their fuel import partners in the short term, improving energy security in the long run requires diversifying the energy mix with low-carbon renewables, such as solar and wind, that are available to all the countries.[1] Therefore, a low-carbon transition from fossil fuels to renewable energy is essential to promote long-term energy security, especially for the importing countries. Currently, fossil fuels account for almost 89% of total energy consumption in countries

along the Belt and Road Initiative (BRI),[2] which makes the transition from fossil to clean energy more challenging. On the other hand, some BRI countries are main energy exporters, and the revenues from fossil fuel exports contribute to an important portion of the country's GDP. For example, the Middle East contributes to a significant part of the energy equation worldwide by accounting for around half of all oil reserves and just over a third of total trade.[5] Therefore, for energy exporting countries, a transition away from fossil fuels has different implications, including the potential impacts on the local economy.

For individual consumers, electricity access is the most prominent and urgent issue for most BRI countries in the short run. Electricity access refers to a situation where a household has initial access to sufficient and stable electricity to power a basic bundle of energy services.[3] Improving basic electricity access (SDG Target 7) is an urgent need aligning with other SDGs. Currently, 13% of the world's population does not have access to electricity, mainly in Sub-Saharan Africa.[4] Compared with other countries, overall electricity access in certain BRI countries is much poorer – less than 20% of the population have electricity access in countries like Niger, Congo, and Burkina Faso (Figure 1).

Figure 1: **Electricity access by country.** % of population have electricity access in 2021.

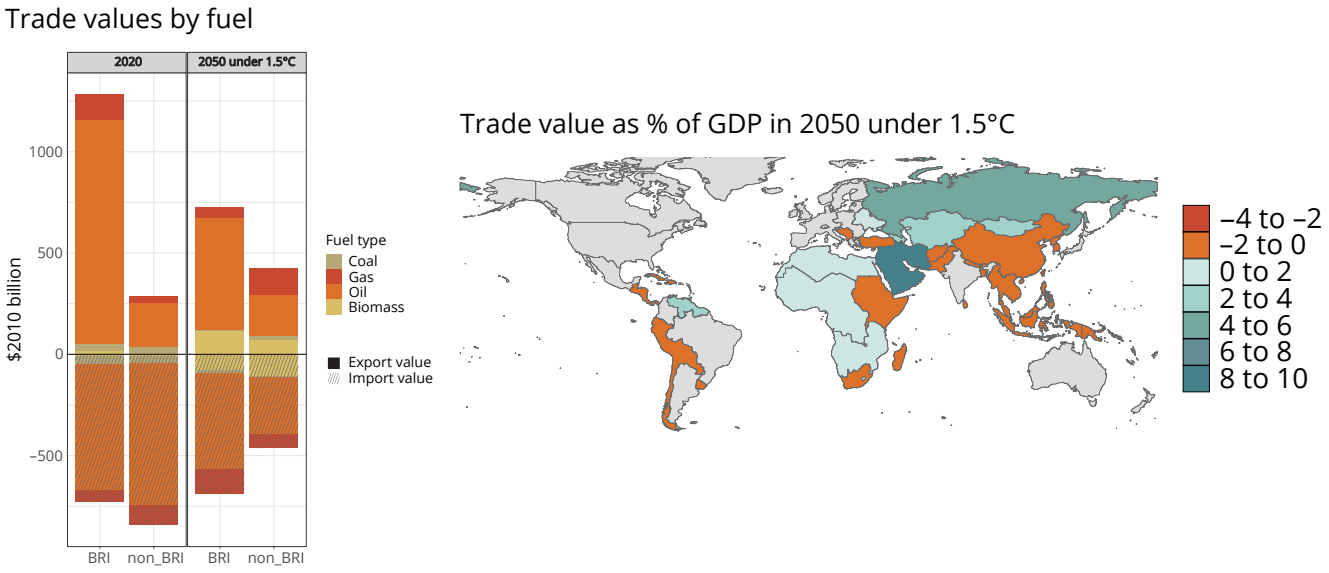


One of the main investment areas of BRI is to build new and upgraded energy infrastructure and to promote the development and deployment of green renewable technologies, which all contribute to improving energy security in the partner countries. Most of the BRI countries have high potentials for renewable energy with abundant wind and solar resources,[5] and can benefit from the shift from fossil fuels to renewables. With massive infrastructure investments through BRI, decisions today will have a long-lasting impact in the future decades. Promoting renewable energy projects in BRI countries can positively affect the BRI's long-term energy security and sustainability.[6,7]

Results

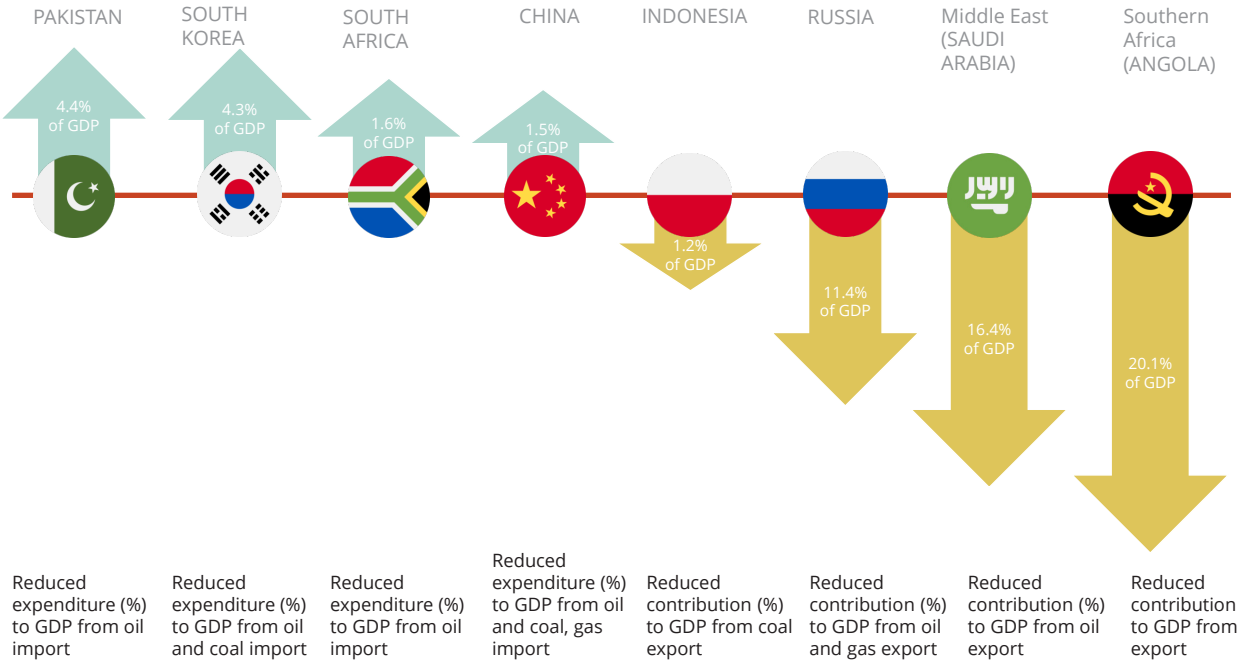
Our results show that under the 1.5°C scenario (see Methodology Appendix for scenario details), global energy trade values decline from 2020 to 2050 as countries move away from fossil fuels to clean energy (Figure 2 Panel A). Global trade value of fossil fuels decreases from $1,555 billion in 2020 to $961 billion in 2050, while the value of traded biomass increases from $19 billion to $188 billion. For the GCAM BRI regions, energy export revenues are much larger than the import costs today, but they will become similar in 2050 under global 1.5°C. This is mainly driven by declining fossil fuel export revenues in Indonesia, the world's largest coal exporter in 2020, the Middle East, and Russia. Meanwhile, coal and oil import costs decline in BRI regions while gas import costs increase. By 2050, most of the energy importing BRI regions spend less than 2% of their GDP on energy imports (Figure 2 Panel B), and energy security improves in regions such as China, Europe, and South Korea, as the share of GDP spent on energy imports declines.

Figure 2: Panel A. Absolute energy trade value between BRI and non-BRI in 2020 and 2050. Panel B. Energy trade value as the % of GDP in our core 1.5°C scenario in 2050.



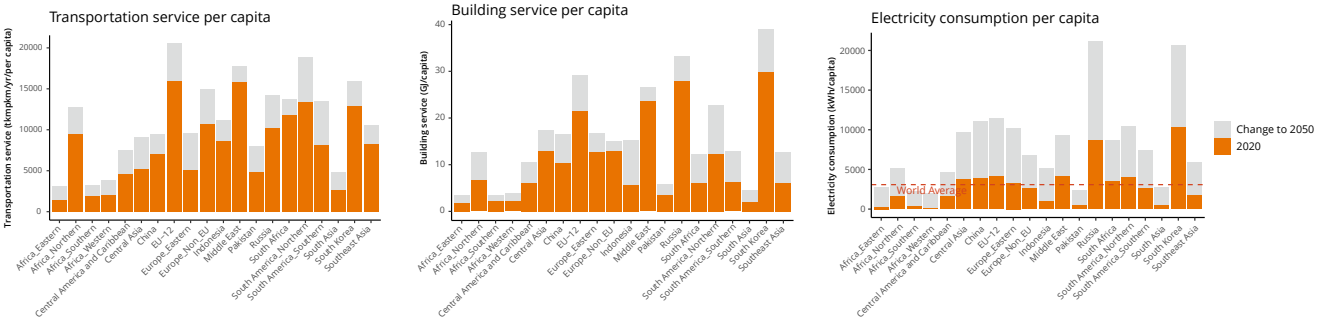
Specifically, the trade impacts on energy exporting and importing countries are quite different. Oil export revenues in 2020 account for 22.0% of the BRI regions' GDP in Southern Africa, and the contribution declines to 1.90% in 2050, indicating that 20.1% of their GDP in 2050 is no longer produced by oil exports but by other parts of the economy due to both reduced oil export revenues and increased GDP (Figure 3). Similarly, the reduced contribution from oil exports is 16.4% the BRI regions' GDP in the Middle East (Figure 3). For Russia, the reduced contribution from oil and gas exports is 11.4% of its GDP in 2050; and the reduced contribution from coal exports in Indonesia is 1.2% of its GDP. On the contrary, we selected four BRI regions on the left side of Figure 3 to show their reduced expenditure to GDP due to savings from declining fossil fuels imports.

Figure 3: Changes in energy trade values as the % of GDP between 2020 and 2050 under 1.5°C. Note: we use the country flags of Saudi Arabia and Angola to represent the Middle East and Southern Africa regions. But the decreased percentage is calculated from the entire region.



To assess energy security at the consumer level, we look at changes in average energy service and electricity consumption that are related to consumer well-being. Our results indicate that electricity consumption per capita improves in all BRI regions from 2020 to 2050 under 1.5°C; however, today's large regional variation persists in 2050 – the average electricity consumption in Western Africa, Pakistan, Southern Africa, South Asia, and Eastern Africa is still below the current world average of 3080 kWh/capita/year.[8] Similarly, average transportation service and building services show improvement from 2020 to 2050 in all BRI regions, but significant regional variations remain.

Figure 4: Change in average energy service and electricity consumption by region from 2020 to 2050 under 1.5°C.



Policy implications

Energy security has been a national priority for many countries. Energy security at both the national and consumer levels can be substantially affected by the low-carbon transition. To inform policymakers with the broad societal implications of a low-carbon transition in BRI countries, this brief identifies energy security as a critical element of the broad impacts with substantial regional variations. It also suggests that region-specific deep dives are needed to better understand the distributional impacts and develop strategies within a country.

Overall, a low carbon transition improves most countries' energy security by reducing energy imports and the dependency on foreign fossil fuels. Meanwhile, it also improves consumer well-being by increasing average energy service and electricity consumption. However, a low carbon transition affects the current energy exporting countries differently, by reducing their export revenues and impacting the economy. At the same time, the leading supplying countries of the world's oil, coal, and gas also own abundant renewable energy resources.[9] The world's energy transition also means an economic transition for these countries, from the traditional fossil fuel industry-centered economies to other emerging opportunities, including the green energy sectors.

Moreover, this transition requires huge energy investments, most of which come from renewable energy investments (an average of $4.2 trillion between 2026 and 2030).[10] The large-scale investment needs require a set of supporting policies and mechanisms to motivate public and private capital. BRI countries should seize the transition as an opportunity to leapfrog beyond investments in traditional carbon-intensive technologies. Instead, they can avoid these investments by investing now in low-carbon infrastructure.

Finally, the ongoing energy crisis in Europe induced by the Ukraine-Russia War demonstrates the risks of high-reliance on fossil fuel imports, where Russia provides around 40% of those imports for Europe.[11] Relying on traditional fossil fuel makes countries vulnerable even without considering climate change risks. The transition from fossil fuels to domestic renewable energy provides an effective path towards long-term energy security for countries with clean, stable, and low-cost energy supply for consumers. This transition cannot be achieved overnight but heavily relies on investment decisions and actions today.

References

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