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How can the global community support LLMIC fossil fuel producers through the climate transition?

Vivien Foster ¹, Philipp Trotter ^{2,3} and Others⁴

Summary

The climate transition poses exceptionally complex challenges for low- and lower middle-income (LLMIC) fossil fuel producing countries. The nature of these challenges differs significantly depending on country characteristics, such as the specific fossil fuel, export status, and sector maturity. Contingent on circumstances, countries may need to simultaneously achieve up to three distinct transitions: *an energy transition* away from domestic fossil fuel dependency; *an economic transition* towards more diversified economic activities and exports; and *an equitable fossil fuel*

production transition that protects those most affected by change.

Currently, LLMIC fossil fuel producers lack many of the prerequisites for delivering such transitions, including access to affordable finance, physical infrastructure, adequate governance, and technical as well as institutional capacities. In response, the global community needs not only to step-up traditional climate finance, but to tailor a broader package of development finance and capacity-building support that also encompasses economic diversification and social protection.

Key Policy Recommendations

- A strong commitment by the international community to technical and financial solidarity with fossil fuel-producing LLMICs is key to easing their particularly challenging transition path. Equally important is offering attractive alternatives to highly risky and short-term-orientated fossil fuel production aspirations.
- Fossil fuel-producing LLMICs need to implement a set of context-specific large-scale transitions, which will require a substantial, comprehensive, accessible, and rapid burst of targeted financial and capacity-building support. This should include, but also in many contexts go beyond, traditional climate finance, to support the development of alternative livelihoods.
- Recent Just Energy Transition Partnerships (JETPs) may represent an initial step in this direction, but they need to rapidly make available sufficient cheap capital to drive the different transitions, broadening their scope beyond coal-producing countries, maintaining transparency to build trust, and shifting away from debt financing.

Introduction

Achieving climate transition plans calls for a steep reduction in the production and consumption of fossil fuels. This poses particular challenges for major fossil fuel producers in low- and lower middle-income countries (LLMICs), whose economic fortunes and government finances are heavily invested in fossil fuels.

This policy brief suggests that the two dimensions of export orientation and fossil fuel production maturity can be used to define four different types of dependency on fossil fuel production faced by LLMICs:

- **Emerging domestic producers:** Countries which are planning to start or significantly increase fossil fuel production for domestic purposes (eg Lao PDR)
- **Emerging net exporters:** Countries where recent resource discoveries are opening up new fossil fuel production potentials (eg Mozambique or Senegal)
- **Existing domestic producers:** Countries which produce fossil fuels (often coal) to satisfy their own domestic energy needs (eg India or Vietnam)
- **Existing net exporters:** Countries where fossil fuel production (often oil or gas) is primarily orientated towards export markets (eg Angola or Nigeria).

Crucially, for each of these cases, different transition pathways are relevant (see **Figure 1A** for a graphical representation of the framework):

- **Energy transition** is a prospect that faces all fossil fuel producers, involving substitution for cleaner sources – often available to them domestically – to supply their own national energy consumption [1].
- In addition, those countries currently or potentially reliant on fossil fuels for export revenues need to achieve an **economic transition** by shifting towards goods and services that can create alternative sources of income and employment [2].
- While for countries where fossil fuel production is already entrenched, an **equitable fossil fuel production transition** is required, to ensure that those most affected by the diversification process are adequately protected and compensated [3].

Specific LLMIC fossil fuel-producing countries can be mapped on to this framework (see **Figure 1B** for a graphical representation of the mapping). Below, we select one country from each of the four relevant types of fossil fuel dependence to illustrate the different transition pathways required in each to align development goals with the global climate transition. These are illustrative examples that demonstrate the broader trends identified by the transition pathways framework; however, it is important to note that each country will have its own context-specific challenges and solutions that need full consideration.

The case of an emerging domestic producer (Lao PDR)

Emerging domestic producers, like Lao PDR, have plans to expand fossil fuel extraction for domestic consumption [4]. As current economic or social dependence on fossil fuel production

is limited for these countries, *energy transition* is the most relevant pathway. Despite large hydropower resources, Lao has suffered from domestic energy shortages, since reservoir

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storage capacity (required to balance seasonal rainfall fluctuations) is tied up in export contracts. In response, Lao has recently focused on unabated domestic coal projects, with 1.8 GW developed to date and a further 5.4 GW in the National Plan.

Yet, Lao also has potential alternative routes to energy security via renewables. One approach would be to adjust export agreements, which

send much of Lao's hydropower production abroad, and increase the domestic share of Lao's reservoir-backed plants. Further, synchronising hydropower operation to integrate increased solar and wind generation is another potential cost-effective means of reducing emissions, although one that is contingent on improving the credit worthiness of the national utility to act as a credible buyer for power purchase contracts.

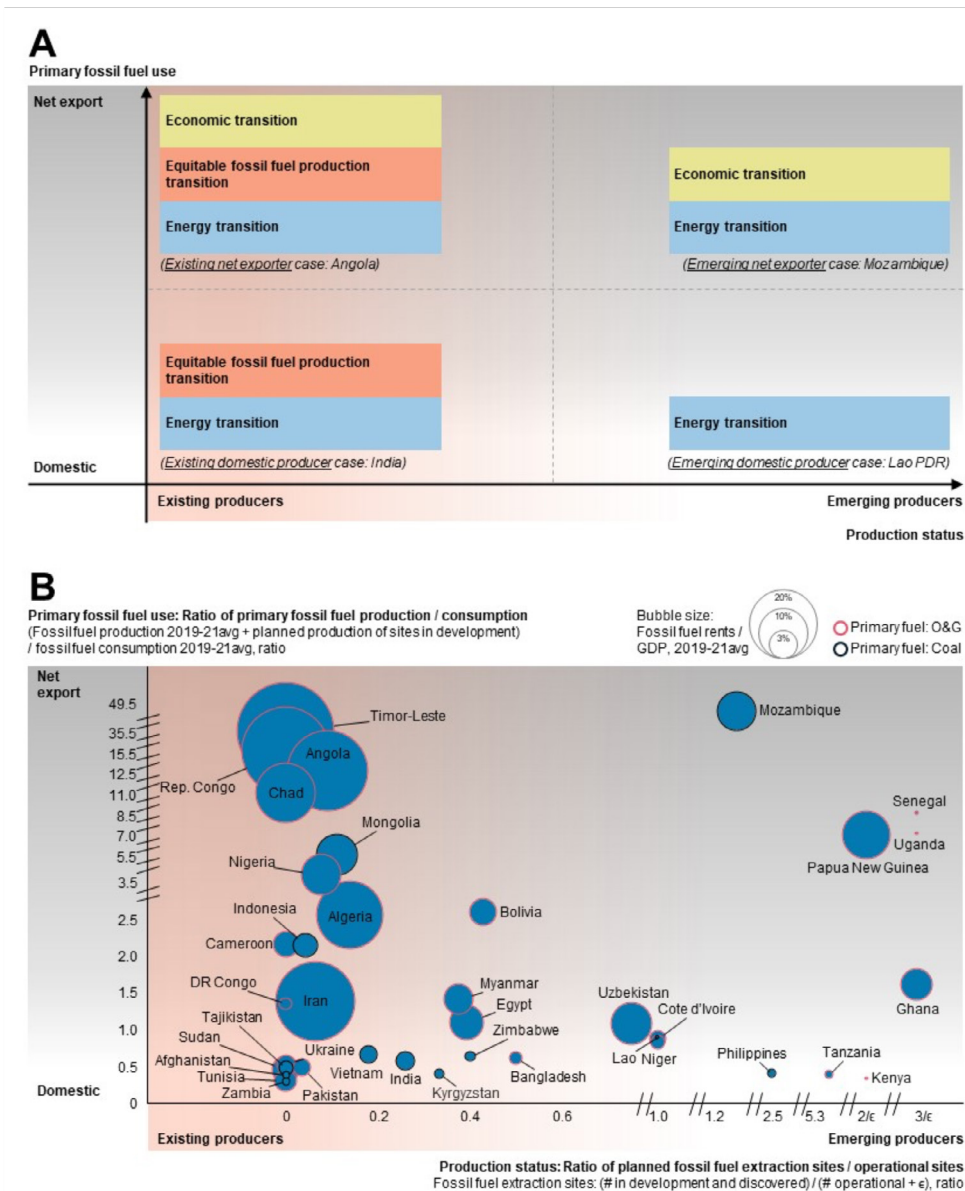


Figure 1: Transition Pathway Framework for Classification of Fossil Fuel-Producing LLMICs in a Carbon-Constrained world (Nb: O&G = oil and gas)

The case of an emerging net exporter: Mozambique

Emerging net exporters like Mozambique have plans for substantial fossil fuel exports in the future, but do not yet have significant fossil fuel production capacity. Mozambique discovered 4 trillion cubic metres of natural gas reserves in the early 2010s. While the government estimated large associated economic benefits and job creation, the years since the gas discovery have instead seen increased domestic conflict, corruption, and economic distortion as well as a 20% decline in GDP per capita [5].

Yet the pursuit of fossil fuels is potentially a high-risk choice against the backdrop of a

global drive for net-zero, limited experience in the sector, the comparatively high cost of capital, and limited empirical evidence that fossil fuel exports deliver widespread benefits to LLMIC populations. *Energy transition* options for Mozambique include growing hydropower exports to the Southern African Power Pool, while *economic transition* would involve increasing value-addition and volume in existing sectors such as the mining of rare minerals, logistics, tourism, financial services, and information service export. However, the fact that parts of Mozambique's public debt have been tied to generating new fossil fuel revenues in the future is certainly a complicating factor.

The case of an existing domestic producer: India

India relies on domestic coal for 70% of its power generation, underpinning the country's energy security. Yet, in terms of *energy transition*, the country also boasts one of the world's most ambitious renewable energy programmes, leveraging its vast renewable energy resources, strong national planning capacity, and deep domestic capital market [6]. These have delivered some of the lowest renewable energy costs in the world which, at \$32 per megawatt-hour, come in well below coal.

Nevertheless, convoluted fiscal and financial arrangements risk compromising India's energy transition. Both coal and electricity prices are kept

artificially low, leaving domestic commercial banks with exposed balance sheets and power distribution utilities with escalating debt burdens. Moreover, *equitable fossil fuel production transition* is critical given that coal mining is highly concentrated in 13 producing states where it generates 2–10% percent of state GDP and constitutes the sole economic activity in certain districts. Yet focusing on developing the high solar potential of some of India's coal producing states could create net positive effects on domestic job creation and regional development compared to coal, as well as mitigating the substantial costs to human health associated with coal-fired power generation.

The case of an existing net exporter: Angola

Existing net exporters, like Angola, are well-established fossil fuel producers who face the complexity of needing to combine all three transition pathways. Angola relies on growing fossil fuel production for over 90% of its export revenues [7], leaving the country exposed to longer-term risks of stranding, as global climate policies take

effect, and posing challenges for *equitable fossil fuel production transition*. There may be some scope for Angola to reduce the carbon footprint of its energy sector by pursuing (potentially costly) carbon dioxide removal technologies in the medium-term, while diversifying towards the export of hydrogen and clean electricity in the longer-term.

In terms of *energy transition*, domestic renewable energy resources, mainly hydropower and, to some extent, solar, could potentially meet domestic needs.

Nevertheless, a major economic transition is unavoidable, with options including high-value agriculture and fishery products, metals, and

increasingly coveted critical minerals, as well as transport and tourism services. Despite the overall complexities, combining different diversification pathways could bring crucial synergies – such as redirecting existing energy sector infrastructure and skills into green hydrogen production.

Scaling international support

A country's ability to achieve this triple transition depends on a wide array of initial conditions, including natural resource endowments, human and physical capital, and an enabling environment for private investment. Many of these conditions are often lacking among LLMIC fossil fuel producers (**Figure 2**). Indeed, the weak governance and political dynamics often associated with the resource curse [8] themselves constitute a barrier to implementing such transitions.

This underscores the importance of tailored support from the international community for fossil fuel-producing LLMICs, comprising a combination of investment finance and technical assistance. Yet, historically, oil and gas producers have received significantly lower levels of Official Development Assistance (ODA) – 3.1% of Gross

National Income versus 7.3% for non-fossil fuel producers.

Climate finance is certainly playing an important role, but only targets the *energy transition* pathway. Moreover, only about 25% of climate finance flows to date have been captured by LLMICs [9]. Supporting an *economic transition* calls for a step change in more traditional technical assistance and development finance engagements, along the lines of Aid for Trade, targeting measures to raise competitiveness and promote employment via foreign direct investments [10]. When it comes to *equitable fossil fuel production transition*, multilateral institutions are beginning to recognise the importance of mitigating associated social impacts, for instance, by providing finance support for coal mine closures and associated reskilling [11].

Conclusion

Crafting an approach to replacing fossil fuels, acceptable to all countries, depends on coordinated action on national and international levels, including a substantial, comprehensive, accessible, and rapid burst of financial and capacity-building support, targeted towards fossil fuel-producing LLMICs.

Recent Just Energy Transition Partnerships (JETPs) signal a growing readiness among

developed countries to provide finance and capacity-building vehicles fostering integrated energy transition and equitable fossil fuel production transition (but, to a much lesser extent, economic transition) [12]. JETPs have initially focused on existing domestic coal producers (such as Indonesia, South Africa, and Vietnam), overlooking other country categories, notably oil and gas producers. Yet, the recent JETP with Senegal (an emerging net exporter) indicates an emerging commitment to expanding the recipient

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base. However, crucially, for JETPs to be the much-needed step change for climate finance to LLMICs, they are likely to need to overcome their heavy reliance on debt finance, deliver on promises of private finance mobilisation, build

trust, and ensure transparency in fund allocation and governance. Most importantly, they also need to sufficiently support country-specific needs for programmes related to economic transition and equitable fossil fuel production transition [12].

Country	Energy diversification					Equitable fossil fuel diversification				Economic diversification						
	Fossil fuel share of energy use (%)	PV potential (kWh/kWp/d)	Wind power potential (W/m ²)	Levelized cost of green H ₂ (\$/kg)	H ₂ transport feasibility (# of ports)	RISE renewable energy index	Country equity risk premium (%)	GINI index	Public expenditure / GDP (%)	ODA / Gross national income (%)	SWF asset value / GDP (%)	Fossil fuel rents / GDP (%)	Human capital index	Government effectiveness index	Economic complexity index	Ease of doing business index
Afghanistan	0.75	5.4	953	-	-	26	-	-	0%	32%	-	0%	0.40	-1.63	-1.20	0.44
Algeria	0.99	5.2	620	-	18	52	0.1	0.28	18%	0%	10%	18%	0.53	-0.62	-0.88	0.49
Angola	0.73	5.1	195	5	16	42	0.15	0.51	8%	0%	3%	26%	0.36	-1.06	-1.43	0.41
Bangladesh	0.98	4.0	167	0	4	37	0.12	0.32	6%	1%	-	1%	0.46	-0.63	-0.85	0.45
Bolivia	0.89	6.1	463	-	1	50	0.16	0.41	19%	1%	1%	3%	-	-0.73	-0.97	0.52
Cameroon	0.69	4.7	197	11	1	34	0.13	0.47	12%	3%	-	3%	0.40	-0.88	-1.36	0.46
Chad	0.99	5.2	958	5	-	77	-	0.38	5%	6%	-	14%	0.30	-1.42	-1.93	0.37
Congo, Dem. Rep.	0.26	4.6	0	5	3	40	0.15	0.42	8%	7%	-	1%	0.37	-1.72	-1.81	0.36
Congo, Rep.	0.84	4.0	0	-	4	17	0.19	0.49	19%	2%	-	31%	0.42	-1.55	-1.02	0.40
Cote d'Ivoire	0.88	4.4	128	5	4	50	0.1	0.37	0%	2%	-	1%	0.38	-	-1.19	0.61
Egypt, Arab Rep.	0.95	5.5	663	6	28	85	0.15	0.32	8%	2%	-	5%	0.49	-0.43	-0.10	0.60
Ghana	0.84	4.4	184	5	4	76	0.23	0.44	10%	2%	1%	4%	0.45	-0.15	-1.27	0.60
India	0.89	4.7	316	6	76	88	0.08	0.36	11%	0%	-	1%	0.49	0.28	0.61	0.71
Indonesia	0.94	4.2	144	-	154	53	0.08	0.38	9%	0%	0%	2%	0.54	0.38	0.04	0.70
Iran, Islamic Rep.	0.98	5.3	744	9	39	82	0.15	0.41	14%	0%	-	25%	0.59	-0.86	-0.09	0.59
Kenya	0.72	4.9	687	9	3	65	0.15	0.41	12%	3%	-	0%	0.55	-0.33	-0.46	0.73
Kyrgyz Republic	0.45	4.5	880	3	-	34	0.15	0.29	17%	6%	-	0%	0.60	-0.73	-0.12	0.68
Lao PDR	0.72	4.1	440	-	-	32	0.2	0.39	0%	3%	-	0%	0.46	-0.62	-0.70	0.51
Mongolia	0.95	5.1	730	4	-	21	0.15	0.33	15%	2%	-	6%	0.61	-0.47	-1.23	0.68
Mozambique	0.48	4.6	258	5	5	59	0.19	0.54	19%	15%	-	6%	0.36	-0.77	-1.36	0.55
Myanmar	0.85	4.3	210	-	5	24	0.2	0.31	20%	2%	-	3%	0.48	-1.41	-0.85	0.47
Niger	0.89	5.1	644	4	1	37	0.15	0.37	17%	12%	-	1%	0.32	-0.61	-0.62	0.57
Nigeria	0.96	4.7	294	5	12	65	0.16	0.35	5%	1%	1%	6%	0.36	-1.00	-1.56	0.57
Pakistan	0.84	5.3	606	5	14	42	0.2	0.30	11%	1%	-	1%	0.41	-0.40	-0.55	0.61
Papua New Guinea	0.87	4.1	204	-	19	36	0.13	-	0%	5%	-	9%	0.43	-0.89	-1.84	0.60
Philippines	0.89	4.2	611	-	68	54	0.08	0.41	16%	0%	-	0%	0.52	0.07	0.72	0.63
Senegal	0.93	4.7	260	5	4	60	0.1	0.38	15%	5%	3%	0%	0.42	0.06	-0.59	0.59
Sudan	0.75	5.2	737	-	3	22	0.3	0.34	11%	11%	-	3%	0.38	-1.64	-1.33	0.45
Tajikistan	0.39	5	905	-	-	26	0.15	0.34	11%	5%	-	1%	0.50	-0.59	-0.69	0.61
Tanzania	0.86	4.9	340	5	13	50	0.13	0.41	8%	4%	-	0%	0.39	-0.63	-1.09	0.54
Timor-Leste	1.00	4.6	414	-	1	-	-	0.29	28%	13%	467%	38%	0.45	-0.76	-	0.39
Tunisia	0.98	5.1	663	3	8	77	0.19	0.33	21%	2%	-	2%	0.52	-0.17	0.22	0.69
Uganda	0.68	4.7	149	-	-	66	0.13	0.43	10%	6%	-	0%	0.38	-0.57	-0.92	0.60
Ukraine	0.71	3.5	414	-	18	64	0.23	0.26	18%	1%	-	1%	0.63	-0.41	0.49	0.70
Uzbekistan	0.97	4.5	634	12	-	35	0.1	-	17%	2%	33%	7%	0.62	-0.20	-0.38	0.70
Vietnam	0.82	4.1	482	10	15	84	0.1	0.37	10%	0%	1%	1%	0.69	0.28	0.10	0.70
Zambia	0.42	5.0	233	5	-	59	0.23	0.57	17%	5%	-	0%	0.40	-0.82	-0.74	0.67
Zimbabwe	0.74	5.0	266	5	-	53	0.16	0.50	15%	4%	-	0%	0.47	-1.24	-0.78	0.54

Cell colour code indicates comparison to all countries incl. UMIC and HIC:



Row background colour indicates relevance of diversification based on country's primary fossil fuel use and production (see Figure 2):



Figure 2: Heatmap illustrating the readiness of fossil fuel-producing LLMICs for different transition pathways along a set of indicative metrics.

Notes: All LLMICs are displayed with GDP 2019–21avg > \$1 billion and (Fossil fuel production 2019–21avg + potential production of sites in development) > 0.01 QBTU. Latest available values are shown. “-” means no data were available: SWF = Sovereign Wealth Fund. Darker cell shadings imply higher relative readiness for a given transition pathway. Missing values are coloured white. Cell colour scale flipped for indicators with lowest value being more preferable (Fossil fuel consumption / Total consumption; Equity risk premium; GINI index). Row background colour is indicative of relevance of the transition pathway for the respective country based on the mapping of Figure 1B.

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AUTHOR STATEMENT

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AUTHOR INFORMATION:

Asterisks denote joint first authors:

Vivien Foster*, Philipp A. Trotter*, Sven Werner, Melin Niedermayer, Yacob Mulugetta*, Ploy Achakulwisut, Aoife Brophy, Navroz K. Dubash, Sam Fankhauser, Adam Hawkes, Stephanie Hirmer, Stuart Jenkins, Sam Loni, Alexis McGivern, Khamphone Nanthavong, Benedict Probst, Steve Pye, Vladimir Russo, Gregor Semieniuk, Carlos Shenga, Vignesh Sridharan, Sugandha Srivastav, Youba Sokona, Lucas Somavilla, Pu Yang.

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