

# Financing just energy transitions in Southeast Asia: Application of the Just Transition Transaction to Indonesia, Vietnam, and Philippines

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**Abstract:** This paper investigates the applicability of the Just Transition Transaction (JTT), initially developed as a financial mechanism for South Africa's energy transition, to Southeast Asian (SEA) countries, including Indonesia, Vietnam, and the Philippines, which heavily rely on coal. Utilizing South Africa as a reference case study, we deconstruct the JTT and develop a novel framework of necessary and conducive features for evaluating its suitability for supporting a just energy transition in SEA. Our findings suggest that the JTT is well-suited for Indonesia and Vietnam but not as well suited for the Philippines. Recommendations for specific research avenues in estimating baselines and aligning emissions trajectories are provided. Finally, we propose a tiered JTT model to encourage a supranational transition in SEA and suggest the potential application of our methods for assessing similar mechanisms in other coal-reliant developing countries.

**Keywords:** Emission pathways, Energy transition, Just Energy Transition Partnership (JET-P), Just Transition Transaction (JTT), South Africa, South-East Asia

Abbreviations: ADB, Asian Development Bank; ADB TA, Asian Development Bank Technical Assistance Programme; CO<sub>2</sub>, Carbon dioxide; DOE, Department of Energy (Philippines); EPTC, Electricity Power Trading Company; ETM, Energy Transition Mechanism; EVN, Vietnam Electricity Group; GT, Gigatonne(s); IPP, Independent Power Producer; IRP, Integrated Resource Plan; JET-P, Just Economic Transition Partnership; JTT, Just Transition Transaction; MT, Million tonne(s); NDCs, Nationally determined commitments; NGCP, National Grid Corporation of the Philippines; OECD, Organisation for Economic Cooperation and Development; PDP, Power Development Plan; PEMC, Philippine Electricity Market Corporation; PPA, Power Purchase Agreement; PLN, Perusahaan Listrik Negara; R, South African Rand; RE, Renewable Energy; REIPPP, Renewable Energy Independent Power Producer Procurement Programme; RPS, Renewable Portfolio Standards; SA, South Africa; SEA, South-East-Asia; t, tonne; USD, United States Dollar; VND, Vietnamese dong; VWEM, Vietnam Wholesale Electricity Market; VCGM, Vietnam Competitive Generation Market; WESM, Wholesale Electricity Spot Market.

## 1. Introduction

### *Background*

Countries within South-East Asia (SEA) persistently rely on coal to meet their expanding energy needs, although their initiation into renewable energy adoption has been comparatively sluggish (SPG, 2022). However, recent advancements, marked by an increasing uptake of renewables, indicate a progressive transition. A significant quandary faced by these nations is the imperative to decouple their swift economic growth from fossil fuel energy consumption. The financial allure of hydro and solar power renders coal plants in the region susceptible to stranded asset risks, potentially resulting in elevated future energy costs (Caldecott et al., 2016).

With ample international attention and investment, SEA countries, exemplified by Indonesia, Vietnam, and the Philippines, possess the potential to redirect their power sectors towards embracing greener energy infrastructure, aligning with the 1.5° pathway outlined in the Paris Agreement. To facilitate this transition, various international frameworks and mechanisms have been conceived to finance the shift towards sustainable energy in different countries. Notable examples include the Energy Transition Mechanism (ETM) introduced by the Asian Development Bank (ADB) in Asian countries (Shrimali, 2020). In the United States, the refinancing of coal is supported by ratepayer-backed securitization bonds, utilizing surcharges on energy bills (Shrimali, 2020). Similarly, competitive auctions are employed in Germany

to compensate coal plant owners affected by the early retirement of plants (CSF, 2022). Table 1 provides a comparison of some of the prominent transition mechanisms.

The Just Transition Transaction (JTT) represents a climate financing mechanism crafted by Meridian Economics (Steyn et al., 2021). This mechanism entails a concessionary sovereign loan proposed to a developing country, exemplified by South Africa, with the overarching goal of advancing carbon mitigation commitments, transitioning to greener energy sources within its energy production mix, and retiring coal power plants. The JTT incorporates a unique aspect wherein developed economies co-sign the proposed debt, enabling the developing country to curtail its cost of borrowing. This, in turn, serves as an incentive for the developing nation to align with a Paris Agreement-compliant mitigation pathway, superseding its existing national commitments (Steyn et al., 2021).

Fig. 1 provides a simplified view of the JTT value chain: developed countries, multilaterals and private investors provide financing to the Just Transition Fund for a grand bargain for structural/ESKOM reforms, accelerated coal phase down and enhanced emission reductions. The Just Transition Fund oversees the deployment of the funds for structural reforms, green investments and affected community support, delivering emissions mitigation. The coal dependent communities would benefit from the JTT funds and from crowding in of new energy projects in the affected region in the country.

The quantifiable mitigation achieved through the JTT, measured in gigatonnes (GT) of Carbon Dioxide (CO<sub>2</sub>), becomes a pivotal element. This mitigation can be offset against the developing country's interest payments on the debt, calculated at an agreed-upon dollar per tonne of CO<sub>2</sub> rate (deal rate) throughout the repayment schedule. Consequently, the developing country is motivated to curtail its grid CO<sub>2</sub> emissions by strategically investing in renewable energy sources and dismantling inefficient or coal-based energy infrastructure, thereby effectively reducing its overall cost of borrowing (Steyn et al., 2021).

During the initial stages of the loan, the recipient country must focus on renewing infrastructure, implementing energy market reforms, and developing renewable energy capacity. This preparatory phase is essential for accurately measuring mitigation performance. Sponsoring countries have the authority to tie loan disbursement or interest payment concessions to key milestones, ensuring accountability. Examples of these milestones include unbundling the national utility, privatization reforms, establishing an energy market regulator, and developing green

**Table 1**  
Summary of financial mechanisms for just energy transition.

Sl. no.	Financial mechanism	Description
1.	Energy Transition Mechanism (ETM)	Introduced by the Asian Development Bank (ADB), for mitigating emissions in the Southeast Asian region (SEA). It has elements of concessional finance built in and carbon financing for avoiding potential emissions from fossil sources.
2.	Accelerating Coal Transition (ACT)	It enables just transition for coal dependent workforce by providing concessional finance for coal plant repurposing and is a source of finance for ETM.
3.	Rate-payer Backed Securitization	Introduced first in the United States (US) through ratepayer-backed bonds. Backed by ratepayer surcharges on energy bills, coal-based assets are refinances and investment made in green assets.
4.	Coal Phase-Out Act	Introduced in Germany, these are competitive auctions which look to help utilities retire coal plants through prepayment of debt and equity.
5.	Just Transition Transaction (JTT)	Introduced in South Africa for debt ridden ESKOM to undertake just energy transition in the country through concessional financing linked to achievement of sustainability goals.

Source: Compiled by authors.

infrastructure or grid capabilities. Failure to meet planned CO<sub>2</sub> reduction targets or milestones may result in penalties, such as deductions to the loan's concessionality or overall principal, loan acceleration, or additional milestones based on negotiated terms. This approach ensures strict adherence to commitments and accountability throughout the loan period (Steyn et al., 2021).

While JTT is focused on the pillars of development of green energy projects, coal retirement and enabling just transition, it is not designed to address the fundamental issue of debt trap for utilities such as ESKOM (Steyn et al., 2021). The longstanding issues of debt overhang for utilities in coal dependent countries would still remain unresolved even after getting the financial package through JTT as the funds are meant to address other key issues. Therefore, JTT does not offer a comprehensive solution to make these coal utilities financially viable without which the decarbonization efforts could also potentially face pushbacks. This poses significant risks to actual implementation of JTT package on the ground.

Further, JTT appears to be more top down in its approach towards recipient nations and rather need to be tailor made for individual countries in view of their specific contexts. For instance, access to technology and technology waivers in addition to debt/grants would be useful in some other countries (SPG, 2022). The existing structure of JTT mechanism fails to capture these issues. Until these concerns are also addressed by JTT, there are apprehensions that coal dependent countries could remain tied to its historical coal-based path dependencies and find it difficult to undertake successful energy transition.

#### Literature review

Financing green energy transitions is a recent global challenge which has drawn the attention of researchers. Despite falling prices of renewable energy sources globally, transitioning away from coal power in emerging and developing economies has remained a challenge. Bodnar et al. (2020) estimate that 93 % of global coal power plants are shielded from competition from renewables because of long-term PPAs or regulatory tariffs. Other studies such as Calhoun et al. (2021), and Hamdi and Adhiguna (2021) have also pointed out that coal power plants have remained distant from competitive market pressures, either because of their status as a regulated state-owned enterprise (SOE) or existing long-term PPAs.

Financial mechanisms address this critical challenge of unlocking the additional value locked away in long-term contracts or overextended state-owned utilities to retire coal plants before the end of their lifetime, increase the uptake of renewable technology and support coal-reliant communities adversely impacted by the transition. Calhoun et al. (2021) develop a comprehensive list of the various transition finance mechanisms being considered globally, categorizing them into four mechanism types: Refinancing, Managed transition vehicle, Compensation, and Broad transition support.

Refinancing schemes, including Securitization proposed by Fong and Mardell (2021) and the Just Transition Transaction developed by Steyn et al. (2021), involve refinancing the utility's existing debt or contract obligations via some form of cheaper capital, either from public or private markets, reducing the utility's indebtedness, increasing its access to credit markets and freeing up capital for coal retirement, renewable investment and supporting affected stakeholders. Bodnar et al. (2020) describe the various forms securitization-based refinancing mechanisms can take including Single-asset refinancing, Ratepayer-backed securitization (Shrimali, 2020) and Asset portfolio securitization. In the literature, securitization-based debt approaches to refinancing are also called green bonds.

Managed transition vehicles are a type of investment fund which purchases coal assets (including PPAs) with an explicit intent of early retirement and fulfilling their contract obligations with cheaper, cleaner energy alternatives. The Energy Transition Mechanism (ETM) being developed and implemented by the Asian Development Bank (ADB) in Indonesia, Vietnam and the Philippines is one such example (Hickey,

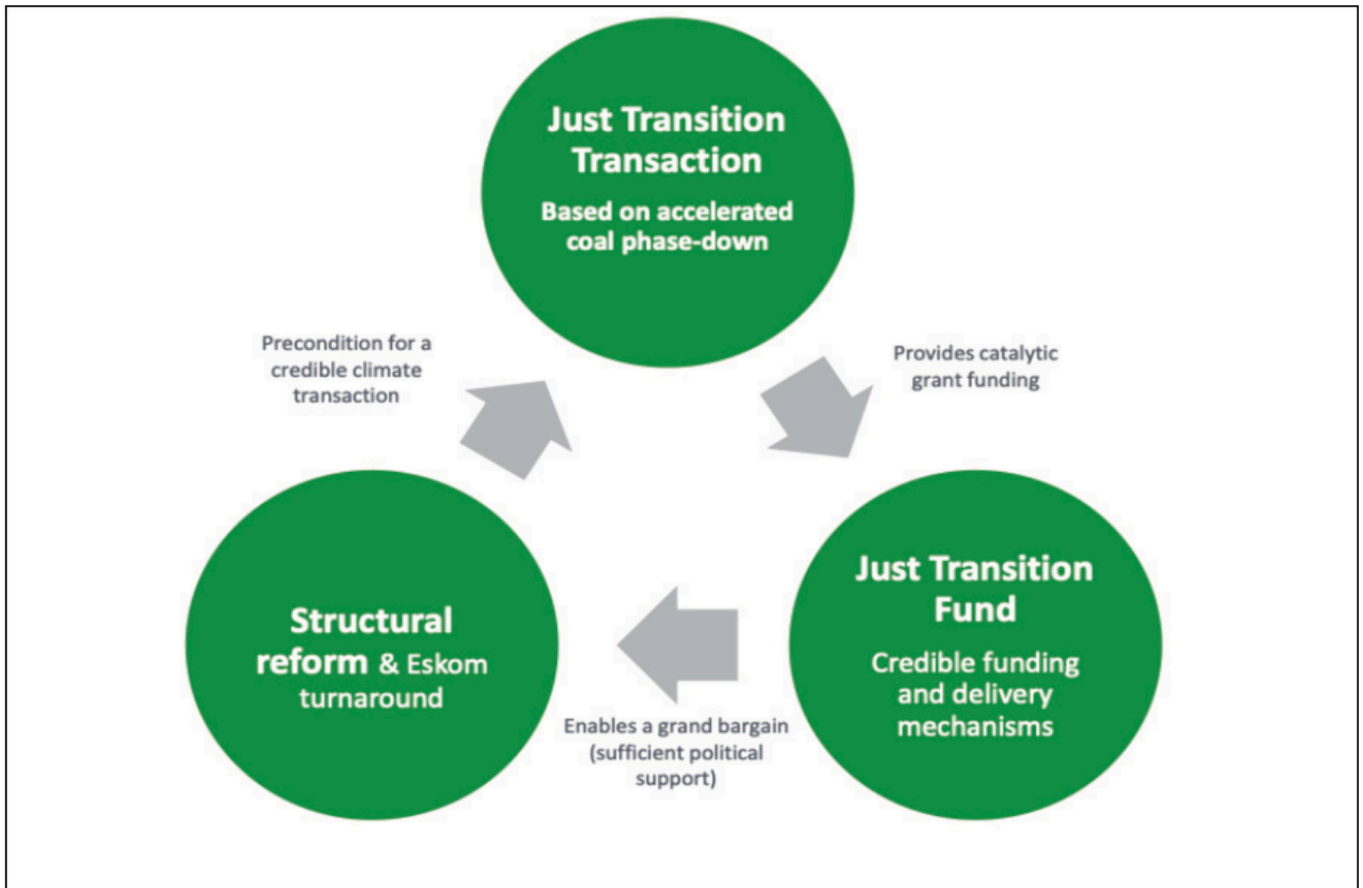


Fig. 1. JTT: major components.  
Source: Winkler et al. (2020)

2022). The ETM aims to deliver concessionary finance and requisite technical assistance to utilities in these countries to facilitate an earlier coal power plant retirement and increased renewable energy investment (ADB, 2021).

Akin to managed transition vehicles, compensation schemes purchase coal assets with a predefined objective of immediate retirement. One prominent use of these is in Germany, which has implemented reverse auctions to compensate coal power plant owners for early retirement with decreasing maximum compensation amounts in the later rounds of the auctions (Eurofound, 2022). Coal plants which remain under operation after 2027 do not receive compensation for mandated closure. Compensation schemes can also take the form of verified carbon payments based on the amount of greenhouse gases mitigated or reverse auctions for the debt forgiveness<sup>1</sup> of overleveraged utilities (Bodnar et al., 2020). Finally, Broad transition support programmes in implementation are supranational initiatives which deliver support to economies for parallel initiatives like R&D investments, grid infrastructure development and economic diversification in addition to supporting a coal transition.

Past studies have evaluated the effectiveness of transition finance mechanisms in the form of individual case studies and through cross-

comparisons (Calhoun et al., 2021; ADB, 2021; Pereira, 2017; Winkler et al., 2021). Calhoun et al. (2021) model, assess, and compare the feasibility of the early retirement of coal power plants by either refinancing or utilizing a managed transition vehicle, concluding in favor of refinancing albeit noting the significant impact of subtle design choices in the transition mechanism. Pereira (2017) emphasized the risks involved in the implementation of blended finance mechanisms to support development and the necessity of suitable design choices to alleviate or mitigate them. The study highlighted key considerations such as developing a taxonomy to prevent double-counting additionalities, proper incentive structures, distribution of responsibilities across stakeholders and evidence-based project planning for any blended finance project. Despite the availability of literature on the broad effectiveness of individual transition mechanisms, there appears to be a paucity of studies analyzing the extensibility of any existing climate finance mechanism to other countries.

The specifics of the JTT and its concession-delivery mechanism have also remained uncovered. Steyn et al. (2021) and Winkler et al. (2021) are among the few studies which explore the JTT's broad implications for SA's electricity system, its political economy and a just transition<sup>2</sup>

<sup>1</sup> Debt forgiveness means debt relief in terms of cancelling the existing debt obligations of utilities transitioning away from coal so as to deliver climate justice. There is a notion that coal dependent countries are generating revenue from coal assets in order to make their outstanding debt payments and a debt forgiveness as part of the JTT mechanism would prove to be a key enabler in green energy transition to a more sustainable energy economy. We thank an anonymous reviewer for pointing this out.

<sup>2</sup> A Just Transition means transitioning the economy to a lower carbon footprint in a way that to the extent possible all stakeholders found the transition fair and inclusive by creating new work opportunities and no one is left behind because of the ensuing transition (ILO, 2024). A just transition on the one hand, looks to maximize the social and economic opportunities emanating from climate action, on the other tries to minimize the related challenges through stakeholder engagement and social dialogue with the affected communities and groups. We thank an anonymous reviewer for pointing this out.

globally while highlighting the nascent stage of various climate finance interventions. They contribute significantly to the case study literature, identifying key structural issues and socio-political considerations involved in a just transition within the context of SA and ESKOM. Our paper can be considered a natural extension of their research, utilizing the singular case study methodology within South Africa to formulate a framework for the applicability of a JTT-like concessionary debt mechanism for other countries.

The SEA region has been the focus of analysis of several studies for examining their energy structure and the progress towards green energy transition. [Gray et al. \(2018a, 2018b, 2018c\)](#) explored the role of coal power in Indonesia, Vietnam, and the Philippines respectively, and highlighted key features of the energy markets in these countries including the level of coal concentration, cost of renewables, existing green initiatives and the presence of monopolies in the generation, transmission and distribution segments. While their analysis of the power situations in these countries is quite detailed, they do not comment on the amenability of these countries for undertaking transition.

To enhance the overall understanding of the challenges and opportunities emanating from JTT driven just transition in developing countries, we examined the stakeholder's perspective on related issues. Past studies indicate that the notion of just transition has drawn significant scrutiny from stakeholders: for instance, energy affordability, pace and extent of decarbonization, employment generation, private investments etc. are areas which need greater consultations and engagement. These studies also mention that the scope and priorities of JTT such as the issues of debt overhang for utilities in coal dependent countries being left out of discussions cast aspersions on the credibility of meaningful transition efforts. Also, in recipient nations, while JTT would allow investments in renewables, the increased penetration of renewables in some cases could potentially give rise to issues of grid inertia and stability. Therefore, along with green energy investments, there is a need to make investments simultaneously in improvements in grid to make them smart and more accessible for renewables. Finally, assigning value to social outcomes such as localization, community ownership, electricity access and employment are also crucial element of just transition along with the economic and energy transition outcomes ([Stakeholder perspective, 2023](#)).<sup>3</sup>

In general, there are few studies which specifically suggest recommendations for compatible climate finance mechanisms that encourage a just transition in the SEA countries. To our knowledge, no study to date has analyzed the energy structure of SEA countries and investigated the suitability of their features for the application of the JTT mechanism. Our study bridges this vital gap by first developing the JTT necessary and conducive features framework using a case study-based approach and then applying it to the three SEA countries to examine the JTT's feasibility as a transition finance mechanism for undertaking green energy transition in these countries given their existing market structure and policies.

### *Our study*

The paper utilizes South Africa as a base case for the application of the Just Transition Transaction (JTT) to the SEA region with an emphasis on three countries, Indonesia, Vietnam, and the Philippines. First, we evaluate the energy market structure, fiscal plans, and renewable energy initiatives in South Africa (SA) to identify the features which make it suited for a transition supported and incentivized by debt forgiveness mechanisms such as the JTT. These features are then formulated into a generalized framework of necessary and conducive conditions to evaluate the JTT's suitability for supporting a green energy transition in key Southeast Asian countries, specifically Indonesia,

Vietnam, and the Philippines.

Our research makes a significant contribution to policy literature by introducing a novel analytical framework for the implementation of the Just Transition Transaction (JTT) in other countries, utilizing a case study approach. This framework, delineating necessary and conducive conditions, serves as a valuable tool for assessing the suitability of JTT or similar transition financing mechanisms in diverse national contexts. Originating from a comprehensive case study of JTT in South Africa, these conditions are believed to be exhaustive within the specified context. However, it is acknowledged that these conditions may evolve as global best practices for similar transactions become more established.

The timeliness of our study is underscored by the pursuits of countries in Southeast Asia (SEA), such as Indonesia and Vietnam, who are exploring transition deals akin to the Just Energy Transition Partnership (JET-P) following South Africa's example ([Steyn et al., 2021](#); [US, 2022](#); [UK, 2022](#)). Our findings offer timely and valuable guidance in assessing the suitability of JTT as a climate financing mechanism in these countries, potentially influencing their transition strategies.

The paper is organized as follows: Methodology section discusses key methodological considerations in using SA as a case study for comparative analysis with South-East Asian countries. It contains an overview of JTT's implementation in SA. Using SA as a reference point, it identifies key necessary and conducive features for the applicability of the JTT to any sovereign. Applying the JTT framework to SEA section develops a comparative analysis between Indonesia, Vietnam, and the Philippines with an emphasis on their characteristics such as the structure of their energy markets, current carbon emissions pathways, renewable energy initiatives, and future debt requirements. The paper then analyses these characteristics for their overlap with the necessary and conducive features of the JTT before closing with an evaluation of the overall suitability of the JTT for the countries. Regional energy transition in SEA: regional cooperation and tiered JTT section proposes the concept of a tiered JTT for regional energy transition in SEA and Conclusion and policy implications section concludes with policy implications and avenues for future work.

### **Methodology**

The paper engages in theory-building by advancing a generalized framework for conditions which support a debt-forgiveness-driven transition based on the case study of South Africa (SA). In the parlance used by [Gerring \(2004\)](#), within the population of countries, we identify SA as our sample case and unit to develop the JTT framework and evaluate its feasibility via application to three other units: Indonesia, Vietnam, and the Philippines.

As mentioned earlier, we split these features into a framework of necessary and conducive features and use it to evaluate the JTT's suitability for the countries in SEA, namely, Indonesia, Vietnam, and the Philippines. By necessary conditions, we mean conditions without which JTT would not have happened in SA, and by conducive conditions, we mean conditions that made it easier for JTT to happen. Both necessary and conducive conditions are further split into a set of conditions which apply exclusively to the recipient country being examined (labelled with an R) and conditions which are a product of the deal undertaken between the recipient and sponsoring countries (labelled with a D). Similarly, conditions labelled NR refer to necessary features of the JTT's recipient country while features labelled ND are a function of the donor countries or the specific negotiations undertaken for the JTT. Like the nomenclature used for the necessary features, conducive conditions determined exclusively by recipient countries are labelled CR while conducive conditions which are a product of negotiations are labelled CD (see [Fig. 2](#)).

We present only the framework of analysis here to conserve space. The detailed methodology is described in Appendix I.

<sup>3</sup> We thank an anonymous reviewer for pointing this out.

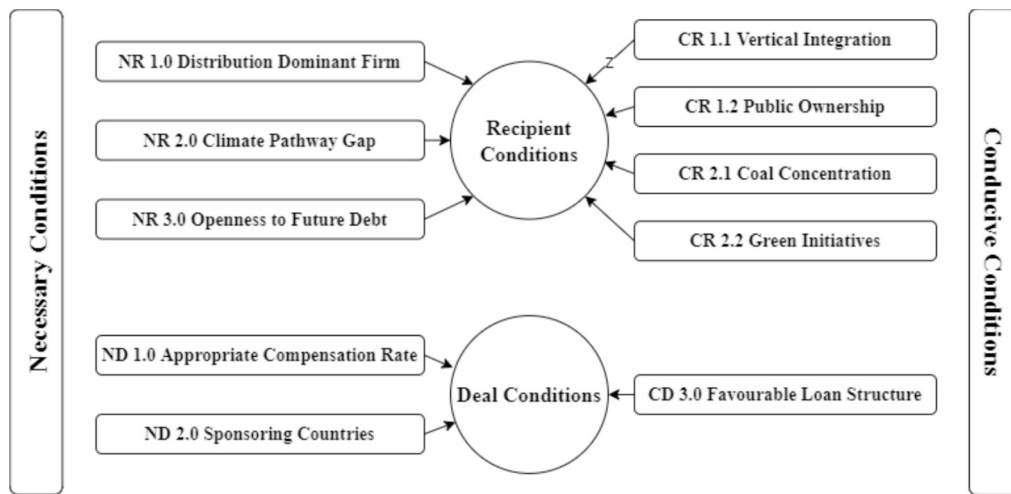


Fig. 2. Our study: necessary and conducive conditions for JTT implementation. Source: Authors creation.

### JTT and South Africa

An application of the necessary and conducive conditions developed above for South Africa is presented in Table 2. Given that South Africa is our reference case used to develop the necessary and conducive conditions, it satisfies all of them and acts as the benchmark for comparison with other countries to determine their suitability for the application of the JTT to achieve a just transition. A more comprehensive examination of the factors within the Table 2 is presented in Appendix II.

South Africa (SA), one of Africa's most industrialized nations and the world's seventh-largest coal producer, is facing a pivotal juncture in its energy landscape (CarbonBrief, 2018). While heavily reliant on coal for approximately 86 % of its electricity generation, SA has substantial solar and wind power resources, setting the stage for an accelerated energy transition (CST, 2022). The ageing coal fleet in SA, coupled with reliability issues, underscores the need for strategic interventions. To ease a successful transition to green energy, SA needs an estimated USD 250 billion in cumulative climate finance over the next three decades. This funding is earmarked for retiring existing coal energy plants, expanding grid infrastructure, and fostering a sustainable energy future. Notably, the private sector is anticipated to contribute approximately two-thirds of this financing, with public sources covering the remaining portion (CST, 2022).

The JTT was first proposed for South Africa (SA) to expedite investment in its renewable energy infrastructure, retire coal facilities, and unbundle its vertically integrated national utility, ESKOM (Steyn et al., 2021). SA's specific circumstances, particularly the structure of ESKOM, make it particularly well-suited for the application of the JTT, offering the potential for more substantial CO<sub>2</sub> reductions compared to its existing commitments. Notably, during the United Nations Climate Change Conference at Glasgow (COP 26) in November 2021, a Just Economic Transition Partnership (JET-P) was unveiled by France, Germany, the United Kingdom, the United States, and the European Union. This partnership pledged USD 8.5 billion to SA, explicitly supporting its just energy transition (Sguazzin & Cele, 2022). The JET-P deal for SA not only illustrates the increasing political acceptance of JTT within the donor countries but also signifies growing support from pressure groups demanding tangible action for climate justice, especially in assisting the transition of middle-income countries.

While the JET-P deal is expected to cover only 3 % of South Africa's (SA) overall transition finance needs, it holds the potential to address critical transition costs, including decommissioning coal plants, supporting coal-dependent communities, and improving grid infrastructure (Freeman et al., 2021). The efficacy of SA's ability to use this pledged

amount and successfully transition to a net-zero economy hinges on several factors. These factors include the structure of its vertically integrated energy market, its existing carbon emissions pathway, the scalability of emissions reduction initiatives, and the availability of international finance.

### Key elements: JTT framework

In this section, we describe the necessary and conducive conditions required for a concessionary-debt scheme such as the JTT and defend why the list of conditions is exhaustive given South Africa as the reference study and external empirical economic literature. As mentioned earlier, necessary conditions, here imply conditions without which JTT would not have happened in SA and conducive conditions, which make it easier for JTT to happen.

Under the necessary conditions, the ones labelled *NR* refer to the required features of the JTT's recipient country while features labelled *ND* are a function of the donor countries or the specific negotiations undertaken for the JTT. Next, we discuss why in the absence of any of these necessary conditions, the JTT framework may not be fully suited to ensuring a sustainable and just coal transition in a developing economy.

#### NR 1.0 Distribution Dominant Firm

A dominant player in the distribution segment of the developing country's energy market could act as a counterparty for the sovereign loan, RE regulation, executing new PPAs and other international financial arrangements. It also allows for better transparency in energy transactions, greater accountability towards the proposed milestones and easier monitoring and measurement of mitigation actions. Without a dominant player, it may prove difficult to propose and enact green reforms in a coal-dominant economy. A dominant distribution firm would also increase the leverage a government has to implement green reforms.

On the other hand, a competitive market structure provides generation companies with alternative supply channels and may add to the existing information asymmetry between companies and regulators thereby increasing the cost and ineffectiveness of regulation (Singhal, 2018). Hence, the ease of implementation of green reforms under the JTT and their effectiveness is likely to be correlated with the degree of market power held by a firm in the energy distribution market.

#### NR 2.0 Gap between baseline and Paris Agreement aligned emissions trajectories

**Table 2**

JTT's framework of analysis: key elements.

Country	Necessary conditions			Conducive conditions			
	Distribution dominant firm	Pathway gap	Open to future debt	Vertical integration	Public ownership	Coal concentration	Green initiatives
	NR 1.0	NR 2.0	NR 3.0	CR 1.1	CR 1.2	CR 2.1	CR 2.2
South Africa	✓	✓	✓	✓	✓	✓	✓

The developing country's baseline CO<sub>2</sub> emissions trajectory based on its existing emissions mitigation targets, RE initiatives and energy market reforms must be significantly above the 1.5° Paris Agreement aligned mitigation pathway. The JTT financing mechanism compensates a developing country for the value generated by the transaction which would be equated to the difference (gap) between these two emission pathways. In other words, the JTT trajectory in this case coincides with the Paris agreement-aligned emission trajectory for the country. However, if the country has already achieved the Paris Agreement-aligned emission pathway or has mitigated CO<sub>2</sub> emissions beyond it, the JTT may no longer be necessary.

#### NR 3.0 Openness to Future Debt

This implies a commitment to raise future government debt by a developing country to finance new RE initiatives, accelerate the retirement of existing coal fleets and ensure a smooth, just transition for its coal-dependent communities. Further, a pre-existing national plan to raise future debt provides the JTT with the necessary compatibility needed for the developing country in terms of its loan-repayment obligations and other existing policy priorities such as the foreign exchange rate, foreign reserves, or national budget constraints.

#### ND 1.0 Dollar per tonne of CO<sub>2</sub> emissions (deal price)

Dollar per tonne (USD/t CO<sub>2</sub>) or the deal price is the compensation rate being used for computation of the monetary value of the emissions mitigation achieved by the developing country. This rate of compensation should theoretically be higher or equal to the marginal cost of CO<sub>2</sub> mitigation<sup>4</sup> for the country to act as a sufficient incentive to undertake any emissions mitigation exercise. In the absence of the above, the country would rather prefer repaying the loan on the scheduled, unsubsidised terms as part of its existing debt servicing plans. Hence, this pre-determined USD/t CO<sub>2</sub> compensation rate should necessarily be higher for developing countries facing higher marginal costs for CO<sub>2</sub> mitigation and must necessarily be sufficient for creating a fiscal space to address the socio-political and financial barriers which hinder decarbonization efforts in the country (Steyn et al., 2021).

#### ND 2.0 Sponsoring countries

Governments in donor countries aim to provide the financial value of the enhanced CO<sub>2</sub> emission mitigations by guaranteeing part of the debt obligations through subsidising the interest payments thereby reducing the recipient country's cost of borrowing. This is the sole means to compensate a country for its ratcheted carbon emission mitigation actions as a part of the just transition transaction.

Next, we list features conducive to the applicability of the JTT financing model.<sup>5</sup>

<sup>4</sup> Here the marginal cost of CO<sub>2</sub> emissions abatement is obtained from the shadow price of CO<sub>2</sub> emissions.

<sup>5</sup> We map the conducive features to the necessary features according to their relevance – e.g., CR 1.1 and CR 1.2 are mapped to NR 1.0; CR 2.1 and CR 2.2 are mapped to NR 2.0.

#### CR 1.1 Vertical integration

A vertically integrated utility refers here to one public entity for all three segments, namely, generation, transmission, and distribution in a recipient country's power sector. While vertical integration in the market is not a necessary condition, it could make the implementation of green energy reforms easier to implement vis-à-vis a private market for the same reasons as highlighted in NR 1.0 above. Additionally, transitioning towards a low-carbon trajectory requires transforming the entire energy system, which includes not only generation (to low-carbon generation sources such as renewables) but also distribution (to enhance energy efficiency and curtail losses) as well as transmission (to ensure system-level balancing needed for intermittent and variable renewable energy). A vertically integrated monopoly would prove helpful for sovereign governments in initiating some of these changes.

#### CR 1.2 National utility

Public ownership of the utility further ameliorates the political economy concerns and simplifies the coordination issues associated with using a sovereign-backed loan for financing its unbundling and implementing green reforms through it. A commonly used approach is command and control regulation which includes the use of rules and regulations imposed by governments backed by coercion, fines, or state penalties for enforcement of public policies and is often used in the environmental/energy domain (Stern et al., 2012). Very often through command-and-control regulation measures, several policy reforms can be instrumentalized in a setup with a predominance of national utilities.

#### CR 2.1 Coal concentration

Heavy coal concentration within a recipient country's energy sources can reduce the marginal cost of carbon mitigation (WBG, 2019). As discussed in ND 1.0 above, a reduction in the marginal cost of emissions abatement could also in turn lower the Dollar per tonne (USD/t CO<sub>2</sub>) deal price offered as a part of the JTT. Heavy coal concentration in a recipient country such as above 85 % in the case of South Africa therefore ensures that the JTT deal price in USD/t CO<sub>2</sub> is not only high enough to meet its fiscal needs for a smooth, just, and green energy transition but also sufficiently low for the donor countries to ensure its feasibility. The cost efficiency of mitigation actions requires due cognizance to be given to the coal concentration in a recipient country which is offered the JTT deal.

#### CR 2.2 Green initiatives

The prevalence of green energy initiatives in a recipient country could prove to be a key enabler as these fit easily within the JTT's milestones. Further, they are reflective of a healthy overlap in priorities with the country's government and a more amicable working relationship.

#### CD 3.0 Bullet Loan with Mitigation-sculpted Interest Payments

This condition refers to such a loan profile which could be structured with (i) distinct bullet principal repayment,<sup>6</sup> and (ii) interest repayments related to mitigation achievements. For the latter, the loan interest repayments are sculpted to match the difference in the mitigation actions between the emissions baseline and the Paris-aligned pathway or the JTT Trajectory. The idea here is to sculpt an interest payment profile that allows the recipient country to match the same with the savings on delivered CO<sub>2</sub> emissions. Typically, the loan profile is structured such that larger interest repayments come due only as the recipient country realises its mitigation measures, allowing it to fully capitalise on its interest payment concessions and minimize the overall size of the loan.

### Applying the JTT framework to SEA

The energy landscape in SEA is presently dominated by coal plants, with expansion plans underway, despite the increasing stranded asset risk associated with the growing cost-effectiveness of renewables. The prevalence of coal in SEA economies is rooted in diverse causes, posing potential challenges for a successful transition (ADB, 2021). Distribution companies in SEA, primarily state-owned entities, tend to favor bilateral purchase agreements with suppliers over reverse auctions. This inclination results in inefficient pricing, elevated transaction costs, suboptimal service, and information asymmetry within the market (ADB, 2021; TRAN, 2021). Challenges such as a lack of market transparency, regional cooperation, and unconnected national grids further impede investments. Establishing connected national grids could address concerns related to intermittent supply posed by renewables and render renewable project investments more attractive to developers (ADB, 2021). Additional hurdles include insufficient financing options for energy efficiency projects and a reluctance to adopt new technologies.

In addition to the overarching regional challenges of SEA, specific national-level issues hinder renewable investments and coal retirement. In Indonesia, the presence of long-term power purchase contracts and government coal subsidies poses significant obstacles for the national utility to make substantial strides towards greener energy, despite its cost-effectiveness (Hamdi & Adhiguna, 2021). Vietnam has experienced notable progress with its feed-in tariff for solar energy in recent years, yet intermittent supply issues persist due to vulnerabilities in its national grid (Sula, 2021). The Philippines faces hurdles in securing project financing to expand its national grid and invest in offshore wind projects (Bala, 2022). In the absence of robust regional cooperation, a JTT framework would be instrumental in addressing these challenges by structuring interest rate concessions around key milestones. The subsequent sections delve into the applicability of JTT to Indonesia, Vietnam, and the Philippines. Furthermore, we propose a tiered JTT model to effectively address supranational objectives related to regional cooperation.

#### Indonesia

Coal made up 58 % of all the power generated in Indonesia in 2017 (Gray et al., 2018a) and therefore the country has a significant coal concentration in its economy. Coal-fired power plants are responsible for nearly 35 % of all CO<sub>2</sub> emissions in Indonesia [2]. Akin to ESKOM, PLN<sup>7</sup> is Indonesia's 100 % state-owned monopoly handling generation, transmission, and distribution. PLN controls, owns, and operates approximately 70 % of the power generation capacity in Indonesia (Tam et al., 2021), and is the sole buyer of electricity produced by IPPs, including renewable energy. It also controls 100 % of the transmission

<sup>6</sup> In general, the bullet loan entails principal payment towards the end of the loan term and interest payments either annually or added to the principal for repayment towards the end of the loan term.

<sup>7</sup> PLN is an abbreviation commonly used for Perusahaan Listrik Negara.

and distribution networks and is thus a vertically integrated national utility.<sup>8</sup>

The country-specific features for Indonesia along with their compatibility with JTT necessary and conducive conditions are discussed in detail in Appendix III in sub-sections 3.1.1–3.1.3. We present a summary of the analysis for Indonesia using our framework in Table 3.

Indonesia clearly shows compatibility with all necessary and conducive features of the JTT and appears as a strong candidate for its application, following in the footsteps of South Africa. In November 2022, a JET-P, akin to the one established for South Africa, was announced for Indonesia, providing USD 20 billion to ease its transition (US, 2022). Our analysis supports the belief that this JET-P is likely to be successful in implementing the energy transition for Indonesia.

#### Vietnam

In Vietnam, coal power accounted for 34 % of the total energy capacity while hydroelectricity and solar energy accounts for 26 % and 11 % respectively. Between 2016 and 2021, Vietnam achieved the fastest growth rate in building solar capacity in the entire world (CAT, 2021). Solar photovoltaic capacity increased from 260 MW in April 2019 to 5053 MW in July 2020 (ADB, 2021) and has been the primary driver of growth for Vietnam's energy sector. Vietnam Electricity (EVN), a state-owned enterprise has a monopoly in transmission and distribution and is the single buyer of electricity.<sup>9</sup> Vietnam's success in the rapid expansion of renewables can be attributed to its attractive feed-in-tariffs offered to renewable IPPs at USD 0.08/kWh for wind and USD 0.09/kWh for solar PV (CAT, 2021) and its efforts towards market liberalization.<sup>10</sup>

The country-specific features for Vietnam along with their compatibility with JTT necessary and conducive conditions are discussed in detail in Appendix III in sub-sections 3.2.1–3.2.3. We present a summary of the analysis for Vietnam using our framework in Table 4.

Vietnam, while lacking a completely vertically integrated monopoly and exhibiting lower carbon concentration in its energy generation sector compared to regional counterparts, aligns with most conditions in our framework, rendering it suitable for the implementation of the Just Transition Transaction (JTT). We posit that Vietnam could be the next prominent candidate for JTT application after South Africa and Indonesia. The nation's strides towards renewables, reduced coal concentration, and rapidly growing energy demand may result in a higher USD/t CO<sub>2</sub> compensation rate under JTT, intensifying negotiations' pressure on sponsoring countries. In December 2022, a Just Energy Transition-Partnership (JET-P), resembling those established for South Africa and Indonesia, was announced for Vietnam, providing a substantial USD 15.5 billion financial package to support its transition (UK, 2022). Our analysis supports the expectation that this JET-P deal is likely to successfully aid Vietnam's green energy transition. A significant challenge, however, lies in decoupling the country's rapid economic growth from fossil fuel energy consumption.

#### Philippines

47 % of Philippines energy generation comprises coal (DOE, 2012). However, the government has placed a moratorium on new coal power plants starting 2020 (ADB, 2021) and approved a 500 % increase in the coal tax in 2018 (Gray et al., 2018c). In Philippines, electricity generation and distribution are completely privatized. The National Grid Corporation of the Philippines (NGCP) operates the state-owned national grid which transmits power from power generators to regional suppliers. Most of the trading in electricity takes place via the spot

<sup>8</sup> We thank an anonymous reviewer for pointing this out.

<sup>9</sup> Prior to 2012, EVN had a complete monopoly over generation, transmission and distribution.

<sup>10</sup> We thank an anonymous reviewer for pointing this out.

**Table 3**  
Analysis for Indonesia: applicability of JTT.

Country	Necessary conditions			Conducive conditions			
	Distribution dominant firm	Pathway gap	Open to future debt	Vertical integration	Public ownership	Coal concentration	Green initiatives
	NR 1.0	NR 2.0	NR 3.0	CR 1.1	CR 1.2	CR 2.1	CR 2.2
Indonesia	✓	✓	✓	✓	✓	✓	✓

**Table 4**  
Analysis for Vietnam: applicability of JTT.

Country	Necessary conditions			Conducive conditions			
	Distribution dominant firm	Pathway gap	Open to future debt	Vertical integration	Public ownership	Coal concentration	Green initiatives
	NR 1.0	NR 2.0	NR 3.0	CR 1.1	CR 1.2	CR 2.1	CR 2.2
Vietnam	✓	✓	✓		✓		✓

market and only 8 % negotiated through PPAs (DOE ERC, 2022). Philippines's liberal market structure has allowed it to achieve the highest electrification rates in SEA with private utilities viewing coal-fired plants as secure investments promoting competition within the market (Gray et al., 2018c).<sup>11</sup>

The country-specific features for the Philippines along with their compatibility with JTT's necessary and conducive conditions are discussed in detail in Appendix III in sub-sections 3.3.1–3.3.3. We present a summary of the analysis for Indonesia using our framework in Table 5.

The Philippines experienced a significant increase in debt during the COVID-19 pandemic due to budget deficits resulting from expansionary fiscal policies aimed at supporting economic recovery. Despite the imperative to fund a green economic recovery and an imminent energy transition, any potential additional borrowing poses a heightened risk of default (ESKOM, 2022). Even if the Philippines considers incorporating concessionary debt to its mounting burden, the diverse nature of its market could pose challenges in organizing the transaction. Utilizing MERALCO to incentivize greener production sources would demand substantial political will and stringent monitoring mechanisms to uphold the private distribution company's accountability. Having achieved multiple regulatory and market reform milestones, the USD/t CO<sub>2</sub> compensation rate under Just Transition Transaction (JTT) for the Philippines would need to be higher, not only to sustain incentives within the transaction but also to persuade the country to accept the debt. Given these formidable hurdles, JTT does not appear to be a viable mechanism for coal retirement and a green transition in the Philippines.

### Regional energy transition in SEA: regional cooperation and tiered JTT

#### *Regional cooperation for regional energy transition in SEA*

In contrast to other regions worldwide, Southeast Asia (SEA) remains heavily dependent on coal, earning a reputation as a slow starter in the global energy transition (SPG, 2022). However, akin to countries globally, SEA nations have committed to their nationally determined contributions (NDCs), grappling with the challenge of balancing economic growth while mitigating emissions.

Despite experiencing rapid economic growth and surging energy demand, the SEA region stands at the threshold of a clean energy transition, witnessing a shift towards renewables that replace coal-based capacity. This transition necessitates significant reforms to reshape energy systems, favoring a more renewable energy-dominated mix and phasing out fossil fuels. Given the shared reliance on fossil fuels, escalating electricity demand, and similar energy market structures in the

region, collaborative efforts among these countries are deemed prudent to facilitate smoother implementation of these reforms. We advocate for closer international cooperation through the Just Transition Transaction (JTT) between donors and recipients, emphasizing the significance of regional cooperation among recipients to advance these reforms. A tiered arrangement, as discussed in the subsequent section, could facilitate such collaboration.

#### *A tiered JTT framework for regional energy transition*

In the earlier sections, we discussed the energy situations in Indonesia, Vietnam, and the Philippines, showing how the Just Transition Transaction (JTT) could help with their green transitions at the national level. Alongside sovereign arrangements, we suggest a tiered JTT framework to speed up regional energy transitions in Southeast Asia (SEA). There are various challenges in SEA's energy markets that individual nations might struggle to manage alone, such as inconsistent energy standards, low efficiency, a preference for Power Purchase Agreements (PPAs) over reverse auctions, and a lack of power-sharing agreements or infrastructure.

To tackle these challenges efficiently, we propose a tiered JTT framework that considers both regional and national milestones. Under this approach, achieving national milestones would only get a country part of the overall concession. The next tier of concessions would be accessible when regional milestones are met, like establishing international regimes for energy standards or engaging in multilateral power trade agreements. This tiered method ensures that collaborative efforts at both national and regional levels are acknowledged and incentivized, promoting a more thorough and effective energy transition in the SEA region.

Reaching regional milestones would bring extra concessions, distinct from the achievements at the national level. We think this approach would encourage countries to collaborate and develop consistent policies. However, implementing such a proposal poses significant logistical and political challenges, which are more substantial than those in a JTT agreement with a single sovereign. Despite these challenges, if the incentive structure is attractive enough through substantial concessions, it could drive meaningful and lasting change in SEA and serve as a model for encouraging similar supranational transitions globally.

Our proposal of a tiered JTT for a regional energy transition in Southeast Asia has drawn significantly from EU Just transition mechanism launched earlier in 2020 (Moesker & Pesch, 2022). The Just transition mechanism for European Union (EU) had the overarching objective of assisting EU countries and regions with the just transition. However, there are several challenges to a tiered JTT. For instance, these countries may be mindful of the futuristic geopolitically - motivated roadblocks, given China has significant influence in the SEA due to investments in the three countries, which could hamper the actual

<sup>11</sup> We thank an anonymous reviewer for pointing this out.



**Table 5**  
Analysis for the Philippines: applicability of JTT.

Country	Necessary conditions			Conducive conditions			
	Distribution dominant firm	Pathway gap	Open to future debt	Vertical integration	Public ownership	Coal concentration	Green initiatives
	NR 1.0	NR 2.0	NR 3.0	CR 1.1	CR 1.2	CR 2.1	CR 2.2
Philippines	✓	✓				✓	✓

implementation of a tiered regional JTT in SEA.<sup>12</sup>

## Conclusion and policy implications

### Conclusions

The rapid economic growth in Southeast Asian economies has brought about an improvement in living standards but has also led to an increase in carbon emissions. These countries are confronted with the unique challenge of shifting to greener energy sources while simultaneously strengthening their grid networks, improving grid access, and supporting industries to meet the escalating energy demands. Although solar, hydro, and wind technologies have become more cost-effective compared to coal, these nations require a substantial amount of low-cost concessional climate finance to complete their energy transitions. However, these climate financing mechanisms come with specific conditions and additional requirements. Given that many of these countries have a predominantly state-heavy market structure in their energy sector, their specific reforms and emission reduction targets must align with the criteria of such financing mechanisms.

The Just Transition Transaction (JTT) stands out as a climate financing mechanism, recently implemented to facilitate transition efforts in South Africa. This study delves into the JTT framework applied in South Africa to assess its potential applicability to other countries and regions. Leveraging South Africa as a reference case, we establish a framework outlining essential features for the effective application of JTT in any country. Subsequently, we employ this framework to evaluate the suitability of JTT for Indonesia, Vietnam, and the Philippines. The findings from this analysis are summarized in Table 6 below.

According to the outlined framework, Indonesia emerges as a favourable candidate for the application of the Just Transition Transaction (JTT), meeting all the necessary and conducive conditions. Following South Africa, Indonesia is considered the next-best country for implementing JTT to facilitate a just transition. Vietnam, despite lacking a fully vertically integrated national utility, has demonstrated noteworthy progress in reducing reliance on coal, positioning it as the subsequent candidate after Indonesia. On the other hand, the paper concludes that the JTT is not suitable for the Philippines. This decision is primarily attributed to the macroenvironmental challenges hindering additional borrowing. Even if the Philippines were open to concessional borrowing, the absence of a public monopoly is expected to complicate the negotiation and implementation of JTT. A noteworthy finding of this study is that the ongoing transition deals with Indonesia and Vietnam manifested as Just Energy Transition Partnerships (JET-P), are anticipated to be successful in steering the green energy transition in these countries.

While Indonesia and Vietnam are recommended as suitable candidates for the application of the Just Transition Transaction (JTT) based on the developed framework, successful implementation demands substantial additional research. This includes future investigations into the baseline pathways of these countries in a business-as-usual scenario and the associated CO<sub>2</sub> reductions, providing essential insights for negotiations with sponsoring countries. Additionally, further research is required to determine the necessary amount of additional CO<sub>2</sub>

mitigation under Paris-aligned pathways and the corresponding USD/t CO<sub>2</sub> rates (deal price) for each country. These factors are crucial in ensuring that the incentives in the transaction are appropriately structured to deliver climate justice and value to both parties – the donor and the recipient. For the former, this involves significant carbon mitigation aligning the recipient country with the 1.5° Paris decarbonization pathway; for the latter, it entails adequate monetary compensation to drive substantial and expedited energy transition reform efforts.

From a socio-economic standpoint, in just transition literature there is a critical need for clarity on how finance can directly or indirectly translate into ground action. While assuming that just transition finance package would create job opportunities and increase income, the fact remains that the coal economy is labour intensive, and it needs to be seen whether the new greener economy can absorb the huge labour force and create income opportunities for a larger number - this remains a dilemma as the requirement of labour in renewable sector and potential engagement is relatively marginal.<sup>13</sup>

Further, in JTT a sizeable part of the concessional element is earmarked for just transition on an annual basis which could then be gainfully utilized for enhancing the social impact and improving the livelihood of affected communities through a more equitable outcome (WEF, 2024). Drawing from the South African example, the Just transition fund is expected to support development projects in coal dependent regions to promote social justice by initiating reskilling programmes for coal dependent workforce and giving them an opportunity to take new and better jobs (UCT, 2020). Therefore, successful implementation of JTT in SEA countries could also result in significant social and environmental impacts leading to job creation, community development and environmental sustainability. The JTT financial package is not only expected to channelize investments into more environmentally sustainable technologies which would add decent jobs but also lead to improvements in job quality and incomes on a large scale. Further, improved access to affordable, environmentally green energy for women and local population in rural areas would also lead to enhanced social inclusion. Reskilling programmes for coal dependent workforce, particularly the informal contractual workers and induced labour segments should also aim at promoting entrepreneurial ecosystem, establishing market linkages and sustainable supply chain. Further, in a developing economy, women's empowerment, ensuring access to decent jobs, women's and other backward segments' dignity and voice assume importance.

### Policy implications

The paper provides guidance to policy makers on whether JTT would be suitable for implementing just energy transition in SEA countries given their respective policy environments, in particular their historical energy market features. For instance, among the three SEA countries analyzed, the JTT appears best suited for Indonesia because of its well aligned energy market features for JTT such as vertically integrated utility and public ownership. Further, our analysis also highlights what countries need to do (i.e., policy reforms) to be more suitable for a JTT like mechanism such as reducing reliance on coal and undertaking green energy initiatives.

<sup>12</sup> We thank an anonymous reviewer for pointing this out.

<sup>13</sup> We thank an anonymous reviewer for pointing this out.

**Table 6**

Summary of necessary and conducive features for JTT's recipient countries.

Country	Necessary conditions			Conducive conditions			
	Distribution dominant firm	Pathway gap	Open to future debt	Vertical integration	Public ownership	Coal concentration	Green initiatives
South Africa	✓	✓	✓	✓	✓	✓	✓
Indonesia	✓	✓	✓	✓	✓	✓	✓
Vietnam	✓	✓	✓		✓		✓
Philippines	✓	✓				✓	✓

In case, countries fail to meet the necessary conditions highlighted by the paper, the application of a JTT like financial mechanism may not be able to yield successful energy transition efforts there. For instance, policy makers may look to examine their current macroeconomic environments in terms of their predisposition towards any additional borrowings, a key necessary condition which makes JTT suited for their respective countries. The example of Philippines is a case in point where in JTT proves unsuited primarily due to the unsuitability of its macro-environment to any additional borrowing.

Another major implication is the potential of a regional energy transition for Southeast Asia (SEA) through implementation of tiered JTT which incorporates both regional and national decarbonization objectives, which would entail countries working together and devising more coherent policies. However, future research is needed to formulate supranational transition goals and link these to a tiered JTT.

Future research is also needed to investigate what would be the required amount of additional CO<sub>2</sub> mitigation under the Paris-aligned pathways, and the USD/t CO<sub>2</sub> rates (deal price) for each country. These would be crucial in ensuring that the incentives in the transaction are properly structured to deliver climate justice and value to both parties, the donor as well as the recipient. For the former, in the form of significant carbon mitigation which aligns the recipient country with the 1.5° Paris decarbonization pathway; and for the latter, through sufficient monetary compensation which must trigger significant and faster energy transition reform efforts.

Our paper has a limitation that it builds the JTT methodological framework from the example of South Africa alone. Therefore, the suitability of JTT for Southeast Asian (SEA) countries such as Indonesia, Vietnam, and Philippines may be conditioned by the dominating influence of energy market conditions and other related features in South Africa. As JTT gets implemented in other countries going forward, future research may be needed to improvise the JTT framework and the features so that its suitability in countries could be assessed more effectively. Another limitation of our study is that the framework of analysis utilizes the JTT mechanism which focuses mainly on the factors that lie within recipient countries and does not incorporate outside influencing factors such as global economic trends, geopolitical phenomenon and international policies.

**CRedit authorship contribution statement**

**Abhinav Jindal:** Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Gireesh Shrimali:** Writing – review & editing, Supervision, Conceptualization. **Bharat Gangwani:** Writing – review & editing, Writing – original draft. **Rajiv B. Lall:** Supervision, Resources.

**Declaration of competing interest**

The authors have no competing interests to declare.

**Appendix A. Supplementary data**

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.esd.2024.101472>.

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