

Phasing out the coal-fired power in South and Southeast Asia

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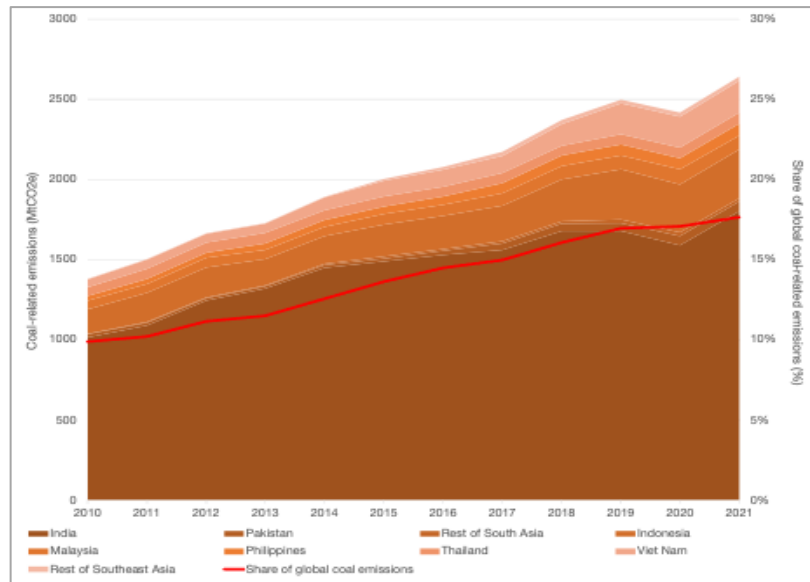
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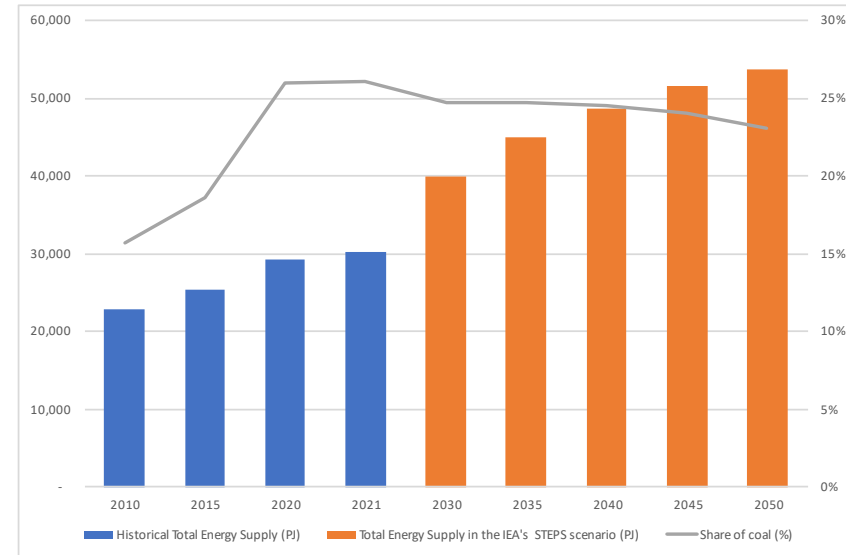
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Rising energy demand underscores importance of shifting to sustainable energy sources



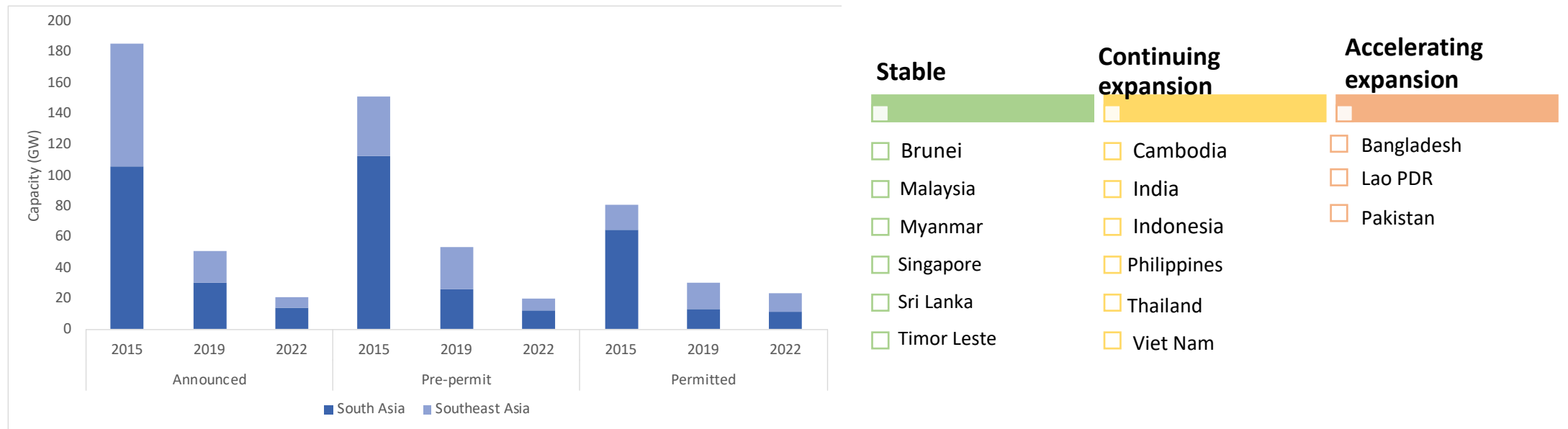
Coal-related emissions per country and total share of the region in global coal-related emissions



Share of coal in the total primary energy supply is increasing in Southeast Asian countries in the Stated Policies Scenario

- Between 2010 and 2021, Southeast Asia's energy consumption rose by 23%. In South Asia, energy demand has grown on average more than 5% annually since 2000.
- Coal remains a dominant component of power generation in the region, representing 45% of power generation in Southeast Asia and 60% in South Asia in 2021

While the expansion of coal-fired power capacity is slowing down, a more accelerated response is imperative



- Brunei, Cambodia, and Malaysia are no longer expanding coal capacity.
- India, Indonesia, and Viet Nam are still growing their existing high levels, but their expansion plans are declining.
- Bangladesh, Pakistan, and Lao PDR are planning to expand their current capacity.

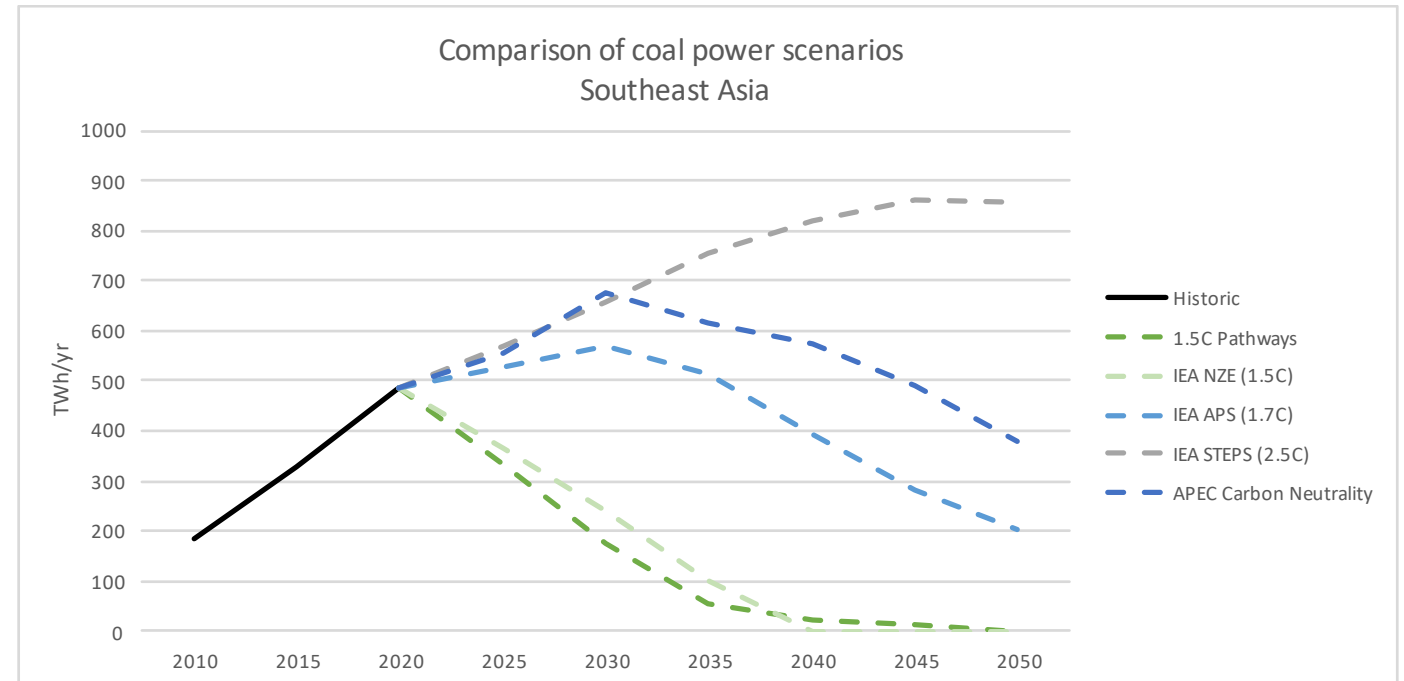
Country-specific challenges and opportunities can be explored further to strike a balanced coal phase down plan

- The impacts of transition vary due to factors such as resource availability, energy mix composition, and economic structures.
- Key challenges can be assessed through indicators such as energy demand lock-in, economic dependency, and structural barriers within the power sector.

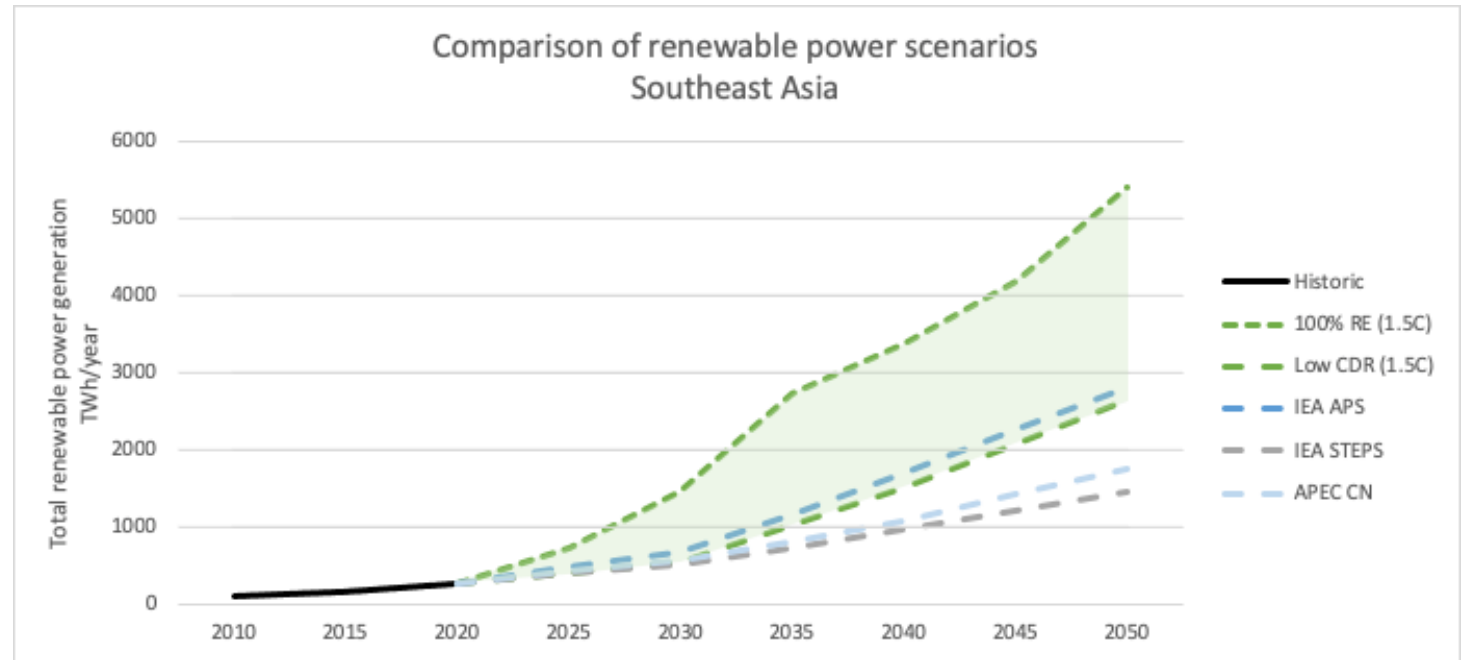
Archetype	I - Wrong-direction	II – Slowing down but off track	III - Off track but promising
Economies	Bangladesh, Pakistan, Lao PDR	India, Thailand, Malaysia	Indonesia, Viet Nam, Philippines
Rationale	Current trajectory towards wrong direction, and a U-turn is needed	Current trajectory is slowing down but pace is not sufficient	Current trajectory is not in right direction but there are intentions to break from that trajectory through international collaboration and domestic policy development

A balanced policy choice is crucial to move towards Paris Agreement compatible pathways to avoid more stranded coal assets

- Coal use for power generation needs to peak by 2020 and be reduced quickly afterwards, across South and Southeast Asia.
- Unabated coal-fired power generation should be reduced by 60% (South Asia) to 70% (Southeast Asia) from 2020 levels by 2030 and phased out by 2036.
- Generation from currently operating coal-fired power generation already largely exceeding the Paris Agreement benchmarks.



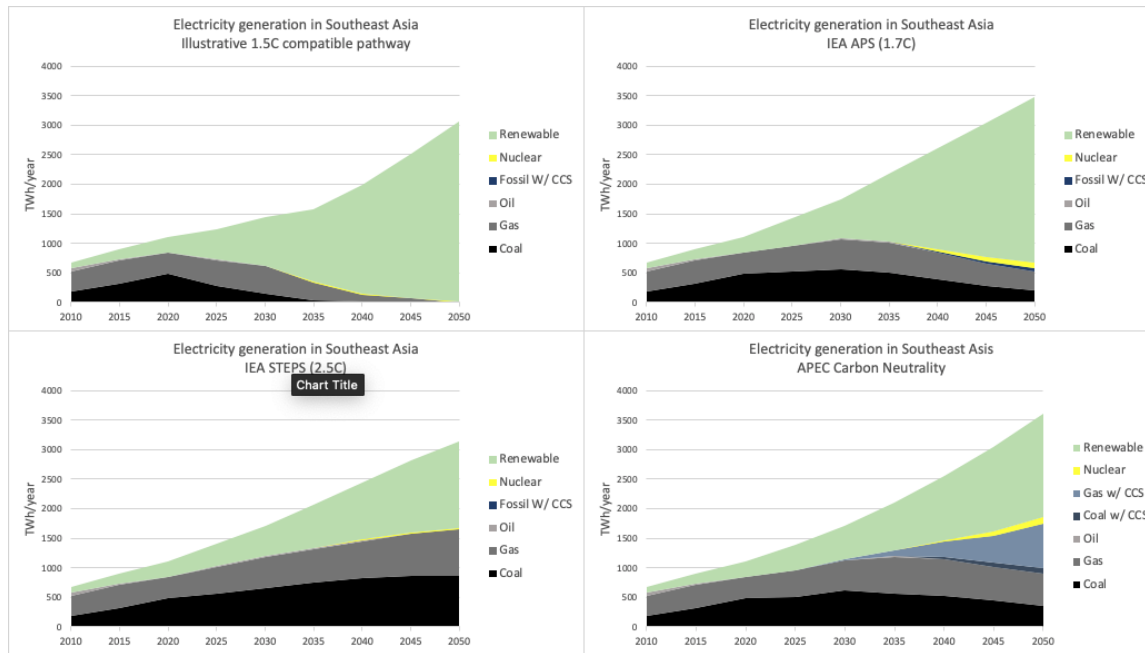
Accelerating renewable energy transition provides opportunity of mitigating climate change and economic risks



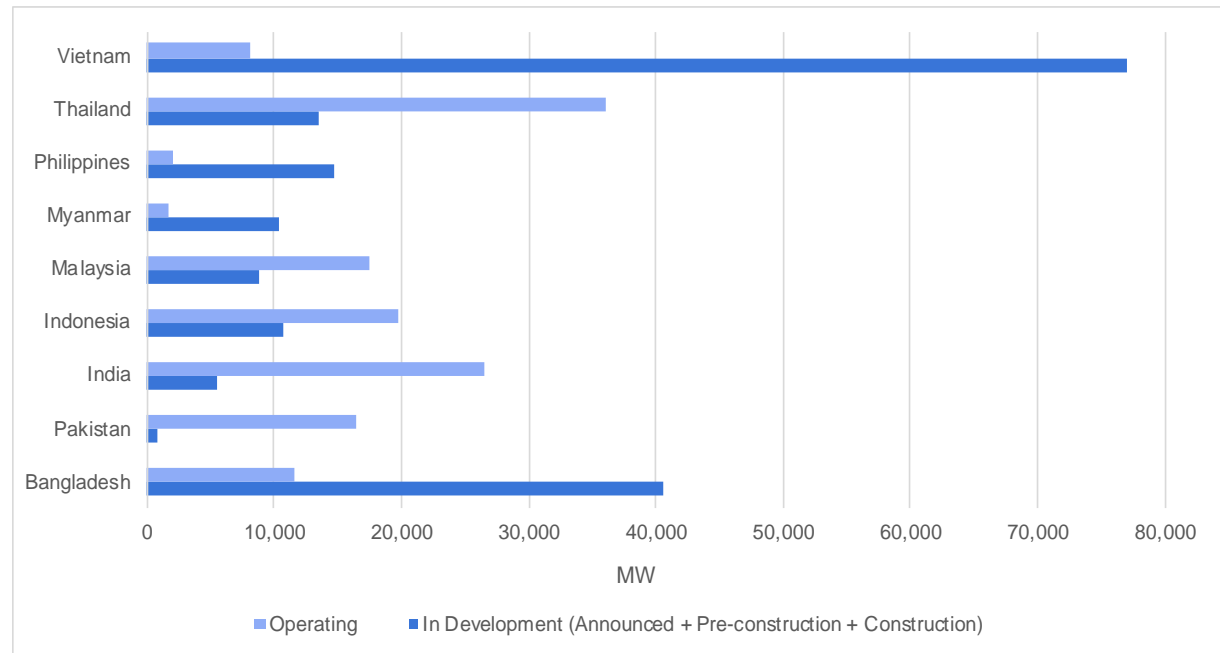
- In Southeast Asia, renewable energy generation is poised for rapid growth.
- Under 1.5°C renewable generation is projected to surge 10 to 20 times above 2020 levels by 2050.

Gas is not a transition fuel

- In 1.5°C scenario gas capacity is peaking by 2030.



Total electricity generation for different sources for Southeast Asia under various forecasts.



Operating and in development of fossil gas-fired capacity in South and Southeast Asia (GEM, 2023)

Cross cutting issues in the power sector of South and Southeast Asia



Regulated market structure with complex contractual obligation

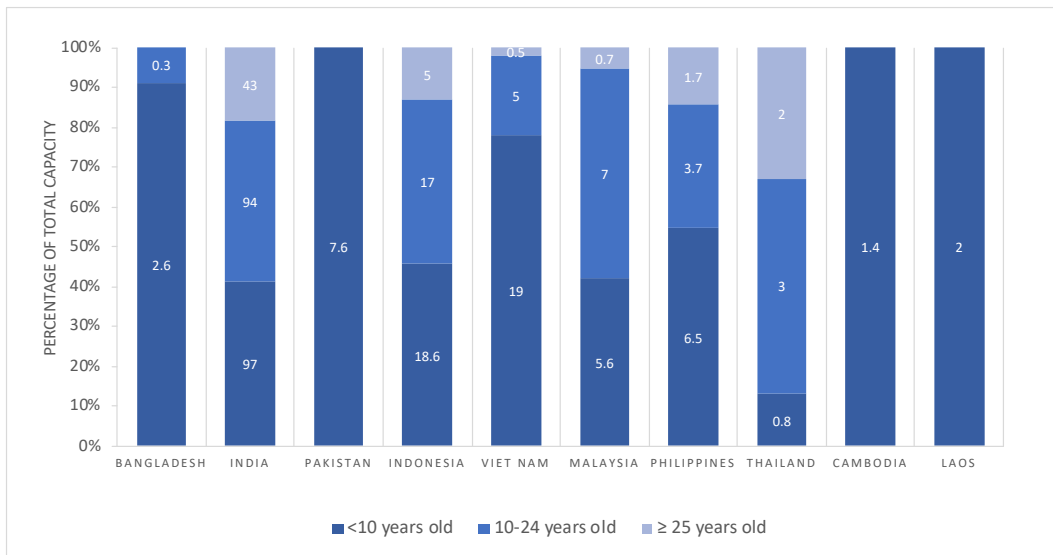
- Coal power plants face limited influence of market competition.
- Most of coal-fired power plants operates under power purchase agreements (PPA).

Archetype	Economies	Market structure
I - Wrong-direction	Bangladesh	Vertically integrated
	Pakistan	Transitioning from vertically integrated to restructured market
	Lao PDR	Vertically integrated
II – Slowing down but off track	India	Restructured market
	Thailand	Vertically integrated
	Malaysia	Vertically integrated
III - Off track but promising	Indonesia	Vertically integrated
	Viet Nam	Transitioning from vertically integrated to restructured market
	Philippines	Restructured market

Young coal fleet and excess capacity

- ~50% of operating capacity is 10 years old or younger.
- This makes coal phase-out challenging due to recent investments and unpaid debt in young coal fleets.

- The consequences of overbuilding coal power include financial inefficiencies, stranded assets.
- Building and maintaining excess capacity, and this also hinders the transition to cleaner energy sources

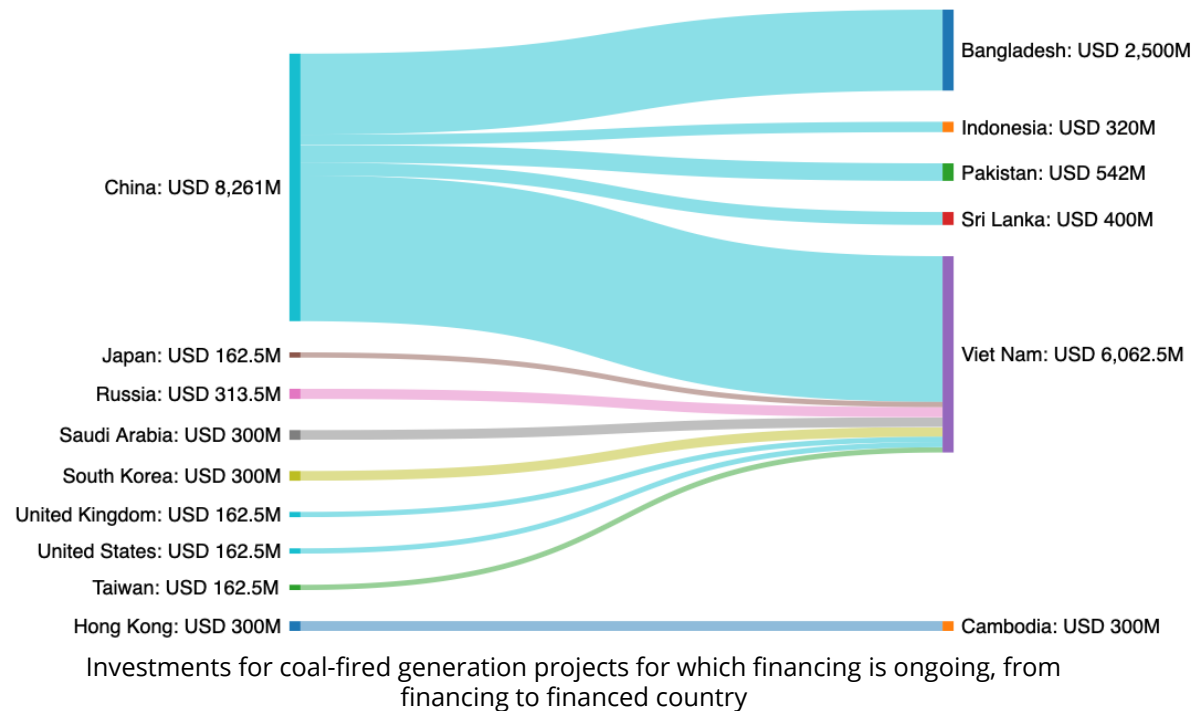


Existing coal fired power capacity by different age group - total capacity under each age group provided in GW

Country	Max peak demand in 2022 (GW)	Installed capacity in 2022 (GW)	Reserve margin (per cent)
India	206	409	101 per cent
Thailand	30	49	158 per cent
Philippines	17	28	155 per cent
Malaysia	18.5	41	82 per cent
Viet Nam*	42	70	150 per cent
Indonesia	20	74	37 per cent

Average peak load and reserve margin of the selected countries of South and Southeast Asia

International public finance

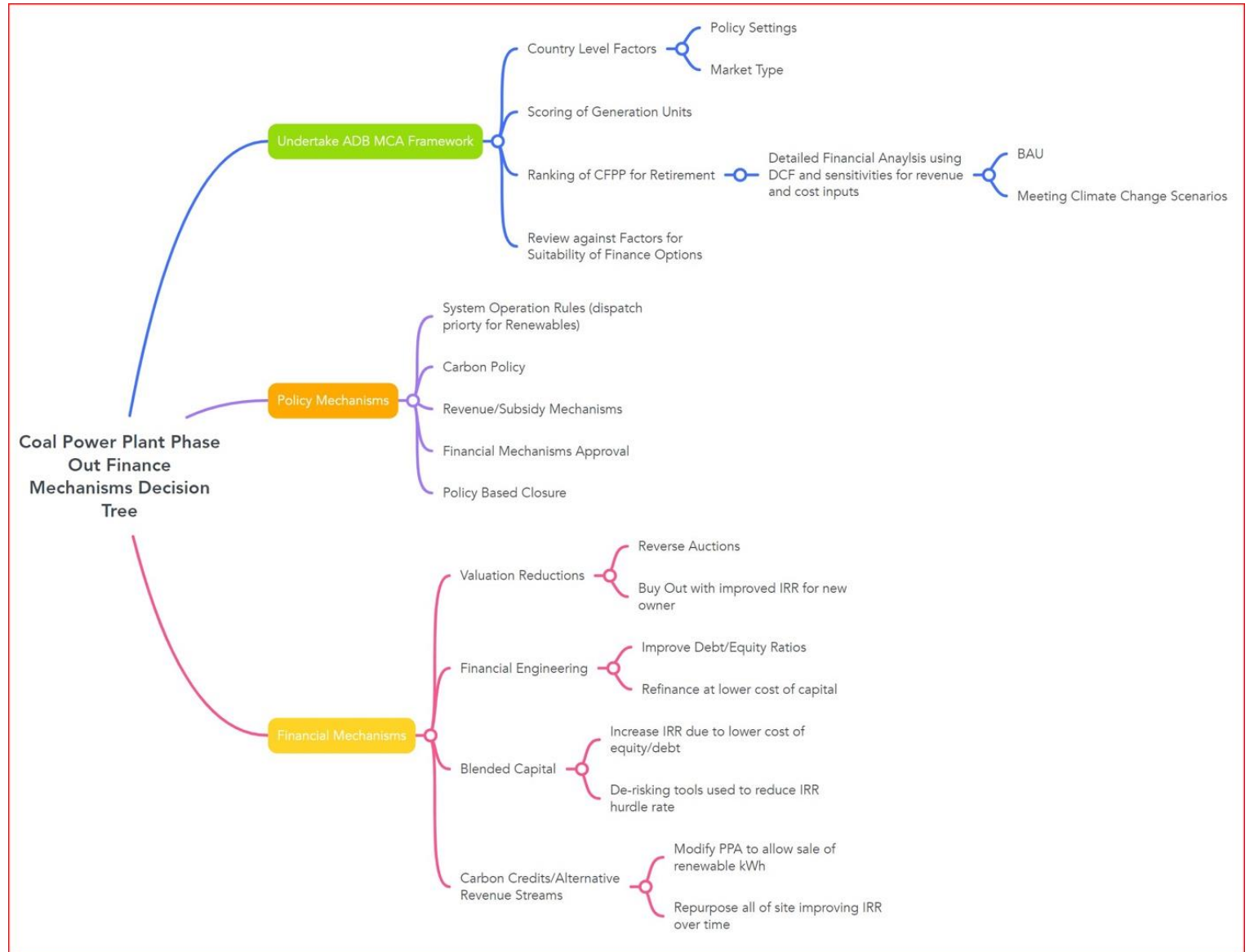


- China, Japan, and the Republic of Korea had been significant providers of public finance for coal-fired capacity in the region.
- Relying on international financing exposes these power plants to the risk of becoming inoperable as global coal financing opportunities decline.

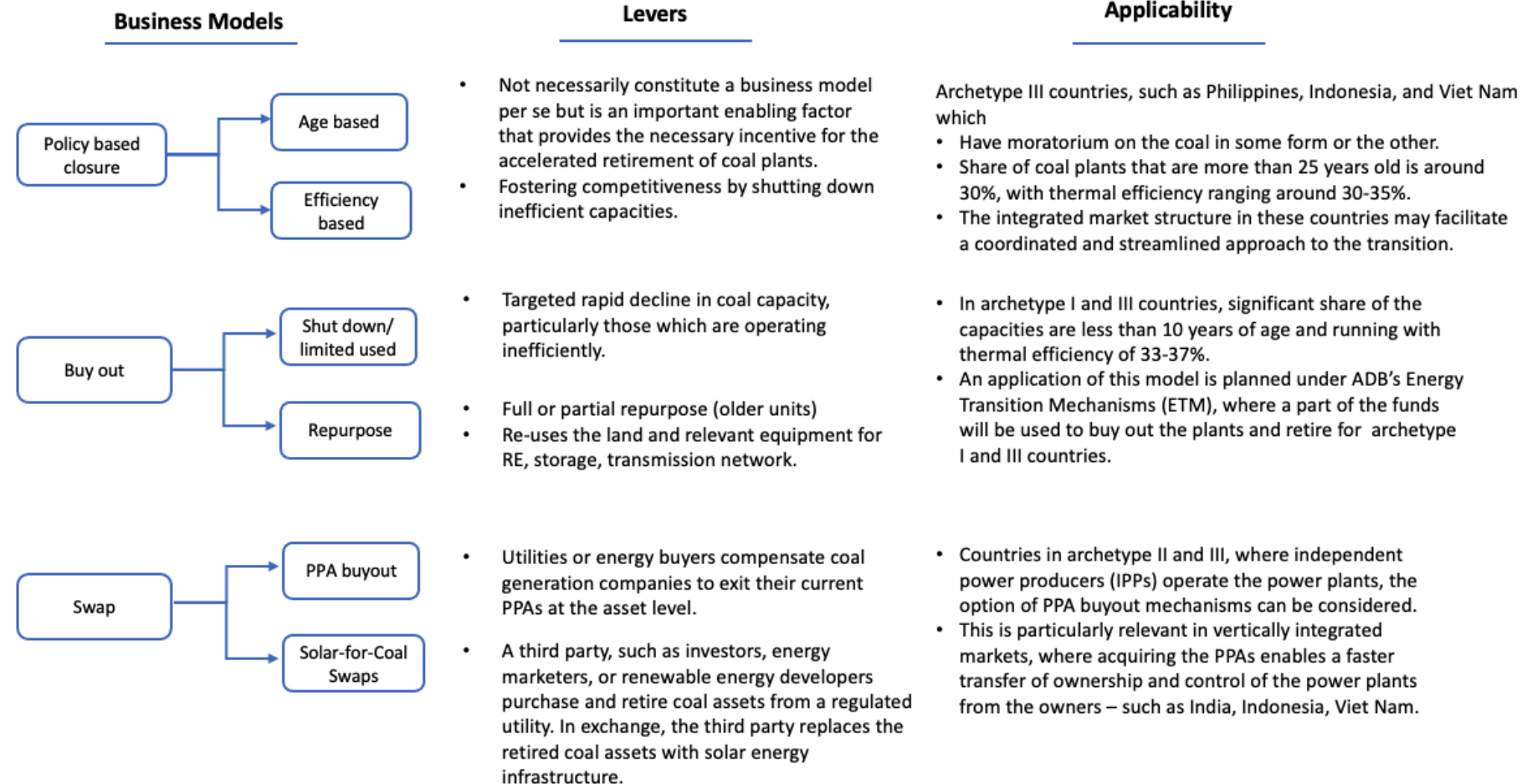
Financial approach and commercial mechanisms



Financial decision tree to minimizing the risk of stranding coal assets



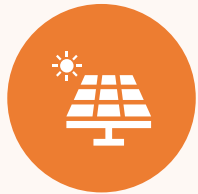
Various business models and their applicability



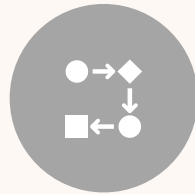
Repurposing of coal plants

Cost		Benefit	
Direct costs: Plant Specific Costs	Employee costs, station overheads, O&M expenses post-retirement	Salvage value/scrap value of coal plant machinery	Direct Benefits: Plant Specific Benefits
	Environmental regulation, such as PCBs, asbestos & hazardous material abatement	Land Reutilization	
	Demolition of the plant and scrap removal from the coal plant equipment and machinery	Equipment (i.e., switchyard, substation) Reutilization	
	Coal combustion residuals (ash/residue ponds) clean up	Remediation benefits, i.e., reduced remediation costs	
	Coal storage areas clean up	Transmission and interconnection evacuation Reutilization	
Indirect costs	Contingency costs, such as unanticipated environmental costs	Peaking power benefits with BESS by retaining ancillary services	Indirect Benefits: System Benefits
	Lost local (city, state) tax revenue	Reactive power benefits with SynCON by retaining system balancing services	
	System balancing cost (eg reactive power) originally provided by the coal plant		
Additional Repurposing costs	Remaining capital expenditure (CAPEX) on the coal plant	Carbon benefits	Indirect Benefits: Societal Benefits
	Remaining operational expenditure (OPEX) on the coal plant	Health benefits	
	Social costs, such as temporary income support for employee rehabilitation	Water benefits	
		Re - employment benefits	

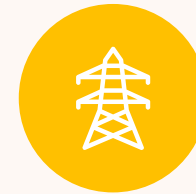
Policy recommendation



Revise power sector outlook focusing on renewable energy target.



Start to develop their long-term strategy for transformational planning.



Power sector infrastructure planning needed for increased penetration of wind and solar energy



Adopt comprehensive planning to access the socio-economic benefit of transitioning away from coal.



Reform the power market to support integration of renewable energy and phasing out coal-fired capacity.



Accelerating early retirement with innovative business models and financial support is crucial