Singapore Green Finance Centre

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Growing the Brown Sectors with Transition Finance: Chinese and International Evidence

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Asia's Decarbonisation

- Asia's decarbonisation trajectories will have to weigh in a lot of factors
  - Continued industrialization and growing demand for energy to support it.
  - High dependence on fossil fuels (oil, natural gas, coal).
  - Limited ability to generate renewable energy because of weather conditions or geography.
  - The intermittent nature of various renewable energies.
- Future supply of renewable energies (wind, sunlight, tides, plant growth, geothermal heat) for Asia (estimates by International Energy Agency)
  - Asia: 11% by 2040 vs. Europe: 35% by 2040

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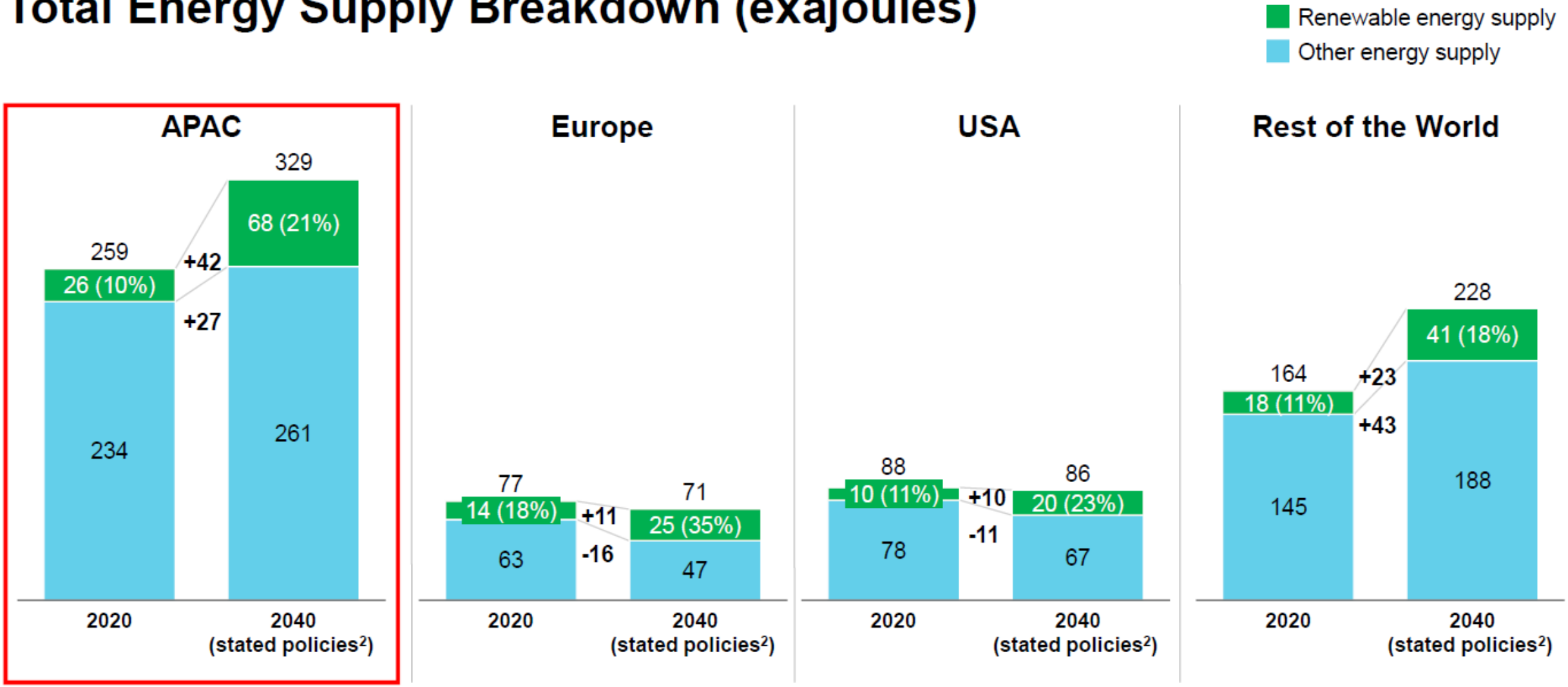
Total Energy Supply Breakdown (exajoules)



1. Share in parenthesis 2. Forecast based on existing policy frameworks and those under development of each country

Source: Based on IEA data from IEA (2021) World Energy Outlook, www.iea.org/statistics, All rights reserved; as modified by The Asia Transition Finance Study Group.

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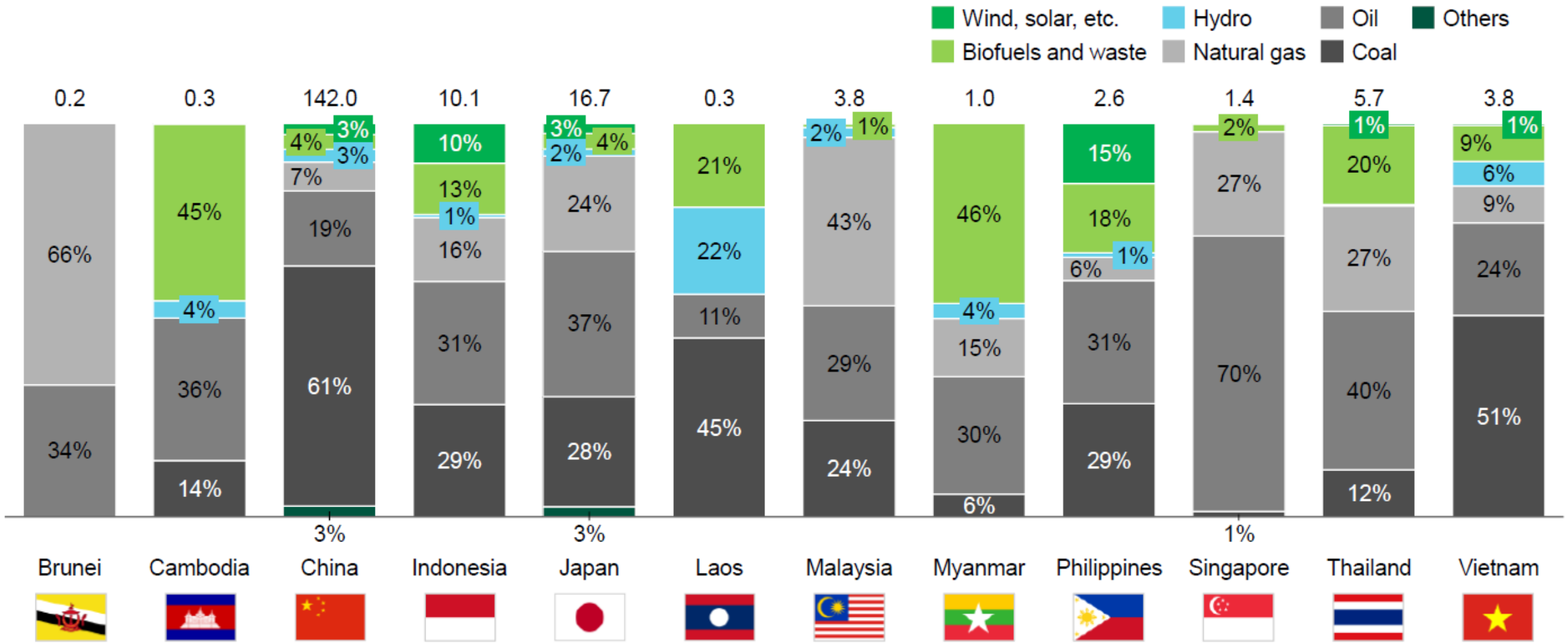
Total energy supply by source (2019, exajoules)



Source: Based on IEA data from IEA (2019) World Energy Balance, https://www.iea.org/data-and-statistics/data-product/world-energy-statistics-and-balances, All rights reserved; as modified by The Asia Transition Finance Study Group.

Financing Decarbonisation

- Hartzmark & Shue (2023) argue that the prevailing green finance approach, i.e., directing capital toward “green” firms/projects and away from “brown” firms/projects, is **counterproductive**
  - Brown (or hard-to-abate sectors) will exist for a long while.
  - Asymmetric impacts: increasing capitals to green firms leads to small improvement in their greenness, whereas depriving brown firms from capitals leads to large magnitudes of pollutions.
  - In addition, financiers have to forgo significant economic profits.
- Need for transition finance – financing brown sectors to make them greener through credible **transition targets**, **taxonomy**, and **technology roadmap**.

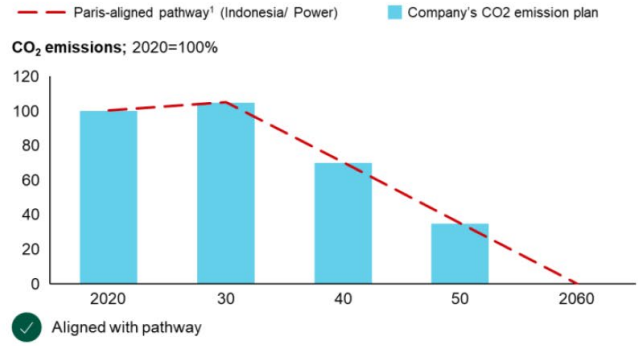
Transition Finance Instruments

Sustainable fixed income market			
Theme		**Label**	**Format**
GSS+	**GSS**	**Green**	Use of proceeds
		Social	Use of proceeds
		Sustainability	Use of proceeds
	Transition	**Sustainability-linked**	Entity KPI-linked
		Transition	Use of proceeds

Case Study: Indonesian Power Utility Company

Decarbonization plan assessment (illustrative)

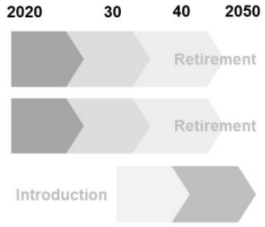
1. Check emission plan, with pathway



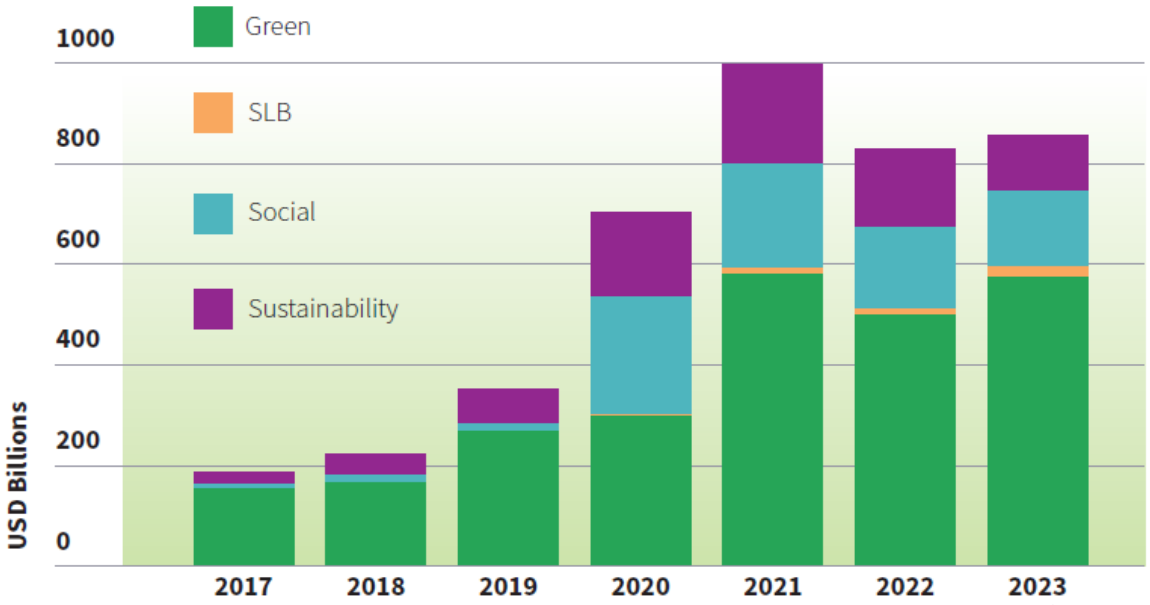
1. Pathway to climate (carbon) neutral/net zero

Source: ATF Study Group

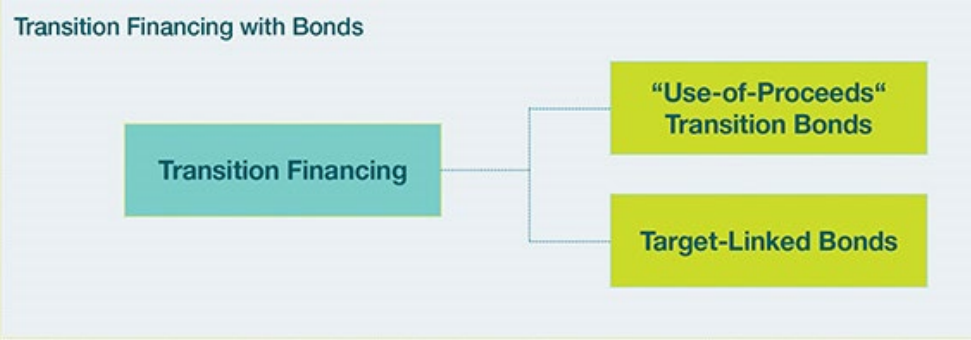
2. Check the corporate plan details

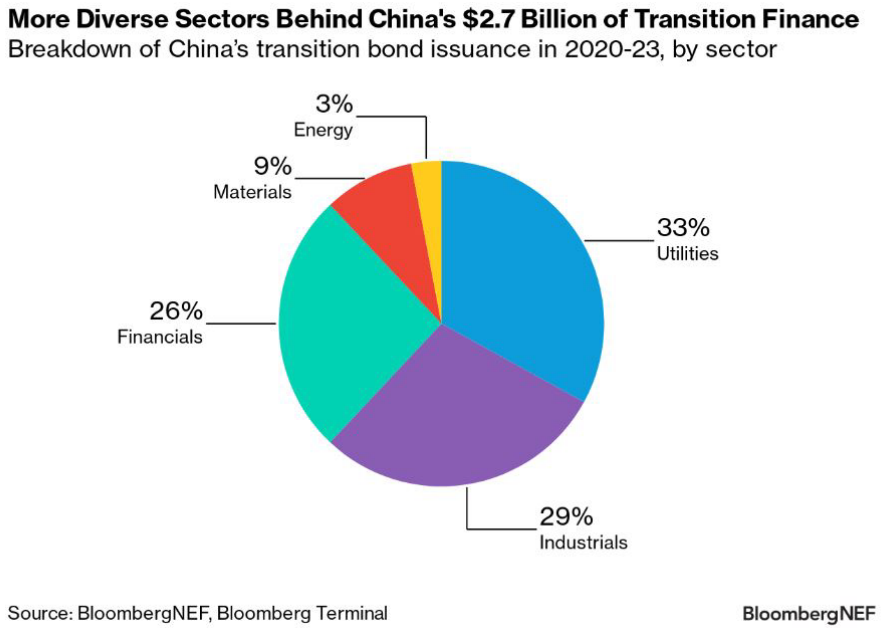


Validity and feasibility of emission reduction targets are to be investigated, in the light of references such as technology roadmaps which stipulate which technology should be ready for use in what year, and how much emission reduction could be expected from each technology

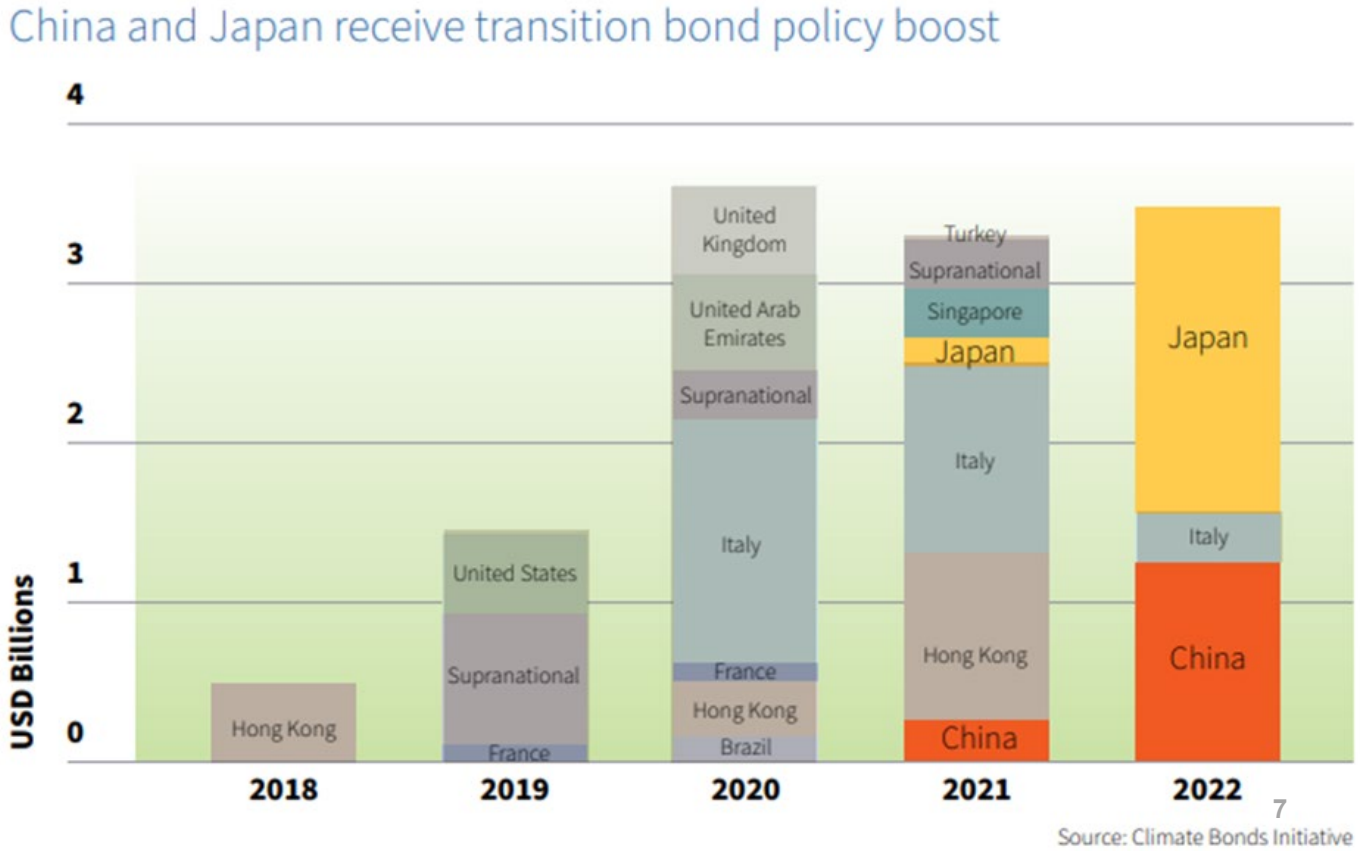


Transition Finance Market in China





The People's Bank of China started researching transition finance in 2021 and has made initial decisions on the basic principles to be applied. It is considering transition finance standards for four sectors: steelmaking, coal power, buildings and building materials, and agriculture.



Evidence from Empirical Research

- In partnership with Central University of Finance & Economics, we obtain data on firm-level greenness based on percentage shares of a firm's revenues that come from green and brown sources (green ratio & brown ratio) for a sample of all listed companies in China.
    - Note that there are not many labelled SLB or transition bonds in the market now; what we aim to demonstrate is that the transition finance logic works: if you lower a company's cost of capital, it **can** become greener instead of browner.
- To this end, we link a firm's green ratio, brown ratio and net (green – brown) ratio to its cost of capital (focusing on debt cost), and partition our sample into green, brown, neutral sectors based on industry-average emission levels.
- To identify causality (i.e., a reduction of cost of capital casually leads to an increase in corporate greenness, not the other way around, or due to other factors), we use China's adoption of accelerated depreciation accounting method for specific sectors, which alleviate firms' cost of financing (because they pay less tax, have more cash, and lower default risk)
- We also utilise an international sample of firms' EU Taxonomy eligibility ratio (as a proxy for corporate greenness) and link it to implied cost of capital.

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Results: Cost of Debt and Corporate Green Transition for Chinese Companies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable =	Green Ratio	Brown Ratio	Net Ratio	Green Ratio	Brown Ratio	Net Ratio	Green Ratio	Brown Ratio	Net Ratio
Debt Cost x Green	-0.043	-0.010	-0.029	0.040	-0.032	0.077	-0.068	-0.002	-0.064
	(0.058)	(0.052)	(0.088)	(0.058)	(0.038)	(0.076)	(0.061)	(0.048)	(0.088)
Debt Cost x Brown	-0.032	0.153**	-0.185**	-0.005	0.106*	-0.111	-0.026	0.132**	-0.157**
	(0.026)	(0.068)	(0.077)	(0.025)	(0.063)	(0.071)	(0.025)	(0.066)	(0.075)
Debt Cost x Neutral	-0.022	-0.007	-0.016	-0.022*	-0.000	-0.022	-0.021	-0.009	-0.012
	(0.014)	(0.010)	(0.018)	(0.013)	(0.008)	(0.016)	(0.014)	(0.010)	(0.017)
Green	0.048**	-0.002	0.051**	0.006	-0.002	0.008	-0.006	0.003	-0.009
	(0.020)	(0.009)	(0.025)	(0.015)	(0.006)	(0.017)	(0.014)	(0.004)	(0.014)
Brown	0.006	0.084***	-0.078***	-0.006	-0.014	0.008	-0.003	-0.013	0.010
	(0.010)	(0.017)	(0.023)	(0.007)	(0.011)	(0.014)	(0.007)	(0.011)	(0.014)
Observations	29,265	29,265	29,265	29,197	29,197	29,197	29,265	29,265	29,265
R-squared	0.856	0.905	0.881	0.870	0.917	0.894	0.857	0.909	0.883
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	No	No	No	No	No	No
Industry x Year FE	No	No	No	Yes	Yes	Yes	No	No	No
Type x Year FE	No	No	No	No	No	No	Yes	Yes	Yes

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Identifying Causality: Accelerated Depreciation Policy as an Exogenous Shock

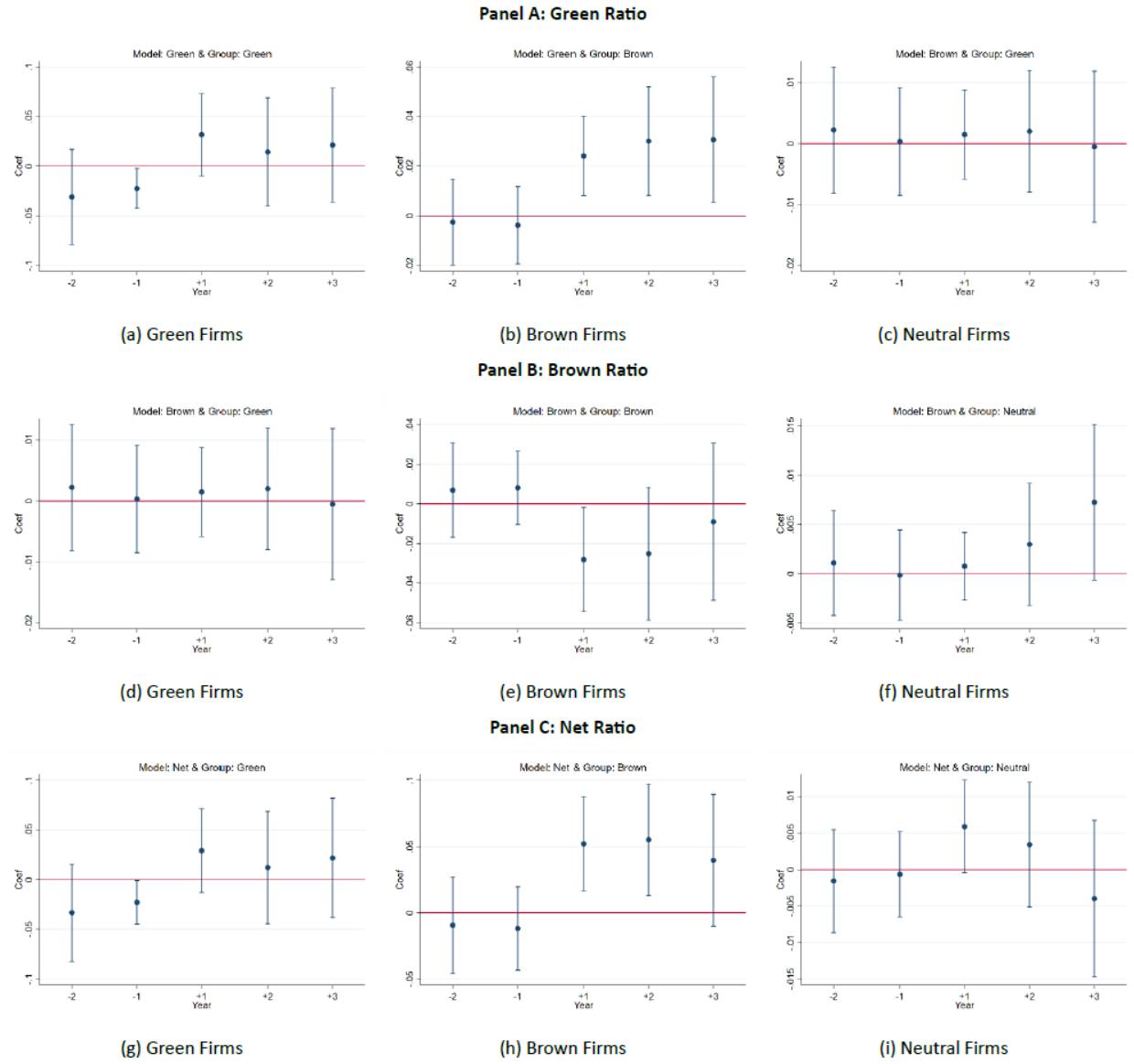

Figure 2 Dynamic Effects of Treatment on Debt Cost

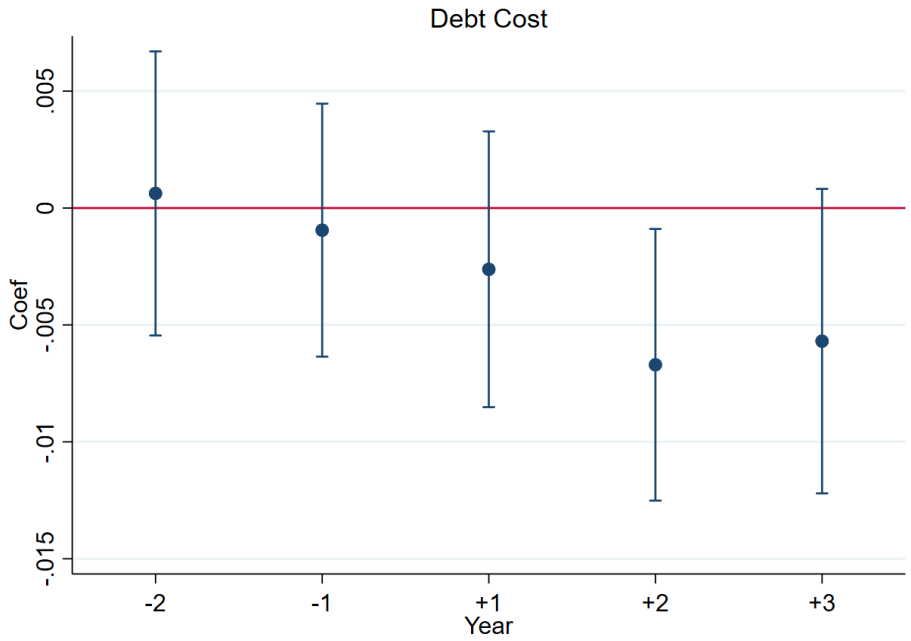

Figure 1 Accelerated Depreciation Policy: Dynamic Effects

Identifying Causality: Accelerated Depreciation Policy as an Exogenous Shock

$$Y_{iet} = \sum_{h\in\{\text{green,brown,neutral}\}} \sum_{\substack{k=-2 \\ k\neq 0}}^{3} \left(\beta_{kh} \cdot D_{ie} \cdot 1[t=k] \cdot 1[g=h]\right) + \lambda_{ei} + \eta_{ejt} + \delta_{egt} + \varepsilon_{iet}$$

Dependent Variable =	(1) Debt Cost	(2) Green Ratio	(3) Brown Ratio	(4) Net Ratio
Treat x Post	-0.005**			
	(0.002)			
Treat x Post x Green		0.040	0.000	0.039
		(0.028)	(0.005)	(0.029)
Treat x Post x Brown		0.030**	-0.026	0.056**
		(0.013)	(0.018)	(0.027)
Treat x Post x Neutral		0.006**	0.003	0.002
		(0.003)	(0.003)	(0.004)
Constant	0.064***	0.048***	0.073***	-0.026***
	(0.000)	(0.001)	(0.001)	(0.001)
Observations	29,539	34,762	34,762	34,762
R-squared	0.494	0.908	0.947	0.929
Event x Firm FE	Yes	Yes	Yes	Yes
Event x Greenness Category x Event-time FE	Yes	Yes	Yes	Yes
Event x First-digit Industry x Event-time FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

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Chinese Sample: Implied Cost of Capital (ICC) and Green Transition

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable =	Green Ratio	Brown Ratio	Net Ratio	Green Ratio	Brown Ratio	Net Ratio
ICC x Green	-0.084	0.018	-0.101	0.151	-0.163	0.314
	(0.402)	(0.073)	(0.431)	(0.461)	(0.117)	(0.519)
ICC x Brown	-0.485**	2.347***	-2.832***	-0.689***	3.269***	-3.958***
	(0.206)	(0.341)	(0.449)	(0.257)	(0.424)	(0.560)
ICC x Neutral	-0.156**	-0.024	-0.132	-0.137*	-0.147***	0.011
	(0.073)	(0.041)	(0.085)	(0.082)	(0.045)	(0.095)
Green	0.012	-0.003	0.016	0.018	-0.004	0.021
	(0.029)	(0.006)	(0.030)	(0.034)	(0.008)	(0.037)
Brown	0.010	-0.089***	0.099***	0.018	-0.135***	0.154***
	(0.016)	(0.022)	(0.030)	(0.018)	(0.026)	(0.036)
Observations	31,158	31,158	31,158	31,090	31,090	31,090
R-squared	0.265	0.433	0.317	0.281	0.453	0.338
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	No	No	No
Year FE	Yes	Yes	Yes	No	No	No
Industry x Year FE	No	No	No	Yes	Yes	Yes

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

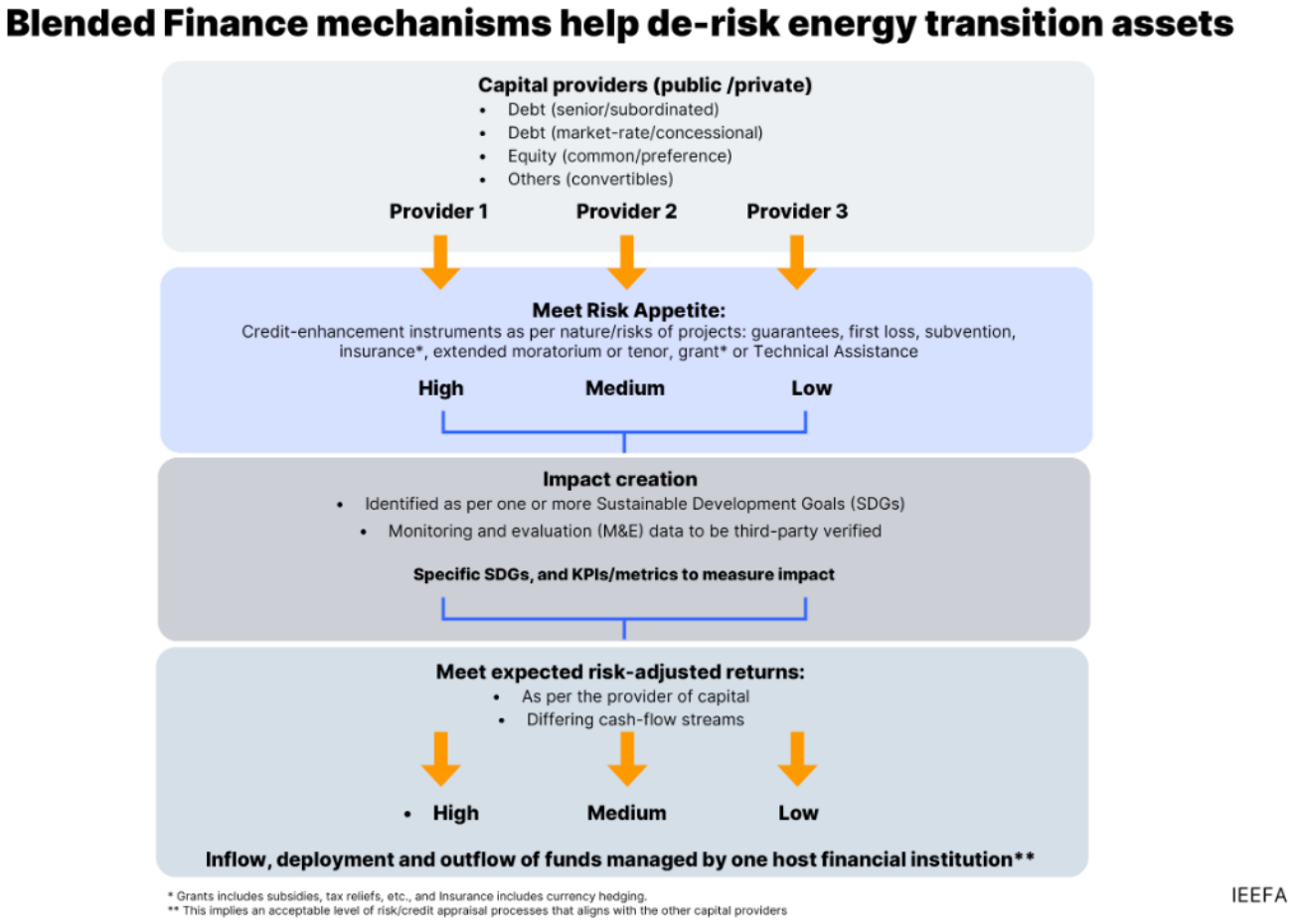
International Sample: Implied Cost of Capital and EU Taxonomy Eligibility Ratio

Dependent Variable = EU Taxonomy Eligibility Ratio	(1)	(2)	(3)	(4)
ICC_ANA	-0.236***			
	(0.062)			
ICC_Hou		-0.113***		
		(0.035)		
ICC_EP			-0.091***	
			(0.023)	
ICC_RI				-0.091***
				(0.023)
Observations	31,498	64,401	62,516	62,453
R-squared	0.892	0.893	0.893	0.893
Control variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Scaling Blended Finance for Transition

- Despite the promise of transition finance, financiers usually face significant risks in the adoptions of renewable energies, and are concerned about below-market returns for such projects.
- Blended finance: combining development funds with private and philanthropic capital to finance decarbonisation in brown sectors.
  - De-risking energy transition assets;
  - Risk-adjusted returns for private capitals;
  - Concessional (below-market) returns for public and philanthropic capitals.
- Currently working on data collection for technology & renewable energy adoption, capital structures, and investor returns – collaborations welcomed!



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Thank You

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