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Beyond the Big Three: Green Industrial Policy in Mid-sized Markets

The Opportunity for Investors

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Beyond the Big Three: Green Industrial Policy in Mid-sized Markets

Executive Summary

To decarbonize the global economy in line with a 1.5°C warming target, the world must rapidly expand clean energy technology manufacturing. COP28 promised to triple renewable energy by 2030 – but the International Energy Agency (IEA) has highlighted significant gaps in manufacturing capacity for wind power, as well as electrolyzers and batteries.¹

Governments are turning to “green industrial policy” to stimulate the investment required to grow clean-tech manufacturing capacity. Their motivations vary, encompassing domestic decarbonization, export promotion, energy security, and industrial resilience. Economists have rightly questioned the efficiency of this approach compared to market-based mechanisms, but the trend is set to continue.

The ‘Big Three’ major economies have led the way. China pioneered green industrial policy with massive supply-side investments which – combined with demand-side policies in third countries – translated into a commanding lead in key value chains. The Inflation Reduction Act (2022) in the United States and the Green Deal Industrial Plan (2023) in the European Union were – in part – a response, including local content requirements.

Other governments are following suit, with dramatic implications for global flows of goods and capital. Twelve of the fourteen mid-sized markets that we assessed have ambitions to expand green industrial capacity for one or more key green technologies, but their policies remain under-development. Green industrial policy is not limited to supply-side subsidies, despite serving as a key starting point. Permitting, liability regimes, product standards, public procurement, market access and R&D are some of many measures with quantifiable impacts on business cases at the project level.

For investors, the spread of green industrial policy creates real opportunities and material risks. Policy makes the market for many green technologies – often including some combination of environmental policy to create demand and Green Industrial Policy to stimulate supply. For example, the EU has imposed carbon pricing on steel, an environmental policy, and provided production subsidies for green hydrogen – a green industrial policy. Good green policy can be the foundation for value-creating investments and national champions. On the other hand, planned investment can be disrupted by policy developments in third countries that undermine their business case, for example by making production subsidies available to competitors.

In this context, we believe that deeper engagement on global green industrial policies can deliver competitive advantage for businesses. We have identified three building blocks:

- **Detailed and comprehensive understanding of policy in key markets.** Our survey of policy on five green technologies across 14 mid-sized markets reveals governments are focusing on different technologies with divergent policy approaches. Overall, green industrial policy is less mature but under-development in mid-sized markets. Businesses will need to work to stay up to date.
- **Evidence-based view of the direction of travel in those markets.** Business needs to better anticipate *where* and *how* governments will compete for green industrial value chains. Our analysis – based on a variety of possible scenarios – indicates the potential green industry strategies of many mid-sized economies can be captured in five broad archetypes, and that individual governments’ approaches in pursuit of these strategies will be heavily shaped by local fiscal and market contexts.

1. IEA, *The State of Clean Technology Manufacturing*, July 2023

- **Engagement with policymakers on the policies required for investment.** Finally, green industrial policy is both immature and insufficient in most mid-sized markets. Business has a positive role to play in identifying the obstacles to investment and the most effective and efficient means to address them. Our analysis has shown that this goes beyond subsidies to encompass a broad range of policy levers.

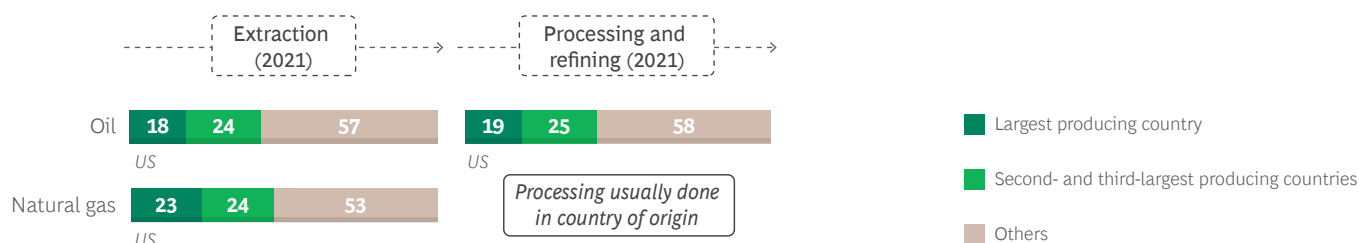
This paper focuses on the clean energy technology manufacturing required to decarbonize industry – not the decarbonization of industry itself.

Context: Opportunity and challenge of green industrial policy

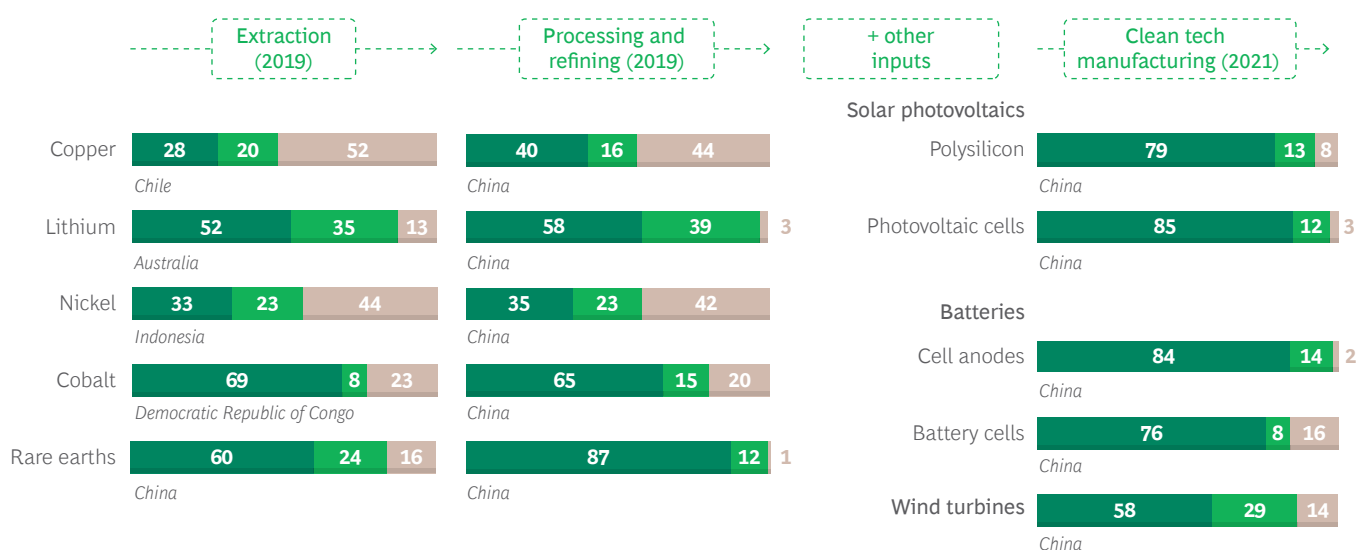
Unprecedented scaling of green technology production across the value chain is needed for the global economy to meet 1.5°C ambitions. New centers of low-cost, low-carbon energy will emerge in nations that previously lacked a large share of the fossil fuel value chain. Competition for today's highly concentrated green value chains (see Exhibit 1) will intensify as these value chains expand to meet the global demands of decarbonization. Rapid growth is expected in key areas: extraction and processing of critical materials; manufacturing of green technology such as solar, wind and batteries production of green hydrogen and derivatives; and the installation of carbon capture, utilization and storage (CCUS).

Exhibit 1 - Green technology value chains are concentrated - pressure to diversify is growing

Fossil fuels (%)



Energy transition and clean energy (%)



Sources: IEA; BP; BCG CEI analysis. Note: Because of rounding, not all bar segments add up to 100%.

Governments are turning to supply-side policy interventions to stimulate the investment required to grow these new green industries and capture a share of global green value chains. The objective of what has become known as ‘green industrial policy’ is the use of targeted government actions to grow and develop green industries (e.g., wind energy production, extraction of minerals for batteries). The motivations are varied within and between governments. For example, the US administration has emphasized decarbonization, blue-collar jobs, energy security and industrial growth through its \$369 billion investment² in low-carbon energy via the Inflation Reduction Act (IRA). For the US, the IRA represents a “deliberate, hands-on investment strategy to pull forward innovation, drive down costs, and create good jobs [in a] twenty-first-century clean-energy economy.”³

Broadly, green industrial policy measures fall into four buckets:

- **Governance** – sector roadmaps or targets and market facilitation activities
- **Regulation** – standards, permitting, liability, trade regimes
- **Direct investment** – infrastructure investment, public procurement, training
- **Economic incentives** – project subsidies, tax credits

Green industrial policies are also highly influential for the business case to scale new domestic manufacturing capacity for core technologies such as solar, wind and batteries. For instance, with IRA credits, the delivered price of domestically-produced solar modules is ~20% lower than the delivered price of modules from South-East Asia.⁴

Beyond simple production or capital expenditure subsidies, other policy levers can meaningfully impact project returns – for example, by supporting demand (e.g., via procurement), market access, and upstream and downstream value chains. Policy levers can also accelerate or de-risk project investments – by ensuring access to materials and infrastructure, streamlining regulatory hurdles, or providing guarantees of demand or financing .

China, the US, and the EU have significant green industrial policy packages in place. China leverages financial incentives, policy measures, and strategic frameworks to strengthen its position in the minerals and manufacturing sectors globally. The current US administration committed \$479B of funding via the IRA and Infrastructure Investment and Jobs Act (IIJA)⁵, to merge environmental and industrial objectives. Funding is made up of supply-side subsidies and tax credits, paired with demand-side local-content rules. The EU has responded with a \$357B package of its own, comprising primarily supply-side subsidies (with a focus on investment subsidies). This complements its demand-side and regulatory approaches (e.g., emissions schemes and border adjustment mechanisms).

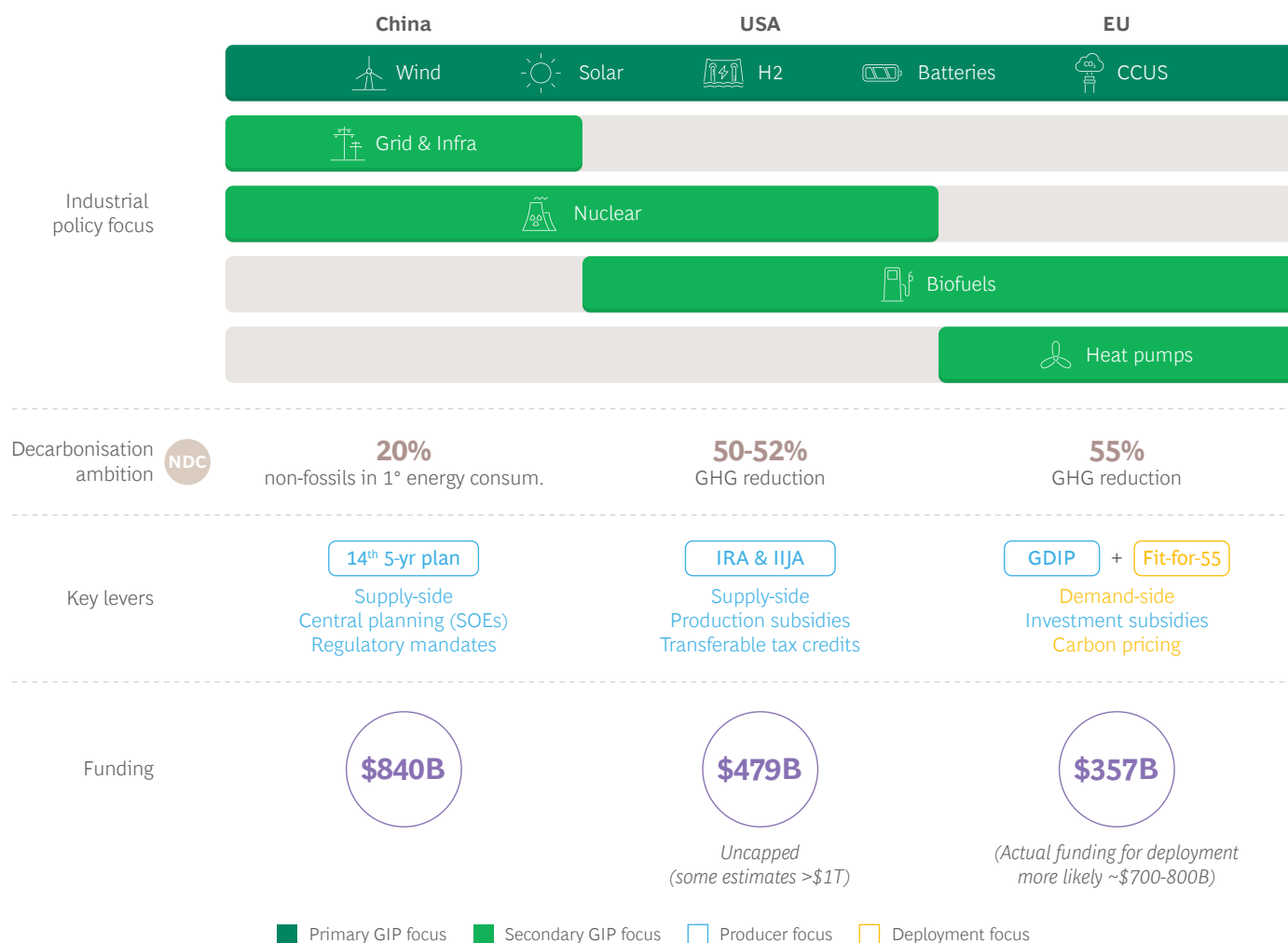
2. US Treasury Department – Treasury Announces Guidance on Inflation Reduction Act’s Strong Labor Productions

3. Remarks by National Security Advisor Jake Sullivan on Renewing American Economic Leadership at the Brookings Institution

4. BCG, US Inflation Reduction Act: Global Implications, December 2022

5. Between both the Inflation Reduction Act and the Infrastructure Investment and Jobs Act (IIJA)

Exhibit 2 - China, US & EU are using GIP to compete aggressively for shares of value chains



Sources: IEA, EPA, CBO; US Treasury; European Commission; BCG analysis.

Note: is based on IRA & IIJA, EU is based on Green Deal and GDIP, China is based on the 14th 5-year plan.

SOE: State-owned entity. **NDC:** Nationally Determined Contributions.

Beyond the ‘Big Three’, mid-sized economies – recognizing opportunities for growth and jobs, the need to protect and pivot existing legacy industries, and pursuing decarbonization – are beginning to follow suit.

This is an opportunity for investors. But the landscape is also dynamic, fragmented and often inadequate for individual projects. It is challenging for investors and producers to navigate, which slows investment. We believe that businesses should focus on three areas to get ahead of the curve:

- Having a granular understanding of the **current landscape** – beyond the Big Three and headline-grabbing announcements of subsidies.
- Assessing the potential future **direction of travel** for green industrial policy, especially in mid-sized economies where green industrial policy strategies and policy settings are less mature.
- Proactively engaging with policymakers on what it takes to create a successful investment case at the project level.

1. Current landscape: where to play today

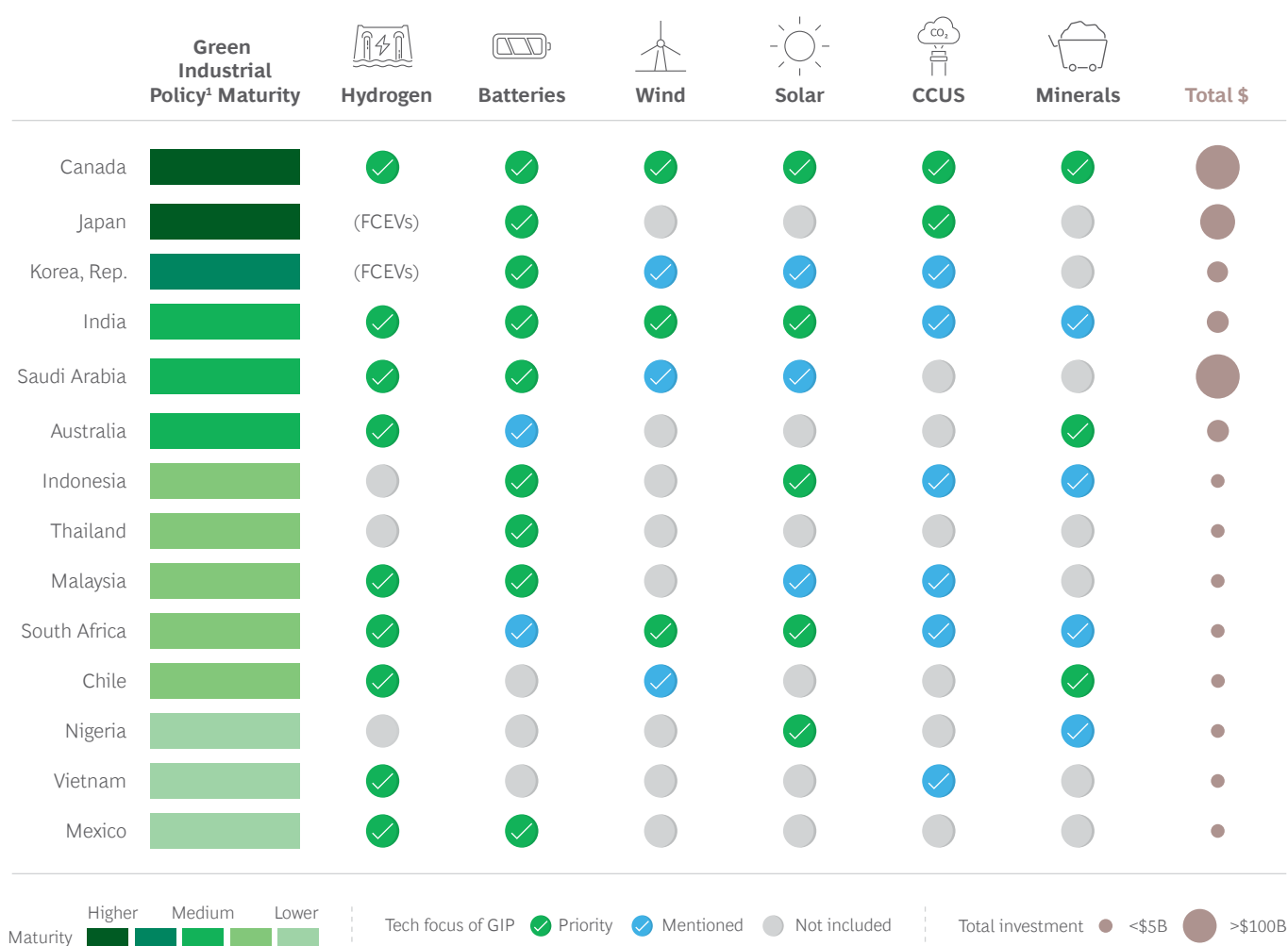
To assess the maturity of policy and opportunity for investors in mid-sized markets, we surveyed green industrial policy in 14 mid-sized markets across five technologies (wind, solar, CCUS, hydrogen, batteries) and their associated value chains. We took a detailed and structured approach, identifying the maturity of GIP across technologies at three phases: announced vision, integrated formalized strategy and roadmap, and policy measures in place. Policy measures were then grouped into four categories – Governance, Direct Investment, Economic Incentives (e.g., tax credits), or Mandates and Standards.

The results of this study illuminated trends in industrial support and reasoning behind policy decision-making in countries (e.g., why a country would tend to support one industry over another). The results of the study also helped to distinguish country decision-making on policy for strategic reasons or due to an inherent competitive advantage which might lead to industrial success (e.g., in refining, manufacturing, and assembly).

Five takeaways from our assessment of green industrial policy in 14 markets:

1. Mid-sized economies are competing more selectively for green technologies (except perhaps India) and their policies are less mature: only Canada and Japan have comprehensive policy packages for targeted technologies;
2. There is a gap between the green industrial capacity required to meet global climate goals and the green industrial policy in place, with a notable gap in wind production, suggesting there is more policy to follow;
3. Many governments are focused on hydrogen and batteries, more due to their local strategic value (e.g., local industrial decarbonization) and regional market potential (e.g., export of hydrogen) than local competitive advantage;
4. Governments pushing CCUS do so because Environmental Policy has created demand to decarbonize incumbent industries;
5. Competition for wind and solar is partly driven by competitive advantage in manufacturing, and the global drive to diversify from single sources.

Exhibit 3 - Green industrial policy is less mature and more focused in most countries



Source: BCG analysis.

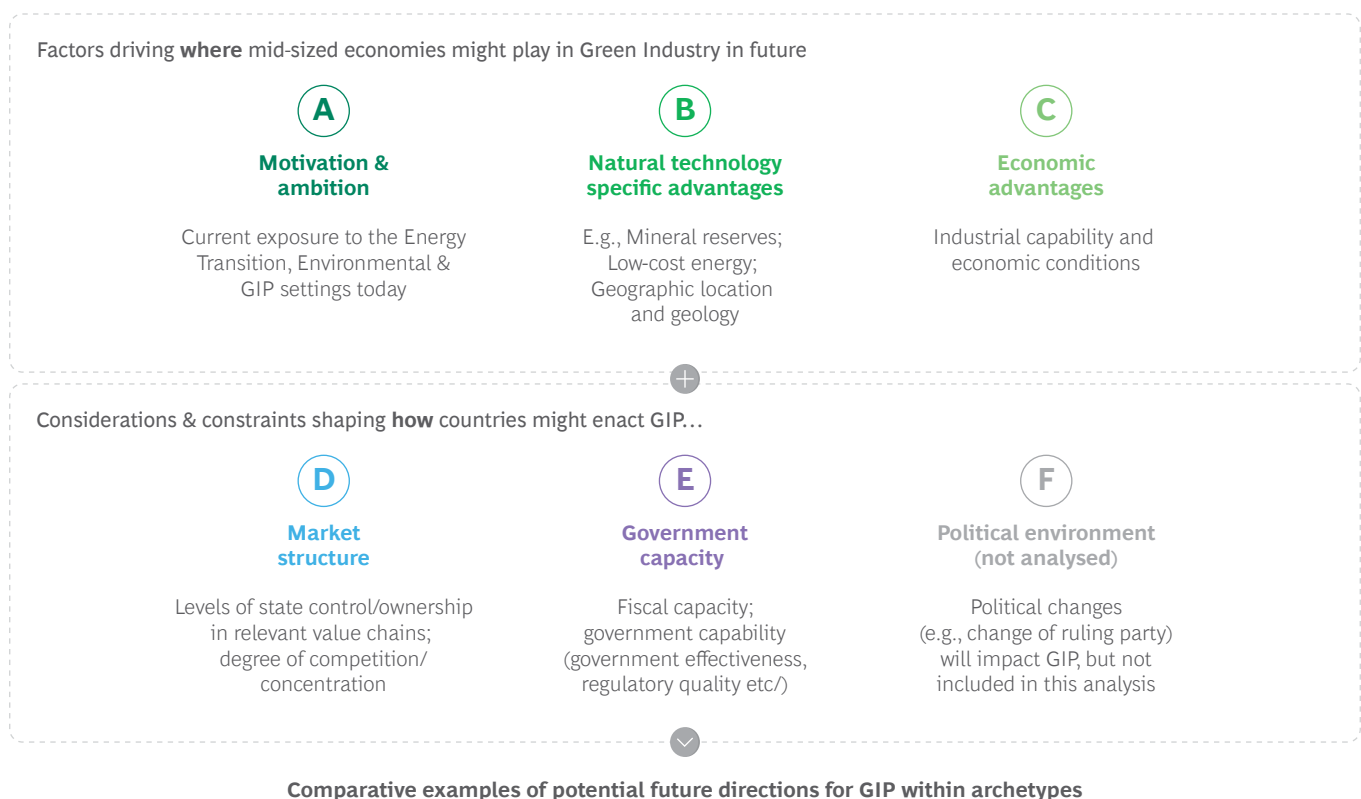
¹Green industrial policy is considered separate to decarbonization policy in this analysis. Green industrial policy (GIP) defined as policies specifically aimed at supporting domestic production capacity for any of the five technologies in focus, e.g., local content rules as opposed to decarbonization policy, which includes any measures to decarbonize the local economy.

2. Direction of travel: anticipating where and how governments will compete in green industrial value chains

Green industrial policy remains under development in all markets and many remain at an early stage. Anticipating the direction of travel in relevant markets would be a source of competitive advantage. Fortunately, the direction of green industrial policy can be anticipated to a degree based on two factors: where to compete – which technologies and which steps of the value-chain; and how to compete – what combination of policy measures.

Based on our assessment of 14 mid-sized markets, “where to compete” is a function of ambition, motivation and structural advantages, and “how to compete” is a function of market structure, government capacity and politics. This provides a valuable starting point for market-specific analysis and engagement.

Exhibit 4 - For mid-sized economies, most plausible future directions for GIP will be differentiated between countries based on multiple factors



Source: BCG analysis.

2.1 WHERE TO COMPETE: 5 ARCHETYPES

We have identified five archetypes of mid-sized economies based on motivation and ambition, natural endowments and economic advantages. These archetypes provide a valuable starting point for technology-specific comparative analysis of markets. Only the Big Three plus a handful of aspiring “green powers” are likely to compete (or compete successfully) across the full range of green industrial technologies. The majority will ultimately be more selective.

1. **Diversifying energy exporters (e.g. Saudi Arabia, Nigeria):** Heavily reliant on fossil-fuel exports and facing declining demand due to the energy transition.
 - Potential to leverage strong balance sheets, engineering expertise, and natural endowments to diversify into green industries such as hydrogen and CCUS.
2. **Green commodity players (e.g., Australia, Chile, South Africa):** Blessed with green endowments such as critical minerals or low-cost renewable energy generation but weaker manufacturing capabilities.
 - Potential to increase production of green commodities and selectively climb the value chain, for example through minerals processing or electrolyzer manufacturing.
3. **Transitioning industrialists (e.g., Japan, South Korea):** Established industrial exporters with higher labor costs, fewer green endowments, and under domestic and international pressure to decarbonize.
 - Potential to leverage and safeguard domestic industrial demand and capacity by developing the green products required for its decarbonization, for example battery manufacturing for automotive, green hydrogen for steel.
4. **Emerging manufacturers (e.g. Malaysia, Thailand, Vietnam):** Emerging economies with manufacturing/assembly capacity and lower labor-costs plus some with critical minerals.
 - Potential to pivot manufacturing/assembly capacity into green industry (e.g., batteries, renewables) and move higher up the value chain.
5. **Aspiring green powers (e.g., India): Economies of a similar scale to the Big Three with the potential for both large domestic demand for green products and green production at scale across multiple steps of the value chain.**
 - Potential to leverage scale and natural endowments to play across multiple value chains – assuming sufficient fiscal capacity.

There are exceptions. Canada, for example, shows characteristics of a “diversifying energy exporter”, “green commodity player” and a “transitioning industrialist”. We have also not assessed the large number of countries that do not have the motivation or many of the advantages necessary to compete for a share of global green industry.

Exhibit 5 - We see five main archetypes of mid-sized countries anticipated to experience GI transitions where GIP levers could be most relevant

					
	Diversifying energy exporters	Green commodity players	Transitioning industrialists	Emerging manufacturers	Aspiring green power
Archetype for green industry transition	<p>Very emissions intensive exports; need to hedge should global action accelerate; some potential in CCUS and green H2; weaker manufacturing capabilities and experience</p>	<p>Emissions intensive exports; upside value in green export commodities; rich critical mineral reserves and low-cost renewable potential; Weaker manufacturing capabilities and experience</p>	<p>Low emissions intensity exports however some key industries exposed (e.g Steel, ICE); value arises if domestic will to decarbonize increases; No meaningful reserves of critical input minerals; Strong existing manuf. base</p>	<p>Some green transition-exposed sectors (e.g., ICE auto manufacturing); upside growth potential in developing new green industries; potential to play end-to-end in some value chains; strong existing manuf. base, low cost of labor</p>	<p>Highly exposed to decarb. & CBAM; diverse economy with large internal markets, motivated to play across green value chains; modest critical mineral inputs and processing capacity; strong existing manuf. base capabilities, low labor costs</p>
Example countries analysed	<p>Nigeria Saudi Arabia</p>	<p>Australia South Africa Chile</p>	<p>Japan South Korea</p>	<p>Thailand Vietnam Mexico Malaysia Indonesia</p>	<p>India</p>

Source: BCG analysis.

2.2 HOW TO COMPETE: 3 KEY FACTORS

Where to compete will not determine how to compete. Approaches to green industrial policy will differ widely between economies, even amongst those competing in the same space. For example, among green commodity players, Australia is more likely to use a mix of facilitation and targeted funding support to encourage private investment in minerals processing capacity, while Chile is expected to take a more interventionist approach through state-owned entities. Across the sample of countries analyzed, we also anticipate a number of broad trends including:

- Some mid-sized emerging markets, particularly in Africa and ASEAN, will be more dependent on international partnerships to encourage foreign investment partnerships in more advanced green industry manufacturing
- Wealthier mid-sized economies are more likely to use targeted funding and financing measures to support local firms to compete and grow
- Some economies with more state-controlled market structures will progress their green industrial policy through state-owned companies and investment bodies.

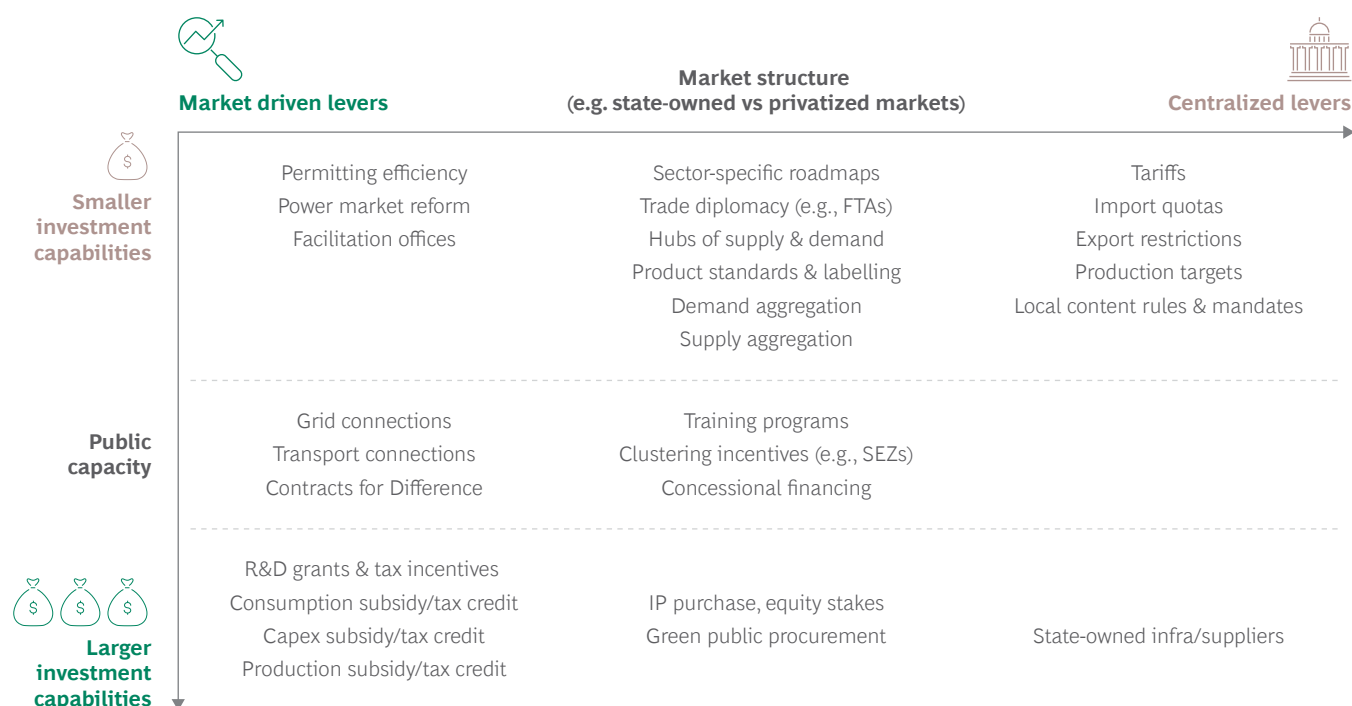
National context is key. Our survey highlighted two dimensions with which to explore the most likely policy combinations for specific markets:

- **Public capacity:** governments with larger, healthier budgets are more likely to invest or subsidize, and those with higher capability are more likely to develop sophisticated policy measures. Conversely, those burdened by debt and/or lacking capability are more likely to rely on cheaper, cruder measures.
- **Market structure:** policymakers with oversight of privatized markets are more likely to rely on market-incentives, whilst those with high levels of state control will intervene more directly with national champions.

Countries should plan a detailed policy roadmap to plot a course from the current state of the industry to the target state in the medium- and long-term. By strategically supporting industries with potential competitive advantage, then reducing support in accordance with a specific roadmap, countries can help to avoid the risk of indefinite policy measures that are costly to the government.

A country-specific roadmap on policy levers can also help to limit the primary policy risk toward investors, in which policy incentives evaporate in short notice. To limit an asset's risk profile, investors might assess a market's stability based on the clarity of a government's goals and timelines associated with policy measures.

Exhibit 6 - Different GIP levers have varying fiscal contribution requirements and suitability across different market structures



Source: BCG analysis.

3. Policy Engagement: Levelling the playing field

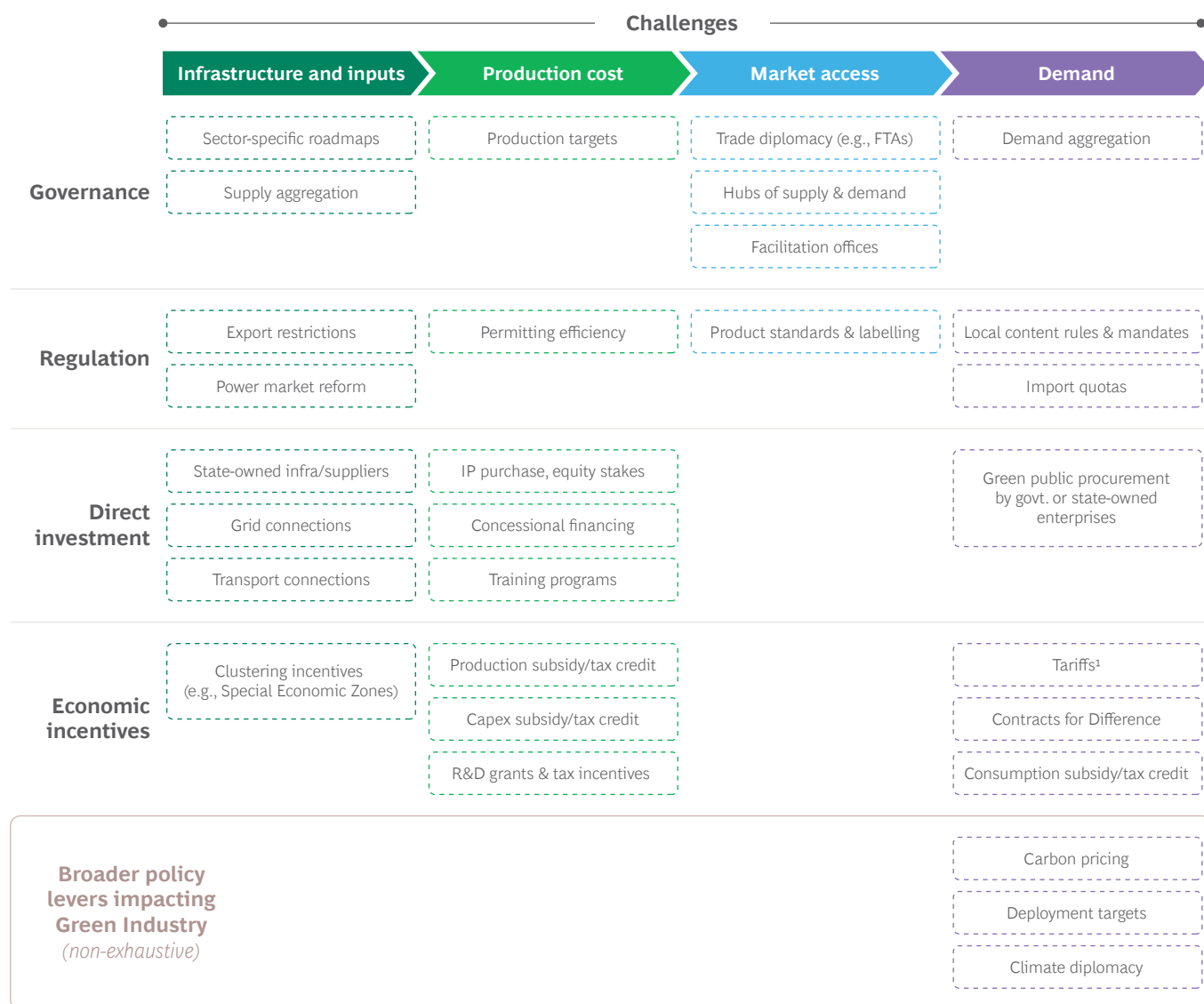
Businesses can bring a practical, evidence-based perspective on the obstacles to expanding green industrial capacity. They are best placed to identify weaknesses in the business case for green investments within and across markets, such as:

- Scarcity of **infrastructure or inputs** (e.g., energy, materials, labor, technology)
- **Production costs** that are higher than competitors or carbon-intensive alternatives – for example due to a lack of sufficient scale or know-how while in nascency
- **Lack of market access** to markets locally or internationally – for example due to non-tariff barriers, or asymmetric information
- **Insufficient or uncertain demand** – for example due to technological uncertainty

This broader perspective on the challenges allows for a wider perspective on the solutions. Subsidies have become synonymous with green industrial policy and have generated most of the headlines around the Inflation Reduction Act and Green Deal Industrial Plan. However, business cases are built on more than subsidies. Policymakers must also accelerate permitting, streamline grid connections, manage liability, stimulate demand, remove market frictions, facilitate new ecosystems and much more. Just as a carbon price cannot redesign a city, a subsidy cannot – alone – create a new industry.

Business brings a valuable micro-economic perspective to complement the macro-economic perspective of many policymakers. Both views are necessary to the development and implementation of effective policy measures that unlock green investment at scale, accelerate decarbonization and generate returns for private investors and public stakeholders.

Exhibit 7 - The right mix of GIP policy levers will depend on the challenges



Source: BCG analysis.

Note: Some policy levers observed in use by some countries (e.g., export restrictions) may not comply with WTO Agreements.

¹Tariffs can result in increased fiscal revenue for Governments.

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