



Industrial Policy Tools for Inclusive Green Industrialisation:
Exploring the Industrial Policy Tools Needed to Promote Inclusive Green
Industrialisation in South Africa

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Abstract

Addressing climate change and reducing environmental degradation is a global priority, particularly for countries like South Africa which face the dual challenge of balancing economic growth with environmental sustainability. South Africa's carbon intensive economy has failed to incorporate environmental costs effectively, hindering both climate change mitigation and broader socio-economic transformation. Given these challenges, an inclusive green industrialisation strategy is key to driving a green transition that delivers both economic growth and social development.

Industrial policy can play a crucial role in this transition by directing industries toward sustainability. The South African Renewable Energy Masterplan (SAREM), recently approved by cabinet on the 27th of March 2025, serves as a key potential policy initiative aimed at promoting renewable energy and green industries, facilitating a shift from carbon-intensive sectors towards more sustainable and resilient forms of economic growth. However, the success of such initiatives depends on the strategic use of industrial policy tools that support both economic development and social inclusion.

This research explores the industrial policy tools necessary for advancing inclusive green industrialisation, in South Africa. The paper assesses SAREM's potential as a policy framework, by drawing lessons from past approaches. By conducting an extensive literature review and a case study analysis of SAREM, this study contributes to academic knowledge on the interplay between industrial policy and green economic transformation.

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1. Introduction

The global climate crisis' scale, interconnected impacts on humanity and the Earth, as well as the required level of multi-dimensional coordination, makes it one of the most urgent and complex challenges of the 21st century. Human-induced increases to greenhouse gasses have significantly contributed to extreme weather events such as floods, heat waves and droughts, that have created threats to human life and caused environmental degradation (Otto et al. 2020). The severe socio-economic consequences of climate change are further exacerbated by pre-existing inequalities that often result in disproportionate vulnerabilities for marginalised communities. Sustainable development that advances the synergies between human prosperity and environmental protection is thus paramount.

Like traditional industrialisation, green industrialisation aims to drive structural transformation, but while reducing dependence on resource-intensive sectors like mining and fossil fuels by fostering diverse, sustainable industries. It therefore offers an alternative pathway to economic growth that minimises environmental harm. (Okereke et al. 2019). Accordingly, the 'green economy' (GE) first coined by the United Nations Environmental Programme (UNEP) in 1989, is a green industrialisation paradigm that presents a low-carbon development pathway alternative to unsustainable carbon-intensive economic models, therefore aiming to harmonize economic growth with environmental sustainability (Tsegay 2020). This involves leveraging a country's natural assets sustainably, enhancing adaptation and resilience to climate change (Ali, Anufriev & Amfo 2021). Biswas and Yila (2022) further define an *inclusive* green economy as one that integrates economic, social and environmental commitments.

Given the dominance of fossil fuels in South Africa's energy sector, reducing carbon emissions is critical to achieving a green economy. Industrial policy is increasingly recognised for its potential to be an important instrument in facilitating the transition towards a green economy in a manner that holistically considers social, economic and environmental dimensions. Industrial policy can drive green industrialisation by creating the necessary regulatory and market conditions that encourage the development of low-carbon industries and phasing out high-emission sectors (Schwarzer 2013). Beyond environmental goals, green industrialisation can create employment opportunities in renewable energy, energy efficiency, and sustainable

manufacturing, while active labour market policies and reskilling programmes support an equitable transition.

The main question that this research aims to answer, is what industrial policy tools are needed to facilitate the structural transformation from a carbon intense economy towards inclusive green industrialisation in South Africa? A further sub question is what lessons can be derived from previous industrial policy tools in other countries, than can inform the effectiveness of future policies such as SAREM?

Section 2 provides a conceptual and theoretical foundation to inclusive green industrialisation and green industrial policy approaches, including key insights from the experiences of China, South Korea, and Ethiopia. This is followed by the description of the Research Methodology in Section 3. Section 4 analyses SAREM as a case study and discusses its effectiveness as a potential green industrial policy initiative based on the key lessons from the literature review. Finally, Section 5 will outline key policy insights that can be applied beyond SAREM.

2. Literature Review

Sustainable development seeks to find a harmonious balance between economic growth and protecting the environment. However, traditional energy markets have struggled to produce “reliable, affordable and environmentally sustainable energy” (Andreoni et al. 2022, 239). South Africa’s unreliable electricity supply exemplifies this challenge, hampering economic growth, job creation and structural transformation that is a particularly important driver of productivity growth for developing countries (Andreoni et al. 2022).

Green industrialisation should therefore avoid environmental degradation without compromising economic progress or human well-being (Altenburg & Rodrik 2017). This literature review will examine existing scholarship on green industrialisation and explore how industrial policy frameworks aligned with just transition principles can support a structural shift toward an inclusive green economy. In addition, applied industrial policy insight from international lessons and South Africa’s experience, will form the foundation for possible applications to inclusive green industrialisation.

Traditional Industrialisation

Industrialisation can be referred to as progressing up the value chain from raw material manufacturing to higher level manufacturing such as capital goods or technological development (Levin & Makgetla 2021). The manufacturing sector's opportunities for innovation can create large knowledge spillovers which enhance productivity in non-manufacturing activities (Altenburg & Rodrik 2017). In effect, industrialisation has often been described as an important engine of growth and 'catch up', as can be demonstrated by the Asian Tigers (Hong Kong, Singapore, South Korea, and Taiwan), who benefited from job creation, poverty reduction, higher levels of growth, and overall economic diversification. This is particularly important for African developing economies that have lagged behind other emerging economies and developed nations, as can it enhance their competitiveness and attracts foreign direct investment. This can further facilitate structural transformation (Nchofoung, Edoh & Monkam 2024) and upgrade their positions in global value chains (Schmidt 2019).

However, despite these positive effects, industrialisation also contributes to harmful carbon dioxide emissions that exacerbate climate change (Avenyo & Tregenna 2022). China's fast-growing development, for example, has resulted in great environmental costs including the 'haze' air pollution explosion, which has negatively affected their sustainable development (Yang, Liu & Den 2022).

Industrialisation in South Africa

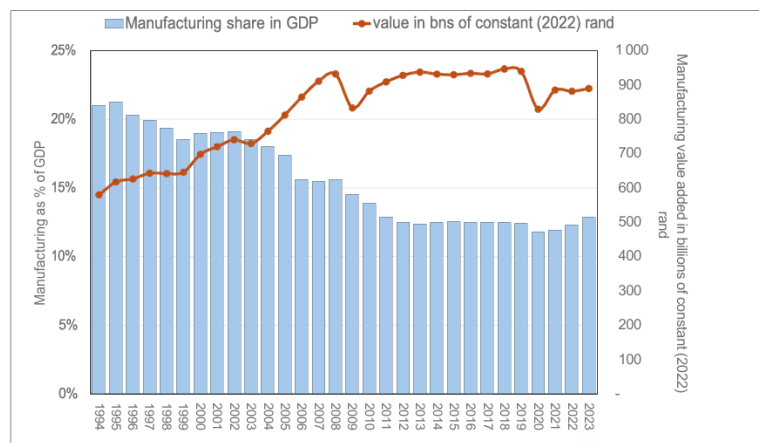
South Africa's economy has historically revolved around its abundant mineral resources, which have played a central role in establishing it as the wealthiest economy in Sub-Saharan Africa (Schwank 2019). The country's mineral reserves are amongst the most valuable globally, including the largest known deposits of platinum group metals (PMGs) and manganese, as well as substantial reserves of gold, diamonds, chromite ore and vanadium (Invest SA 2025).

The mining sector, rooted in the mineral revolution of the 1870s, has therefore significantly shaped the country's economic structure. The rise of capital-intensive industries was largely driven by mining activities that demanded highly energy-intensive processes, which in turn spurred the development of complementary sectors such as coal mining, electricity production, and the manufacturing of chemical explosives (Bell & Farrel 1997). These backward linkages laid the foundation for the establishment of state-owned enterprises including Sasol (petrochemicals), Eskom (electricity), and Iscor (steel), often in collaboration private industry (Schwank 2019).

The deep integration of the mining, energy and manufacturing sectors gave rise to what Fine and Rustonjee (1996, 71) termed the ‘Minerals-Energy Complex’. They further assert that the MEC lies as the core structure of accumulation in South Africa’s economy (Fine & Rustonjee 1996). The MEC has since evolved into a broader framework that includes linkages with mineral beneficiation and the production of petrochemicals derived from coal and crude oil (Marquard 2006, 67 as cited by Baker 2015, 249).

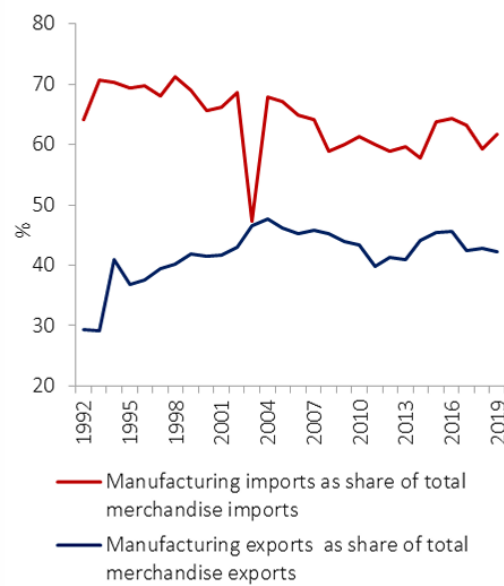
As of late, South Africa’s manufacturing sector accounts for 12.8% of the national GDP (World Bank 2025), surpassing the mining sector share which has dropped from 7.3% to 6.2% in 2023 (Minerals Council South Africa 2024). Manufacturing also makes up a substantial share of South Africa’s export profile, sitting at 42% in 2019 (Mnguni & Simbanegavi 2020).

Figure 1: Manufacturing Value Added in Billions of Constant (2022) Rand and Percentage of GDP, 1994 – 2023



Source: The DTIC 2024

Figure: Share of Manufactured Imports/ Exports

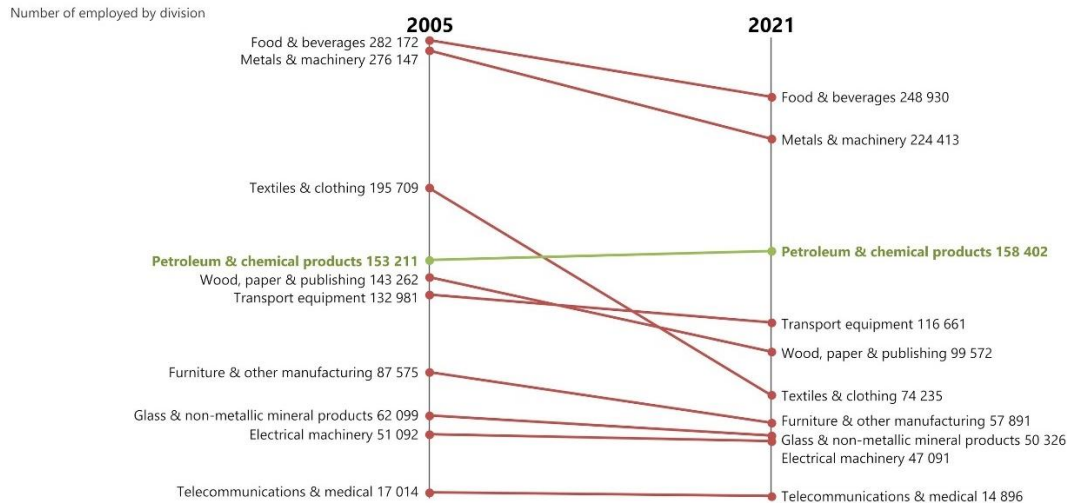


Source: Mnguni & Simbanegavi 2020; DTI as cited by Mnguni & Simbanegavi 2020

While manufacturing and mining each distinctly contribute to development, manufacturing is particularly notable for its strong linkages with a wide range of supplier and supporting industries, including mining (Mnguni & Simbanegavi 2020). A crucial component of these connections lies in mineral extraction and beneficiation, which form essential bridges between the country's natural resource base and its industrial activity. Platinum, coal and gold remain South Africa's top export commodities, and the mining value chain is highly integrated, providing critical inputs to various manufacturing segments such as metal fabrication, automotive and jewellery manufacturing (Invest SA 2025).

A major concern with the MEC is strong reliance on capital-intensive industries, which contrasts sharply with the country's abundance of low-skilled labour. Schwank (2019, 3) quotes Kaplan (2003, 10) who explains that "Low rates of growth in the labour-intensive sectors have combined with overall rising capital intensity resulting in consistent declines in manufacturing employment." (Kaplan 2003, 10). This can be reflected by the country's declining manufacturing jobs where the industry employed 1.40 million individuals in 2005, which reduced to 1.18 million in 2017. The sharp drop to 1,09 million in 2021 was likely tied to the impacts of the COVID-19 pandemic (Stats SA 2021).

Figure 2: Most Divisions Lost Jobs in the 2005-2021 Period, Except for Petroleum & Chemical Products



Source: Stats SA 2021

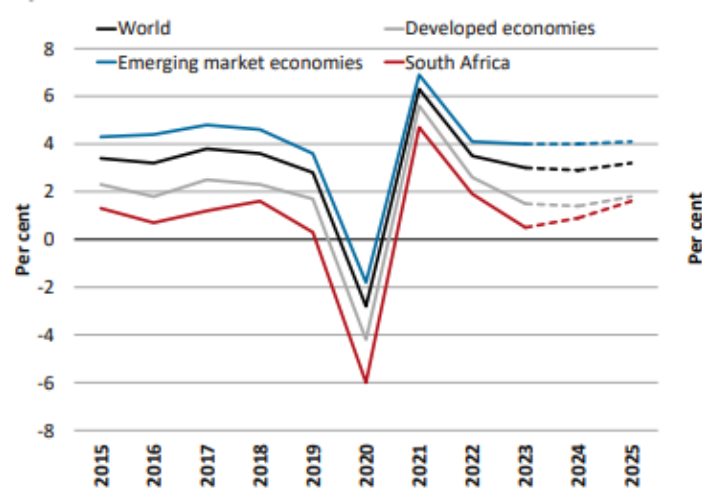
Moreover, historically, heavy public investment was directed toward capital intensive sectors, mainly employing well-paid, skilled white workers (Schwank 2019). This alignment between state-owned enterprises, private capital, and the apartheid regime entrenched a legacy of production and consumption patterns around the energy and mining sectors, along with related areas of manufacturing (Baker 2015). Hence, there is a growing recognition of the need to diversify away from this capital-intensive structure. Leveraging the existing skills base and industrial capabilities, South Africa has the opportunity to build linkages with downstream sectors and promote a more inclusive, diverse, and employment rich path for industrial development (Schwank 2019).

Another significant aspect of South Africa's industrialisation is the evolution of its automotive sector. It remains as one of the country's largest manufacturing sectors, contributing to 4.3% of South Africa's gross domestic product (GDP) and accounts for 18.1% of total exports as of 2024 (Augustine 2024). Following the automotive industry's gained momentum in the 1950s, the Motor Industry Development Programme (MIDP) was introduced in 1995 to promote exports, increase local content, and improve productivity in the sector (Black 2001). Although the likes of Masondo (2018) argue that the MIDP's main focus is maintaining business objectives around export performance rather than promoting developmental goals, the MIDP led to increased foreign direct investment and the integration of South Africa's automotive industry into global value chains (Black 2001). However, despite these advancements, the automotive industry remains energy-intensive, relying heavily on the country's coal-dominated energy sector (Omarjee 2022; Ambe & Badenhorst-Weiss 2011).

South Africa's industrial history therefore offers an example of the associated carbon intensity of industrialisation. The heavy reliance on coal for energy production, and the prevalence of energy-intensive industries such as mining and manufacturing, can be attributed to the interlink between the mining of mineral resources and primarily coal-based energy production.

South Africa's economic growth is projected to average 1.6%, an improvement from the 1.4 % predicted in the 2023 Medium Term Budget Policy Statement (MTBPS). Despite this modest revision, the country continues to lag behind many of its emerging market counterparts, which are experiencing stronger growth and drawing greater investment. Along with high production costs and declining competitiveness weighing down output growth, the Reserve Bank has highlighted severe load-shedding and inefficiencies in logistics infrastructure as major obstacles inhibiting both current economic activity and the country's long-term growth potential (Jacobs 2023). Furthermore, South Africa's continued reliance on natural resources contributes to sector-specific volatility in foreign exchange earnings, dampens economic dynamism, and perpetuates high levels of unemployment (Schwank 2019). Achieving sustained growth in the future will require significant improvements in energy, rail transport and port operations, as well as the removal of structural impediments that hinder economic participation (National Treasury 2024).

Figure 3: South Africa's Economic Growth Performance



Source: National Treasury 2024; Bloomberg, Reserve Bank & IMF as cited by National Treasury 2024

Figure 4: Economic Growth in Selected Countries

Table 2.1 Economic growth in selected countries

Region/country	2022	2023	2024	2025
Percentage	Actual	Estimate	Forecast	
World	3.5	3.1	3.1	3.2
Advanced economies	2.6	1.6	1.5	1.8
United States	1.9	2.5	2.1	1.7
Euro area	3.4	0.5	0.9	1.7
United Kingdom	4.3	0.5	0.6	1.6
Japan	1.0	1.9	0.9	0.8
Emerging and developing countries	4.1	4.1	4.1	4.2
Brazil	3.0	3.1	1.7	1.9
Russia	-1.2	3.0	2.6	1.1
India	7.2	6.7	6.5	6.5
China	3.0	5.2	4.6	4.1
Sub-Saharan Africa	4.0	3.3	3.8	4.1
Nigeria	3.3	2.8	3.0	3.1
South Africa ¹	1.9	0.6	1.3	1.6
World trade volumes	5.2	0.4	3.3	3.6

Source: IMF World Economic Outlook 2024, as cited by National Treasury 2024

Green Industrialisation

Mjimba (2015) points out that ‘green’ industrialisation adds an additional step to structural transformation, as developing economies are required to adjust some resource-intensive and inefficient products and processes. On the other hand, Padilla (2017) usefully argues that adopting, adapting or deploying clean technologies early, allows for more cost-effective and efficient development, avoiding infrastructure, sectoral and technological lock-in. Moreover, developing countries have the advantage of existing knowledge to avoid carbon-intensive development pathways (Padilla 2017). It is also worth noting that new green technologies have positive externalities such as improving health conditions through clean air, or cheaper renewable energy sourced electricity (Altenburg & Rodrik 2017).

Based on various key writings on green industrialisation, I argue here that there are two main approaches. The first, is the greening of industry, which makes environmental related improvements on all existing industries, including efforts to reduce pollution, promote resource efficiency of energy and raw materials, and the adoption of clean production approaches (Mjimba 2015). The second approach posited by Mjimba, involves establishing new green industries that create and supply environmentally friendly goods and services, fostering skills development and technological spillovers important for industrial growth. Both approaches therefore contain elements of structural transformation through the aim to reduce economic dependence on primary commodities (Mjimba 2015). It can be argued that depending on the specific objectives, either approach of green industrialisation can improve environmental performance and promote industrialisation sustainably (Nchofoung, Edoh & Monkam 2024).

Considering South Africa's challenges such as dependence on primary commodities, a high unemployment rate currently sitting at 33.5% (World Bank 2024), and limited industrial diversification, the latter approach appears to be the most suitable for promoting inclusive green industrialisation. Developing new industries that focus on producing environmentally friendly goods and services aligns with the country's goals of economic transformation, job creation, and climate resilience. By establishing green industries, South Africa can reduce its dependence on mining and raw material exports, promoting a more diverse and sustainable industrial base (Mjimba 2015). The development of clean technologies, such as renewable energy components, can further enhance local technical capacity, improve productivity, and create opportunities for knowledge transfer (Oqubay 2024). South Africa's potential to become a regional hub for clean technology production could further foster trade by meeting international growing demand.

However, considering resource constraints and other important developmental challenges that the country faces, one could argue that the first approach of greening of existing industries is a more practical and immediate strategy. Transitioning South Africa's well established industrial base to greener practices can maximise the use of existing infrastructure while reducing emissions and resource wastage. For example, enhancing energy efficiency in mining operations or reducing water consumption in manufacturing can yield environmental and economic benefits simultaneously. Furthermore, adopting greener production methods can mitigate these challenges more quickly than building entirely new industries. This serves as a more cost-effective alternative in the short term as it avoids the high capital investment and risk associated with creating new sectors while promoting sustainable development (Nchofong, Edoh & Monkam 2024). Additionally, greening existing industries ensures the retention of current jobs while creating opportunities for upskilling the workforce.

Although the first approach of greening existing industries could provide incremental benefits, the second approach provides greater opportunity for structural transformation required for long-term growth and sustainability. Prioritising the establishment of a green industry base, supported by strategic industrial policy tools, would thus likely yield greater economic and environmental benefits for South Africa.

While there are clear pros discussed above, there is scepticism on the feasibility and ease of achieving green industrialisation particularly for developing countries. For example, high investment costs can act as hurdle for nations that have limited fiscal capacity (Rodrik 2014).

Moreover, public budgets and resources can be diverted away from other urgent priorities such as healthcare and education goals (Altenburg & Rodrik 2017). Additionally, technological barriers can inhibit the progress for green industrialisation when the country does not have adequate technological capabilities or absorptive capacity (Avenyo & Tregenna 2022). Without the appropriate advancements in technological transfer mechanisms and supportive international cooperation, the transition to green industrialisation may remain out of reach for developing nations.

Critics including trade unions and civil society also point out concerns for potential job losses and the displacement of workers that could come from the shift away from traditional, carbon-intensive industries. Cosbey et al. (2017) for instance argues that without comprehensive social protection measures and retraining programmes, the pursuit of green industrialisation could exacerbate unemployment and deepen social inequality. Tamasiga et al. (2023) further point out that the informal sector which employs a large portion of the workforce in developing countries, may face significant challenges in adapting to the demands of green industries.

Scepticism on green industrialisation also stems from environmental and energy paradoxes. Golroudbary et al. (2022) note that while renewable energy systems reduce carbon emissions, their production, installation, and maintenance involve energy-intensive processes. For instance, some green technologies require raw material that are extracted through environmentally harmful practices, thus potentially undermining the environmental objectives of green industrialisation (Golroudbary et al. 2022).

Additionally, considering developing countries' resource and funding constraints, dependence on international support to achieve green industrialisation is another concern. Some argue that this reliance leads to power and resource imbalances that create vulnerabilities which may perpetuate global inequalities (Medinilla & Byiers 2023).

Despite these criticisms, proponents of green industrialisation continue to emphasise the long-term advantages of shifting to a low-carbon economy, including economic growth, social progress, environmental sustainability, the emergence of new markets, and increased innovation. Additionally, the development of targeted industrial policies such as subsidies for green technologies and training programmes for displaced workers can mitigate many of the challenges outlined (Altenburg & Rodrik 2017). The debates surrounding green industrialisation highlight the complexity of transitioning to a sustainable economy. Whilst the criticisms point to significant challenges, these issues can be addressed through carefully

designed policies that appropriately balance environmental goals with economic and social considerations.

Consequently, Tamasiga et al. (2023, 18) summarise six critical components for achieving green industrialisation that emerge from leading research on green industrial policy (GIP). Firstly, sustainable development can be promoted through green growth strategies. This includes the implementation of subsidies and practices within the circular economy. The circular economy is an economic model designed to minimise waste and make the most of available resources, by preserving and protecting products, materials, and resources in use through reuse, recycling, remanufacturing, and regeneration (Geissdoerfer et al. 2017). This is in attempt to prevent resource depletion and environmental degradation within economic growth (MacArthur 2019).

Secondly, transitioning to renewable energy is pivotal, provided that it is supported by energy policies that foster the adoption of green or clean technological innovations. Thirdly, examining the relationship between trade, investment, and green industrialisation is crucial for aligning economic growth with environmental sustainability. Fourthly, advancing green innovation and technological progress is key to improving total factor productivity, ensuring that industrial growth is still achieved with reduced environmental impact. Fifthly, creating green jobs and integrating these efforts with sustainable development goals within the green economy framework provides an opportunity to address social and economic challenges while protecting the environment. Finally, institutions and industrial policies play a significant role in facilitating structural changes towards a low-carbon economy (Tamasiga et al. 2023, 18). These themes collectively indicate the multifaceted nature of green industrialisation and the diverse policy areas that must be addressed to enable this transition.

Inclusive Green Industrialisation

The GE has been criticised for failing to deliver expected outcomes such as poverty reduction through economic growth. Tsegay (2020) for instance suggests that societal structure and social values need to be integrated further into the economic model. The *inclusive* green economy (IGE) is an economic model that has evolved from the green economy where it not only aims for low carbon, efficient and clean production, but it is also inclusive in consumption and outcomes (Steiner 2015). As Schaaf (2017, 23) describes it, the IGE “holds the promise and potential to blend equitable growth and environmental performance with economic prosperity” (Schaaf 2017 23). It therefore demonstrates the interaction between economic, social and

environmental commitments (Biswas & Yila 2022). Others such as Ali, Anufriev and Amfo (2021) importantly emphasise that this social integration of the GE is particularly crucial for impoverished communities in developing countries that heavily rely on natural resources for their subsistence and are thus disproportionately affected by environmental degradation.

The United Nations Economic Commission for Africa, together with the United Nations Environment Programme (UNEP) Regional Office for Africa (2016, 3), identify several key “enablers” necessary for advancing an IGE, which can be expanded or adapted to fit the country’s context. These include:

- “(a) supportive institutions and policies on which the transition will be grounded;*
- (b) policy instruments that encompass and serve as incentives and disincentives to foster the transition;*
- (c) an environment that stimulates innovation and the adoption of green technologies that do not exclude any social group;*
- (d) building capacity at all levels to implement inclusive green economy policies and strategies;*
- (e) adequate financing for the process, including mobilization of domestic and international resources and investments;*
- and (f) a bolstered role of the private sector to complement the efforts of Governments in driving the transition”* (United Nations Economic Commission for Africa & UNEP 2016, 3)

They also emphasise that this process should be embedded in long-term national development strategies aimed at achieving sustainability goals, external assistance as needed to support domestic efforts (United Nations Economic Commission for Africa & UNEP 2016).

The IGE can thus be viewed as an ideal outcome of a green transition, as its comprehensive framework seeks to shift away from the existing development model toward an economy that balances economic gains with environmental sustainability and social equity. The IGE will accordingly be the reference point of an ideal outcome of sustainable green industrialisation.

In South Africa’s attempt to move towards an IGE, the just transition (JT), spearheaded by the Congress of South African Trade Unions (COSATU), has emerged as a critical framework that

seeks to balance the shift towards a sustainable, low carbon economy with ensuring that the process is inclusive and equitable for workers and communities affected by the transition (Just Transition Alliance 2024). By prioritizing policies that ensure job creation, social protection, and equitable economic opportunities, the JT approach seeks to mitigate the potential negative effects of the green transition and fairly distribute its benefits (ILO 2018).

The Presidential Climate Commission (PCC), an independent, statutory and multistakeholder body established by President Cyril Ramaphosa in 2020, developed a JT Framework in 2022, setting out policy measures, a shared vision, and principles for the just transition. (PCC 2022). However, South Africa has faced substantial challenges in its implementation of the JT goals, as seen in the Komati Power Station's repurposing under Eskom's Just Energy Transition Partnership (JETP), a decarbonisation programme aimed to shift South Africa from coal power to renewable energy (Zhou 2024). The PCC has pointed out the project's limited inclusive engagement around the decommissioning process, as well as poor timing and sequencing with regards to the plant's closure (PCC 2023). Limited priority given to relevant skills development and minimal involvement from local and provincial government was also highlighted (PCC 2023). Furthermore, while job creation in the renewable energy sector is a priority, creating 'decent work' that offers fair income, security, and social protection, and ensuring the quality and sustainability of these jobs remains a challenge (Mohlakoana et al. 2024).

It is therefore evident that ensuring an equitable transition requires comprehensive strategies to address the socio-economic impacts on vulnerable communities. This underscores the critical need for a targeted industrial policy framework that can ensure that the transition creates inclusive economic opportunities, promotes job creation in green industries, and facilitates the reskilling of workers in carbon intensive sectors.

Industrial Policy

As Tsegay (2020) aptly notes, adopting a green economy approach requires systemic change. It can be further argued that industrial policy is a key instrument in this process. Environmental justifications for industrial policy, are increasingly influencing policy discussions (Schwarzer 2013). Chang (1994, 61) defines industrial policy as government intervention aimed at specific industries, to achieve the outcomes that are perceived by the state to be efficient for the economy. Generally economic justifications for industrial policy include the necessity of government intervention when markets are either distorted or incomplete (Schwarzer 2013). It can thus be argued that industrial policy is necessary, considering the failure of markets in

traditional energy systems to produce “reliable, affordable and environmentally sustainable energy”, (Andreoni et al. 2022, 239) as previously mentioned.

The role of industrial policy has however, sparked significant debate within economic discourse, particularly over the past century. In the post-World War II era, industrial policy was viewed by many developing nations as a vital mechanism for achieving post-colonial independence and social development. Meanwhile, European countries employed economic planning and industrial policy as part of their broader reconstruction efforts. However, the rise of neoliberal thinking in the 1970s led to a diminished role for industrial policy, with scholars and policymakers increasingly questioning its relevance. While traditional industrial policy tools were not completely disregarded, industrial policy lost prominence in many advanced economies (Andreoni & Chang 2019). Under this market-oriented perspective, policy interventions were only deemed necessary when market failures impeded investment coordination, particularly in developing countries (Kosacoff & Ramos 1999).

Despite this shift, countries in East Asia actively centred industrial policy as part of their development agendas, demonstrating that targeted policy could facilitate economic catch-up. Their success helped revive interest in industrial policy and expose weaknesses in the neoliberal model, especially after the 2008 global financial crisis. This has since prompted governments to revise and adapt their policy tools and institutions in response to a changing global industrial landscape (Andreoni & Chang 2019).

A key issue of tension is whose responsibility ‘picking winners’ should be, where many mainstream economists do not believe it should be the role of the government (Warwick 2013). Juhász, Lane and Rodrik (2023) argue that the controversy generally revolves around informational shortcomings and political capture. The informational critique claims governments may lack the necessary information to effectively identify and correct market failures. The political critique is that industrial policy can become vulnerable to lobbying and political influence, resulting in decisions that benefit select private actors rather than society as a whole. Warwick (2013) similarly acknowledges challenges such as rent seeking and protectionist tendencies which have historically undermined policy outcomes. He therefore advocates for a more facilitative form of industrial policy, where governments play a co-ordinating role, strengthened by robust monitoring and evaluation systems (Warwick 2013).

Although the risks of government intervention are clear, I argue that robust supporting and enforcing mechanisms, including the monitoring and evaluation systems that Warwick alludes

to, can enhance the likelihood of industrial policy success, even when the government is playing a proactive role. For instance, Rodrik (2014, 484 – 488) highlights three basic rules for industrial policy that I believe are crucial for the success of industrial policy, whether the government plays an interventionist or coordinating role.

First is the rule of ‘embeddedness’. This refers to the deep integration and reciprocal relationship between the public and private sectors, in a way that ensures coordinated efforts in economic transformation and industrial development. The cooperation between the public and private sectors is also supported by Mazzucato (2015) who notes that the state should aim to work dynamically with interest groups to stimulate green growth and technological advancement. This suggests the importance of the state not merely as a regulator, but as an active participant in shaping markets and innovation pathways. She also references Evans (1995) who argues that “the capitalist economy will always be embedded in social, cultural and political institutions and therefore subordinate to the State and subject to its changes” Mazzucato (2015, 30). This highlights the necessity of strong relationships, trust, and collaboration between the state and private actors to achieve shared goals.

Evans (1995) further expands on this combination of corporate coherence and connectedness by referring to “embedded autonomy” (Evans 1995). This describes the balance between state involvement and the independence required to prevent corruption and make objective decisions. Evans argues that embedded autonomy provides the foundation for successful state involvement in industrial transformation. Embeddedness can therefore help governments be well-informed about specific needs, constraints, and opportunities of industries, enabling them to design policies that are more effective in fostering innovation, green growth, and structural transformation.

Secondly, there must be rigorous and institutionalised evaluation processes that assess the performance of companies that receive government assistance. Additionally, the goals and targets for these initiatives should be clearly defined, with a primary emphasis on achieving sustainability outcomes (Rodrik 2014). Mjimba (2015) also observes that industrial policy is most effective when the dominant policy regime avoids rent-seeking practices. Schmitz, Johnson and Altenburg (2015, 813) similarly highlight the importance of rent management, by arguing that it is “at the heart of green industrial policy” (Johnson & Altenburg 2015, 813). They describe it as determining the right number of extra profits, offering them optimally, and withdrawing them when markets start functioning without them (Schmitz, Johnson &

Altenburg 2015). This can be strengthened through monitoring systems and procedures like reciprocal control mechanisms, just as development banks impose operating standards onto their clients (Amsden 2008). Various forms of conditionalities can therefore encourage better performance in design and policy implementation (Andreoni et al. 2022).

Lastly, the entire process of GIPs must be transparent and accountable to the public (Rodrik 2014). Ensuring transparency and accountability within the institutional framework of GIPs can also help government officials resist the inappropriate influence of interest groups in order to prioritise public benefit over private interests (Shen, He & Yao 2021).

Schmitz (2007) also emphasises the importance of aligning industrial policy with the realities of global economic integration, calling for greater collaboration among researchers, policymakers, and advisors to reduce complexity and foster consensus. He identifies accounting for sectoral differences and the dynamic nature of industries over time as key challenge. Echoing these concerns, Andreoni and Chang (2018) propose reframing the industrial policy debate around managing strategic coordination and addressing institutional weaknesses, stressing the need for aligning diverse interest and navigating political economy constraints to support successful industrial transformational.

All things considered, Chang (2024) challenges the notion that government involvement in the economy inherently stifles private sector growth. He argues that depending solely on market forces is inadequate, especially but not exclusively, in emerging economies (Chang 2024). This suggesting the key role industrial policy plays in facilitating structural transformations. Industrial policy should thus instead be positioned as a means of enhancing productive capacity, which necessarily involves nurturing and expanding the private sector within a capitalist framework.

As illustrated, despite the neoliberal shift in ideology, industrial policy can and has facilitated economic and development transformation in emerging economies. It is also apparent that there are various avenues to implementing industrial policy. The key question therefore shifts from determining if industrial policy is relevant, to how to strengthen the likelihood of industrial policy success, considering its application and context.

Industrial Policy in South Africa

South Africa's unique historical context has significantly shaped the expectations and challenges placed on industrial policy in the post-apartheid era (Schwank 2019). The

Reconstruction and Development Programme (RDP), introduced in 1994, and the Growth, Employment and Redistribution (GEAR) plan which replaced it in 1996 aimed to address the socioeconomic challenges inherited from apartheid South Africa. However, these frameworks and their policies have been highly criticised for their neoliberal underpinnings and failures to deliver social equity (Lehulere 2018; Singh 2010).

For instance, Visser (2004) explains that while an extensive welfare system emerged from the RDP, a lack of government capacity led to maladministration and poor implementation of basic service delivery. Moreover, following financial instability and failure to recover from South Africa's poor economic performance dating back to the 1970s, GEAR replaced the RDP with a heavier emphasis on economic growth through "trickle-down economics" (Visser 2004). The framework's focus on tighter fiscal and monetary policy led to austerity led disruptions to social security through reduced social spending (Gelb 2007).

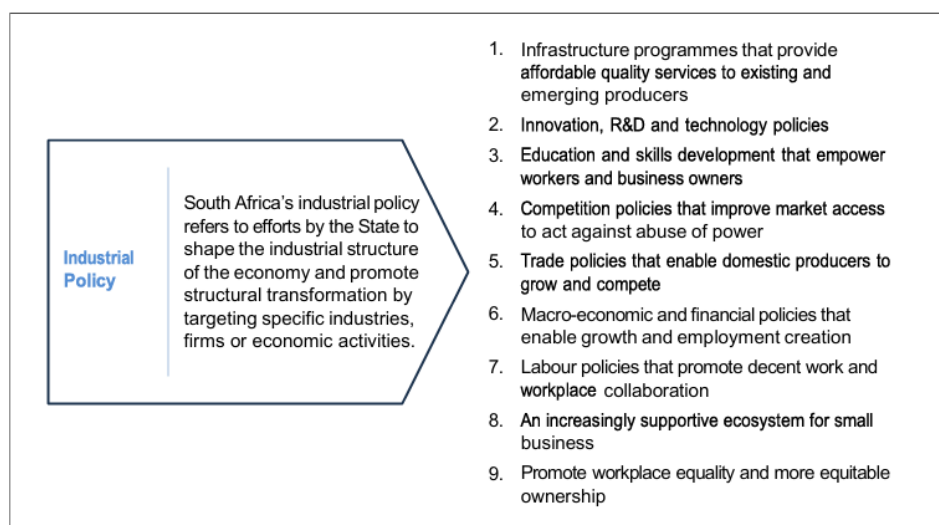
In response to GEAR's criticism on its neglect for social development, there was a renewed focus on using industrial policy more proactively to promote more inclusive forms of industrial development (The DTIC 2024). For instance, the 2005 Accelerated and Shared Growth Initiative for South Africa (AsgiSA) prioritised largescale infrastructure investment and enhanced skills development. The 2007 National Infrastructure Policy Framework led to the creation of the Industrial Policy Action Plans (IPAPs) which were annual rolling plans implemented between 2008 to 2019, outlining detailed, sector-specific actions and broad-based initiatives aimed at driving economic growth and employment (The DTIC 2024). These industrial policy initiatives were aligned with and strengthened by a series of broader strategic frameworks such as the New Growth Path (NGP), the National Development Programme (NDP), the 2012 National Infrastructure Plan, the Trade Policy and Strategy Framework, and the 2011 Preferential Procurement Regulations all aimed at economic reconstruction and development (The DTIC 2023).

South Africa's industrial policy has since been shaped by the insights of earlier IPAPs. Three major lessons emerged. First, that sector-specific policies are most effective when developed in partnership with industry stakeholders to ensure relevance and sustained collaboration toward national development objectives. The second key lesson is that government efforts should be concentrated on a limited number of high-impact sectors with strong potential for socio-economic returns. This can be demonstrated by how limited investment and collaboration for research and development (R&D) of advanced renewable energy technologies, as well as

inadequate support for skills development in manufacturing, have further hindered industrial progress (The DTIC 2023; Institute for Economic Justice 2021). Finally, industrial policy must be better integrated across different arms of the state, as illustrated by the lack of a well-defined technology transfer strategy, largely as a result of poor coordination between the Department of Science and Technology, Department of Trade, Industry and Competition, as well as major electrical industry companies (Institute for Economic Justice 2021).

These three core lessons formed the foundation of the Reimagined Industrial Strategy initiated in 2019. The Strategy shifted focus toward improved execution and broadened the scope of industrial policy from firm-level incentives to a more comprehensive coordination framework involving both public and private actors, aimed at fostering a more inclusive and economy (The DTIC 2023). The Reimagined Industrial Strategy introduced a fresh approach to industry-level planning, through the development of Masterplans. These plans adopt a collaborative multi-stakeholder model, bringing together government, business, and labour to jointly design and implement industry-specific strategies and each aim to address unique challenges within a given sector (The DTIC 2024). To support the broader goals of the strategy, several cross-policy initiatives were also introduced. These included the Policy statement on Localisation for Jobs and Industrial Growth, the Trade Policy for Industrial Development and Employment Growth, the Competition Policy for Jobs and Industrial Development, and a dedicated strategy paper on the advancement of electric vehicle production in South Africa, culminating in the adoption of a White Paper on Electric Vehicles in 2023 (The DTIC 2024).

Figure: Pillars of the Reimagined Industrial Strategy



Source: The DTIC 2024

However, the emergence of state capture severely disrupted progress, placing pressure on public finances and weakening institutional capacity. Rodrik (2014) highlights that while traditional scepticism on industrial policy involves concern over the difficulty of achieving well-targeted and effective institutions, effective institutional frameworks can alleviate informational and political risks. South Africa's industrial policy shortcomings demonstrate the destructive role of weak institutional mechanisms. Therefore, while it remains a central element of economic strategy, industrial policy must work in tandem with other policy areas such as infrastructure development, education, agricultural and land reform, public employment programmes, and community-based social services, to maximise its impact (The DTIC 2024).

Green Industrial Policy

Fine and Mohamed (2022) indicate that the goals of industrial policy need to be expanded to incorporate more than economic growth, but also development in areas such as employment generation, wages, and living conditions across different socio-economic levels. Moreover, the need for industrial policy in providing opportunities for 'green' technology and innovation is emphasised by Mazzucato (2015). She explains that due to embedded energy infrastructure and the failure of markets to value sustainability, the market forces are not enough for the renewable energy industry to develop.

The concept of GIPs has thus emerged. GIPs can be defined as "government intervention to build a carbon-neutral economy and accelerate structural transformation and economic catch up" (Oqubay 2024, 3). They go beyond the traditional notion of industrial policy. They recognise environmental externalities, emphasise green technologies, and highlight the need for rapid structural transformation within a constrained timeframe to prevent irreversible environmental damage. Altenburg and Rodrik (2017) however significantly emphasise the growing need for effective policy coordination, and the commitment to managing global commons to ensure long-term sustainability.

Harrison, Martin and Nataraj (2017) note that GIP may offer a more compelling justification than traditional industrial policy, particularly in addressing both local and global environmental externalities. Given the global nature of environmental market failures and the political resistance often encountered when attempting to implement cross-border carbon taxes, GIP emerges as an additional alternative for tackling international environmental challenges (Harrison, Martin & Nataraj 2017). The successful implementation of GIP innovation can thus

drive local productivity growth and job creation (Altenburg & Rodrik 2017) and leverage technological or political feedback to kick-start the transition (Jaakkola, van der Ploeg & Venables 2023). Rodrik also applies his general three rules of IP to green growth strategies which he defines as trajectories of economic development based on the sustainable use of non-renewable resources that fully internalise environmental costs, especially those associated with climate change (Rodrik 2014).

Necessary industrial policy tools

Industrial policy tools act as the mechanisms that transform the policy ideas into the specific policy actions. They are therefore vital in ensuring the effectiveness of the industrial policy and thus the success of the green transition.

Altenburg & Rodrik's (2017) inference that public policies should support R&D, subsidize cost discovery, coordinate complementary investments, and facilitate information sharing and technological learning, can be translated to the required industrial policy tools required to achieve green industrialisation and inclusivity. For instance, Tamasiga et al. (2023) propose technological innovation, which can be informed by the R&D that Altenburg and Rodrik highlight. They also point to interconnections with trade and investment which aligns with the mentioned point on complementary investments. Targeted and sector specific subsidies similar to Altenburg & Rodrik's (2017) cost discovery subsidies, are also suggested by Tamasiga et al. (2023).

State-led industrial strategies and public subsidies have been pivotal in driving the growth of renewable energy manufacturing sectors globally. For instance, public banks in countries like Brazil, China, Germany, and Japan, as well as some in the European Union have played as important financial actors that provided funding for long-term industrialisation strategies (Mazzucato and Semieniuk 2018). In contrast however, South Africa's policy framework, as outlined in SAREM, has not adequately accounted for the importance of such mechanisms in creating a globally competitive renewable energy manufacturing industry. This gap is particularly evident in the limited public ownership of key projects and insufficient government support for ensuring consistent demand for local manufacturers' outputs (Institute for Economic Justice 2021; Mazzucato and Semieniuk 2018).

Schwarzer (2013, 45) also proposes green government procurement as a way of stimulating demand for green products such as “clean bus fleets, green lighting solutions and green building

design” (Schwarzer 2013, 45). He further highlights that the approach is increasingly being implemented in both high-income and developing countries. However, governments should be strategic when formulating industrial policies that integrate the growth of domestic industries with demand (Schwarzer 2013). Altenburg & Rodrik (2017) further indicate that avoiding harmful environmental externalities necessitates targeted policy tools such as environmental taxes and cap-and-trade systems, which are designed to regulate emissions and incentivize sustainable practices.

Additionally, Cosbey et al. (2017) bring attention to promoting green industrial development through disruptive GIP, which they define as strategies to limit or gradually eliminate harmful industries, creating space for more sustainable sectors to thrive. It aims to complement the more commonly recognized positive GIPs by fostering the necessary conditions for green sectors to grow and thrive. This can include financial burden such as environmental taxes, charges, levies, and fees, imposed on businesses and industries to reduce their competitiveness compared to other players in the economy. The elimination of incentives such as subsidies like “cash grants, low-interest loans, loan guarantees, limits on liability, price supports, purchase mandates, (and) various types of tax breaks” granted to sectors targeted for phase out, is another set of tools in the form of phase out (Cosbey et al. 2017, 71). Schwarzer (2013) similarly explains that removing harmful subsidies to polluting sectors of the economy helps incentivise the development of green industries. Moreover, this removes existing policy-induced distortions in the economy that make market failures easier to identify (Schwarzer 2013).

Mandated phaseouts are among the most effective tools of disruptive GIP, as they compel the targeted sectors or firms to discontinue operations (Cosbey et al. 2017). Altenburg & Rodrik (2017) however affirm that the urgency to phase out polluting technologies and replace them with green substitutes within a short time frame calls for more comprehensive and aggressive R&D. This should be accompanied by technology diffusion programmes that involve particularly comprehensive policy coordination and consensus-building mechanisms, in order to manage radical systemic changes (Altenburg & Rodrik 2017).

Disruptive GIP however presents unique challenges that are less common to conventional green industrial strategies. One major difficulty is that it compels governments to identify and phase out specific industries or businesses, often referred to as ‘losers’. This process involves evaluating which sectors have the greatest environmental impact and determining whether viable green alternatives exist. Moreover, it is argued that the most complex aspect of disruptive

GIP is ensuring a just transition. This is evident in the varied outcomes of fossil fuel subsidy reforms, where the industries causing the most environmental harm are often deeply integrated into national economies through substantial capital investment and interconnected production networks. Shifting away from these industries, while essential, is likely to result in both direct and indirect job losses, disproportionately affecting marginalized communities (Cosbey et al. 2017). Cosbey et al. (2017) therefore note, that should a country engage in disruptive GIP, they should also incorporate positive measures to ensure that the transition results in the desired outcomes.

Avenyo and Tregenna (2022) further explain that part of the requirements necessary for developing countries to achieve inclusive green industrialisation, is significant effort and investment in human capital and an upgrade of productive capabilities. The associated technological upgrading will however face various constraints such as “barriers to entry, domestic and international political economy factors, inadequate skills, limited domestic markets for high-tech manufactures, and so on” (Avenyo & Tregenna 2022, 9). A more practical strategy for developing countries may therefore involve enhancing technological processes in in carbon-intensive and low-tech manufacturing industries by adopting cleaner technologies and improving production methods across various sectors (Avenyo & Tregenna 2022).

Other Strategies to Promote Effective Green Industrialisation

Despite the strong theoretical arguments for GIPs, their successfully implementation remains complex (Harrison, Smith & Chatré 2017). Rodrik (2014) however contends that mistakes are inevitable in the process of defining a well-designed industrial policy programme. Consequently, it is essential to have effective mechanisms in place that recognize these errors and adjust policies accordingly (Rodrik 2014). An efficient industrial policy framework therefore requires room for learning and adapting (Amsden 2008; Rodrik 2014).

Furthermore, each country should apply GIPs according to their specific contextual needs to appropriately balance the benefits against the potential risks (Padilla 2017). Lall (2004, 769) explains that aside from “a common context of export orientation, sound micromanagement and a good base of skills” there was no standard East Asian model (Lall 2004, 769). Each country had a different pattern of industrial and export growth, reliance on FDI, technological capability and enterprise structure (Lall 2004, 769). Linking the green transition to industrial policy could thus result in indigenous solution-driven green innovations (Andreoni et al. 2022). Realising this new context will however depend on committed political leadership and an

active, well-coordinated state that can strategically steer long-term structural change (Oqubay 2024).

Altenburg & Rodrik (2017) further expand on the role of governments in striking an appropriate balance between environmental objectives and competitiveness, industrial development, and job agendas by understanding how to minimise costs and maximise gains. Supported by industrial policy, this transformation and diversification could also stimulate further job creation, income generation and improved living standards.

The following table summarises the various industrial policy tools that could be employed, including their implementation mechanisms, positive aspects, and potential challenges.

Table 1: Possible Industrial Policy Tools for Inclusive Green Industrialisation

Tool	Implemented By	Benefits	Challenges
R&D	Governments supported by public-private partnerships such as national-level innovation centres	- Encourages technological innovation and green solutions - Improves productivity and competitiveness	- High initial costs - Outcomes depend on effective coordination and funding allocation
Trade and Investment Policies	Governments through tariffs, trade agreements, and investment incentives	- Encourages cross-border collaboration - Attracts green investments - Fosters export of green technologies	- Vulnerable to global market fluctuations - Challenges in balancing trade liberalization with domestic industry protection
Subsidies for Clean Technologies	Governments through targeted, sector-specific financial incentives	- Promotes green innovation - Reduces financial barriers for new industries - Stimulates private sector involvement	- Risk of market distortions - Potential misuse or misallocation of funds requires careful design to ensure alignment with environmental objectives
Environmental Taxes	- Governments - Tax authorities	Reduces negative environmental externalities	May face resistance from industries and consumers

		• Incentivizes sustainable practices	• Requires robust monitoring to prevent tax evasion
Green Government Procurement	• Public sector entities	• Creates demand for green products • Drives innovation • Encourages adoption of sustainable technologies	• May increase public sector costs initially • Requires alignment with broader policy goals
Phase-Out Policies	• Governments through mandates or financial disincentives	• Reduces dependence on polluting industries • Fosters opportunities for green sectors	• Job losses in affected industries • Social and economic disruptions if not paired with just transition strategies
Technological Diffusion Programmes	• Governments, research institutions, and private sector partnerships	• Accelerates adoption of green technologies • Promotes knowledge-sharing and capacity-building	• May be slow to implement without strong coordination capacity building
Removal of Harmful Subsidies	• Governments	• Incentivises green industries • Removes distortions that promote unsustainable practices	• Opposition from industries reliant on subsidies • Potential short-term economic disruptions
Skill Development Programmes	• Governments • Educational Institutions • Private sector	• Builds human capital for green industrialisation • Reduces skill gaps • Promotes employment	• Long-term investment needed
Just Transition Programmes	• Governments • Labor unions • Private sector	• Mitigates social consequences of green transitions • Ensures inclusivity and equity	• Requires significant funding and strategic planning • Risks inefficiencies if not well-coordinated

Sources: Altenburg & Rodrik 2017; Avenyo & Tregenna 2022; Cosbey et al. 2017; Lebdioui 2024; Tamasiga 2023; Schwarzer 2013

The effectiveness of these tools depends on strategic planning, political will and institutional capacity.

International Lessons

South Korea

South Korea, has exemplified strong embedded autonomy where strong state-business collaboration drove technological innovation and export-led growth, leading towards the industrial transformation that made them an Asian Tiger (Evans 1995). This was strengthened by reciprocal control mechanisms. When firms failed to meet their export targets, they received subsidy cuts or aggressive tax audits (Rodrik 2014).

China

Made in China 2025, launched in 2015, is an example of industrial policy expanded to incorporate the creation of opportunities for ‘green’ technology and innovation. It attempts to address low energy efficiency and environmental pollution in the manufacturing industry, by sustainably striving towards ecological development (Xu 2022). Furthermore, the industrial policy tools that Made in China 2025 used to promote green innovation included tax, environmental subsidies, and corporate responsibility which could effectively enhance enterprise environmental performance (Xu 2022).

In particular, China’s development of battery-electric vehicles (BEV) has significantly reduced their air pollution (Altenburg, Feng & Shen 2017). China’s BEVs serving as cleaner alternatives to fossil-fuel-powered vehicles with high carbon dioxide emissions (Gopal et al. 2018), demonstrate an establishment of a new green industry through the new supply chains, R&D infrastructure, specialised labour and industrial clusters focused on batteries and charging technologies (He et al. 2022). This fostered skills development and technological spillovers important for industrial growth, such as the improvement of resource efficiency and emissions in battery production (Yuan et al. 2015) which could arguably fall under greening an existing industry.

Ethiopia

The Ethiopian government’s adoption of its ‘Green Economy and Climate Resilient Strategy’ in 2010, illustrates how GIP can drive local productivity growth and job creation. The strategy outlines a pathway for transitioning Ethiopia’s economy towards carbon neutrality

and climate resilience, while also clarifying the responsibilities of both government and non-government actors (Biswas & Yila 2022). It further supports environmental sustainability in manufacturing and the creation of green industrial clusters. The country's eco-industrial parks that have developed since, have not only had positive environmental impacts but have also created several work opportunities through technological and managerial training to prioritise relocated community members (Oqubay 2024).

Similar to China, Ethiopia's development of eco-industrial parks built on zero liquid discharge (ZLD), exemplify the establishment of new green industries. The resulting development of clean technologies strengthened local technical capacity, boosted productivity, enabled knowledge transfer, and facilitated Ethiopia's broader green transformation (Oqubay 2024).

Inclusive Green Industrialisation and Industrial Policy

Andreoni et al. (2022) emphasise that coordinating the green transition with industrial policy has the potential to foster local solution-driven green innovations as can be exemplified by Made in China 2025 and Ethiopia's Green Economy and Climate Resilient Strategy. As has been discussed, it can be argued that transitioning to an IGE requires deliberate industrial policy to drive green industrialisation and long-term structural transformation. The latter refers to changes in the structure of the economy from low-productivity sectors such as subsistence agriculture, to more high-value activities, particularly in manufacturing and modern services (McMillan, Rodrik & Verduzco-Gallo 2014). This transformation is essential for achieving sustained economic growth and development, as it enhances productivity, fosters innovation, and enables economies to transition towards higher-income status (Szirmai 2012).

Furthermore, lessons can be derived from the restrictive economic reforms imposed by the mid-1980s Structural Adjustment Programmes (SAPs) of the Bretton Woods institutions, which hindered industrial diversification in Sub-Saharan Africa (SSA) (Acheampong 2021). These SAP reforms were introduced as preconditions for accessing external financial assistance in response to widespread sovereign debt crises (Schoneveld & Zoomers 2015). The reforms typically entailed large cuts in public expenditure and a diminished role for the state, driven by recognition of its limited administrative and fiscal capacity. Additionally, rising concerns over the mismanagement of natural resources by central government agencies led to the adoption of

decentralisation policies aimed at shifting natural resource management to local authorities (Sowman & Wynberg 2014).

However, insufficient local enforcement capacity often resulted in unregulated access which in turn led to resource depletion and the misappropriation of publicly owned assets for private gain (Nelson 2010). At the same time, continued dependency on natural resource-based industries, combined with limited economic diversification, has left these economies highly vulnerable to global commodity price swings, leading to macroeconomic instability and impeding sustainable growth (Schoneveld & Zoomers 2015). The failure of SAPs alongside the success of East Asia's developmental strategies, has thus challenged the idea of 'trickle down' economics and highlighted the need to embed equity and social objectives into macro-economic policy (Schoneveld & Zoomers 2015). In this context, any energy transition in the region must not only adopt cleaner energy sources but also stimulate industrial development. Establishing new competitive clusters that leverage renewable energy can drive economic growth, generate employment, and alleviate poverty (Acheampong 2021).

While a green economic transformation promotes sustainable industrial practices, green technology production, and resource efficiency (Lebdoui 2024), an inclusive approach additionally balances economic development with environmental sustainability and social equity. Industrial policy can support this process by both incentivising the development and deployment of green technologies, such as renewable energy systems, electric vehicles, and energy-efficient manufacturing processes which could also accelerate investment in these areas (Rodrik, 2014). In addition, it can incorporate reskilling programmes, social safety nets, and community development initiatives (Cho 2019). This holistic objective aligns with goals of the JT to incorporate social justice in the shift towards renewable energy.

Schwank (2019) argues that a more developmental and interventionist industrial policy should reorient the country's industrial trajectory toward more inclusive, employment-intensive growth. The next step would be establishing which industrial policy tools are the most appropriate to achieve such green industrialisation objectives that are also inclusive through just transition principles.

Research Gap

All things considered, it can be argued that green industrialisation that is supported by GIP aligned with just transition principles holds the potential to drive profound structural

transformation towards a green economy. This is particularly relevant in the African context as it offers opportunities for economic growth and development for economies that are highly dependent on natural resources.

South Africa's policy commitment to decarbonisation creates a strategic opportunity to investigate the GIP tools needed to drive green industrialisation towards an inclusive green economy. Although the transition of SAREM into policies is still under development, analysing it as a potential policy framework offers valuable insights into how such tools might be applied in practice. This research therefore contributes to the broader academic discourse of the role of industrial policy in achieving a just and sustainable economic transformation. It further uses SAREM as a case study to examine the GIP tools necessary for advancing South Africa's inclusive green economic transformation.

3. Description of Research Methodology

The main research question that this research report aims to answer, is what industrial policy tools are needed to facilitate the structural transformation from a carbon intense economy towards inclusive green industrialisation in South Africa. The foundation has been set through the extended literature review that surveyed existing literature on green industrialisation and the role of industrial policy in promoting a sustainable green economic transformation.

The literature review also began answering the study's sub-question of what lessons can be derived from previous industrial policy tools in other countries, than can inform the effectiveness of future policies such as SAREM. Although only recently approved by cabinet on the 27th of March 2025, the masterplan represents a potential industrial policy initiative that aims to advance an inclusive green economic transformation.

Analysing SAREM against Tamasiga et al. and Rodrik's guidelines could therefore be helpful in seeing how their application can help determine if such initiatives align with strategically using industrial policy tools to support both economic development and social inclusion. Tamasiga et al.'s six key elements of GIP provide useful guidance on how environmentally sustainable practices can be integrated with economic development and social inclusion (Tamasiga 2018). They can therefore serve as a valuable lens through which to evaluate whether SAREM is aligned with the goals of inclusive and sustainable green industrialisation. However, as Tamasiga et al. (2018) clarify, important research gaps remain, particularly in

areas such as incorporating the informal sector into green economies, harmonising climate policies with global trade regulations, and assessing the role of digital technologies in shaping green industrialisation in developing contexts. These six components should therefore merely act as indicative guidelines rather than a comprehensive framework.

With regards to Rodrik's three rules for industrial policy, though he applied these to the advancement of green growth strategies, the rules can also be used as instruments to help advance inclusivity in a green economic transformation. These analyses along with the lessons from other countries that have been established in the literature review, will then help identify the potential effectiveness of similar future policies.

This research report therefore takes on a qualitative approach using secondary data and desk research. A qualitative approach has the advantage of being able to incorporate a nuanced understanding of a topic as complex as this. The desk research used in this research report is also based on reputable sources from various types of stakeholders of whom many have used a mixed methods approach with a more comprehensive understanding of the topic.

4. SAREM Case Study

Overview

The South African Renewable Energy Masterplan (SAREM), launched in July 2023, is “an industrial and inclusive development plan for the renewable energy and storage value chains by 2030” with its targets presented as ambitious yet realistic (DMR & DTIC 2023, 1). Its vision focuses on fostering the industrialisation of the renewable energy value chain and ensuring inclusive participation in the energy transition by addressing societal needs while supporting economic recovery and growth. This is important in achieving the socio-economic objectives laid out in the country's NDP (DMR & DTIC 2023). The plan is one of 14 industry-focused Masterplans designed to support a national industrial strategy led by the Department of Trade, Industry and Competition (DTIC) (Institute for Economic Justice 2021).

Public policies focused on accelerating the decarbonization of economies aim to promote the widespread adoption of renewable energy technologies, due to their potential as cost-effective means of generating electricity (DMR & DTIC 2023). SAREM aims to take advantage of the

growing demand for renewable energy and storage technologies, by focusing on “solar energy, wind energy, lithium-ion battery and vanadium-based battery technologies”, to drive industrial growth and inclusive development within associated value chains in South Africa (Molelekwa 2023).

The plan’s key 2030 objectives include growing the economy through reliable, affordable and low-carbon energy by providing energy security, reducing costs, and providing protection against climate risks such as foreign and local carbon taxes. Another objective is expanding the industrial capacity in the renewable energy and battery storage value chain, as it is recognised that manufacturing operations in industrial value chains generate positive linkages and spillover effects that stimulate job creation and boost economic growth. Additionally, with the wide range of employment opportunities that renewable energy and battery value chains offer, particularly for skilled and semi-skilled workers, SAREM aims to create and sustain decent employment across the value chain (DMR & DTIC 2023).

SAREM also plans to build the capabilities needed for the industry by upskilling existing workers in the energy and manufacturing sectors while creating opportunities for new entrants. This goal includes addressing technological gaps by introducing local or international innovations into the domestic market, with the objective of improving South Africa’s technological readiness, boosting competitiveness, and expanding export potential.

An additional objective is ensuring broad-based economic participation across the entire value chain to promote inclusive development, by for instance facilitating the shift of South Africa’s electricity sector from a centralized to a decentralized energy system. Finally, SAREM aims to contribute towards a JET. Currently, renewable energy and storage solutions are primarily accessible to middle- and high-income households as well as large businesses. Expanding access not only promotes social equity but also stimulates local market growth, driving further industrial development (DMR & DTIC 2023). SAREM therefore presents a potential pathway to reform current industrial policy frameworks in a way that both enhances economic gains and supports the objectives of a JET (Institute for Economic Justice 2021).

These are summarised in four ‘pillars’ namely expanding local demand for renewables, strengthening industrial development through localisation and supportive trade and industrial policy, promoting inclusive development and a just transition by transforming the industry and supporting the development of emerging suppliers, and finally, enhancing local skills and technological innovation (DMR & DTIC 2023, 8).

The following tables outline the masterplan's targets:

Table 2: Masterplan Targets

Outcome	Target area	Indicator	Baseline	2030
Industrial development	Increase local content in the renewable energy and battery storage manufacturing and associated services sectors	Local content as a share of total project value: - Solar - Wind - Storage	45% 47% 20%	50% 47% 60%
Competitive-ness	Strengthen the competitiveness of local renewable energy and battery storage manufacturers	Trade balance for selected renewable energy and battery storage products (LIBs, solar panels, inverters, transformers)	Negative trade balance	Neutral or positive trade balance
Economic growth	Increase investment in the RE & BES manufacturing and associated services sectors	Value of cumulative investment in the renewable energy and battery energy storage key component manufacturing	R2.5 billion	R15 billion
Job creation	Grow employment in the RE & BES manufacturing and associated services sectors	Number of people (full-time equivalent) employed in RE & BES key component manufacturing Youth employment target (share of jobs created)	2500 jobs n/d	25 000 jobs 50%
Transformed industry	Achieve a higher level of transformation (race and gender) in the RE	Procurement (capital expenditure) from Black-owned	<1%	5%

	& BES and associated services sectors	manufacturers (defined as 50%+1 ownership) Procurement (capital expenditure) from woman-owned manufacturers (defined as 50%+1 ownership) Share of female employees in the value chain Rollout of ESOPs, and ownership by youth, persons with disabilities and other designated groups	<1% 30% TBC within 6 months of launch	5% 50% TBC within 6 months of launch
Capacity building and new entrant support	Augment funding for incubation and capacity building of the sector	Funds allocated by the project company to supplier development: - Construction (share of capital expenditure) - Operation (share of net profit after tax)	1% 1%	1.5% 2%
Youth participation and empowerment	Widen sector contribution to youth empowerment and skills activation	Share of the RE & BES participating in Yes4Youth and/or other programmes (such as the South African Wind Energy Association internship programme)	<5%	75%
Skills development	Grow the skill base in the RE and BES manufacturing and	Skills development expenditure, as a percentage of revenue	n/d	0.5%

	associated services sectors	Share of renewable energy and battery storage manufacturing companies submitting their workplace skills plans and annual training reports	20%	75%
Technology development	Increase R&D funding in the RE and BES manufacturing VC	R&D expenditure in renewable energy-relevant fields	R500 million	+100% in real terms

Source: Qase & Montmasson-Clair 2024

Furthermore, SAREM's comparative research from Argentina, Brazil, India, Morocco, and Russia highlights the importance of procurement strategies like feed-In tariffs and auction bidding, as well as strategic industrial policies that include local content requirements in developing a sustainable renewable energy sector (Institute for Economic Justice 2021, 6).

SAREM and Supporting Context Critique

Civil society and climate experts have however identified certain gaps in SAREM. A major concern is the limited consultation with communities. It has been argued, that although SAREM has engaged in an extensive consultation process with industry and government stakeholders, limited consultation has occurred with affected communities and household stakeholders who bear the responsibility for energy security in their homes. It is thus suggested that SAREM should place more focus on addressing energy poverty in order to prioritise societal transformation and promote inclusivity (Molelekwa 2023).

Furthermore, eco-justice organisation, The Green Connection, points out that the plan narrowly emphasises renewable electricity and its storage, neglecting a broader vision for the entire renewable energy sector. For instance, less attention is placed on other domestic renewable energy solutions such as the deployment of solar water heating systems (The Green Connection 2023). This is however partly due to the absence of an efficient Integrated Energy Plan (IEP) that integrates economic, environmental, political, and social interests, as well as sets the context in which energy related decisions should be made.

Section 6 of National Energy Act, 2008 (NEA) requires the Minister of Energy to develop such an annually reviewed plan that considers rapidly changing global trends and modern developments and serves as a guide for how South Africa can escape the energy crisis. This would help provide a clearer pathway for decarbonisation in the energy sector, enhancing the impact of renewable energy on energy-poor households (The Green Connection 2022; 2023). Although South Africa's 2023 Integrated Resources Plan (IRP) outlines a gradual phase-out of coal and the eventual shutdown of ESKOM's coal power stations, to "ensure security of electricity supply necessary by balancing supply with demand, while considering the environment and total cost of supply" (DMRE 2024, 1), it has been criticised for its misalignment with the objectives of the just energy transition (Obsie-Orlu & Siyobi 2024).

The Green Connection therefore argues that SAREM needs to be guided by a more comprehensively aligned Integrated Energy Plan, address the shortcomings of previous renewable energy efforts, and incorporate emerging renewable technologies to foster a sustainable and JET for South Africa (The Green Connection 2023).

Analysing SAREM Against Tamasiga et al.'s Six Themes of GIP

The first intervention that Tamasiga et al. identify is the advancement of sustainable development through green growth strategies, with a focus on supporting subsidies and practices that promote the principles of a circular economy. Although SAREM promotes green growth through local renewable energy manufacturing and encourages the development of local supply chains for solar photovoltaic (a technology that uses sunlight to generate electricity), as well as wind, and battery storage technologies, there are no direct subsidies for clean technologies beyond general investment incentives.

Government innovation subsidies play a key role in incentivising the green transformation of enterprises by improving energy utilization and reducing carbon intensity. They can also incentivize industrial enterprises to increase the quantity and improve the quality of green technological innovation. Additionally, unit government innovation subsidies can reduce carbon dioxide emissions of industrial enterprises. This suggest that government subsidies focused on innovation can encourage industrial enterprises to decrease carbon emissions (Lyu, Ma & Arash 2024). Research subsidies could also be useful in addressing knowledge-related market failures and direct technical change towards clean technology (Dutz & Sharma 2012). Such targeted green subsidies could therefore be beneficial for green technology adoption and local production.

In terms of circular economy principles, SAREM recognises the necessity of conducting further research on what is referred to as ‘end-of-life management’ within the renewable energy and storage value chain with regards to reusing, remanufacturing and recycling (DMR & DTIC 2023).

The second critical component of GIP policy presented, is transitioning to renewable energy with energy policies that foster the adoption of green or clean technological innovations. SAREM prioritises scaling up renewable energy generation and promotes local content in renewable energy projects to reduce import dependency. It also encourages public-private partnerships (PPPs) to expand solar PV, wind and battery industries. However, SAREM’s success in advancing these objectives is threatened by the ongoing policy uncertainty and procurement delays within the REI4P, which have already weakened investor confidence in the renewable sector (Engineering News 2022). These unresolved issues create a high-risk environment that could undermine SAREM’s potential to deliver long-term industrial development and energy transition goals.

A predictable and transparent, rolling procurement schedule for REI4P is therefore required to reduce uncertainty for investors and manufacturers can be established. Furthermore, Andreoni et al. (2022) highlight that incorporating both conditionalities to financing and procurement as well as investment attraction schemes or company bailouts could further encourage a balance between compulsion and innovation.

A third key component is the interaction of the transition to green industrialisation with trade and investment. This intersection is essential in aligning economic growth with environmental sustainability. SAREM seeks to integrate renewable energy with industrialisation by developing local supply chains and exporting South African-made components. However, SAREM’s goal of making South Africa a regional green energy hub could be limited by South Africa’s weak trade incentives in its broader industrial strategy, with regards to the lack of tariff protections for local firms competing with cheap imports (Black & Hasson 2016), as well as limited export strategy to leverage opportunities within the continent’s regional markets (Oqubay 2024).

A green trade strategy that strengthens regional and international trade agreements under the AfCFTA for instance, could leverage South Africa’s position as a regional leader in renewable energy supply. This would attract foreign direct investment and promote cross-border energy projects (Arbisman, Ahuja & Yong 2025). Additionally, strategic tariffs and subsidies for

locally manufactured solar and wind components can be introduced, ensuring that South African firms remain competitive (Lall 2004). More specifically, feed-in tariffs and power purchase agreements guarantee favourable rates for renewable energy producers which could encourage investments in renewable energy infrastructure and promote the transition to clean energy sources (Shana & Ji 2024). Since SAREM's masterplan targets include competitiveness of local renewable energy and battery storage manufactures, feed-in tariffs for solar panels and subsidies for inverters and transformers could for example be employed (Qase & Montmasson-Clair 2024).

Fourthly, advancing green innovation and technological progress is encouraged. This is to ensure that industrial growth is still achieved with reduced environmental impact. The masterplan encourages domestic production of green technologies including solar PV, wind turbines and battery storage. It also supports technical training and skills development for workers in renewable energy industries. The allocation of R&D funding is however focused on green energy. Broader R&D is required to improve other aspects of industry. Strengthened university-industry partnerships could help broaden R&D to improve other aspects of industry and further advance indigenous green innovation.

A fifth key component is integrating efforts of green job creation with sustainable development goals within the green economy framework. This allows a simultaneous focus on both socio-economic challenges and environmental protection. SAREM aims to create 25, 000 jobs in the renewable energy sector. It further promotes skills development in solar, wind, and battery technology, and supports local economic development through renewable energy value chains. There however remains the challenge of a mismatch between the skills required by the industry and those currently available in the workforce (Borel-Saladin & Turok 2013), and limited funding for technical training programmes (Institute for Economic Justice 2021). Moreover, there is limited integration of green jobs with broader Sustainable Development Goals (SDGs), which can for instance be seen through the gap in green jobs outside the energy sector.

Finally, Tamasiga et al. (2023) note that institutions and industrial policies play a vital role in facilitating structural changes towards a low-carbon economy. Local content requirements need supportive frameworks, as ineffective implementation can negatively impact the appeal of renewable energy investments or drive-up energy costs. They should therefore be incorporated into a broader industrial development strategy that is aligned with current domestic capacities and aims for long-term competitiveness (Lebdioui 2024). SAREM recognises that the local

content trajectory should be ‘Specific, Measurable, Achievable, Relevant and Time-bound’ (SMART) based on the existing capacity. It also acknowledges green government procurement as a tool for renewable energy expansion (DMR & DTIC 2023).

However, weak policy enforcement and regulatory uncertainties delay renewable energy projects as can be demonstrated by previous subsidy programmes such as REFIT which suffered from policy uncertainty and irregular implementation (Baker et al. 2014). Furthermore, considering that SAREM has not been launched yet, further confusion and miscoordination has also resulted from the plan being moved from the Department of Mineral Resources and Energy (DMRE) to the recently established Department of Electricity and Energy which oversees energy policy. The absence of a unified coordinating body for industrial policy and energy planning, as well as weak enforcement of local content policies, slow down investment in renewable energy industries and reduce industrialisation benefits (Oqubay 2024).

It can thus be argued that SAREM moderately aligns with Tamasiga et al.’s six critical themes. Strong adherence applies to the promotion of sustainable economic growth through the advocacy of local renewable energy manufacturing and the development of local supply. Additionally, the encouragement of technical training and skills development for workers in renewable energy industries supports the advancement of green innovation and could consequently inspire technological progress. SAREM’s commitment to incorporating green jobs within a green economy framework further reflect an effort of integrating green job creation with sustainable development goals.

There are however critical gaps to be addressed in SAREM and South Africa’s broader policy environment. Key areas for improvements include targeted subsidies, more structured policy enforcement and better coordination for a comprehensive energy policy, a stronger trade strategy to promote South Africa as a regional green hub, broader R&D and greater integration of green jobs and SDGs outside the energy sector. Addressing these shortcomings would enhance SAREM’s effectiveness in driving inclusive green industrialisation.

Analysing SAREM Against Rodrik’s Three Rules for IP Applied to GIP

SAREM can also be assessed using Rodrik’s three foundational principles for industrial policy, which he applied to GIP. The first rule of embeddedness, referring to strong coordination between the state and private sector, can further enhance social inclusion and local empowerment in addition to promoting economic transformation and innovation. By

encouraging participatory governance of local communities, workers, small businesses, and informal enterprises in green transition policymaking and implementation, governments can ensure policies reflect the diverse needs and capacities of marginalised voices, and not just those of dominant industrial players.

SAREM's extensive consultation with industry and government reflects the embeddedness principle in terms of state-business alignment. The plan was co-developed with input from the Department of Trade, Industry and Competition (DTIC), business representatives, and labour groups, ensuring alignment with industrial policy priorities. However, SAREM's limited engagement with affected communities weakens its inclusive embeddedness. While industry stakeholders are heavily involved, the insufficient consultation with communities and households particularly facing energy poverty (Molelekwa 2023) implies an inadequate integration of both corporate and social interests.

There is also a lack of structured long-term collaboration mechanisms. Although industry consultation occurred, SAREM does not establish a permanent state-business dialogue platform to ensure continuous responsiveness to evolving market needs. This can be contrasted by South Korea's industrial policy model that was built on long-term state-business engagement to drive innovation (Evans 1995). Furthermore, without robust mechanisms like conditional incentive structures to balance corporate interests with public welfare, large firms may capture policy benefits, sidelining enterprises and community-driven initiatives. Therefore, with regards to embeddedness, SAREM is strong in its government-business coordination, but weaker in its community inclusion and long-term state-market engagement mechanisms.

The second rule is discipline, involving rigorous evaluation mechanisms, performance-based conditionalities, and avoidance of rent-seeking. Incentivising firms to meet green targets like emission reductions, and social targets like local job creation and skills development, can ensure that the green transition creates shared value and addresses social outcomes. Furthermore, the absence of discipline mechanisms that can penalise underperforming firms or reward firms that advance inclusive outcomes, may reinforce existing structural inequalities. Therefore, adhering to Rodrik's notion of discipline may also be key to preventing elite capture.

SAREM has defined localisation and job creation targets. This includes clear targets for local content in solar (50%), wind (47%), and battery storage (60%) by 2030, as well as an employment target of 25, 000 jobs. These provide measurable benchmarks for industrial

development. Furthermore, state-driven financing mechanisms through the IDC and Development Bank of Southern Africa (DBSA), are expected to fund renewable energy projects. Conditional financing could potentially serve as a discipline mechanism.

However, similar to South Korea's model where firms lost subsidies if they failed to meet export targets (Rodrik 2014), SAREM would need to further link incentives to firm performance. Similarly, while SAREM sets industrial targets, there is no defined process for penalising non-compliant firms or rewarding high performers. In addition, SAREM will need to explicitly address how rents will be managed, which Schmitz, Johnson and Altenburg's (2015) highlight as a critical component of GIP. Without effective rent withdrawal mechanisms, dominant firms could capture excessive profits without reinvesting in local capacity. To improve discipline, policymakers could link incentives to performance metrics. For instance, firms should only receive subsidies, tax breaks, and procurement contracts if they meet green industrialisation targets (Andreoni et al. 2022). Alternatively, firms could return public subsidies if they fail to meet local content or job creation targets (Rodrik 2014). Such conditionalities can ensure firms adequately contribute to local industrialisation, job creation and technology transfer.

The last rule is transparency and accountability. Public access to policy outcomes and decision-making processes help prevent inappropriate influence by special interest groups. Inclusive green industrialisation requires socially accountable institutions that publish disaggregated data such as who benefits from jobs created, and local versus foreign ownership, as well as established mechanisms for civil society oversight. A transparent and accountable industrial policy can thus ensure that public interests are protected against private capture and that affected groups can hold decision-makers to account.

SAREM's strategic framework is publicly available, providing some level of transparency, and the involvement of industry associations and labour unions ensures some degree of accountability in policy design. SAREM could further incorporate clear reporting structures for public scrutiny of its industrial performance, in its future implementation outcomes. Public reporting of SAREM's industrial outcomes like local content delivered, job quality and regional investment distribution can potentially help citizens evaluate whether the energy transition is equitably advancing. Germany's Energiewende energy transition model which deeply integrates public feedback and independent auditing mechanisms (Agora Energiewende 2025), serves as an example of an independent auditing mechanism to track progress.

Transparency and accountability can be enhanced through independent renewable energy regulators who ensure transparent licensing, compliance monitoring, and enforcement (Andreoni et al. 2022). This prevents policy capture and ensures public trust in green industrialisation. Additionally, third party audits that conduct independent performance reviews of government-supported firms could strengthen checks and balances.

It can therefore be argued that although SAREM demonstrates strong embeddedness with industry, its discipline and transparency could be developed. Embeddedness can be further strengthened through more intimate inclusion of marginalised and affected voices. Furthermore, more rigorous evaluation mechanisms and performance-based conditionalities could ensure the effective implementation of well-designed policies to prevent unintended consequences of exacerbated inequalities. Transparency and accountability further encourage equitable enforcement of GIPS. By including historically excluded communities in the equitable distribution of decision-making power and economic benefits, imposing equity-linked conditionalities, and building trust in a just green transition through strong accountability measures, these three rules for GIP can therefore aid the promotion of an inclusive green economy.

Other Key Strategies

Rodrik (2014,) further highlights room for learning rents and policy flexibility as a key strategy for effective green industrialisation. He notes that successful GIP frameworks require mechanisms that recognise errors and adjust policies accordingly (Rodrik 2014). SAREM incorporates continuous policy refinement and acknowledges that green industrialisation is an evolving process. It however lacks structured feedback mechanisms to identify inefficiencies and adapt policies over time.

It is also importantly noted that each country must design GIPs that align with its unique economic structure and resource endowments (Padilla 2017). SAREM is for instance tailored to South Africa's mineral wealth, leveraging critical minerals such as platinum and lithium for clean technologies. There is however greater opportunity for green manufacturing expansion, to further advance structural transformation.

These industrial policy tools and key strategies of course require strong political will and state leadership (Oqubay 2024). While SAREM aligns with government decarbonisation goals and

industrial transformation, bureaucratic inefficiencies and potential resistance from carbon-intensive industries pose potential risks to effective implementation.

Overall, SAREM provides a strong foundation as an industrial policy framework that supports South Africa's green industrialisation. Its strengths include a context-specific approach to leveraging the country's mineral wealth, and its commitment to green growth and industrial transformation. It also advocates for inclusivity through one of its core pillars of fostering inclusive development. This involves transformation by means of increasing the level of B-BBEE scoring, supporting new entrants, and shifting towards a just transition under a decentralised energy model. SAREM additionally, aims to create and sustain decent employment across the renewable energy and battery value chain (DMR & DTIC 2023).

The plan has however been criticised for its limited level of consultation with marginalised stakeholders. There is also great opportunity in addressing the significant gaps in R&D, trade protection, technological transfer, and regulatory frameworks for policy enforcement. These challenges therefore need to be addressed to ensure that all benefits of the plan are fully realised.

Beyond SAREM

While SAREM serves as a valuable case study that represents an important step toward green industrialisation, these policy lessons extend to other frameworks that aim to achieve a more sustainable and inclusive transition. Furthermore, the success of GIPs largely rests on the will, capacity and strategy of the political environment (Oqubay 2024). This includes proactive and coherent state interventions (Lebdioui 2024). Moreover, while a balance should be struck with the cooperation of the state with non-state actors, political will and state leadership should also involve disciplining private capital to ensure that green economic transformations not only serve private interests, but also developmental and social inclusion objectives (Lebdioui 2024). Conditionalities and regulatory frameworks have for instance been a regular suggestion for enforcement and implementation mechanisms (Amsden 2008; Andreoni et al. 2022; Rodrik 2014).

Ultimately a just and sustainable transition towards inclusive green industrialisation depends on the ability to balance economic competitiveness with environmental responsibility and social progress, in which the discussed industrial policy tools are beneficial in achieving.

6. Concluding Remarks

An inclusive green transformation is not just a necessity, but a strategic response to the deepening socioeconomic inequalities exacerbated by human-induced climate change. Industrial policy is an instrumental tool in promoting structural transformation and economic diversification that builds resilience to climate change. Achieving inclusive green industrialisation in South Africa requires a nuanced and adaptive approach to industrial policy, one that carefully balances economic growth, environmental sustainability, and social equity.

This analysis confirms that while South Africa has taken steps toward industrial decarbonisation and green growth, a coherent and coordinated policy framework specifically targeting inclusivity remains underdeveloped. At the core of inclusive green industrialisation is not only the transition to low-carbon production, but also the deliberate redistribution of economic opportunity, employment, and ownership. This calls for a green industrial strategy that restructures the economy to benefit historically marginalised communities and actively promotes labour-absorbing sector, especially within green manufacturing and service ecosystems, in addition to reducing emissions.

A range of industrial policy tools that are essential to this transformation have been highlighted. These include R&D investments, trade and investment policies, strategic green subsidies, feed-in tariff schemes, green government procurement, phase out policies, technological diffusion programmes, removal of harmful subsidies, skill development programmes and just transition programmes. The industrial policy tools should, however, not operate in isolation, as their effectiveness lies in how they are strategically sequenced and linked. For instance, public R&D investments should be tied to technology diffusion programmes targeting SMMEs and worker-owned cooperatives, particularly in sectors like solar assembly, green transport, agro-processing, and circular economy value chains. Feed-in tariffs must be designed not just to promote renewable energy generation, but to strengthen domestic supply chains and localise manufacturing of components. Trade policy should prioritise regional integration, facilitating export-led growth in green goods and services while protecting nascent domestic sectors from unfair global competition.

The policy implications of this are significant. South Africa's current industrial policy landscape, though evolving, remains fragmented and prone to elite capture, which limits its

redistributive potential. If green industrialisation is to be truly inclusive, stronger alignment is needed between macroeconomic, trade, innovation, and energy policies. The effectiveness of the above industrial policy tools therefore depends on well-coordinated implementation, robust institutional reform, democratic oversight, and stakeholder accountability. Tamasiga et al.'s summary of six critical components for achieving green industrialisation, and Rodrik's three rules for IPs applied to GIP, serve as helpful guidelines on which to apply these industrial policy tools.

SAREM exemplifies a sound step towards green industrialisation but requires critical improvements to align with the discussed best practices in GIP. Strengthening embeddedness by ensuring deeper state-private sector collaboration, implementing rigorous performance monitoring with conditionalities, and enhancing transparency through independent oversight are necessary to address the existing gaps. Moreover, tackling persistent industrial policy shortcomings such as market uncertainty, weak local content enforcement, limited technology transfer strategies, and insufficient trade protections, will be vital for creating a resilient and inclusive green economy.

As international experience suggests, there is no universal blueprint for GIP, but rather a need for context-specific, adaptive strategies that account for South Africa's unique economic, social, and environmental landscape. By integrating learning mechanisms into policy design, fostering indigenous green innovations, and ensuring a JT that prioritises workers and vulnerable communities, South Africa can build an industrial framework that not only supports green growth but also advances social and economic inclusion.

Despite these contributions, this study has several limitations. Methodologically, it draws primarily on qualitative policy analysis and does not include empirical fieldwork or econometric modelling to assess the impact of specific tools. The scope is also limited to national-level policy, with less attention paid to provincial or municipal dynamics where implementation barriers are often most acute. Moreover, the study does not sufficiently explore gender and youth dimensions within the green industrialisation process, which are critical for deepening inclusivity. Future research should therefore focus on disaggregated case studies of how specific green industrial policy tools operate in practice, particularly in emerging sectors like bioenergy.

In summary, the transition to a low-carbon economy will require a multi-stakeholder approach, with government, industry, academia, and civil society working together to drive innovation, investment, and sustainable development. This would therefore also require coordination among various sectors such as energy, trade, science and technology, finance, labour and education. If implemented effectively through robust and strategic conditionalities, a well-structured GIP can position South Africa as a leader in sustainable industrialisation, leveraging its renewable energy potential and industrial capabilities to create a competitive and inclusive green economy. Moreover, the promotion of inclusivity will further ensure that the decarbonation of energy systems occurs while balancing economic prosperity and sustaining the livelihood of lower income, marginalised and vulnerable groups. Inclusive green industrialisation is therefore key in ensuring equitable distributional effects of GIP.

References

- Acheampong, T., 2021. Leveraging clean energy to drive industrialization in Sub-Saharan Africa: Imaginaries and Realities. *African Policy Research Institute*. Available at: <https://afripoli.org/leveraging-clean-energy-to-drive-industrialization-in-sub-saharan-africa-imaginaries-and-realities> [Accessed 31 July 2024].
- Agora Energiewende, 2023. *The German Energiewende*. Available at: <https://www.agora-energiewende.org/about-us/the-german-energiewende> [Accessed 19 February 2025].
- Ali, E.B., Anufriev, V.P. and Amfo, B., 2021. Green economy implementation in Ghana as a road map for a sustainable development drive: A review. *Scientific African*, 12, pp. 1-17.
- Altenburg, T., Feng, K. and Shen, Q., 2017. Electric mobility and the quest for automobile industry upgrading in China, in Altenburg and C. Assmann, (eds.) *Green Industrial Policy: Concept, Policies, Country Experiences*. Geneva: German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE), pp.185-198.
- Altenburg, T. and Rodrik, D., 2017. Green industrial policy: Accelerating structural change towards wealthy green economies, in Altenburg and C. Assmann, (eds.) *Green Industrial Policy: Concept, Policies, Country Experiences*. Geneva: German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE), pp.185-198.
- Ambe, I.M. and Badenhorst-Weiss, J.A., 2011. South African automotive industry and challenges in the supply chain. *Journal of contemporary management*, 8(1), pp.337-362.
- Amsden, A.H., 2008. *The Rise of the Rest: Challenges to the West from Late-Industrializing Economies*. Oxford: Oxford University Press.
- Amsden, A.H., 2008. The wild ones: industrial policies in the developing world, in J. Stiglitz and N. Serra, (eds.) *The Washington consensus reconsidered: Towards a new global governance*. Oxford: Oxford University Press, pp.95-118.
- Andreoni, A. and Chang, H.J., 2019. The political economy of industrial policy: Structural interdependencies, policy alignment and conflict management. *Structural change and economic dynamics*, 48, pp.136-150.

Andreoni, A., Creamer, K., Mazzucato, M. and Steyn, G., 2022. How can South Africa advance a new energy paradigm? A mission-oriented approach to megaprojects. *Oxford Review of Economic Policy*, 38(2), pp.237-259.

Andreoni, A., et al., 2022. *Industrial Policy for Green Transformations*. Cambridge: Cambridge University Press.

Arbisman, J. Ahuja, N. and Yong., 2025. Investment in Africa: Free trade area agreement powers continent's energy future. *Reuters*. Available at: <https://www.reuters.com/legal/legalindustry/investment-africa-free-trade-area-agreement-powers-continent-energy-future-2025-01-17/> [Accessed 19 February 2025].

Augustine, C., 2024,. SA automotive sector. Available at: <file:///C:/Users/HP/Desktop/New%20folder/9783111071251.pdf> [Accessed 14 July 2025].

Avenyo, E.K. and Tregenna, F., 2022. Greening manufacturing: Technology intensity and carbon dioxide emissions in developing countries. *Applied energy*, 324, pp. 1-12.

Baker, L., 2015. Renewable energy in South Africa's minerals-energy complex: a 'low carbon transition?'. *Review of African political economy*, 42(144), pp.245-261.

Baker, L., 2015. The evolving role of finance in South Africa's renewable energy sector. *Geoforum*, 64, pp.146-156.

Bell, T. and Farrell, G., 1997. The minerals-energy complex and South African industrialisation. *Development Southern Africa*, 14(4), pp.591-613.

Black, A., 2001. Globalization and restructuring in the South African automotive industry. *Journal of International Development*, 13(6), pp.779-796.

Black, A. and Hasson, H. (2016) Capital-intensive industrialisation, comparative advantage and industrial policy. In Black, A. (ed.) *Towards Employment Intensive Growth in South Africa*. UCT Press.

Biswas, S. and Yila, O., 2022. *Why transitioning to an Inclusive Green Economy is vital to fulfilling climate goals in Africa*. Available at: <https://thecommonwealth.org/news/blog-why-transitioning-inclusive-green-economy-vital-fulfilling-climate-goals-africa>.

[Accessed 31 July 2024].

Borel-Saladin, J.M. and Turok, I.N., 2013. The impact of the green economy on jobs in South Africa: News & views. *South African Journal of Science*, 109(9), pp.1-4.

Chang, H.J., 1994. *The political economy of industrial policy*. London: Macmillan Press Ltd.

Cho, R., 2019. How Climate Change Impacts the Economy State of the Planet. *Columbia Climate School*. Available at: <https://news.climate.columbia.edu/2019/06/20/climate-change-economy-impacts/>. [Accessed 5 December 2024].

Cocks, T., 2024. Focus on coal miners, power grid as South Africa spends just sixth of climate aid. *Reuters*. Available at: [https://www.reuters.com/world/africa/focus-coal-miners-power-grid-south-africa-spends-just-sixth-climate-aid-2024-09-26/#:~:text=JOHANNESBURG%2C%20Sept%2026%20\(Reuters\),to%20renewables%2C%20two%20sources%20said](https://www.reuters.com/world/africa/focus-coal-miners-power-grid-south-africa-spends-just-sixth-climate-aid-2024-09-26/#:~:text=JOHANNESBURG%2C%20Sept%2026%20(Reuters),to%20renewables%2C%20two%20sources%20said). [Accessed 26 January 2025].

Cosbey, A., Wooders, P., Bridle, R. and Casier, L., 2017. In with the good, out with the bad: Phasing out polluting sectors as green industrial policy. in Altenburg and C. Assmann, (eds.) *Green Industrial Policy: Concept, Policies, Country Experiences*. Geneva: German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE), pp.185-198.

Department of Mineral Resources & Energy (DMRE)., 2024. *Integrated Resource Plan, 2023*. Available at: https://www.dmre.gov.za/Portals/0/Energy_Website/IRP/2023/IRP%20Government%20Gazzette%202023.pdf [Accessed 9 March 2025].

Department of Mineral Resources & Energy (DMRE) and Department of Trade, Industry and Competition (DTIC)., 2023. *South African Renewable Energy Masterplan (SAREM)*. Available at: [file:///C:/Users/HP/Desktop/Masters%20Research%20Report/South%20African%20Renewable%20Energy%20Masterplan%20\(SAREM\)%20Draft%20III_DMRE%202023.pdf](file:///C:/Users/HP/Desktop/Masters%20Research%20Report/South%20African%20Renewable%20Energy%20Masterplan%20(SAREM)%20Draft%20III_DMRE%202023.pdf) [Accessed 5 December 2024].

Dutz, M.A. and Sharma, S., 2012. Green growth, technology and innovation. *World Bank Policy Research Working Paper*, 5932.

Engineering News., 2022. Delays, inconsistency and lack of clarity blocking South African renewables rollout. *Engineering News*. Available at:

<https://www.engineeringnews.co.za/article/delays-inconsistency-and-lack-of-clarity-blocking-south-african-renewables-rollout-2022-02-11> [Accessed 19 February 2025].

Evans, P.B., 1995. *Embedded autonomy: States and industrial transformation*. Princeton University Press.

Fine, B. and Mohamed, S., 2022. Locating industrial policy in developmental transformation: Lessons from the past, prospects for the future. *SOAS Department of Economics Working Paper Series*, 247.

Fine, B & Rustomjee, Z., 1996. *South Africa's political economy: From minerals-energy complex to industrialisation*. Johannesburg. Wits University Press.

Geissdoerfer, M., Savaget, P., Bocken, N.M. and Hultink, E.J., 2017. The Circular Economy—A new sustainability paradigm?. *Journal of cleaner production*, 143, pp.757-768.

Gelb, S., 2007. Macroeconomic policy in South Africa. From RDP through GEAR to ASGISA. *At the end of the rainbow*, pp.15-26.

Golroudbary, S.R., Makarava, I., Kraslawski, A. and Repo, E., 2022. Global environmental cost of using rare earth elements in green energy technologies. *Science of the Total Environment*, 832, pp 1-12.

Gopal, A.R., Park, W.Y., Witt, M. and Phadke, A., 2018. Hybrid-and battery-electric vehicles offer low-cost climate benefits in China. *Transportation Research Part D: Transport and Environment*, 62, pp.362-371.

Harrison, A., Martin, L.A. and Nataraj, S., 2017. Green industrial policy in emerging markets. *Annual Review of Resource Economics*, 9(1), pp.253-274.

Harrison, N., Smith, M. and Chatré, B., 2015. *Benefits of a green economy transformation in Sub-Saharan Africa*. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

He, H., Sun, F., Wang, Z., Lin, C., Zhang, C., Xiong, R., Deng, J., Zhu, X., Xie, P., Zhang, S. and Wei, Z., 2022. China's battery electric vehicles lead the world: achievements in technology system architecture and technological breakthroughs. *Green Energy and Intelligent Transportation*, 1(1), pp.1-24.

International Labour Organisation (ILO)., 2018. Just transition towards environmentally sustainable economies and societies for all-ILO ACTRAV Policy Brief. *Geneva: International Labour Organization.* Available at: https://www.ilo.org/sites/default/files/wcmsp5/groups/public/%40ed_dialogue/%40actrav/documents/publication/wcms_647648.pdf [Accessed 31 July 2024].

Institute for Economic Justice., 2021. Challenging privatisation, Centring Public Ownership and Decent work. Climate, Energy and Infrastructure Policy Brief. *Institute for Economic Justice.* Available at: <https://www.iej.org.za/wp-content/uploads/2021/10/IEJ-policy-brief-SAREM.pdf> [Accessed 31 July 2024].

Invest SA., 2025. Mining & Mineral Processing. Available at: <https://www.investsa.gov.za/key-sectors/mining-mineral-processing/#:~:text=Mining%20and%20mineral%20beneficiation%20plays,fabrication%2C%20automotive%20and%20jewellery%20manufacturing.> [Accessed 28 July 2025].

Jacobs, S., 2023. 'Grants don't create jobs'. *Daily Investor.* Available at: <https://dailyinvestor.com/south-africa/21516/grants-dont-create-jobs/> [Accessed 19 February 2025].

Jaakkola, N., van der Ploeg, F. and Venables, A., 2023. " Big push" green industrial policy. *EconPol Forum* 24(6), pp. 32-36. Munich: CESifo GmbH.

Juhász, R., Lane, N. and Rodrik, D., 2023. The new economics of industrial policy. *Annual Review of Economics*, 16.

Just Transition Alliance., 2024. *Just Transition Alliance Principles.* Available at: <https://jtalliance.org/what-is-just-transition/> [Accessed 26 January 2025].

Kosacoff, B. and Ramos, A., 1999. The industrial policy debate. *Cepal Review*, 1999(68), pp.35-60.

Lall, S., 2004. *Reinventing industrial strategy: The role of government policy in building industrial competitiveness.* G-24 Discussion Paper Series, No. 28. Geneva: UNCTAD.

Lebdioui, A., 2024. Survival of the greenest: Economic transformation in a climate-conscious world. *Elements in Development Economics.*

- Levin, S., & Makgetla, N., 2021. Regional value chains and industrialisation: The southern African experience. *Transforming agriculture: Harnessing regional value chains and industrial policy for development*, pp. 1-30.
- Lyu, H., Ma, C. and Arash, F., 2024. Government innovation subsidies, green technology innovation and carbon intensity of industrial firms. *Journal of Environmental Management*, 369, p.1-22.
- MaArthur, E. 2019. How the circular economy tackles climate change. *Ellen MacArthur Found*, 1, pp.1-71.
- Masondo, D., 2018. South African business nanny state: the case of the automotive industrial policy post-apartheid, 1995–2010. *Review of African Political Economy*, 45(156), pp.203-222.
- Mazzucato, M., & Semieniuk, G., 2018. Financing Renewable Energy: Who is Financing What and Why it Matters. *Technological Forecasting and Social Change*, 120, 1–14.
- Mazzucato, M., 2015. The green entrepreneurial state. *The politics of green transformations*, 28, pp.134-152.
- McMillan, M, Rodrik, D & Verduzco-Gallo, Í 2014, 'Globalization, structural change, and productivity growth, with an update on Africa', *World Development*, 63, pp. 11–32.
- Medinilla, A. and Byiers, B., 2023. *The political economy of green industrialisation in Africa*. ECDPM Discussion paper No, 363. Maastricht: European Centre for Development Policy Management (ECDPM).
- Minerals Council South Africa., 2024. *2023 Comprehensive Facts and Figures*. Available at: file:///C:/Users/HP/Desktop/9465-24_minerals_council_facts_and_figures_es30.pdf [Accessed 28 July 2025].
- Mjimba, V., 2015. A case for industrial policy towards green economy transition in developing economies. *Africa Insight*, 45(3), pp.76-90.
- Mohlakoana, N., Rathupetsane, A., Malope, B. and Jacob, M., 2024. Demistifying employment in South Africa's Just Energy Transition: Exploring emerging decent work themes. *Development Southern Africa*, pp.1-17.

Molelekwa, T., 2023. Gaps in the renewable energy masterplan, civil society weighs in. *Iol.co.za*. Available at: <https://www.iol.co.za/news/gaps-in-the-renewable-energy-masterplan-civil-society-weighs-in-0fd5b798-37f5-4701-9c56-d82d481c1499> [Accessed 5 December 2024].

Mnguni, P. and Simbanegavi, W., 2020. *South African Manufacturing-A situational analysis* (No. 10410). South African Reserve Bank.

National Planning Commission., 2012. *Ensuring Environmental Sustainability and Equitable Transition to a Low Carbon Economy*. Available at: https://www.nationalplanningcommission.org.za/assets/Documents/NDP_Chapters/NDP%202030-CH5-Environmental%20sustainability.pdf [Accessed 19 February 2025].

National Treasury., 2024. 2024 MTBPS Economic Outlook. Available at: <https://www.treasury.gov.za/documents/mtbps/2024/mtbps/Chapter%202.pdf> [Accessed 18 July 2025].

Nchofoung, T.N., Edoh, O.M. and Monkam, N., 2024. Green finance, green innovation, and industrial development in Africa. *Energy Reports*, 12, pp.2801-2811.

Nelson, F. ed., 2010. *Community rights, conservation and contested land: The politics of natural resource governance in Africa*. Routledge.

Newman, S., 2019. The minerals-energy-complex and structural inequality in South Africa.

Obsie-Orlu, V. and Siyobi, B., 2024. Bridging gaps in the Integrated Resource Plan. *Mail & Guardian*. Available at: <https://mg.co.za/thought-leader/opinion/2024-02-23-bridging-gaps-in-the-integrated-resource-plan/> [Accessed 9 March 2025].

Okereke, C., Coke, A., Geebreyesus, M., Ginbo, T., Wakeford, J.J. and Mulugetta, Y., 2019. Governing green industrialisation in Africa: Assessing key parameters for a sustainable socio-technical transition in the context of Ethiopia. *World Development*, 115, pp.279-290.

Omarjee, L., 2022. SA still heavily reliant on coal for electricity. *News24*. Available at: <https://www.news24.com/fin24/economy/sa-still-heavily-reliant-on-coal-for-electricity-report-20220405> [Accessed 19 February 2025].

Otto, F.E., Harrington, L.J., Frame, D., Boyd, E., Lautu, K.C., Wehner, M., Clarke, B., Raju, E., Boda, C., Hauser, M. and James, R.A., 2020. Toward an inventory of the impacts of

human-induced climate change. *Bulletin of the American Meteorological Society*, 101(11), pp.1972-1979.

Oqubay, A., 2024. *Green Industrial Policy and Industrialisation in Africa*. SARChI Industrial Development Working Paper Series WP 2024-02. Johannesburg: University of Johannesburg.

Ovadia, J.S., 2014. Local content and natural resource governance: The cases of Angola and Nigeria. *The Extractive Industries and Society*, 1(2), pp.137-146.

Padilla, E., 2017. What can developing countries gain from a green transformation?. *Green Industrial Policy*. in Altenburg and C. Assmann, (eds.) *Green Industrial Policy: Concept, Policies, Country Experiences*. Geneva: German Development Institute / Deutsches Institut für Entwicklungspolitik (DIE), pp.185-198.

Presidential Climate Commission., 2023. *Easy Lessons and Recommendations from Komati's Decommissioning and Repurposing Project. A Presidential Climate Commission Report*. Available at: <https://pccommissionflo.imgix.net/uploads/documents/PCC-Komati-Power-Station-Recommendations-Report.pdf> [Accessed 25 January 2025].

Presidential Climate Commission., 2022. *A Framework for a Just Transition in South Africa*. Available at: https://pccommissionflo.imgix.net/uploads/images/22_PAPER_Framework-for-a-Just-Transition_revised_242.pdf [Accessed 9 March 2025].

Presidential Climate Commission., 2025. *Overview*. Available at: <https://www.climatecommission.org.za/> [Accessed 9 March 2025].

Rodrik, D., 2014. Green industrial policy. *Oxford review of economic policy*, 30(3), pp.469-491.

Schaaf, L., 2017. Leading the way. *Our Planet*, 2016(1), pp.22-25.

Shan, C. and Ji, X., 2024. Environmental regulation and green technology innovation: an analysis of the government subsidy policy's role in driving corporate green transformation. *Industrial Engineering and Innovation Management*, 7(1), pp.39-46.

Shen, W., He, J. and Yao, S., 2021. Green industrial policy in the post grid parity era: Governing integrated Solar+ projects in China. *Energy Policy*, 150, pp.1-10.

Schmitz, H., Johnson, O. and Altenburg, T., 2015. Rent management—the heart of green industrial policy. *New Political Economy*, 20(6), pp.812-831.

Schoneveld, G. and Zoomers, A., 2015. Natural resource privatisation in Sub-Saharan Africa and the challenges for inclusive green growth. *International Development Planning Review*, 37(1), pp.95-118.

Schwank, O., 2018. *Linkages in South African economic development: industrialisation without diversification?*. Peter Lang International Academic Publishers.

Schwarzer, J., 2013. *Industrial policy for a green economy*. Winnipeg, MB, Canada: International Institute for Sustainable Development.

Singh, S., 2010. The South African ‘information society’, 1994–2008: Problems with policy, legislation, rhetoric and implementation. *Journal of Southern African Studies*, 36(1), pp.209-227.

Stats SA., 2021. *Three facts about the manufacturing industry 2021*. Available at: <https://www.statssa.gov.za/?p=16493#:~:text=Manufacturing%20jobs:%20Johannesburg%20is%20in,30%25%20of%20the%20provincial%20workforce> [Accessed 28 July 2025].

Steiner, A., 2015. *Uncovering pathways towards an inclusive green economy: A summary for leaders*. UNEP.

Sowman, M. and Wynberg, R., Governance for Justice and Environmental Sustainability.

Szirmai, A 2012, ‘Industrialisation as an engine of growth in developing countries, 1950–2005’, *Structural Change and Economic Dynamics*, vol. 23, no. 4, pp. 406–420.

Tamasiga, P., Mfuni, H., Onyeaka, H. and Ouassou, E.H., 2023. Green industrial policy as an enabler of the transition to sustainability: challenges, opportunities and policy implications for developing countries. *Environment, Development and Sustainability*, pp.1-22.

The DTIC., 2024. Industrial Policy & Strategy Review. *Transforming Vision into Action: Charting South Africa’s Industrial Future*. Available at: <https://www.thedtic.gov.za/wp-content/uploads/dtic-industrial-policy-review.pdf>. [Available 14 July 2025].

The Green Connection., 2022. ‘Mr President, SA Urgently Needs a Plan to Address the Energy and Climate Crises!’ *Emergency Speeches and Knee-Jerk Reactions do not Provide*

Real, Sustainable Solutions - The Green Connection. [online] Available at: <https://thegreenconnection.org.za/2022/11/04/mr-president-sa-urgently-needs-a-plan-to-address-the-energy-and-climate-crisis-emergency-speeches-and-knee-jerk-reactions-do-not-provide-real-sustainable-solutions/> [Accessed 5 December 2024].

The Green Connection., 2023. *SAREM Falls Short Of Articulating A Vision For Renewable Energy.* Available at: <https://thegreenconnection.org.za/2023/08/02/sarem-falls-short-of-articulating-a-vision-for-renewable-energy-the-green-connection/> [Accessed 5 December 2024].

Trading Economics., 2025. *South Africa – Manufacturing, Value Added (% Of GDP).* Available at: [https://tradingeconomics.com/south-africa/manufacturing-value-added-percent-of-gdp-wb-data.html#:~:text=Manufacturing%2C%20value%20added%20\(%25%20of%20GDP\)%20in,development%20indicators%2C%20compiled%20from%20officially%20recognized%20sources](https://tradingeconomics.com/south-africa/manufacturing-value-added-percent-of-gdp-wb-data.html#:~:text=Manufacturing%2C%20value%20added%20(%25%20of%20GDP)%20in,development%20indicators%2C%20compiled%20from%20officially%20recognized%20sources) [Available 28 July 2025].

Tsegay, B., 2020. *Green Economy for Climate Change Mitigation and Poverty Reduction in Sub-Saharan Africa: A Critical Analysis of Carbon Finance in Ethiopia* (Doctoral dissertation, SOAS University of London).

United Nations Economic Commission for Africa. and UNEP., 2016. *Enabling measures for an inclusive green economy in Africa:* Available at: file:///C:/Users/HP/Desktop/UNECA_Enabling%20measures%20for%20an%20inclusive%20green%20economy%20in%20Africa.pdf [Accessed 14 July 2025].

UNDP., 2024. *UNDP South Africa Launches Report on the Just Energy Transition from the Perspectives of Mining Communities.* Available at: <https://www.undp.org/south-africa/press-releases/undp-south-africa-launches-report-just-energy-transition-perspectives-mining-communities> [Accessed 5 December 2024].

Visser, W., 2004, September. Shifting RDP into GEAR: The ANC government's dilemma in providing an equitable system for social security for the 'new' South Africa. In *A paper presented at the 40th ITH Linzer Konferenz* (Vol. 17).

Qase, N. and Montmasson-Clair, G. *South African Renewable Energy Masterplan (SAREM) - An inclusive industrial development plan for the renewable energy and storage value chains by 2030.* Workshop Presentation.

Warwick, K., 2013. Beyond industrial policy: Emerging issues and new trends. *University of Cambridge*.

World Bank Group., 2022. *Country, Climate and Development Report*. Available at: [file:///C:/Users/HP/Desktop/SA_CCDR_MainReport%20\(1\).pdf](file:///C:/Users/HP/Desktop/SA_CCDR_MainReport%20(1).pdf) [Accessed 5 December 2024].

World Bank Group., 2023. *Social Dimensions of Climate Change*. Available at: <https://www.worldbank.org/en/topic/social-dimensions-of-climate-change> [Accessed 5 December 2024].

World Bank Group., 2024. *Overview The World Bank in South Africa*. Available at: <https://www.worldbank.org/en/country/southafrica/overview> [Accessed 27 January 2025].

World Bank Group., 2025. Manufacturing, value added (% of GDP) – South Africa. Available at: <https://data.worldbank.org/indicator/NV.IND.MANF.ZS?locations=ZA> [Accessed 2 October 2025].

Xu, L., 2022. Towards green innovation by China's industrial policy: Evidence from made in China 2025. *Frontiers in Environmental Science*, 10, pp. 1-10.

Yang, L., Liu, Y. and Deng, H., 2023. Environmental governance, local government competition and industrial green transformation: Evidence from China's sustainable development practice. *Sustainable Development*, 31(2), pp.1054-1068.

Yuan, X., Li, L., Gou, H. and Dong, T., 2015. Energy and environmental impact of battery electric vehicle range in China. *Applied Energy*, 157, pp.75-84.

Zhou, R., 2024. South Africa's Komati Reporting and Repurposing Project. *Climate Scorecard*. Available at: <https://www.climatescorecard.org/2024/02/south-africas-komati-reporting-and-repurposing-project/#:~:text=The%20JETP%20programme%20is%20a,though%20at%20a%20lower%20output> [Accessed 25 January 2025].