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The IDC and green industrialisation in South Africa

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CCRED-IDTT Working Paper 2023/05

July 2023

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Department:
Trade, Industry and Competition
REPUBLIC OF SOUTH AFRICA



SARChI Chair:
Industrial Development



Abstract

The push for decarbonisation is dictating international efforts to limit GHG emissions. As one of the most carbon-intensive economies in the world, South Africa is facing increasing pressures to reorientate its most carbon-intensive sectors. However, South Africa's economy has been plagued by persistent issues linked to the lack of structural transformation and diversification of the product space and export basket due to a political economy created during the apartheid era that entrenched a particular set of industries. The challenge for South Africa's policymakers is thus to industrialise while transitioning its energy system away from carbon towards renewable energy sources in an environment of constrained energy supply and loadshedding. Achieving these targets necessitates embracing economic opportunities in green technologies to drive industrial development, innovation, and economic diversification and foster a more sustainable and inclusive economy. Development finance must be central to this.

The significant economic pivot and restructuring depend on a massive investment and reinvestment programme in renewable energy, specific sectors known as high emitters, and developing linkages between sectors. South Africa's green financial landscape is not developed enough to supply the scale needed while realising the economy-wide spill-overs require development finance to crowd in investment along value chains and across sectors. This lack of a developed green financing landscape suggests a more significant role for development finance institutions (DFI), which can more easily mobilise patient capital aimed at longer-term development goals. Considering these issues, this paper evaluates development finance's role in green industrialisation in South Africa, particularly the green financing of the country's largest DFI, the Industrial Development Corporation (IDC). The paper reviews the IDC's green industrial financing using disclosed and publicly available data and suggests a set of criteria with which the IDC can assess the transformational impacts of its climate change funding.

Keywords: climate change, development finance, South Africa, industrialisation

JEL codes: Q54, G23, O14

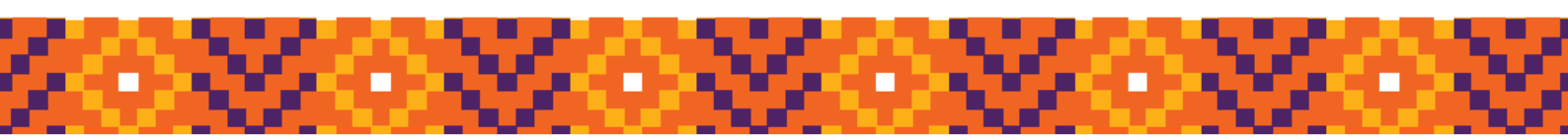


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1. Introduction

From being one of the most carbon-intensive energy suppliers in the world (IEA, 2022), South Africa is engaging efforts to map out a route towards a green just and equitable energy transition. It has reinforced its commitment to meet the Paris Agreement target while recognising a just transition towards low-carbon development as an explicit goal of South Africa's climate policy. The challenge for South Africa is great, given that South Africa's economy is based on energy and carbon-intensive industries (Fine & Rustomjee, 1996; Bell, et al., 2018; Andreoni et al., 2021), and there is also increasing global pressure, notably from EU Green Deal policies, pushing for the greening of production, impacting how producers participate in global value chains (PCC, 2023; Bell et al., 2022). However, South Africa's natural advantages in solar and wind renewable energy also mean significant opportunities for industrialisation in transitioning to renewable energy.

This paper analyses the role of the IDC in green industrialisation in South Africa. We define green industrialisation as any activities utilising technologies and methods that assist in achieving the government's climate change mitigation agenda. This definition includes a broader scope of supporting sectors such as renewable electricity and green hydrogen that assist in decarbonising the economy and can strengthen linkages between different industrial sectors. Whilst a crucial component, low-cost and patient development finance is only one part of a much larger set of structures that must work in tandem to support the development of the green economy and other green value chains. This includes a stable policy framework around renewable energy, the commitment to developing green hydrogen, and a focus on broader sectoral linkages.

Green economic growth in South Africa will be driven by investing in cleaner industries and sectors and creating green jobs while reducing the carbon intensity of established industries (DFFE, 2022). Embracing economic opportunities in green technologies can drive industrial development, innovation, and economic diversification, leading to a more sustainable economy and better inclusion.

South Africa's Just Energy Transition Investment Plan (JET-IP) sets out South Africa's priorities for the next five years (2023-2027) in terms of transitioning the economy. It sets out the scale of need and investment required in a set of priority sectors to support the decarbonisation commitments made by the South African government (Table 1). The three main sectors identified are electricity, NEV, and green hydrogen.

- In electricity, the focus is on decommissioning the retiring coal generation fleet, the development of renewable generation at scale and pace, strengthening the grid infrastructure, and modernising the distribution system;
- In the NEV sector, the focus is on transitioning the automotive sector towards electric vehicles by building the NEV supply chain localisation and setting the base for NEV manufacturing and components to protect sector employment;
- In the green hydrogen sector, the focus is on setting South Africa up to become a world-leading exporter of green hydrogen by incubating local green hydrogen ecosystems; undertaking critical planning, feasibility, and proofs of concept; and developing the necessary skills. This is intended to create jobs, exports, and domestic decarbonisation of key emissions-intensive industries.

Table 1: JET-IP funding requirements

Funding requirements (2023-2027)	R'Billion (USD'Billion)
Electricity sector	711.4 (47.2)
New Energy Vehicle (NEV) Sector	128.1 (8.5)
Green Hydrogen (GH2) Sector	319 (21.2)
Skills development	2.7 (0.18)
Municipal capacity	319.1 (21.3)
TOTAL	1,480 (98.7)

Source: JET-IP

Additionally, a range of trade-based initiatives, mainly from the EU, require greening and more sustainable production in at-risk sectors for producers to compete effectively in markets. The external risks and internal challenges necessitate a robust and efficient industrial development finance landscape to assist in structurally transforming the economy and building a more diversified industrial base that can compete in a world where green is becoming the standard.

The IDC is the most prominent industrial financier in the development finance space in South Africa. As such, it has a pivotal role in supporting the transition of South African industry toward greener methods of industrialisation and supporting the broader mitigation agenda. The study seeks to understand the IDC's strategy regarding what specific funding schemes or programmes are available for green industrialisation purposes from the IDC; and what the scale, scope and focus of funding have been since 2010. In addition, the study takes a more forward-looking approach in certain areas, considering how the IDC is placed to deal with some of the green transition issues in the future, including incentivising businesses to transition toward greener technologies, facilitating growth in green hydrogen, and supporting the move towards electric vehicles.

This paper proceeds as follows. Section 2 details some green financing demands and gives an overview of the green industrial financing landscape in South Africa. Section 3 explores the IDC's financing patterns from the point of view of green industrialisation. The section also outlines the IDC's positioning and support for specific segments of the green economy, notably green hydrogen and NEVs. Then in section 4, we explore a set of criteria for assessing the IDC in the context of their support for green industrialisation and what specific measures of success they can be evaluated on before providing some concluding remarks.

2. Green financing demand and an overview of the green industrial financing landscape in South Africa

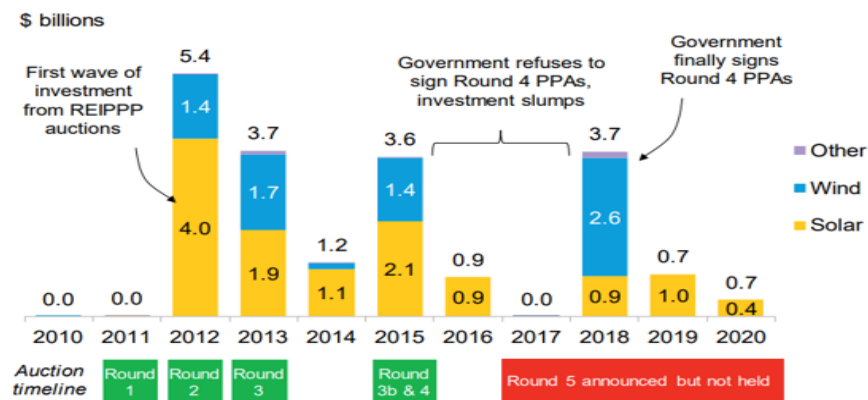
2.1. Green financing demand: Renewable energy and the REIPPP

The Renewable Independent Power Producers Procurement Programme (REIPPPP), launched in 2011, aims to bring additional megawatts onto the country's electricity system through private sector investment in wind, biomass and small hydro. Eligible technologies include onshore wind; solar photovoltaic (PV); concentrated solar power (CSP); small hydro; biomass; biogas, or landfill gas. It was introduced to implement the Integrated Resource Plan (IRP 2010-2030) objectives to diversify the country's energy mix away from fossil fuels towards greener energy.

From 2011 to 2021, four bidding windows of the REIPPPP were completed, allowing the private sector and independent power producers to invest in the South African renewables markets. Excluding Bid Windows 5 and 6, 302 bids were submitted, with around 30% (92) selected, amounting to 6.4 GW of power. Of the 92, close to 70% (4.41GW) are operational. Most projects are in wind and solar (5.65 GW) (Nxumalo, 2022).

However, these four windows bidding windows occurred between 2011 and 2015, with the government stalling the programme between 2016 and 2021 when no new clean energy auctions were held. In addition, round 4 power purchase agreements were only signed in 2018. The programme was finally brought back onstream in 2021 (Figure 1).

Figure 1: New Renewable Investment in South Africa between 2010 and 2020

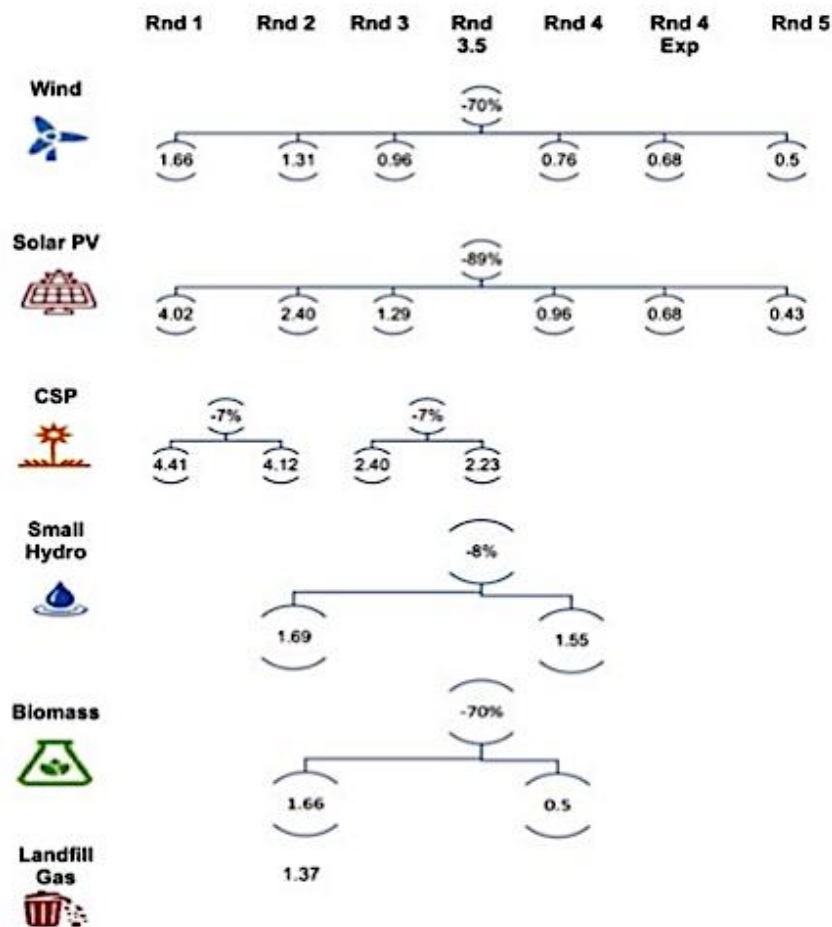


Source: BloombergNEF

The REIPPPP's auctions have had significant benefits for the costs of renewable energy. Auctions allow for costs to be revealed through setting up competitions, and successive auctions enable learning to flow through to lower prices. Thus, competitive auctions generally result in prices that reflect ongoing technology cost trends, which can lower subsidy costs (Esser and Champion, 2021). South Africa is now producing renewable energy at some of the lowest tariffs in the world (Figure 2). However, had the renewable energy programme been pursued post-2015, tariffs would likely have been lower.

Auctions provide a route to the market and long-term price contracts that can give revenue certainty and attract a low cost of capital to new renewables projects (Esser and Champion, 2021). The REIPPPP auction scheme was successful in kick-starting renewables investment in South Africa. It boosted investment rapidly following each successful round. Thus, the evidence suggests a potential to unlock low-cost renewable energy exists, given an appropriate policy framework in South Africa that sets up a foundation for attracting finance. However, the lack of commitment to the REIPPPP creates significant investor uncertainty.

Figure 2: REIPPPP Bid 1-5 Pricing Trends R/kWh



Source: Nxumalo (2022)

There are significant problems with the electricity supply currently, and this – together with the need to decarbonise the energy system given the commitments to the Paris Agreement as well as the renewable needs for green hydrogen – requires a stable and appropriate policy framework to crowd in finance. It is estimated that with green hydrogen the average annual build rate could potentially be around 13 GW per annum (NBI, 2022). The scale of financing required is thus very significant compared to what has thus far been invested.

2.2. The green industrial financing landscape

Ideally, the financial system of a country is responsible for aggregating and allocating savings toward productive and long-term investments. However, due to structural deficiencies and market failures in many financial systems, particularly in developing countries, there often needs to be more financing of longer-term investments for structural transformation. Development finance institutions play this role. Historically, the role of development banks has been to mobilise and combine or 'blend' public with private finance to bridge the gap in financing required to advance the need for structural transformation and development (Ocampo and Ortega, 2020; Griffith-Jones and Ocampo, 2018). DFIs are specialised development banks or subsidiaries (either bilateral or multilateral) that support private sector development in developing countries. Evidence shows that DFIs positively

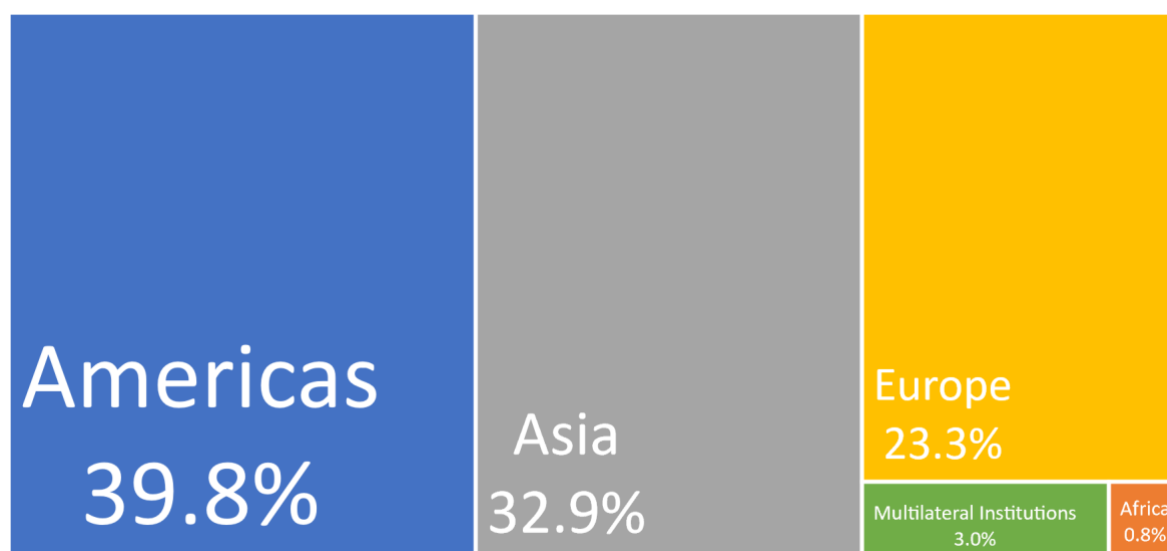
impact economic growth, GDP per capita, investment, and labour productivity (Massa, et al., 2016).

Recent research has revived the case for the role of development banks in creating new industries and industrial capabilities by acting as a primary source of long-term patient finance for development (Amsden, 2001; Mazzucato & Penna, 2016; Griffith-Jones & Ocampo, 2018; Xu, et al., 2020; Ocampo & Ortega, 2022). This case for DFIs has increasingly become more critical as developmental challenges have steadily increased, including climate change, financial crises, food and oil price swings, security threats, pandemics, and the increasing scarcity of water, energy and land resources (Te Velde, 2011). Moreover, these challenges are amplified because many economies continue subsidising carbon emissions instead of pricing them correctly.¹

Despite climate finance globally reaching record levels in 2021 (\$51 billion in developing economies), there is a need for more funding in low- and middle-income countries (African Development Fund, 2022). These needs are apparent in South Africa, particularly given the failings of the private sector to provide sufficient climate funding (Lowitt, 2021). Long-term finance is critical, given the long horizons associated with measures taken to cut carbon pollution (Kahn, 2016). Therefore, to respond to the climate challenges DFIs necessitate a significant expansion in the scope of their activities along with an increase in the volume of their funding (Songwe, et al., 2022).

By asset size, development institutions in the Americas, Asia, and Europe dominate, controlling over 90% of the global assets (approximately \$22 trillion in 2020) (Figure 3).

Figure 3: DFI assets by region, 2022



Source: Xu et al. (2021)

Notes: The percentages do not sum to 100% due to rounding.

¹ Remarks by Gernot Wagner in an interview with Climate Central “10 Years on, Climate Economists Reflect on Stern Review”. Available here: <https://www.climatecentral.org/news/climate-economists-stern-review-20827>

In contrast, Africa's total DFI assets amount to a mere \$188 billion (0.8% of the total asset value), with the largest institution being the African Development Bank, with assets of \$50 billion in 2020 (Xu et al., 2021).

South Africa faces a formidable challenge in mobilising its financial sector to finance its climate agenda (UNECA, 2016). As of 2021, the country required climate finance investment of R600 billion per year to 2030 to hold to the Paris Agreement's aim of holding warming well below 2°C, aiming for the target of 1.5°C (Cassim, et al., 2021).

Most funding available in South Africa (whether from public or private, local or offshore sources) is for well-developed projects operating in the diffusion of commercially mature technologies (NBI, 2013; 2015; Cassim, et al., 2021). These are predominantly large ticket projects using established and tested technology with low-risk profiles and predictable financial returns. In line with this, evidence shows that most climate finance in South Africa has been private finance for clean energy generation (Cassim, et al., 2021). Regarding public finance (including funds provided by governments and their agencies, climate funds, and DFIs), the government was the biggest player, accounting for 55% of the tracked public investments in 2017-2018. DFIs accounted for 25% of tracked public investments in 2017-2018, focusing on clean energy and mitigation projects.²

59% of the tracked climate finance was raised as debt, with the majority (R28.9 billion of R36.5 billion) at market rates, some of which may have had other concessional characteristics. The debt raised indicates the confidence and viability of climate mitigation projects in South Africa, with a total of R27.9 billion being invested in clean energy (Cassim, et al., 2021).

South Africa's DFIs do not compare favourably to comparator countries³ like Thailand, Malaysia and Brazil when we look at the scale of South Africa's DFI systems compared to these countries (Table 2). DFI assets as a percentage of GDP for Thailand (35.8%), Malaysia (15.1%) and Brazil (9.8%) are significantly higher than for South Africa (6.1%) in 2020. The ability of DFIs to fund activities for structural transformation is thus much higher in countries like Thailand, Malaysia and Brazil than in South Africa.

Table 2: DFI Assets and share of GDP, 2020

	2020 GDP (USD Million, constant 2015 prices)	GDP per capita 1994 (USD, constant 2015 prices)	GDP per capita 2020 (USD, constant 2015 prices)	2020 Total Assets (Million USD)	DFI assets (% of GDP, 2020)
Brazil	1,749,103.39	6,358.70	8,204.20	170,841	9.8%
Thailand	344,099.36	3,371.30	6,042.00	123,081	35.8%
Malaysia	431,857.37	5,453.90	10,374.20	65,102	15.1%
Türkiye	1,015,326.66	5,376.20	12,072.40	44,442	4.4%
South Africa	335,640.15	4,330.70	5,726.30	20,488	6.1%

Source: Authors' calculations based on Xu et al. (2021) and World Bank World Development Indicators

² Climate finance from international donor governments and agencies accounted for a mere 20% of tracked public flows in 2017-2018.

³ These countries are often used as comparators for South African given their similar GDP per capita figures in 1994.

One of the constraining factors for South Africa is that the largest DFIs in South Africa (the IDC and Development Bank of Southern Africa (DBSA)) are self-funded while internationally, DFIs are majority-owned by national governments and mainly source their funding from national or international development funds or benefit from government guarantees to ensure their creditworthiness and competitiveness (OECD, 2022). For instance, the Brazilian development bank BNDES receives funding from the Brazilian government (OECD, 2019) as does the Asian Development Bank, which oversees and provides funding to Thailand and Malaysia (ADB, 2023a; 2023b). The lack of funding security offered to South Africa's DFI limits their extension of credit despite the positive impact this funding has been found to have on manufacturing and the country's human development index (Barnard, 2016). The evidence points to the IDC having not provided adequate patient capital since 1994. Moreover, much of its finance has supported capital-intensive upstream sectors of the economy at the expense of labour-absorptive downstream sectors (Goga et al. 2019).

One area which has attracted significant investments is the REIPPPP programme, where roughly 80% of the investment has been raised locally, with 20% originating from foreign direct investment, showing how strong the financial sector is in South Africa (Nxumalo, 2022). In the early rounds of the REIPPPP, finding suitable bidders or financing locally was not a challenge, pointing to the efficacy of the green financial landscape to pool finance where programmes are well-designed. However, the scale of renewable energy and the finance needed going forward is much higher, considering the decarbonisation needs of the economy. It is estimated that by 2050, at least 190GW of renewables need to be installed. This means that at least ~6-7 GW of renewables must be deployed yearly for the next three decades for the power system alone. Furthermore, to capture the significant opportunity presented by the GH2 economy and other green industries, the average annual build rate could double to around 13 GW per annum (NBI, 2022). This expected scale is a challenge given that South Africa's installed capacity of ~5 GW of renewables today took over 10 years to build, though this was mainly between 2011 and 2015.

The required capacity going forward points to the challenge that the country will need to overcome. This will require a stable policy framework that sets the basis for investment in renewable energy capacity from DFIs and private sector funders. It will also require investments to the grid, as the shortage of grid connections is a major challenge to the ramping up of renewable energy in South Africa.⁴

In summary, the scale and focus of funding for climate finance partly has to do with the presence of programmes. The presence of bidding windows for REIPPPP in the 2011 to 2015 years attracted projects and funding and lowered tariffs substantially. Thus, the government's commitment to a renewable energy programme, including investment in grid infrastructure, is essential for boosting investor confidence and setting the basis for development finance to play a role.

2.3. External risks driving green economy investments in other priority sectors

Increasingly, firms will require investments to deal with a raft of policies related to EU Green Deal that are pushing firms to decarbonise and produce more sustainably. One of South Africa's main trading partners is the EU, with around 20% of exports in 2021 going to the EU

⁴ See for instance <https://www.timeslive.co.za/news/south-africa/2023-03-14-inadequate-grid-hampers-south-africas-power-generation-plans/>

and the share of exports to the EU increasing over time (Bell, et al., 2022). The EU has the most advanced set of climate policies related to the EU Green Deal, many of which impact importers from developing countries. These policies will increasingly challenge producers from developing countries through carbon taxes, sustainability measures, and changing consumer preferences.

The most direct of these is the Carbon Border Adjustment mechanism (CBAM), which will force exporters from developing countries to pay a carbon price equal to local producers unless they are equally carbon taxed or have already decarbonised (Montmasson-Clair, 2021). Initially, only the iron and steel, cement, fertiliser, aluminium and electricity sectors were included to be taxed by the CBAM, but hydrogen has now been included. Importantly, the policy space around carbon taxes is evolving and may include both downstream products (“some precursors and a limited number of downstream products” although precise details are not available), and in the future, may include chemicals and polymers.

Furthermore, it appears as though indirect emissions will also be included, that is, emissions from the use of electricity. This would be a real challenge for South Africa, given the coal intensity of electricity production in South Africa (Andreoni, et al., 2023). The CBAM will come into effect in 2023. However, it will be administrative until 2026, during which time importers of the identified products into the EU will be required to report on actual direct and indirect embedded emissions. South African exports to the EU will fall relative to a baseline with no CBAM, and the impact will be greater if indirect emissions are included. The sectors expected to be impacted the most (given their carbon intensity and exports to the EU) will be the iron, steel, and aluminium sectors (Bell et al., 2022; PCC, 2023).

Two other sectors (transport and automotives and agriculture) face significant risks, primarily from the EU’s EGD policies (Bell et al., 2022), considering their emissions from production, the number of jobs in these sectors, and the value of exports they generate for the economy.

2.3.1. Food, agriculture and other

Beyond the CBAM, the Common Agricultural Policy (CAP) and Farm-to-Fork strategy will impact on the food and agriculture sectors, with several priorities relating to reducing pesticide usage, fertilisers and antibiotic usage in farming. The agriculture and food sectors represent two of South Africa’s most significant sectors employing 575,000 people in 2021 and accounting for R150 billion in exports in 2020. South Africa’s exports to the EU are mainly citrus, grapes, wine and fruit juices (Bell et al., 2022).

As far as pesticides are concerned, some used locally are already not authorised for use in the European Union or are subject to much stricter standards. In 2020, the European Food Safety Authority adjusted maximum levels for certain pesticides and excluded several others (Wood, 2021). Furthermore, the CBAM may, in the future, include other products such as wine, sugar and wool, all of which rank among South Africa’s top 50 exports (Bell et al., 2022). The CAP and Farm-2Fork strategies are taking shape as trade barriers that will necessitate South Africa’s agriculture sector to seek avenues for competitiveness and emissions reductions.

The EU German Supply Chain Law and the EU Supply Chain Due Diligence Directive will make importers responsible for the environmental impact of their suppliers, as well as labour standards and human rights. It will mean large importers become even stronger

gatekeepers, aggregating data while likely pushing adjustment costs onto suppliers. The vast disparities between large and small food producers in dealing with the challenges posed by green standards and regulations such as eco-labelling will ultimately reinforce the power of large food companies at the expense of smaller players (Bell, et al., 2022). These power imbalances must be addressed if the gains from the green economy are to be shared more inclusively among a broader base of players in the food and agriculture sectors.

2.3.2. Electric vehicles

The transport and automotive sectors have been identified as needing prioritisation due to the risks the sector faces from the EU's Green Deal policies explicitly targeting the import of internal combustion engine vehicles (Bell, et al., 2022). The European Commission (EC) has adopted ambitious CO2 emissions standards for new cars and vans to help grow the amount of low and zero-emission vehicles on European roads. It has proposed a 55% reduction of emissions from cars by 2030, a 50% reduction from vans by 2030, and zero emissions from new cars and vans by 2035. Essentially, traditional ICE vehicles will be phased out by 2035. This poses a significant threat to the future of the automotive industry in South Africa, with as much as 23% of the total exports to the EU in 2022 coming from the sector. It is estimated that 110,000 people are employed in the automotive sector (Crouth, 2022), making a move towards electric vehicles in the sector critical.

3. The Industrial Development Corporation

3.1. The IDC in the South African DFI landscape

The IDC is the most significant development financier (by asset size) in South Africa (Table 3) and is tasked with facilitating the implementation of industrial policy to align with the objectives and aims of the new Growth Path (NGP), National Development Plan (NDP), and the Industrial Policy Action Plans (IPAPs).⁵ The core of the IDC's agenda is the development of industrial capacity, regional development, and nurturing the integration and empowerment of black industrialists. Crucially, the IDC is a self-funded institution where much of its funding is derived from income from debt payments and the maturation of equity investments. Additional funding is secured through agreements with commercial banks, other DFIs, and other financing institutions.

Table 3: South Africa's DFI's by Total Assets, 2020

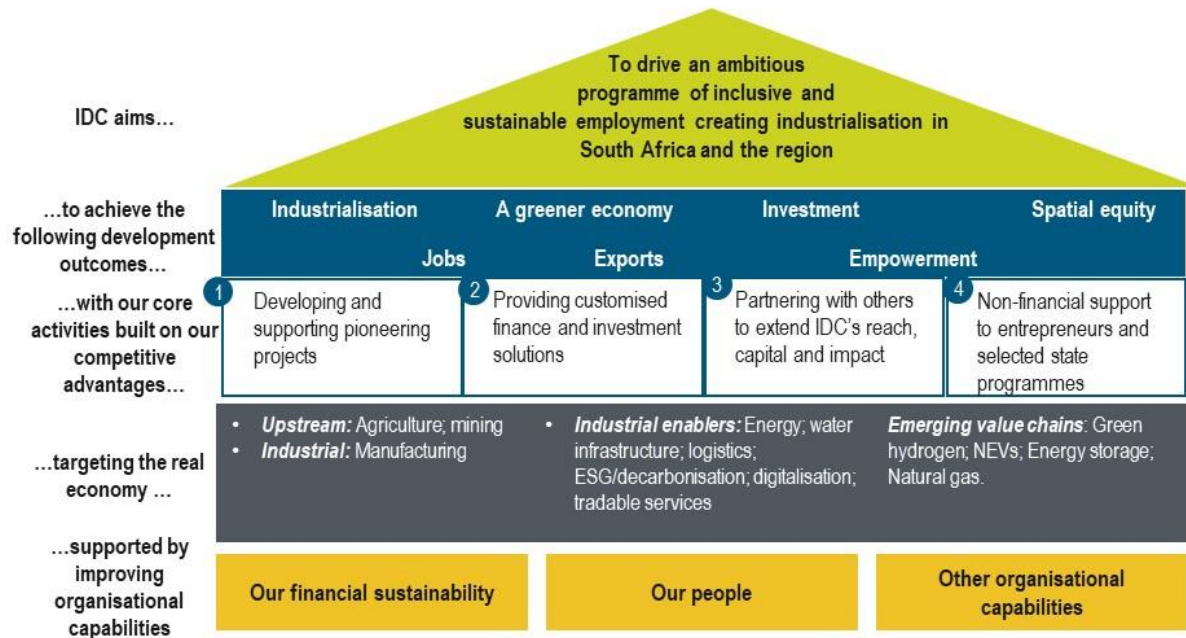
DFI	Total assets (2020, USD'Millions)
Industrial Development Corporation	9,811
Development Bank of Southern Africa	6,830
Land Bank	2,742
National Housing Finance Corporation	469
Small Enterprise Finance Agency	324
National Empowerment Fund	312
SA total	20,488

Source: Authors' calculations based on Xu, et al. (2021)

⁵ <https://idc.co.za/about-us/>

The IDC measures its success through its impact on jobs, exports, industrialisation, a greener economy, investment, spatial equity, and empowerment impacts (Figure 4). These are achieved through the IDC participating in developing and supporting pioneering projects; providing customised finance and investment solutions; partnering with others to extend the IDC's reach; and non-financial support in the real economy (key sectors and value chains).

Figure 4: IDC's organisational aims and operational pillars



Source: IDC (2022)

Before 1994, the IDC worked with the government to support the formation of an economy and export basket focused on promoting the industries making up the minerals-energy complex (MEC) (Fine & Rustonjee, 1996). Throughout much of the early democratic era (1994 to 2007 period), studies have pointed to the role of the IDC in reinforcing the economic structure by continuing funding of upstream, resource-based sectors (Mondi & Roberts, 2005; Black & Roberts, 2009; Fumbata, 2016; Goga, et al., 2019). However, after adopting the National Industrial Policy Framework (NIPF), which focused on supporting labour-intensive and value-added manufacturing sectors, the IDC began diversifying its funding in some respects, including renewable energy and adaptation projects.

3.2. IDC's early renewable energy and green economy financing, 2011-2017

3.2.1. Overview

The South African government mandated the IDC to align its green financing agenda with the NGP and IPAP2 (2011/12 – 2013/14) to assist it in achieving its evolving green industrialisation agenda.⁶ **Error! Reference source not found.** The IDC's support for the green economy has been primarily through its dual involvement with financing REIPPPP and projects to reduce emissions and air pollution from industrial activities (van Tonder, 2014). The IDC utilises several funding streams. These include its own funding and portfolio, while

⁶ Key sectors included: Wind power generation, Photovoltaic power generation, Concentrated solar power generation, Industrial energy efficiency, Water efficiency, Waste management, Biomass and waste management, Energy-efficient vehicles.

it also manages partner funding schemes and special programmes to help it facilitate its green mandates.

In 2011, the IDC began funding projects in the REIPPPP, playing a pivotal role in the early de-risking of the green economy and supporting its own identified sub-sectors, including energy efficiency, fuel-based green energy, and emissions pollution mitigation, and bio-ethanol (van Tonder, 2014). To facilitate the renewable energy sector and green economy, the IDC began managing partner funding schemes, including the Sustainable Use of Energy Resources and Energy Financing (SUNREF) from the Agence Française de Développement (AFD) - (SUNREF I, established in 2012), with a second round of funding (SUNREF II) concluded in 2016. IDC also managed the Green Energy Efficiency Fund from KfW (GEEF, established in 2010). Additionally, the PIC provided a funding pool investing R5 billion into the IDC to establish a green bond to fund clean-energy infrastructure developments and securely operationalise its green economy funding.⁷

The IDC's approach to green industrialisation is multi-pronged, encompassing five pillars: decarbonisation, diversification, finance mobilisation, partnerships and inclusivity.⁸

3.2.2. Funding for the REIPPPP and the role of the IDC

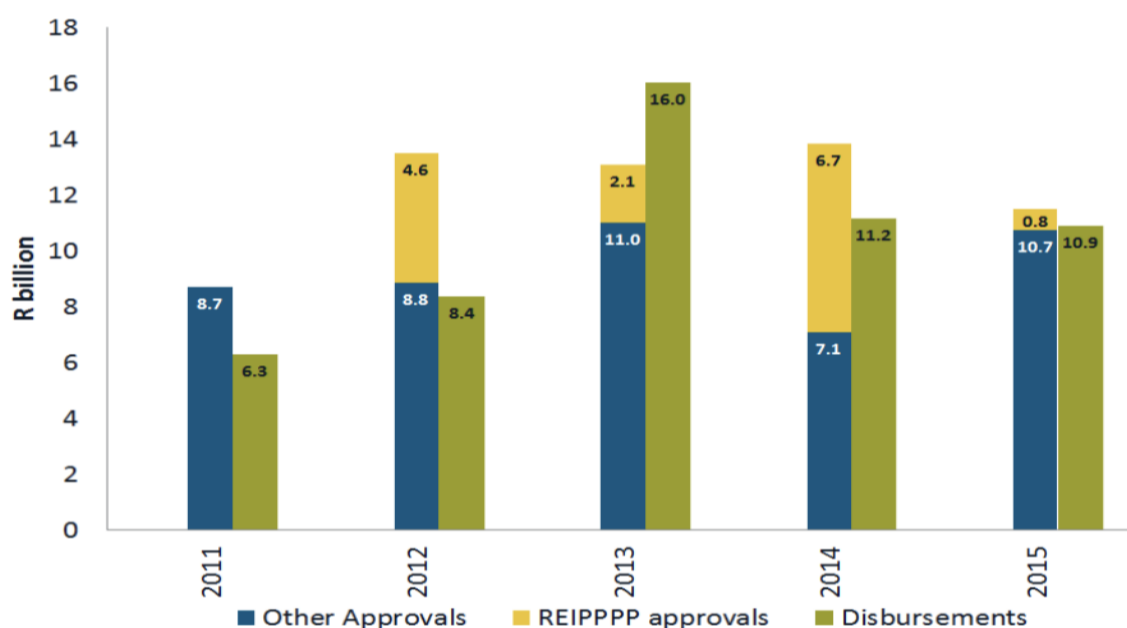
The total investment for the REIPPPP has been around US\$ 20.5 billion, with most investments targeting solar (\$13 billion tracked by BNEF between 2011 and 2020) (Esser and Champion, 2021). The IDC's investments in renewable energy, most notably REIPPPP Rounds 1 and 2, have helped to add 900MW of power to the national grid. It was critical to share risk in the earlier rounds as the IDC did to crowd in private sector investment and allow for learning, leading to further investment in the future. The IDC's involvement is estimated to have created about 8 000 jobs in the Northern Cape, Western Cape, North West and Eastern Cape. The Northern Cape has been the biggest beneficiary of IDC's investment, with a combined capacity of 486MW and R2.5 billion in the combined purchase price for community shareholding in 15 projects (IDC, 2022).

However, the lack of auction rounds since 2015 (as a result of policy decisions on the part of the government) has severely limited the options for developers to build new projects and has dampened investment. The data supports this by showing that the IDC's renewable energy financing slowed after 2014, evidenced by the sharp decline in REIPPPP approvals (Figure 5).

⁷https://www.engineeringnews.co.za/article/idc-concludes-r5bn-green-bond-with-pic-2012-11-07/rep_id:4136

⁸ IDC correspondence, 13 April 2023.

Figure 5: IDC's approvals and disbursements, 2011-2015



Source: IDC (2015)

While the IDC approved less renewable energy projects in 2015 (R0.8 billion) than in 2014 (R6.7 billion) (IDC, 2015)⁹, it gave preferred bidder status to twenty-three solar (photovoltaic and concentrated), wind and hydro-power projects, worth a future potential of R13.1 billion. Importantly, during 2015, several IDC projects were commercialised along with the opening of the Kakamas Hydro Electric Power Plant in the Orange River; the KaXu concentrated solar plant near Pofadder in the Northern Cape¹⁰; photovoltaic power plants in the Northern Cape and North West; and several wind farms in the Eastern Cape and Western Cape.

The IDC's annual reports suggest that in 2015 it provided substantial support and rehabilitation funding for carbon-intensive firms, including the likes of African Chrome, the Columbus Joint Venture, and Scaw Metals and Foskor, who combine to account for over 90% of the IDC's CO₂ emissions (IDC, 2015). The funding was provided due to these companies' poor financial results. There is tension between the IDC's green industrialisation funding and funding for its historical investments and sectors. The IDC notes that its mandate is to expand and maintain the industrial capacity of South Africa¹¹, and that some of the funding for these investments is mitigation funding as well.¹²

The IDC's involvement in the early rounds of REIPPPP has notably increased risk appetite and investments in the green economy by the private sector (Goga, et al., 2019). Local commercial banks, funds, and DFIs are major players in the renewable energy market. Most

⁹ These included investments in the Khana Energy wind farm projects (a black-controlled REIPPPP Programme co-investor), and the Oyster Bay and Garob wind farms.

¹⁰ KaXu Solar One is a 100MW concentrated solar power (CSP) plant in the Northern Cape. It is jointly-owned by Abengoa Solar (51%), the IDC (29%), and a community trust owned by Broad-Based Black Economic Empowerment (BBBEE, 20%).

¹¹ IDC correspondence, 13 April 2023.

¹² Part of the IDC investments in African Chrome and the Columbus Joint Venture were to cover the costs for the treatment of the contaminated land and the waste dump rehabilitation, respectively (IDC correspondence, 13 April 2023).

of the debt has been local¹³, with 5 of the largest local banks (ABSA, Nedbank, RMB, Standard Bank and Investec) contributing to 68% of the debt to the REIPPPP projects (Eberhard & Naude, 2017). The IDC and DBSA together provided a substantial 13% of the debt. The key catalyst role played by IDC in the REIPPPP programme was to facilitate broad-based BEE in these projects, with a view to ensuring inclusivity.

3.2.3. The AFD Fund

The AFD SUNREF Fund was focused on providing finance to stimulate small-scale Power Purchase Agreements for renewable energy projects and greenfield energy efficiency investments in commercial and industrial sectors.¹⁴ The total approvals and disbursements under SUNREF I and SUNREF II amounted to R478 million (IDC data). The minimum investment period for the AFD Fund was three years with a maximum payback based on energy savings of 8 years. Under SUNREF 1, the projects were priced at Prime – 1% or fixed at 10% and under SUNREF 2, the IDC's regular risk pricing with a cap of Prime plus 1.6% or an equivalent fixed rate. Crucially, the IDC maintains not to exceed a total investment cost of 25% of the facility, not wanting to be overly invested in a single industry or project to spread its exposure.

Through SUNREF I, six projects valued at R172 million for renewable energy projects in small and medium enterprises were approved under the AFD Fund. Some notable deals included biogas projects, a hydro turbine, and heat and power supply agreements. Many of these projects were relatively concessional loans¹⁵ with long-time horizons¹⁶. All funds under SUNREF have been disbursed. The fund ran up to the end of November 2021.

In 2016, the IDC strengthened its ties with the AFD and its commitment to green projects by signing a €60-million credit line to provide long-term loans for local small-scale green projects (van Wyngaardt, 2016). In the same year, the IDC received €3 million from Swiss-based SECO to assist the IDC in boosting its capacity to provide clean energy finance. Under SUNREF 2 a total of four (4) projects to the value of R137,8 million were approved and disbursed. The fund period ended in November 2021.

3.2.4. The GEEF

The Green Energy Efficiency Fund (GEEF) was developed as part of a partnership between the IDC and the German Development Bank (KfW). The GEEF was launched as R500 million fund to prioritise private sector companies seeking funding for energy efficiency and renewable energy projects across all industry sectors (IDC, 2010). The GEEF provided loan funding ranging from R1 million to R50 million at a concessionary rate of prime less 2%, with repayment periods of up to 15 years.

Between 2011 and 2017, the GEEF and IDC approved a combined R970 million. In the later years of the GEEF (2014-2017), the IDC also began granting significant loans to GEEF-approved funding to complement the funding of specific projects (Figure 6). These additional loans granted by the IDC were for large-scale infrastructural projects in gas, Led lighting, solar water heating, biogas, and rooftop solar panels.

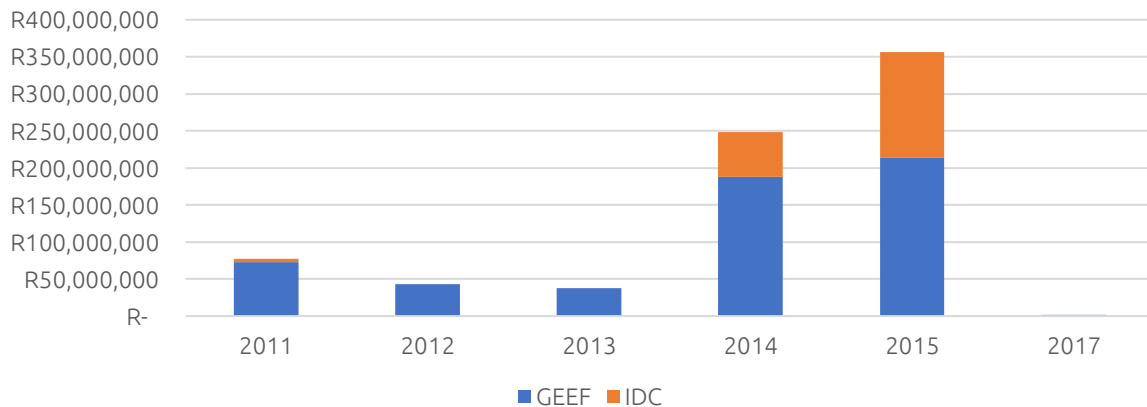
¹³ https://www.qsb.uct.ac.za/files/EberhardNaude_REIPPPPReview_2017_1_1.pdf

¹⁴ <https://idc.co.za/afd-green-energy-fund/>

¹⁵ Priced at prime – 1 percentage point and 10% fixed for the hydro project.

¹⁶ Most of these loans were for 8 years (with between 12 and 18 months grace periods). The hydro turbine was granted a payback period of 12 years.

Figure 6: GEEF loan approvals, 2011-2017

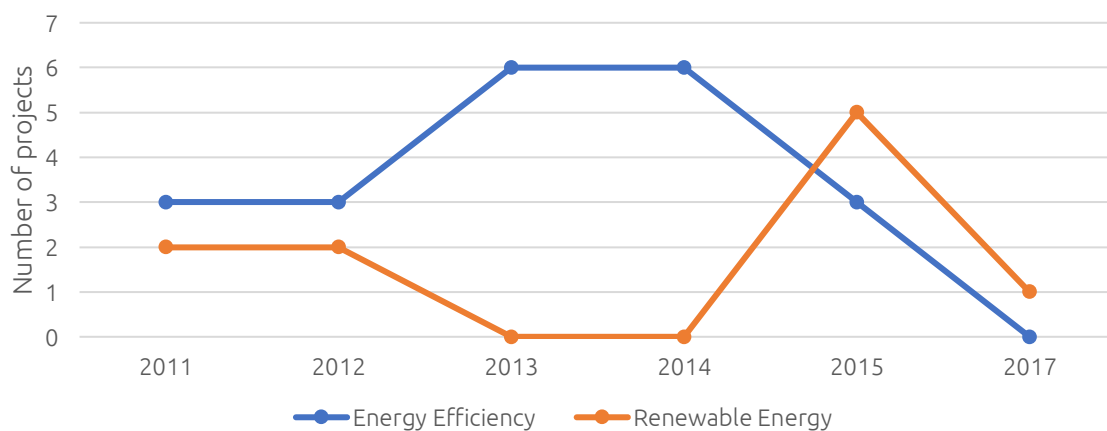


Source: Adapted from data provided by the IDC

Notes: No loans were approved in 2016. 2017 = R1,300,000

The data shows that this fund has granted energy efficiency projects (66%) more loans than renewable energy projects (34%). The number of energy efficiency project approvals has declined since 2014, with more renewable energy projects being approved in the later years (Figure 7).

Figure 7: Number of GEEF energy efficiency vs renewable energy project approvals, 2011-2017



Source: Adapted from data provided by the IDC

Notes: No loans were approved in 2016

Of the 32 approvals between 2011 and 2017, approximately 69% were for SMEs and 31% for non-SMEs. Geographically, most of the GEEF's approvals were located in the industrial centres of Gauteng (40.2%), the Western Cape (25.4%), Limpopo (21.3%) and Kwa-Zulu Natal (10.3%), which appears to reinforce the existing industrial base of South Africa.

3.2.5. Summary

The IDC's early involvement in financing the REIPPPP showed a commitment to achieving the country's green mandate as described in the NGP and IPAP2. The significant number of REIPPPP projects approved is evidence of this commitment. Similarly, the IDC's management of its partner financing schemes, such as the AFD Fund and GEEF, effectively supported

smaller-scale renewable energy and energy efficiency projects. However, the quantum of funding through these schemes has been limited.

Between 2014 and 2017, the IDC's overall support for renewable energy and efficiency projects fell drastically both as a result of the stalling of the REIPPPP programme and as it committed funds to support Scaw and Foskor, which were struggling with profitability. The delays in the subsequent REIPPPP rounds has been a significant factor in how the IDC participates in green industrialisation funding in the economy. The success of the IDC's involvement in the REIPPPP is evidence of its ability to finance well-designed industrial policies in the green economy.

Furthermore, while playing an instrumental role in the REIPPPP programme, the IDC also adopted a broader sectoral approach to its green financing agenda, focusing on supporting green manufacturing and other activities. In recent years, this broader green industry scope led the IDC to explore other sectoral opportunities for achieving its green economy mandate, which we explore further in section 3.5.

3.3. IDC's later renewable energy and green economy financing, 2018-2022

3.3.1. Overview

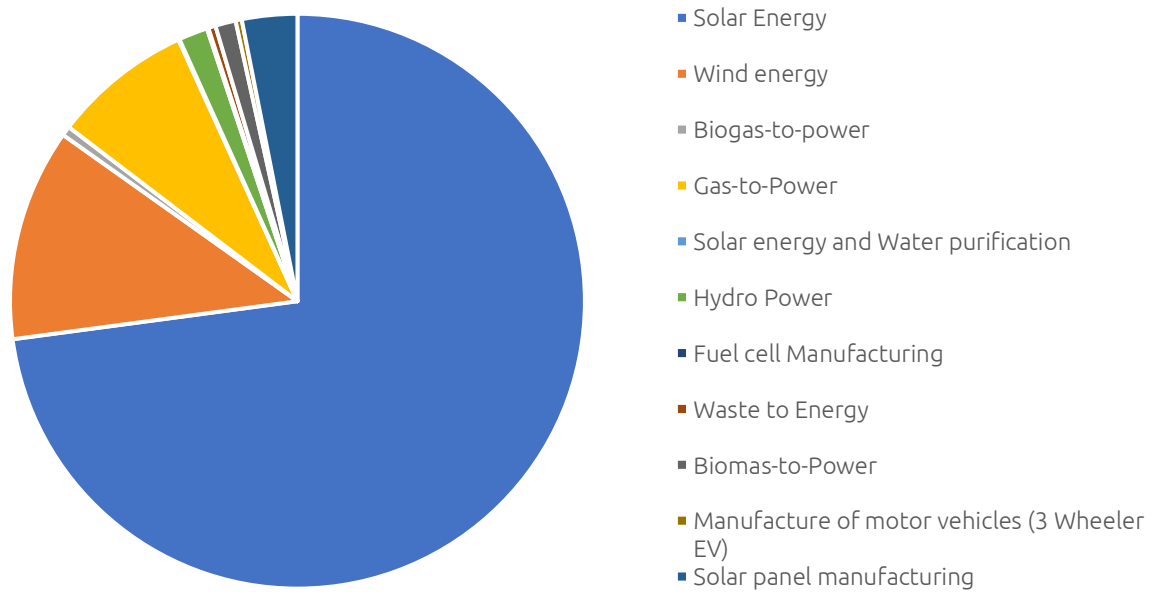
The analysis in the previous section highlighted a decline in approvals of renewable energy projects in the period leading up to 2017. The delays in the REIPPPP severely hindered the IDC's ability to scale up its investments in BBBEE-backed energy projects, black industrialists, and inputs for local content.

More recently, there have been several pressures warranting more funding for green industrialisation. In 2017/18, the IDC began to focus on increasing its participation and funding for renewable energy transactions to mitigate risks to the IDC's energy-intensive investments posed by unstable electricity supply. The IDC targeted these concerns by offering green energy efficiency funding to their most intensive electricity users and approved projects as part of the Small Projects Renewable Energy Procurement Programme. This green efficiency strategy was supported by the Public Investment Corporation's long-tenure private placement bond in 2012 (IDC, 2017). Furthermore, the IDC began diversifying its involvement in the renewable energy sector by supporting off-grid other African renewable energy markets. Building on these approvals, the IDC added to its burgeoning solar portfolio by committing to invest in localising solar components.

3.3.2. The IDC's green portfolio

As of February 2023, the total value of the IDC's green portfolio stood at approvals of R19.8 billion and exposure or disbursements of R12 billion. 73% of the exposure is in solar energy projects, with wind accounting for 12% (Figure 8).

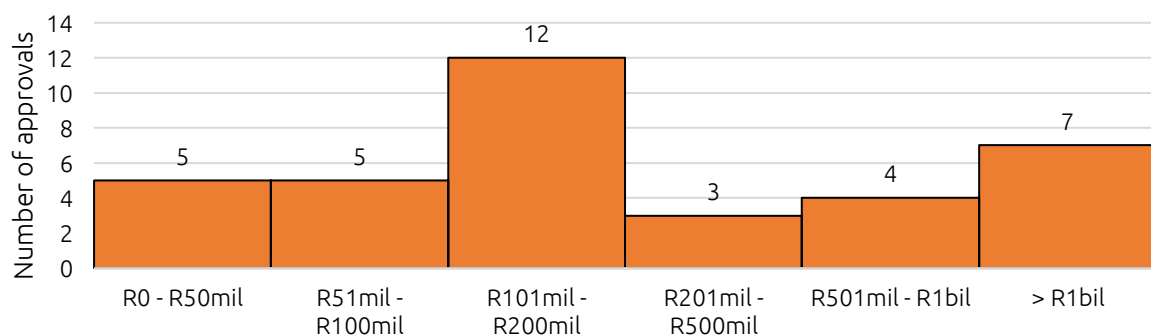
Figure 8: Share of IDC's portfolio in green projects as of February 2023



Source: IDC data

The majority of the IDC's approvals in its green portfolio were between R101 million and R200 million, with 7 projects over R1 billion (Figure 9). 72% of projects exceeded R100 million. The IDC's funded projects within its green portfolio are either for own-use by commercial and industrial sectors or for sale by IPPs (Bate, 2022). Its funding activity has thus far benefitted entities with exposure to generation and efficiency projects with projects ranging from utility-scale to smaller-scale distribution energy solutions either for own use by (predominantly) commercial and industrial sector or for sale by independent power producers (IDC, 2022).

Figure 9: Number of IDC approvals in different ranges



Source: Calculations based on IDC data

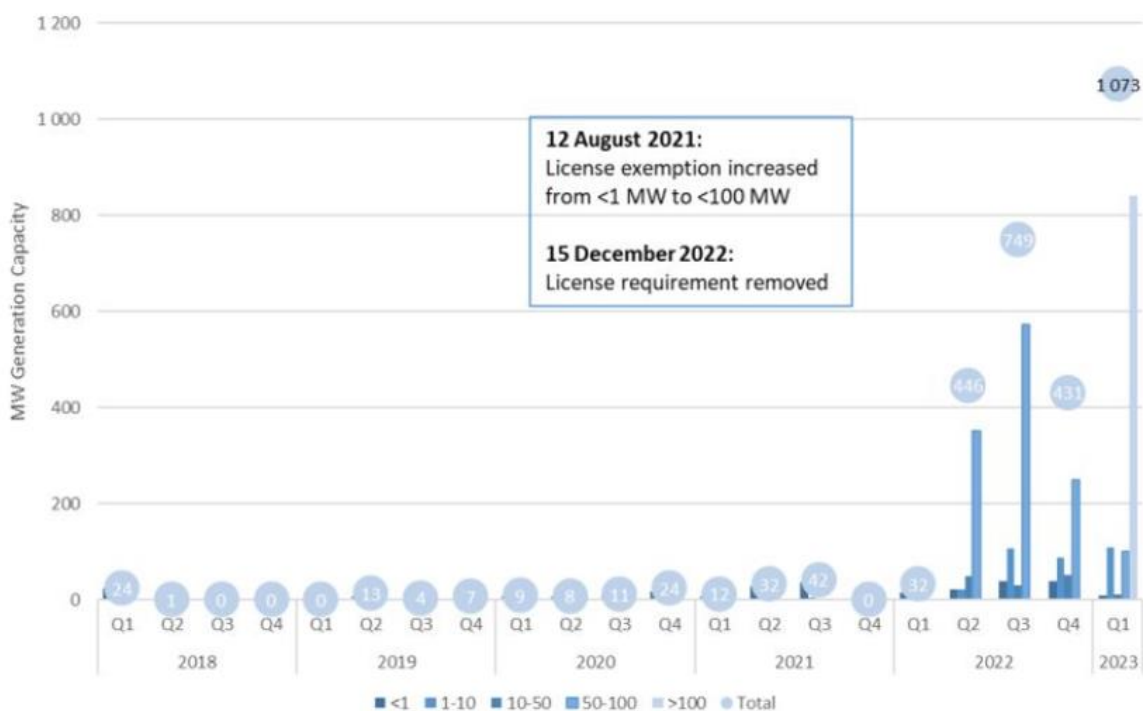
Regarding transformation impacts, it is noteworthy that companies with BEE shareholding have healthy participation and access to IDC funding. As much as 61% of the IDC's entire green portfolio is for companies/projects with BEE shareholding, while there is a 31% BEE shareholding on average.

3.3.3. The revival of REIPPP

Early indications are that the revival of the REIPPPP and the scrapping of licence requirements for generation facilities below 100MW has boosted the renewable energy space. Round 5 was announced in 2021 and resulted in 25 preferred bidders for wind and solar projects.¹⁷ However, Round 6, announced in 2022, only resulted in 5 solar photovoltaic projects despite being oversubscribed with 56 project bids totalling 9.6 GW.¹⁸ Additionally, all the preferred bidders were for solar projects with no allocations given to wind projects.

In 2022, the government announced an allowance for generation facilities below 100MW in size to wheel power across the grid and to sell power to multiple customers without requiring a licence.¹⁹ This announcement was to counteract the delays in the REIPPPP between 2015 and 2019 that hampered the energy base of the economy by delaying the rollout of the Independent Power Producers (IPP). As a result, power generation capacity has begun to increase significantly, as shown below (Figure 10 and 11). Figure 13 shows that private PPA in solar has taken off, likely due to the scrapping of the licence requirement. Thus, outside of the REIPPPP, there are significant opportunities for renewable energy generation which the IDC and other institutions can support.²⁰

Figure 10: Power generation capacity registered with NERSA under licencing exemption conditions



Source: Montmasson-Claire (2023): accessed at <https://twitter.com/GaylorTIPS>

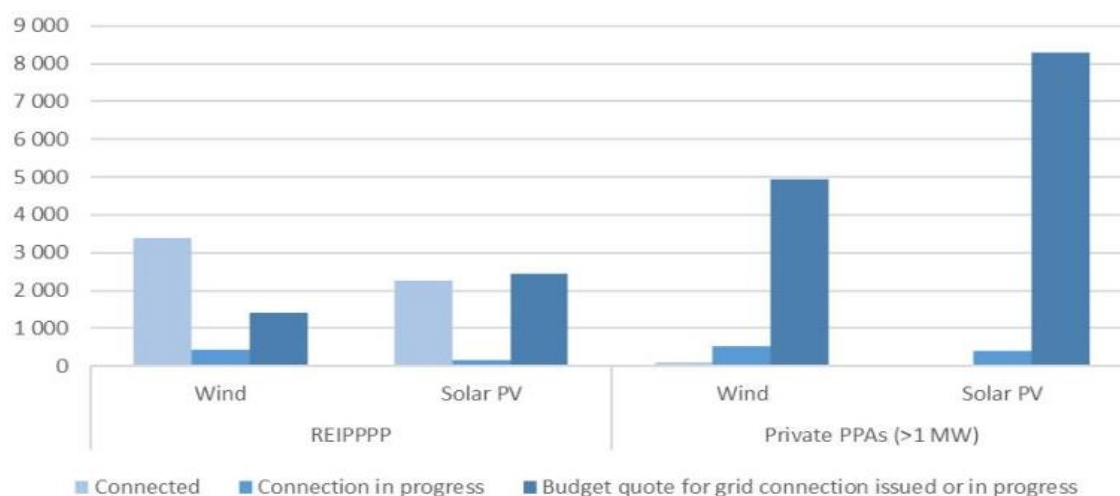
¹⁷ <https://www.ipp-renewables.co.za/>

¹⁸ See footnote above.

¹⁹ <https://www.engineeringnews.co.za/article/ramaphosa-doubles-next-renewables-round-to-5-200-mw-scrap-100-mw-cap-on-distributed-plant-and-moots-feed-in-tariff-as-he-unveils-load-shedding-crisis-response-2022-07-25>

²⁰ <https://www.engineeringnews.co.za/article/renewables-industrialisation-plan-to-be-aligned-to-expected-surge-in-private-projects-2023-01-13>

Figure 11: Renewable energy generation capacity (>1MW; Eskom grid) in South Africa, as of February 2023



Source: Montmasson-Clair (2023) based on data from Eskom: accessed at <https://twitter.com/GaylorTIPS>

One of the biggest constraints impacting the large-scale uptake in green economy projects by the green financial landscape is the inherent riskiness of many green economy industries and technologies, which necessitates longer time horizons on the part of lenders and patient capital that can facilitate growth over time. One funding avenue is through equity investments. These investments offer longer terms, and also provide the IDC with potential profit-sharing and future dividend streams that can contribute to further increasing its investments in the green economy. The sub-section below discusses insights from the IDC's publicly available data on its equity investments between 2017 and 2022, supplemented with reviews of its annual reports.

3.3.4. Insights from the IDC's equity funding²¹

Between 2017/18 and 2021/22, the IDC funded approximately R33 billion in equity investments. Half of this funding went to the mining and metals industries and basic and specialty chemicals industries, followed by industrial infrastructure (12%)²² (Figure 12).²³ These figures are commensurate with the IDC maintaining large stakes in firms that make up the country's industrial base, which we note is energy-intensive. These firms include Foskor (fertiliser), Scaw Metals (steel), and Arengo316 (liquid fuels) (IDC, 2017).²⁴ The IDC's holdings in these firms were maintained given these firms' (and the industries they operate in) importance to the economy's productive base.

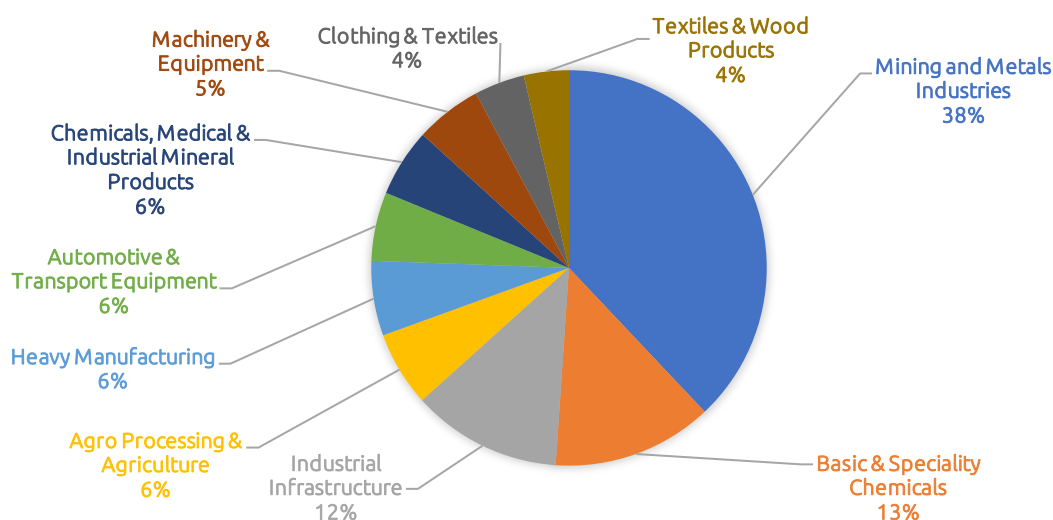
²¹ We note that it is not clear whether the IDC's publicly available data on equity investments (analysed in this section) and the data on its green portfolio discussed above are separate datasets.

²² The remaining categories were Agro Processing & Agriculture (6%), Heavy Manufacturing (6%), Automotive & Transport Equipment (6%), Chemicals, Medical and Industrial Mineral Products (6%), Machinery & Equipment (5%), Clothing & Textiles (4%), and Textiles & Wood Products (4%)

²³ Between 2017/18 and 2018/19, the IDC's new equity investments in the top 10 sectors declined by 42%. Investment activity picked up again in 2019/20 by 14%. However, the COVID-19 pandemic disrupted this growth with the IDC's equity investments declining by 59% y-o-y in 2020/21. This depression in financing was short-lived, as the following financial year (2022/22) increased substantially by 260% to R8 billion.

²⁴ The IDC's stakes in Foskor, SCAW, and Arengo316 amounted to 59% (in 2017), 74% (in 2017), and 100% (in 2017), respectively (IDC, 2017).

Figure 12: IDC's top 10 total equity investment sectors on average, 2017-2022



Source: Authors calculations based on IDC data

Scaw and Foskor, are directly exposed to physical and transition risks from climate change owing to their significant carbon emissions and intensity. As a result of challenges with the companies operating environments and other external threats and shocks, the IDC invested in Foskor (R1.6 billion) and Scaw (R900 million) in 2018 to maintain these companies' infrastructure. The investments in Scaw were punctuated by the IDC's decision to split Scaw into several different companies to improve its financial sustainability (IDC, 2020). Additional equity finance was granted to Scaw in 2021/22 at R500 million. This funding was part of the R3 billion commitment Scaw made in 2022 to invest in its flat-steel operations, the first monumental investment in South Africa's steel industry since the 1990s (Creamer, 2022a). The IDC notes that the investments in the steel industry (Scaw) were earmarked as part of the steel master plan to develop the value chain²⁵ - to turnaround the performance of Scaw and to introduce competition in the flat steel sector in South Africa.²⁶

Foskor is a subsidiary of the IDC which was struggling to perform. The IDC notes that selling Foskor would have resulted in losses for the IDC. Therefore, it chose to support the firm to turnaround, noting that part of the investments in Foskor were to assist them with compliance in new emissions standards.²⁷

The IDC, however, also began increasing its investments in green companies and projects (Figure 13), with the total equity finance provided to companies engaged in the green economy between 2017/18 and 2021/22 equalling approximately R3.6 billion (see Appendix 1 for a list of companies).²⁸ Most of this equity finance has been for green firms in the Industrial Infrastructure, Energy, and New Industries sectors, with additional equity funding for green companies as part of the Industry Planning, Project Development, and Basic and

²⁵ IDC correspondence, 13 April 2023.

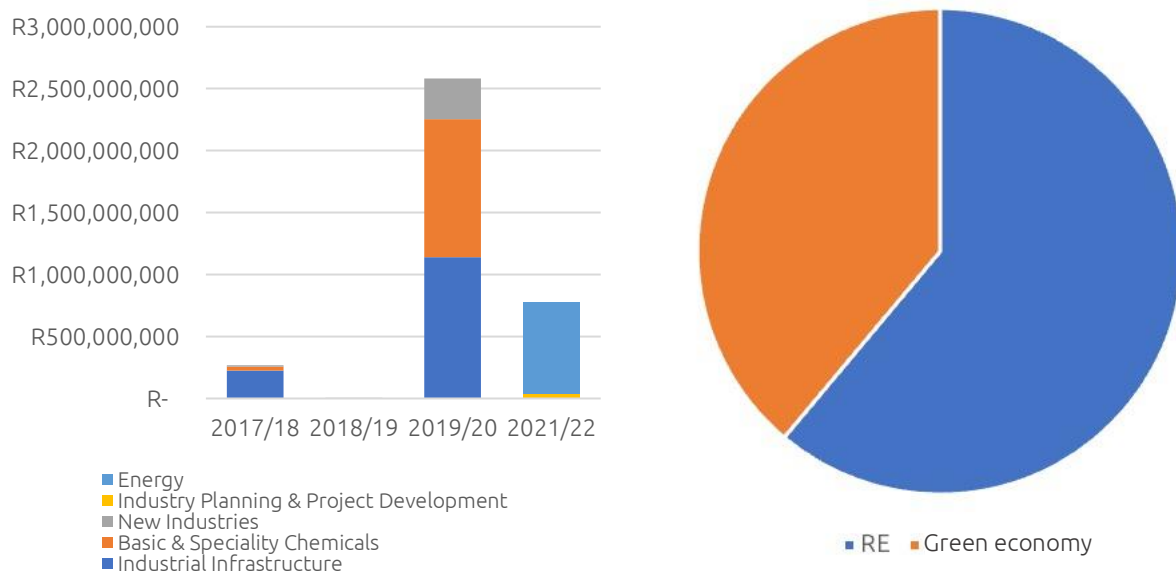
²⁶ Scaw Metals has invested R3 billion in a flat steel plant to introduce competition to Arcelor Mittal South Africa (AMSA), funded by a combination of loans from the IDC and ABSA and internal Barnes Group Resources (IDC correspondence, 13 April 2023).

²⁷ IDC correspondence, 13 April 2023.

²⁸ This data is for green companies whose businesses are easily recognised as part of the green economy. According to the data, no equity investments were made into recognisable green companies in the financial year 2020/21.

Speciality Chemicals sectors. Some of this investment includes firms operating in the solar PV industry and others, such as nanotechnology for carbon-based materials, battery energy systems, ocean wave energy, waste-to-energy projects, basic and speciality chemicals, and new rounds of the REIPPPP Programme.

Figure 13: IDC equity investments into green economy firms and RE vs green economy split, 2017/18-2021/22



Source: Based on data provided by the IDC

Note: Total investments amounted to R3 million in 2018/19.

Critically, the finance provided to green companies grew by 24% compounded annually compared to a 12.5% decline for the mining and metals industries between 2017/18 and 2021/22. However, on average, the funding to the mining and metals projects (R 2.2 billion per annum) was still well above the average investments made into green projects (R900 million per annum), showing the vast size disparity between the two sectors. During 2019/20, the IDC invested significantly in green fuels and chemicals within the Basic and Speciality Chemicals sector with an R1.1 billion investment in Swayana SPV (Pty) Ltd, a BEE company operating in the green fuels and chemical industry. This was in addition to an R30.6 million investment in Swayana in 2017.²⁹ In addition, the IDC continued to fund several big-ticket renewable energy projects, with R1.1 billion invested in the Redstone Solar Power Thermal Project, a 100MW concentrated solar plant expected to electrify 210,000 homes and create 3,500 jobs.³⁰

However, the COVID-19 pandemic dramatically affected the IDC’s financing, with no green projects being supported. In 2021/2022, the IDC’s funding remained firmly entrenched in MEC-linked sectors, with mining and metals firms receiving R2 billion in 2021/22. During the

²⁹ Several other investments into green companies were made during the period. These included R200 million for Econet Energy Limited (an offshoot of the telecommunications company Econet Group) and R126 million for EMV Nanomaterials (a producer of nano-precipitated calcium carbonate). The investment in EMV Nanomaterials aims to introduce competition to a concentrated sector dominated by importers and Idwala Industrial Holdings.

³⁰ <https://www.nenergybusiness.com/projects/redstone-concentrated-solar-project/>



COVID-19 period, the IDC focused on protecting the existing industrial base and jobs.³¹ Despite this, the IDC did continue to finance the renewable energy space with plans to fund an additional 21,000MW of renewable energy generation capacity to the energy grid (IDC, 2021). Some of this capacity could be found in investments in Bronkhorstpruit Biogas (a 4MW waste-to-energy project), Scatec Kenhardt 2 and 3 (part of Round 5 of the REIPPPP), and Sustainable Heating 8 (Pty) Ltd (involved in developing heating solutions using renewable energy sources to produce process heat). The IDC is involved (through an investment in the black empowerment group, H1) in what could be one of the largest hybrid solar PV (photovoltaic) and battery storage facilities worldwide (Demana, 2022). The project (receiving assistance from Norwegian renewable energy manufacturer Scatec) is located in the Northern Cape and is expected to comprise 540MW of solar capacity and 1,140MWh of battery storage (Arnoldi, 2022b).

3.3.5. Summary

The IDC has demonstrated an understanding of its vital role in supporting South Africa's green energy transition and industrialisation agenda. The analysis of the disclosed data of the IDC's green portfolio, AFD Fund, and the GEEF for the 2017 to 2022 period shows that the funding has not been significant in scale.³² However, the IDC, and more generally South Africa, is at an early stage of transition. The funds of the IDC discussed here were small and experimental in funding for green industrialisation. The IDC will take lessons from these early funds to improve the design of future products, as it, together with other institutions, begin to respond more significantly to the transition imperatives of the country.³³

The funds analysed also give a partial story of the IDC's green industrialisation investments, which is impossible to glean cleanly from the data. See, for instance, the discussion on the IDC's investments in *food, agriculture and other industries* in section 3.5 below. Additionally, there are investments at pre-feasibility/feasibility or project development stage where the money required to support this stage is smaller but will be ramped up as projects come on-board. The project preparation phase is critical and IDC's project development unit, formed in 2020, has proven to be very important for green industrialisation projects.³⁴

The IDC played a very important role in sharing risk in the earlier rounds of the REIPPPP, and to crowd in private sector investment and allow for learning, leading to further investment in the future. While the stalling of the REIPPPP programme has been a challenge, the recent reinstating of the REIPPPP programme together with the removal of the licence requirement to wheel power across the grid and sell to multiple customers for projects below 100MW is expected to result in a surge of renewable energy projects in which the IDC can participate. The IDC is taking up opportunities with some notable investments: a R1.1 billion investment in the Redstone Solar Power Thermal Project, and planned(?) investments in Bronkhorstpruit Biogas (a 4MW waste-to-energy project), Scatec Kenhardt 2 and 3 (part of Round 5 of the REIPPPP), and involvement in one of the largest hybrid solar PV (photovoltaic) and battery storage facilities worldwide (Demana, 2022).

In addition, during the period, the IDC has also taken on a critical role in the green hydrogen sector, to eventually replace fossil fuels and spur the decarbonisation of the economy

³¹ IDC correspondence, 13 April 2023.

³² In 2019, the GEEF only approved one project before it was closed.

³³ IDC correspondence, 13 April 2023.

³⁴ IDC correspondence, 13 April 2023.

(discussed in section 3.4 below). This position is embodied in the IDC's championing of the country's green hydrogen commercialisation strategy. There is an opportunity for the IDC to participate in the localisation of renewable energy value chains, with two projects in its green portfolio in the solar manufacturing space and the possibility of expansion (more sector-specific examples of the IDC's involvement in the green economy is discussed in section 3.5.).

Given the scale of funding needed for green industrialisation, the IDC sees its role as catalysing investments and unlocking key development areas. Thus, once commercial banks start funding an aspect of the green industrialisation agenda, the IDC will not prioritize it if it cannot offer better rates. For instance, significant funding is now available in the market for renewable energy projects. Given this, the IDC prioritises other green industrialisation areas, including unlocking renewable projects for green hydrogen, supporting early-stage investments for green hydrogen projects, exploring ways to co-fund expanding/strengthening the grid to allow for greater uptake of renewable projects and supporting domestic production for e-mobility.³⁵

The IDC's self-funded financing model constrains it in terms of scale. A potential solution is to build more robust collaborations and partnerships with international lenders such as the AFD and KfW. In 2022, South Africa agreed with the AFD to further fund its climate financing with a €300 million 20-year loan, with a 5-year grace period at 3.6%. At the same time, an additional €300 million deal was agreed with Germany's KfW with the same horizon period but at a lower rate of 3%. These loans are earmarked to help the country transition from its dependence on coal (IOL, 2022a). This funding was commensurate to the R7.2 billion committed to the DBSA by the European Investment Bank (EIB) to aid South Africa's private sector green transition as part of its Just Energy Transition (IOL, 2022b). It is unclear whether any of this funding has flowed to the IDC.

Finally, given the competing priorities that the IDC faces, the IDC is developing a more systematic approach to its funding that includes support for localisation, competition within industries and creating employment.³⁶ One of the tensions it faces is its funding for carbon-intensive industries. It notes that the approach it takes is to limit shocks to the IDC portfolio while developing transition paths for the carbon-intensive sectors it funds.³⁷

We now turn to the green hydrogen economy and IDC's crucial role in its commercialisation.

3.4. IDC and Green Hydrogen

Despite the IDC's pockets of financing for renewable energy projects, South Africa's industrial energy base remains dependent on coal-powered, high-polluting sectors such as chemicals and steel. These high-polluting sectors also account for a significant share of South Africa's exports to its major trading partners, which, if the emissions are not addressed, will lead to a loss in competitiveness and other negative spillovers (Bell, et al., 2022). Noting these risks, the South African government has begun targeting a shift in its energy structure to one that focuses on producing, consuming, and exporting green hydrogen.

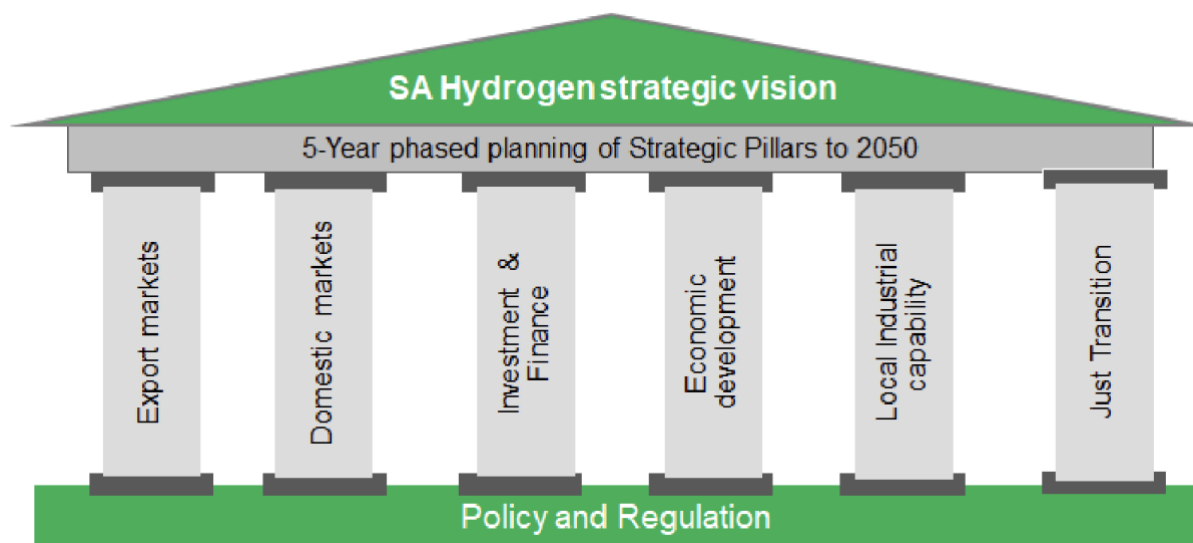
³⁵ IDC correspondence, 13 April 2023.

³⁶ IDC correspondence, 13 April 2023.

³⁷ IDC correspondence, 13 April 2023.

The shift to a green hydrogen economy was first outlined in the Hydrogen Society Roadmap (DSI, 2021). The Hydrogen Society Roadmap recognises the unsustainability of South Africa's current energy and fuel landscape, which remains firmly entrenched with carbon-based energy, and contributes to a significant amount of direct process and input emissions in most industrial sectors. Green hydrogen offers significant opportunities for the South African economy, from exporting and foreign direct investment attraction to ushering in a just transition and decarbonising carbon-intensive sectors underpinned by inclusiveness and structural transformation (Figure 14).

Figure 14: South Africa's hydrogen strategic vision



Source: Green Hydrogen Panel (2022)

Given its investments in steel and basic chemicals, the green hydrogen economy is of primary importance for the IDC's strategies and growth trajectory. Regarding its support for the green hydrogen economy, the IDC has played a dual role since early 2011.³⁸ The first has been the IDC's increasing support to renewable energy projects such as solar and wind, critical inputs for producing green hydrogen. Secondly, since 2021, the IDC has been mandated to take on an important role in the green hydrogen economy as the coordinating body for developing the green hydrogen commercialisation strategy (GHCS). Regarding this, the IDC was appointed "commercialisation champion" for South Africa's green hydrogen ambitions.

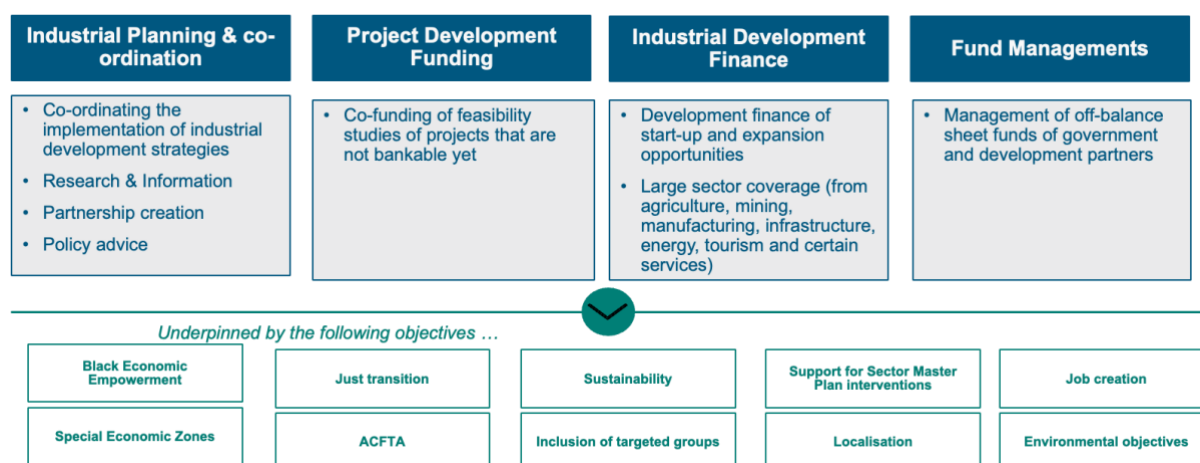
To operationalise the country's green hydrogen ambitions, the IDC and others through the Green Hydrogen Panel have developed South Africa's green hydrogen commercialisation strategy, which sees the institution partnering on several large-scale hydrogen projects in South Africa (Green Hydrogen Panel, 2022). While the IDC is at the forefront of several GH2 projects, it is not formally participating in the high-profile Boegoebaai GH2 project in the Northern Cape. However, the IDC is supporting the project strategically and is involved in other inland and coastal hubs. These locations have been chosen given their strategic positioning as export hubs, hubs for local hydrogen deployment, or a combination of both. The IDC's hydrogen commercialisation strategy portfolio covers at least 20 projects covering a range of products from ammonia, aviation fuel, and hydrogen (Creamer, 2022). Many of

³⁸ Based on a presentation at an IDC workshop on 20/02/2023.

the IDC’s targeted commercialisation programs encompass different policy and incentive vehicles to ensure their success. Some of these include special economic zones to boost domestic private investment in GH2, and the introduction of Guarantees of Origin to enhance traceability, tradability, transparency, and trustworthiness (Green Hydrogen Panel, 2022).

In the GHCS, the IDC is transcending its typical industrial financing and project development funding roles and is extending its expertise into industrial planning and coordination. It coordinates the implementation of industrial development and strategies, engaging in research and development, fostering partnerships, and imparting policy advice (Figure 15).³⁹

Figure 15: IDC’s role in the commercialisation of GH2



Source: IDC (2023)

From a development finance perspective, the IDC recognises the challenges and limitations of South Africa’s development finance system. The GHCS recommends several avenues for unlocking green hydrogen finance. These include issuing a government-backed green bond, special marginal levies on existing fuel consumption to generate a pool of funding for green fuels development, and redirecting income from carbon taxes to green projects (Green Hydrogen Panel, 2022). In addition, the IDC notes the use of public-private partnerships in Japan, China, Germany, and the Netherlands in kickstarting green hydrogen projects in these countries.

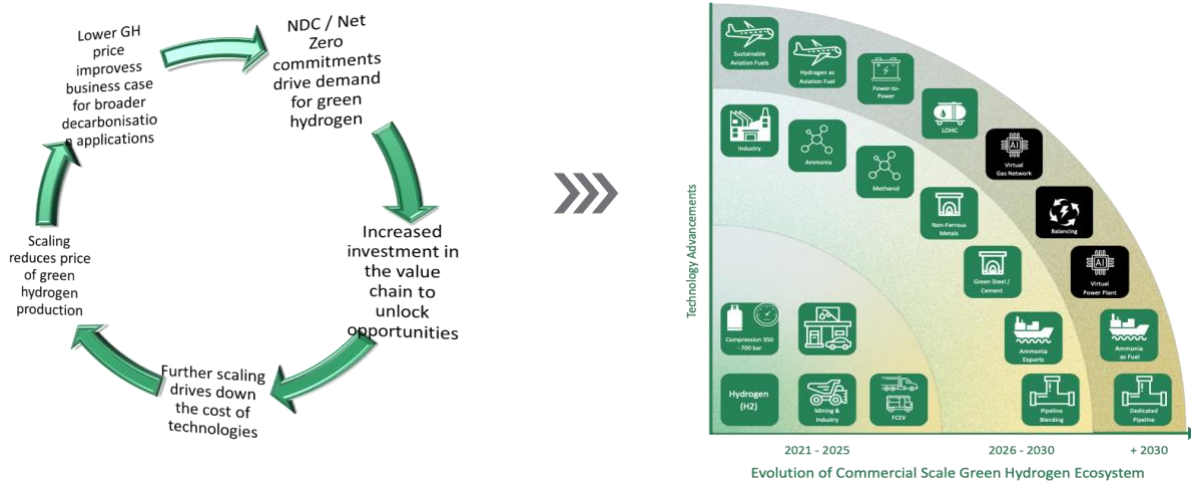
The GHCS marks a major step forward for the South Africa’s industrial development investments. This is seen by promoting a value chain approach that fosters growth across multiple potentially high-value-adding sectors with the potential for localisation of vital components in the solar and wind value chains (Green Hydrogen Panel, 2022). Overall, the IDC views its role in facilitating the commercialisation of GH2 as part of a larger process of unlocking opportunities across critical sectors to decarbonise many of South Africa’s industries (Figure 16). If successful, the GH2 industry and economy can act as a virtuous circle where sequential declines in green hydrogen production costs will contribute to evolving the commercial scale of the GH2 ecosystem to generate linkages into greater numbers of sectors. As a baseline, this includes green hydrogen for electric vehicles and the

³⁹ See footnote above.



mining and industrial sectors broadly before targeting GH2 to decarbonise specific products, industries, and targets (such as exports), all things the IDC is targeting with the GHCS.

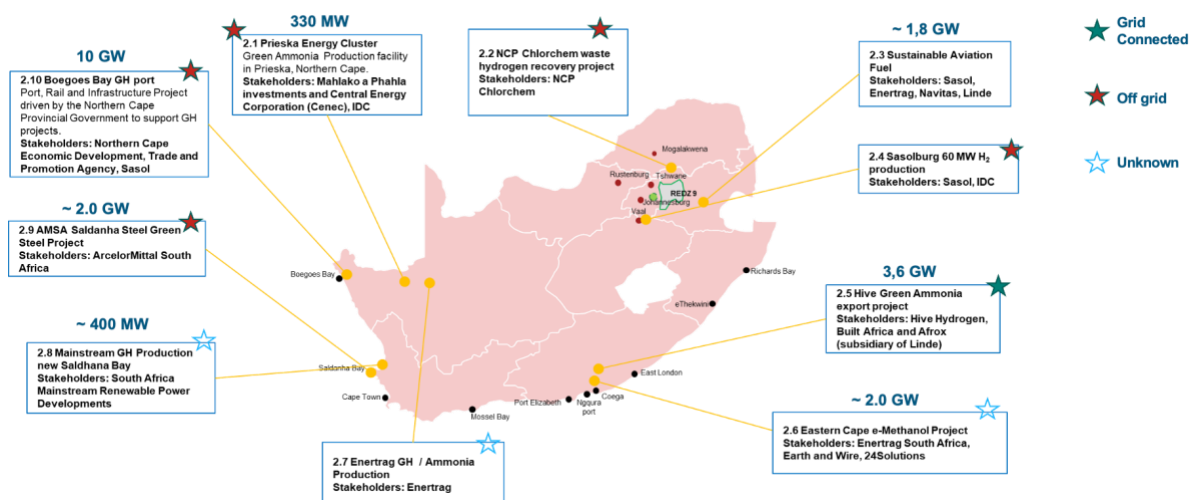
Figure 16: The evolution of the IDC's value chain focus for green hydrogen



Source: IDC (2023)

Two projects mentioned in the GHCS are green steel and chemicals (green fertilisers). Transition of these energy-intensive sectors is critical in the context of global imperatives. There are other opportunities for decarbonisation through green hydrogen in the chemicals (explosives) and cement sectors (Andreoni, et al., 2023). The IDC recognises these sectors as “hard-to-abate” and has begun contributing to decarbonising them in the short term through its development finance and project development funding roles. Concerning green steel in South Africa, R13.2 billion is required to meet the capital costs for the sector’s production targets and roadmap actions, whereas R109.3 billion is expected to be required for the commercialisation of GH2 in the green ammonia industry (IDC, 2023a). If the funding requirements and capital costs are met, the GHCS expects several catalytic projects in green steel and ammonia to be underway by 2025/26 (Figure 17).

Figure 17: Expected catalytic projects for green ammonia and steel, 2025/26



Source: IDC (2023)

Achieving an ambitious industrial project such as that described in the GHCS will be challenging considering the history of weak linkage development in many of South Africa's most prominent exporting sectors. The IDC should be cognisant of several structural problems within the steel and chemicals value chains as it looks to support green hydrogen capabilities given they each have one major player – AMSA and Sasol. Each of these value chains have a historical track record of support that has continued into the 21st century. However, this support has undermined downstream diversification and more robust capabilities, negatively impacting the performance of their industries and the economy (Mondliwa, et al., 2021).

Given the control of AMSA over the South African steel sector and its impact on the metals to machinery value chain (Andreoni, et al., 2023), significant levels of reinvestment will be needed to reorientate the sector to be conducive to GH2. This massive investment must be granted with strong conditionalities to avoid forming a green steel enclave. Failure to do so will repeat the poor outcomes experienced during the coal boom, locking in existing patterns of rents and value extraction at the expense of value creation and inclusive structural transformation.

The IDC is also already developing several GH2 projects with another of its legacy investments, Sasol, with Sasol and the IDC recently concluding an MoU to jointly develop and shape South Africa's green hydrogen economy (Sasol, 2021). However, a significant concern, similar to the case of steel, is that the partnership would only lock in Sasol as the prominent producer of green hydrogen at the expense of creating value-adding downstream linkages, thus creating a GH2 enclave rather than fostering an inclusive and just transition to GH2 (Andreoni, et al., 2023). The IDC notes that its MoU with Sasol is non-exclusive and it is also considering other potential green hydrogen investments.⁴⁰ Nonetheless, support for large upstream players like AMSA and Sasol should be given while also ensuring local linkages and stronger conditionalities linked to support (Rustomjee, et al., 2018).

Achieving large-scale decarbonisation of steel and chemicals will require substantial amounts of investment, which must be complemented with an understanding of the political economy and geography of these sectors to ensure that these sectors are delinked from coal and fuel in a structurally transformative manner that prioritises local linkage development, new industrial priorities, and appreciates the specific-sectoral capabilities, incentives, and constraints that will influence these sectors' respective transitions (Andreoni, et al., 2023). This will also require diversified investments in green hydrogen projects to promote competition in the industry, something the IDC is committed to with its investments in other GH2 projects in Prieska and Phoenix.⁴¹

Overall, the IDC supports developing the green hydrogen ecosystem in South Africa. Over R100 million has been approved in project development funding, with the first green hydrogen production expected to begin in June 2023. This initial work in the green hydrogen space is critical for green industrialisation. Scale and cost-competitive production of green hydrogen is expected to trigger tipping points for green ammonia for fertilizers

⁴⁰ IDC correspondence, 13 April 2023.

⁴¹ IDC correspondence, 13 April 2023.

and shipping, hydrogen DRI for steel, aviation fuels, and eventually green synthetic diesel and petrol.⁴²

In addition, the IDC has recognised that the existing regulatory framework must be overhauled to be fit for practice and that support from other institutions and government departments is essential for breaking down infrastructural and logistical barriers in the hydrogen economy (IDC, 2023a). Thus, for development finance to play its role in developing green hydrogen, the government must commit to a coherent policy framework guided by an inclusive structural transformation agenda while addressing issues around the need to rapidly increase renewable energy and grid capacity. Thus, the IDC's partnership with ACWA Power to explore green hydrogen projects and their derivatives is a positive step (IDC, 2022b).

3.5. IDC's support of firms impacted by trade policies

The IDC recognises its role in expanding its green economy investments beyond renewable energy generation and energy efficiency projects.⁴³ While the IDC, through the GHCS is focusing on supporting the transitioning of the steel and chemicals sectors, its investment priorities have extended to a broader set of sectors and value chains that are either set to be significantly impacted by climate change and the policies designed to combat its effects.

Data from the IDC on specific green-funded projects linked to these sectors is not readily available. Accounting for the lack of sector-specific data, we discuss the IDC's role in funding decarbonisation and green projects in these sectors based on its position documents and public statements.

3.5.1. Climate adaptation: Food, agriculture, and other industries

Development finance through the IDC is important in addressing the existing imbalances in the food and agriculture sectors. Regarding the IDC's role in greening the agriculture and food sector, the IDC is focused on inclusively developing the rural agricultural sector by supporting the strengthening of linkages of SMEs to retail supermarkets and developing higher-value-added exporting and jobs-creating agricultural sub-sectors.⁴⁴

Recognising the need for green financing, the IDC has expanded its offerings to include financing green activities in other sectors through additional funding schemes (**Error! Reference source not found.**). These funding schemes target mitigation or a combination of mitigation and adaptation, either earmarked for the clean energy sector or open to funding a range of sectors as long as the firms qualify according to the IDC's criteria. Some funds of a more general nature (like the MCEP and TVC) may also have small pockets of green funding. However, the extent of these pockets of green finance is uncertain.

⁴² IDC correspondence, 13 April 2023.

⁴³ Based on a presentation on the IDC's investment approach on 20/02/2023.

⁴⁴ See footnote above.

Table 4: Other IDC green funding schemes

Name of funding opportunity	Financial instrument	Size of investment	Direct Use	Sector(s)
SUNREF (Sustainable Use of Natural Resources and Energy Financing) Programme South Africa	Debt	Unspecified	Mitigation	Clean Energy
Green Tourism Incentive Programme	Grant	< R 1 million	Mitigation	Clean Energy
Manufacturing Competitiveness Enhancement Programme (MCEP) Industrial Financing Loan Facilities	Debt	< R 30 million	Dual benefits	Cross-sectoral
Technology Venture Capital Fund (TVC)	Debt/Equity	R1 million < R5 million	Dual benefits	Cross-sectoral
Manufacturing Industry Finance	Debt/Grant	< R 50 million	Dual benefits	Cross-sectoral
IDC Gro-E Scheme	Debt/Equity	R 1 million—R1 billion	Dual benefits	Cross-sectoral

Source: Adapted from the GreenCape Finance Database (2022)

The IDC also administers sector-specific funds which may include financing related to upgrading for a range of climate change mitigation and transformational objectives (**Error! Reference source not found.**). The Agri-Industrial Fund targets the development of high-impact black-owned large-scale commercial agriculture projects to promote high-value export crops such as citrus, avocado, table grapes, blueberries, tree nuts, and poultry and livestock. Crucially, the financing provided by the IDC for qualifying agri-businesses (at least 60% black-owned) must be used to acquire capital equipment and infrastructure that will assist in mitigating the climate impact of the sector. The transformational criteria of this funding stream is also crucial given that the South African food sector is highly concentrated and often vertically integrated, possessing high barriers to entry (Nkhonjera, 2020). As such, the IDC's partnership with the South African Sugar Association is another welcomed step towards diversification in a historically concentrated industry to as part of plans to develop alternative and sustainable fuels and plastics.⁴⁵

Table 5: IDC's industry and sector-specific funds

Fund	Fund size	Financial instrument
Agri-Industrial Fund	R1 billion	Debt/Grant/Equity/Quasi Equity
Scheme for Sustainable Plastics	R500 million	Debt/Quasi Equity

Source: IDC (2019)

Regarding the plastics sector, the IDC's scheme for sustainable plastics targets downstream firms in the plastics value chain. The fund provides qualifying plastics firms with a maximum of R35 million per investment with the condition that the funds will be utilised to grow aspects of the circular plastics economy (more efficient use of raw materials, material development, and better utilisation of non-virgin materials) or diversify and improve existing products (incorporating new plastic materials into existing production processes and developing new products). Considering the critical backwards and forward linkages the plastic industry has to several sectors like automotives (Monaco, et al., 2019) and their

⁴⁵ IDC correspondence, 13 April 2023.

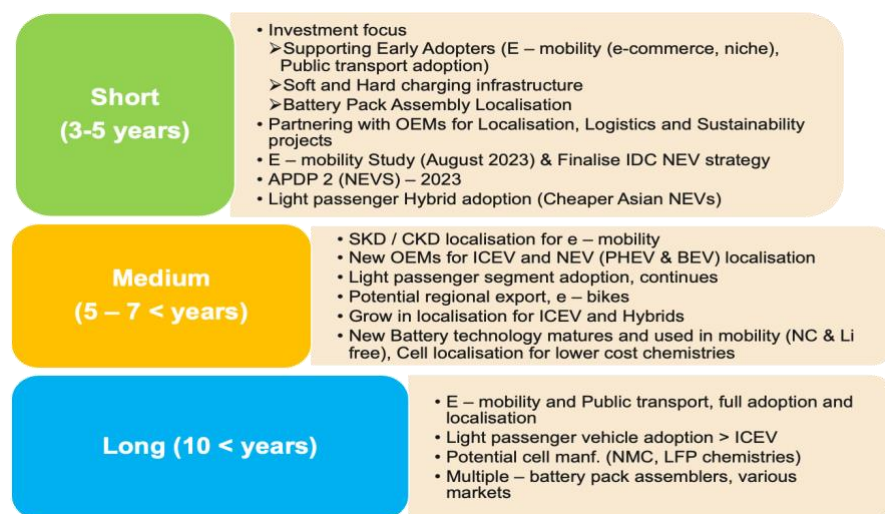
potential to be included in the future scope of CBAM, the IDC must drive the push towards decarbonisation, climate change mitigation, and sustainability.

In all, it is difficult to measure the impact of IDC investments to decarbonise firms and ensure greater sustainability in line with increasing trade-based policies. This is because support is dispersed across various schemes and funds.⁴⁶ It is noteworthy that the agriculture and food sectors are less likely to be affected by the CBAM, but will be affected by a raft of measures and smaller initiatives that will impact smaller producers and farmers more than larger players, requiring support to participate in European markets effectively. Smaller producers typically struggle to access finance from traditional financial institutions, bringing the IDC's role into focus more sharply (Hattingh and Appies, 2022).

3.5.2. Industrialising for climate change: Electric vehicles and battery storage

Recognising the threats posed to the automotive sector in South Africa, the IDC has, in line with the draft green paper published in 2021, committed to playing an instrumental role in the country's transition to electric vehicles through its identification of several e-mobility projects as low-hanging fruit that it has already begun funding. Moreover, the IDC supports policy developments for local original equipment manufacturers (OEMs) and invests in e-mobility projects to decarbonise the value chain and nurture smaller-volume manufacturers (Figure 18).

Figure 18: IDC outlook on NEVs and ICE vehicles



Source: IDC (2023)

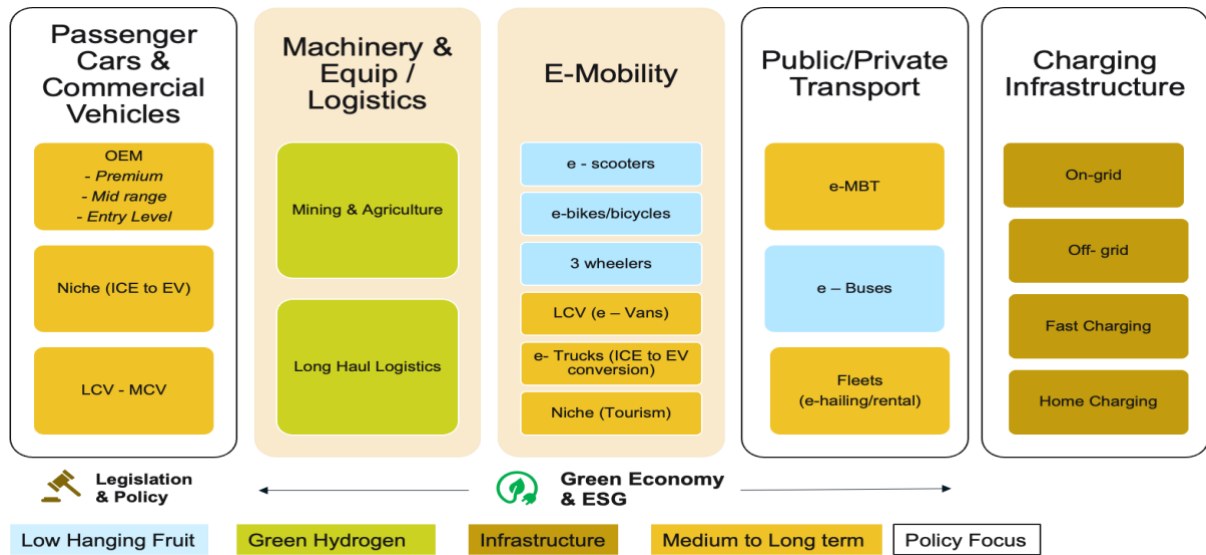
From the perspective of the transition of OEMs and multinational corporations (MNCs), this is part of the IDC's and the government's medium- to longer-term plans. For these longer-term plans to be achieved, there needs to be a good understanding of the power of MNCs and automotive assemblers to dictate the direction through lobbying and setting standards. These must be addressed if the NEV value chain is to transform to greener outcomes (Bell & Monaco, 2021).

The IDC is looking to support several other segments of the NEVs industry beyond smaller e-mobility projects (Figure 19). These include utilising green hydrogen in the mining and agriculture and logistics sectors, public and private transport (specifically in the passenger

⁴⁶ Discussion with the IDC, 20 January 2023.

transport and e-hailing and rental markets), and investment in infrastructure for the required charging stations for NEVs.

Figure 19: The IDC's NEV segmentation



Source: IDC (2023b)

The IDC’s approach positions the NEV value chain as an opportunity for developing linkages into other green economy sectors such as batteries, green steel, minerals, and chemicals (Figure 20) (IDC, 2023b), and this is to be welcomed. It aims to utilise opportunities in NEVs as a “fulcrum for industrialisation” (Error! Reference source not found.) to widen and deepen existing industrial linkages and increase local content production to meet the targets in South Africa’s Automotive Masterplan 2035 to help build a regionally and globally competitive supply base and open new avenues for trade into Africa through AfCFTA.

Figure 20: The IDC's focus on automotives and NEVs

Traditional and new energy value chains	Fulcrum for industrialisation	Utilising full range of IDC capabilities
<p>Automotive Sector (ICEV & NEV)</p> <ol style="list-style-type: none"> OEMs (assembly platforms) Components Logistics infrastructure (industrial parks, rail/port access) <p>New energy vehicles (NEV)</p> <ol style="list-style-type: none"> Energy storage solutions (e.g. batteries, fuel cells) Battery minerals and chemicals (e.g. NMC, Lithium, Graphene, Rare Earths, Nickel Sulphide, Graphite, Lithium Hydroxides) Charging devices Components/electronics <p>Automotive-linked material supply (e.g. steel, aluminium, copper, new technology metals)</p>	<ul style="list-style-type: none"> Mature industry with strong linkages to the rest of manufacturing, mining, and agriculture Anticipate changing demand in export markets (fuel efficiency and new energy vehicles) Increased local content – widening & deepening Build a regional & globally competitive supply base. AfCFTA demand opportunities – replacement of grey imports; collaborative component supply arrangements between countries (e.g. Kenya, Ghana, Morocco, Egypt) 	<ul style="list-style-type: none"> Active Master Plan Participation and Policy Advocacy: <ul style="list-style-type: none"> (a) Automotive Master Plan; (b) New Energy Vehicle Policy; (c) Hydrogen Commercialisation Strategy (d) Climate Initiatives Project Development: <ul style="list-style-type: none"> Mine to Magnets Initiative; Strategic metals for energy storage applications; Fuel Cell Localisation; Lithium-Ion Precursor Project, Vehicle Assembly Projects; Copper mining. Business Development <ul style="list-style-type: none"> Focussing on increased local content through component suppliers (wider and deeper), Black Industrialist participation, 4IR conversions and attraction of new OEMs. SEZ development: <ul style="list-style-type: none"> inland port project (maximise linkages) customised supplier park New development areas: <ul style="list-style-type: none"> Increased activities in NEV development incl. OEMs and component manufacturing (battery, fuel cells & electric motor manufacturing); maximise opportunities of existing last mile investment. Transversal issues with other master plans such as Steel Industry

Source: IDC (2023b)

Increasing regional exposure is another priority for the IDC as it looks to grow intra-continental trade and strengthen regional integration (IDC, 2022). As part of this regional expansion, the IDC is working on playing a pivotal role in developing the local energy storage

value chain, given the endowment of many key inputs in other African economies (SAREM, 2022). The battery value chain has numerous linkages to upstream battery minerals mining and processing, downstream assembly and recycling, and potential linkages to transport and agriculture that further strengthen the business case as demand for greener production grows across Africa. Because of these opportunities, since at least 2017, the IDC has been working on opportunities in the energy storage value chain, which is critical for the renewable energy sector (specifically solar and wind). Competitive success in renewable energy will depend on how cost-effectively the renewably generated energy can be stored and on a coherent policy framework governing these new industries.

4. Conclusion: Rethinking the climate change transformation impact of the IDC

Given its competitive solar and wind production advantages, South Africa can link its decarbonisation to economic growth by building linkages between sectors. However, this will require large investments in new and existing renewable capacity, which can only be done with a coherent policy framework incorporating renewable energy, grid capacity, the green hydrogen sector and a focus on sector linkages for structural transformation. For the IDC, the most significant DFI in South Africa, this marks an opportunity to place itself at the centre of the green transition and leverage its position to ignite reindustrialisation. For the IDC to effectively play this role, its investments must align with a set of criteria to guide their impacts.

This section explores an expanded set of criteria for evaluating the IDC's investments in green industrialisation, drawing on the critical assessments of the industrial development challenges and the evolving role envisioned for the IDC in the green economy. We begin with two broader objectives for the IDC to consider before considering three more specific and complementary measures and actions to be realised.

Competitiveness of diversified green industries

From the point of view of the role of development finance in the economy, the IDC should ensure that investments are geared towards making diversified industries more competitive in a world where green is the standard. The challenge, therefore, is to link investments in the emissions reduction space with the regeneration of diversified downstream industries. For this occur, it is necessary to ensure that large upstream players do not capture investments. South Africa's post-apartheid political economy, including through support from the IDC, has been one where upstream industries have been supported, including as national champions, to the detriment of more downstream diversified industries. Placing too much emphasis on supporting the upstream at the expense of downstream development will result in the same barriers and hindrances of previous industrial development agendas.

For instance, investments in the metals value chain in the green hydrogen space must be linked to a downstream regeneration since most jobs lie downstream in the machinery and equipment sectors. Similarly, for the chemicals value chain, ammonia could be produced for the agriculture and mining sectors in South Africa and the region (Andreoni et al., 2023). Investments must therefore be aligned to government's green industry growth strategy. The GHCS is an example of this, but it currently does not have a robust sectorally-focused industrial strategy. Therefore, building the green hydrogen economy will require an

integrated policy approach to tackle more significant systemic issues surrounding South Africa's industrial space (Andreoni, et al., 2023).

Knowledge and industry strategy lead, with the IDC as a catalyst and coordinating body

The IDC has been given a very important role as the commercialisation champion in green hydrogen, uniquely positioning the institution to take on a bundle of important roles in South Africa's transition since green hydrogen links to renewable energy upstream. At the same time, downstream industries can gain from the commercialisation of green hydrogen in South Africa. Commercialising green hydrogen in South Africa requires the IDC to act as the area's knowledge and industrial strategy lead. As a development finance institution, investments from and through the IDC will act as a catalyst, with the IDC as the coordinating body for investments and strategy.

The successful commercialisation of green hydrogen will be contingent on domestic demand and the success of decarbonisation strategies at some of the largest emitters of CO₂. There are concerns about the potential for developing GH2 enclaves that lock in existing patterns of rents and value extraction in value chains (for example, in green steel and chemicals). Since the IDC has a lead/influencing role in strategy, this will provide it with insight and influence to shape the development trajectory, which can assist with its financing decisions. Thus, the IDC can leverage its strategic leadership role to catalyse investments to develop a set of green industry linkages that focus on structural transformation instead of green export enclaves.

Realising low-priced and available renewable energy for reindustrialisation

South Africa has world-class solar and wind potential, and at the same time, South Africa's renewable energy costs are very low and are expected to decrease further. Thus, the shift towards increased solar and wind power can reduce South Africa's electricity prices relative to other countries and over time restore international competitiveness in key sectors, conferring an advantage in exports of "green" products. Importantly, this will require linked investments in, among others, renewable energy and grid and energy storage capacity.⁴⁷

An accelerated electricity sector transition is the key to South Africa's sustained economic recovery in the currently constrained electricity system and with the pressures of decarbonisation. Large-scale investments in renewable energy sources can now replace several coal-fired power stations that have reached the end of their lifecycles. The key is to ensure *inclusive* upscaling in our energy capacity, governed by a coherent policy as well as finance to leverage the significant opportunities in renewable energy.

While the debate around jobs in the transition have often pitted coal against renewable 'green' jobs, the greening of industries in South Africa implies growth, especially with the demand for green hydrogen. Green industry growth means a growth in employment in the East Rand (industrial sectors) for employment reductions in Mpumalanga coal, in addition to jobs created directly by the renewable energy sector. Thus, the investments in renewable energy for the growth of green industry are expected to have a much larger employment effect than what is assumed in the narrow framing around coal versus renewables.

⁴⁷ The energy transition requires linked investments from renewable generation through storage and transmission. This involves energy and industrial policies, finance, and energy regulation.

With a strong pipeline of renewable energy, new industries can be built around renewable energy industries, given the scale of renewable energy required. However, this requires a commitment to large-scale renewables as demand is the single biggest factor in the localisation of components. Without demand, localisation will not be possible and at high cost. The government must commit to a stable and coherent renewable energy policy (including grid capacity, green hydrogen, storage and energy regulation).

Catalytic projects

Developing catalytic projects is critical to crowding-in finance, requiring appropriate government policies. The IDC played this catalytic role in the early stages of the REIPPPP programme, thus de-risking the programme and crowding in private funders. However, this success was contingent on the supporting government frameworks and strategies that guided the IDC's investments. Similar supporting frameworks are necessary to foster success with many of these proposed catalytic projects such that the IDC's investments are aligned with the government's green industry growth strategy. Moreover, the IDC must stay abreast of the latest international policy developments to better price potential shocks and uncertainty. This proactive approach will assist in mitigating risks most associated with firms in the green economy. Catalytic projects need to be funded in various sectors, including hard-to-abate sectors (those still heavily reliant on dirty energy), EVs, batteries, and inputs into renewable energy sectors to kickstart the development of linkages in value chains.

Patient capital and risk

The transition will be realised through the ability of the financial system to be patient and take on risks. Given that South Africa has enormous potential in renewable energy and green hydrogen, the challenge is identifying high-potential investments. While taking on riskier projects has been a challenge for the IDC due to the institution being self-funded, there are several opportunities – the reigniting of the REIPPPP programme and removal of licences for projects below 100MW likely means a flourishing of projects in the renewable energy space. Furthermore, seeking financing partnerships through, for instance, the KfW, AFD, and Interpublic Group (IPG) is critical to mobilise the necessary financing and play a more market-shaping role. However, utilising such funding pools effectively requires a coherent renewable energy policy to attract these agreements.

Summary

South Africa is well-placed for a transition from coal to renewable energy, given very good solar and wind resources in South Africa, falling renewable energy costs and the potential for green hydrogen. The transition must be seen as a multipronged growth agenda – providing electricity in an environment of severe loadshedding; seeking to make South African industry more competitive, and building linkages to key diversified sectors for structural transformation. Thus, linking the transition to a broader agenda around industrialisation is key. Still, if achieved, it offers tremendous potential for the South African economy, including enhanced energy capacity, decarbonisation, local linkage development, regional and international exports, employment and socioeconomic benefits such as improved well-being.

However, development finance and industrial policy cannot achieve the necessary changes in isolation. Such a massive shift in the economy's structure, intrinsically linked to coal, will necessitate a combination of factors to ensure success. A commitment to renewable energy

through coherent policies in energy, finance, transport and logistics is critical to crowd-in investment. At the same time, catalytic projects and project development identified and primarily funded through the IDC are necessary to unlock South Africa's green finance landscape and new development areas based around the green economy. Crucially, from the standpoint of the IDC, access to finance (Mazzucato & Semieniuk, 2017; SA SME Fund 2018) must become more closely aligned and integrated with green- and sectorally-focused industrial strategies. Furthermore, given the political economy favouring upstream industries in South Africa, including through the IDC (Goga, et al., 2019), the development of green hydrogen must take an integrated approach. This integrated approach should link the expansion in renewable energy generation capacity and promotion of green hydrogen with active industrial policy strategies to accelerate growth, investment, and employment opportunities in an inclusive and structurally transformative manner (Andreoni, et al., 2023).

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6. Appendix

Appendix 1: List of IDC equity investments in “green” companies, 2017-2021

"Green" Companies	IDC Sector Assignment	Amount Invested
Redstone Solar Thermal Power Company	Industrial Infrastructure	R 1,140,000,000
Swayana G2E SPV (Pty) Ltd	Basic & Speciality Chemicals	R 1,116,000,000
Scatec Kenhardt 2 (Pty) Ltd	Energy	R 300,000,000
Scatec Kenhardt 3 (Pty) Ltd	Energy	R 300,000,000
Econet Energy Limited	New Industries	R 200,109,000
EOH KAREBO SPV	Industrial Infrastructure	R 180,000,000
EMV Nanomaterials (Pty) Ltd	New Industries	R 126,670,000
Sustainable Heating 8 (Pty) Ltd	Energy	R 116,385,526
Ario Metapower Pty Ltd	Industry Planning & Project Development	R 40,002,000
Swayana SPV (Pty) Ltd	Basic & Speciality Chemicals	R 30,600,000
Mean Sea Level Pty Ltd	Industrial Infrastructure	R 23,000,000
Emergent Impact Investing (Pty) Ltd	Energy	R 13,600,000
Battery Power Industries (Pty) Ltd	New Industries	R 13,000,000
Du Plessis Solar PV4 (Pty) Ltd	Industrial Infrastructure	R 11,000,000
Lukhanyiso Food and Energy Centre	Industrial Infrastructure	R 11,000,000
Bronkhorstspuit Biogas Plant (Pty) Ltd	Energy	R 4,500,000
Southern African Tantalum Mining	Industry Planning & Project Development	R 3,000,000
Klydon Gas (Pty) Ltd	New Industries	R 3,000,000
Bushveld Energy Company (Pty) Ltd	New Industries	R 615,250

Source: Based on IDC publicly disclosed data