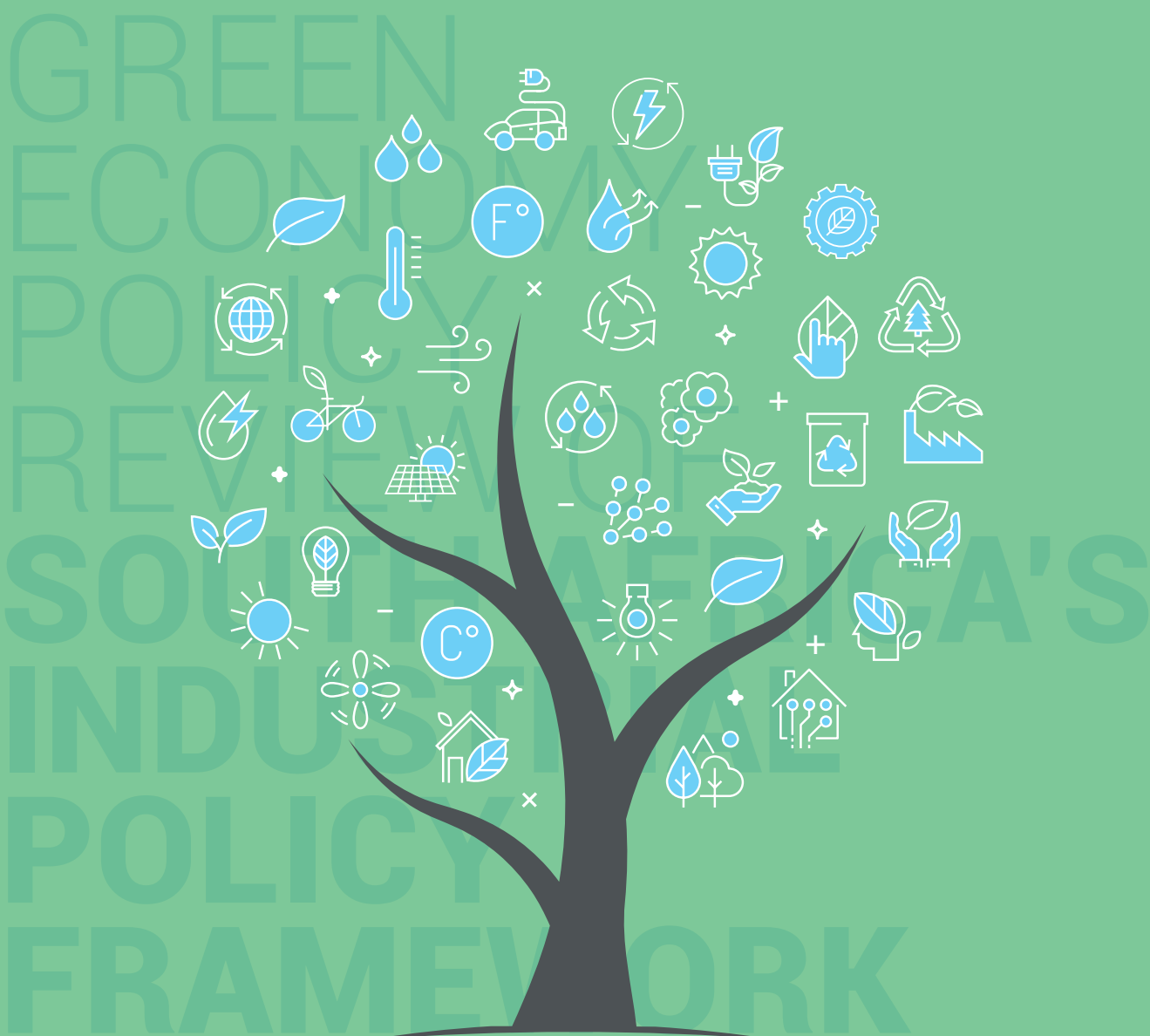


GREEN ECONOMY POLICY REVIEW OF **SOUTH AFRICA'S INDUSTRIAL POLICY FRAMEWORK**



Environment, Forestry and Fisheries
Trade, Industry and Competition
Science and Innovation



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TRADE & INDUSTRIAL POLICY STRATEGIES

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Abbreviations and Acronyms

BRT	Bus Rapid Transit System	NDP	National Development Plan
CAGR	Compound annual growth rate	Nedlac	National Economic Development and Labour Council
CSIR	Council for Scientific and Industrial Research	NEES	National Energy Efficiency Strategy
CSP	Concentrated Solar Power	NEMA	National Environmental Management Act No 107 of 1998
DBSA	Development Bank of Southern Africa	NGP	New Growth Path
DDG	Deputy Director-General	NIPF	National Industrial Policy Framework
DEA	Department of Environmental Affairs	NMISA	National Metrology Institute of South Africa
DEFF	Department of Environment, Forestry and Fisheries	NSSD	National Strategy for Sustainable Development and Action Plan 2011-2014
DFI	Development finance institution	NPC	National Planning Commission
DHET	Department of Higher Education and Training	NT	National Treasury
DMRE	Department of Mineral Resources and Energy	PV	Photovoltaic
DoE	Department of Energy	PCCCC	Presidential Climate Change Coordinating Commission
DoT	Department of Transport	PPD	Peak-Plateau-Decline
DSI	Department of Science and Innovation	PPP	Pollution Prevention Plan
DST	Department of Science and Technology	R	South African rand
dti (the)	Department of Trade and Industry	R&D	Research and development
DPME	Department of Planning, Monitoring and Evaluation	RECP	Resource Efficiency and Cleaner Production
DWS	Department of Water and Sanitation	REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
EDD	Economic Development Department	SABS	South African Bureau of Standards
EGA	Environmental Goods Agreement	SADC	Southern African Development Community
EIA	Environmental Impact Assessment	SANEDI	South African National Energy Development Institute
EIP	Environmental Implementation Plan	SDG	Sustainable Development Goal
ESEID	Economic Sectors, Employment and Infrastructure Development	SEIAS	Socio-Economic Impact Assessment System
FOSAD	Forum of South African Directors-General	SET	Sector Emissions Target
GDP	Gross domestic product	SETA	Sector Education and Training Authority
GHG	Greenhouse gas	SEZ	Special Economic Zone
IDC	Industrial Development Corporation	SWH	Solar Water Heaters
IDD	Industrial Development Division	TIA	Technology Innovation Agency
IGCCC	Intergovernmental Committee on Climate Change	TIPS	Trade & Industrial Policy Strategies
ILO	International Labour Organization	US\$	United States dollar
IPAP	Industrial Policy Action Plans	UNEP	United Nations Environment Programme
ISO	International Organization for Standardization	UNFCCC	United Nations Framework Convention on Climate Change
M&E	Monitoring and Evaluation	UNOG	United Nations Office at Geneva
MCEP	Manufacturing Competitiveness Enhancement Programme	WRC	Water Research Commission
NBI	National Business Initiative		
NCCRWP	National Climate Change Response White Paper		
NCPC-SA	National Cleaner Production Centre South Africa		

Executive Summary

South Africa aims to transition to an inclusive green economy, combining economic development, social progress and environmental preservation. Both the economy and society remain, however, highly unsustainable. Targeting the transition to an inclusive green economy therefore signifies a massive and disruptive shift, commanding a new model of development. Industrial policy is core to this process, notably to ensure a “just transition” and manage a balancing act, consisting of maximising the benefits of the transition and minimising the risks associated with not transitioning; but in line with South Africa’s capabilities to minimise the short-term trade-offs and threats. This requires a careful alignment of South Africa’s industrial policy with the inclusive green economy paradigm to support the country’s green industrial development. Ultimately, this requires the shift from industrial policy to green industrial policy. To inform such a transformation, this report reviews South Africa’s industrial policy, from an inclusive green economy lens. It investigates the extent to which South Africa’s industrial policy is responding to, if not driving, the country’s transition.

Policy design

A number of broad policy documents, such as the National Development Plan (NDP), the Innovation Plan, and the National Strategy for Sustainable Development and Action Plan (NSSD), have called for the transition to a more sustainable development path in South Africa. Such documents mention and support (at least in principle) a green industrial transition, but they do not constitute a strategic, coherent, green industrial development vision. They still mainly see the green economy as a sector, failing to paint the picture of a cross-cutting transformation. The National Planning Commission (NPC) has embarked on a process to develop 2050 pathways for South Africa which may provide the platform to establish the country’s vision for green industrial development (and beyond).

Similarly, despite some “green shoots”, South Africa’s industrial policy, historically structured around the 2007 National Industrial Policy Framework and the rolling Industrial Policy Action Plans (IPAPs), has not shaped a green industrial development vision.

On the one hand, the dti has provided leadership for the development of green industries, with building blocks to support renewable energy, resource efficiency, the circular

economy, and e-mobility. In addition, the department increasingly focuses on aligning industrial policy with environmental objectives. Industrial policy has also been core to designing and implementing a just transition, leading with the identification of vulnerable sectors and stakeholders, the development of resilience plans and the implementation of the Socioeconomic Impact Assessment System (SEIAS).

On the other hand, South Africa’s overall industrial policy vision remains fundamentally entrenched on a business-as-usual trajectory from a green economy perspective. It tends to consider the transition to an inclusive green economy as an add-on to other developments in the country. The links between green economy and inclusive development, and between green economy, competitiveness and industrial development, have not been adequately developed.

Going forward, industrial policy will be structured around the development of Master Plans for key industrial value chains, as coordinated by the Presidency’s Re-imagining our Industrial Strategy for Inclusive Growth framework. The Presidency’s approach has not, however, overtly embraced a green economy lens and focusses on traditional sectors and activities.

The underpinning rationale and indeed long-term objectives of South Africa’s industrial and green economy policy frameworks are well aligned and emerge as an opportunity for cooperation and mutual benefits. Nevertheless, the double mainstreaming of green economy considerations into economic policy and of socioeconomic development issues into green economy policy, has not occurred yet.

A general coherence seems to emerge, in theory, from national policy documents, with renewable energy, energy efficiency, green buildings, and even waste management and sustainable transport arising as key focus areas. In practice, a number of issues lack consensus or clarity. This is the case around key technological choices in the energy space. In addition, a broader misalignment persists between South Africa’s green economy objectives and the country’s other policies and priorities, with substantial support still directed at energy- and carbon-intensive sectors.

This is reflected in the alignment of South Africa’s industrial policy with the 17 Sustainable Development goals (SDGs). The country’s industrial policy demonstrates key areas of alignments where it makes positive contribution towards

all SDGs. In contrast, many interventions remain in contradiction of some key SDGs.

From an institutional perspective, the cross-cutting nature of the transition to a green industrial development leads to responsibilities being scattered among multiple entities and levels. Ultimately, elements of green industrial policy are conducted by a wide array of stakeholders, sometimes with conflicting priorities and interests, including all spheres of government.

Multiple official channels aimed at facilitating the coordination and alignment of public policy exist, such as the Forum of South African Directors-General, the Economic Sectors, Employment and Infrastructure Development (ESEID) cluster, Ministerial political and technical structures, and the Intergovernmental Committee on Climate Change.

Despite these channels, management of the transition to a green industrial development remains a key challenge, with instances of uncoordinated work, contested responsibilities and duplication. At the industrial policy level, the dti works with other departments and agencies to implement key action programmes, but internal annual processes within the dti, such as the development of IPAPs and annual business plans, could be leveraged further to foster a green industrial development agenda. Multiple entry points are available to introduce a green industrial development agenda into the discourse and ultimately public policy and business plans. Industrial policy has also been elevated to the Presidency, opening the door for a more coordinated approach. A strong push for green industrial development from the Presidency could effectively require the dti and other departments to be more proactive. The Climate Change Bill of 8 June 2018, also makes provision for additional coordination mechanisms at national and provincial levels.

Beyond the coordination of public action, social dialogue is a central aspect of the transition to green industrial development, particularly because of the socioeconomic implications. It is historically vibrant in South Africa, notably through the National Economic Development and Labour Council (Nedlac). Attempts at creating a social compact in favour of the transition, such as the Green Economy Accord and the Decent Work Country Programme, have, however, failed to deliver their promises. The NPC aims to reach a social compact through an extensive process of bottom-up consultation. Furthermore, the upcoming establishment of a Presidential Climate Change Coordinating Commission

(PCCCC) shows a strong interest by all social partners in improving coordination of the (just) transition.

At the industrial level, the degree of stakeholder engagement varies vastly from one industry to the next. In most cases though, engagement appears to be more reactive than proactive and culminates if and when particular issues (or crises) arise. Furthermore, stakeholders often do not consider their concerns and proposals to be taken into account meaningfully. The extent to which such engagements are mobilised to discuss issues pertaining to the transition to a green industrial development also seem to depend on the political agenda. The Master Plan approach may provide the adequate platform for proactive, forward-looking planning and implementation.

At the monitoring and evaluation level, the knowledge base necessary for evidence-based decision-making and effective implementation of a green industrial development agenda, although growing rapidly, remains largely incomplete. The 14 Outcomes framework, used for tracking the operationalisation of national policies, remains problematic from a green industrial development perspective. Industrial policy is absent from the framework of the Environmental Outcome 10 and green industrial development issues are only marginally covered through an energy efficiency target. In turn, industrial policy indicators, while useful at the programme level, remain quite high level and do not allow for effective tracking of progress. At the SDG level, initial tracking efforts provide a view of South Africa's progress, but many indicators remain unavailable due to data availability challenges or lack of definition. The country also participated in the United Nations-led development of a Green Economy Progress Measurement Framework. Information gaps also persist on firm-, sector- and community-level dynamics.

Policy implementation

Mirroring the multitude of plans and strategies, numerous measures have already been implemented in South Africa to foster the transition to green industrial development. Altogether, while far-reaching, the mix of measures appear to lack coherence and certainty. There is no clarity on the role, scope and impact of the mix of measures and the interaction of its many components. In some cases, like the carbon tax and carbon budgets, the integration remains weak. In addition, the mix of measures does not adequately capture the diversity of industrial situations vis-à-vis the transition and fails to propose tailored solutions. All industrial policy

tools have, however, been used to some extent to foster the transition.

Industrial finance directed at the transition to green industrial development has steadily increased over the last 10 years. Overall, the energy sector, namely renewable energy and energy efficiency, has garnered the most focus, through the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) and a series of tax incentives. Non-specific industrial finance programmes have also contributed, such as Industrial Development Corporation funding and the Black Industrialist Support programme. Private sector institutions, such as Nedbank and the Johannesburg Stock Exchange, have also demonstrated an increased interest in developing initiatives. In addition, capacity building activities, as rolled out by the National Cleaner Production Centre, have had an indirect mobilisation effect on investment.

Despite the increasing focus on green industrial finance, material gaps remain. They range from policy-related issues (such as the misalignment between the industrial and green economy policy frameworks), to structural problems (such as the lack of a funding pool for some segments), to skill and capacity issues (such as the misunderstanding of green economy by financiers), to fund design problems (such as the focus on renewable energy and energy efficiency). In addition, the amount of support directed at unsustainable activities remains particularly high. Direct fossil fuels subsidies amounted to 2.2% of gross domestic product (GDP) in 2015 and rose to 13.2% when the cost of externalities is included.

On the research and development (R&D) and innovation front, while South Africa has set the target of increasing R&D expenditure to 1.5% of GDP by 2019, it only reached 0.8% in 2016. Green R&D, which accounted for 17%-20% of total expenditure, has, however, been growing steadily at 4.3%-4.8% per annum in real terms from 2010/11 to 2016/17. South Africa's patenting activity similarly shows a dynamic green R&D and innovation field. Over the 1977-2016 period, more than 100 000 green patent applications were registered in South Africa, primarily in alternative energy and waste management. This is promoted by a tax incentive for R&D expenditure as well as substantial investment by government, notably through universities and science councils.

The transition also rests on the ability to identify and supply green skills. Overall, no central repository of learning

opportunities exists in the country, hindering the rollout of skills and competencies. South Africa also does not have a comprehensive, cross-cutting approach to green skills development, despite existing initiatives in some universities, Sector Education and Training Authorities, and Technical Vocational Education and Training colleges. For champions driving the transition, however, a wide spectrum of learning opportunities relevant to a green economy already exists in South Africa, such as in the case of resource efficiency.

Regulations, through their various forms, can have a fundamental impact on the transition to green industrial development and have been used with various degrees of success in South Africa. Command-and-control regulation, such as licensing and requirements for impact assessment, pollution prevention plans or industry waste management plans, is widely used in South Africa. However, its implementation remains highly imperfect, from the lack of enforcement to the difficulty in obtaining some licences. In some cases, it has moreover had a hindering effect on the transition by obstructing circular economy initiatives or preventing the roll-out of new technologies.

From a climate change perspective, quantity-based regulations around greenhouse gas (GHG) emissions have been implemented at the national (Peak, Plateau and Decline trajectory), sector (Sector Emissions Targets) and firm (carbon budgets) levels. Similarly, price-based instruments have been used to change behaviours, with various degrees of success. The levies on electric filament lamps and plastic bags have had a positive impact on consumption, while the impact of a carbon tax on new vehicles is more tenuous. A carbon tax on GHG emissions has been implemented since June 2019.

Rules and frameworks (such as the REIPPPP and the industrial symbiosis programmes), as well as procurement and fiscal rules (such as deductions for 'green' investments) provide the platform and regulatory settings for certain operations and have also been used with some success in South Africa to promote the transition.

The use of standards and targets has shown mixed results. In line with the National Energy Efficiency Strategy, fast-rising energy prices have led to a dramatic progress in industrial energy efficiency over the last two decades. By contrast, South Africa lags behind other key industrialised economies in the rollout of International Organization for Standardization (ISO) standards, such as ISO 14001 for

environmental management and particularly ISO 50001 for energy management.

Local content requirements are a key industrial policy tool to develop the manufacturing capability in the country. "Green procurement" has yet to be rolled out in South Africa, despite some initial investigation. In the meantime, the REIPPPP has been the main avenue used to localise green goods. The sound design and governance of the programme attracted numerous manufacturers. However, implementation issues have forced most facilities to close down. Over and beyond local content requirements, products can be earmarked ("designated" in South African terms) by the dti for local procurement by public entities. Of the 23 designated, four are directly linked with the transition to an inclusive green economy. These revolve around renewable energy and resource efficiency. The impact of such designation remains uncertain but the experience of the roll-out of Solar Water Heaters demonstrate some of the difficulties in reaping benefits.

Industrial parks support, manage and administer industrial activities within a specified area to facilitate socioeconomic benefits for the surrounding area its tenants and the country as whole. They can also be eco-industrial parks, bringing multiple economic, social and environmental benefits. South Africa hosts a variety of economic zones and multiple initiatives are under way to tap into the opportunities associated with the transition to a green economy. The dti, through the National Cleaner Production Centre (NCPC-SA), runs a programme aimed at greening the country's industrial parks through resource efficiency and industrial symbiosis. Some industrial development zones and Special Economic Zones (SEZs) have also engaged on the transition to eco-industrial parks, with the East London, Atlantis, Dube Tradeport and Richards Bay SEZs leading the way. In addition to initiating the transition to eco-industrial parks, some SEZs aim to harnessing the manufacturing opportunities associated with the transition to a green economy. Examples include the Greentech Atlantis SEZ, Upington Solar Corridor SEZ and the Bojanala Platinum Valley SEZ.

Trade policy, as a component of industrial policy, can be used to promote the development of green goods and services globally as well as domestically. South Africa's trade balance for green goods could be materially improved, notably by promoting imports substitution. Imports are roughly double the size of exports. At the global level, South Africa has elected not to participate in the negotiation of

the Environmental Goods Agreement, due to concerns over its legitimacy. At the regional level, tariffs are not a significant barrier and the Southern African Development Community (SADC) increasingly focuses on developing a regional industrial policy, including a SADC Green Economy Strategy and Action Plan. Discussions are, however, yet to deliver concrete interventions.

Recommendations

Building on these diagnostic policy implications and recommendations to foster green industrial development in South Africa can be formulated. They are split into four complementary components: capacity building; policy mainstreaming; information/data systems; and transition planning.

Developing a green industrial policy in South Africa is conditioned on building the capability of the state in designing and implementing it. Green industrial policy is, by definition, cross-cutting, complex and challenging of the status quo. Efforts should be directed towards building internal capacity on sustainability transitions within the departments of the ESEID Cluster. Sustainability issues must notably be mainstreamed into all sector desks and divisions of the dti. The use of the SEIAS should be further leveraged to improve the understanding of cross-cutting issues through the public sector, including politicians. Complementing individual capabilities, institutional capabilities should be built by enhancing intra-governmental coordination at the strategic as well as design and implementation levels. To ensure continual progress, sustainability issues should be embedded in personal, team and institutional performance management systems.

A double mainstreaming of sustainability in industrial policy and industrial development in environmental policy should take place. This should prelude the full alignment of environmental and industrial development policies.

Sustainability objectives should become an integral pillar of South Africa's industrial policy, including the upcoming Master Plans. The integration of sustainability into industrial policy should ultimately lead to greening the programmes which form industrial policy. Support to key industrial value chains should be strategic, time-bound and conditional to green performance improvements. Measures incompatible with the transition, such as fossil fuel subsidies, should be progressively phased out. Complementarily, policy and regulatory bottlenecks for industries to move towards a sustainable development pathway should be identified

and unlocked. Moreover, measures necessary to stimulate and unlock market demand, particularly from the private sector and households, should be prioritised.

Similarly, the realities of industrial development should be taken into account in all sustainability-related policies and strategies. An important step in that direction should be to provide long-term clarity on the climate change policy framework (and more broadly environmental regulation), including carbon pricing.

Another important area of alignment is skills development and the commercialisation of local innovation and R&D. Further collaboration between entities is required on technology development and commercialisation to bridge the “valley of death” preventing new innovation to reach the market. At the same time, further efforts are required to develop the green skill base in the country, through awareness raising, establishing professional bodies and the mainstreaming of green skills in education programmes.

Both capacity building and policy mainstreaming interventions, in order to be successful and long-standing, need to rely on up-to-date, accurate information and data. A just transition to green industrial development cannot occur without evidence-based policymaking. Establishing a central, robust and extensive information base should be prioritised. Complementarily, economic data and information should be further disseminated and understood, notably by non-economic departments and stakeholders. A one-stop-shop platform dealing with the interplay of sustainability and industrial development should also be established in the country. In the longer run, systems for the co-development of policy (in its broad sense) by government, the private sector, labour and communities should be established.

In addition to all policy interventions aimed at fostering South Africa’s sustainability transition, further attention should be paid to managing the transition process within a just transition framework. A long-term vision aligned with the country’s sustainability objectives should be developed. Leveraging the Master Plan process, sectoral roadmaps should accompany the vision to flesh out the implications for each economic activity. The development of sectoral roadmaps should be informed by a clear understanding of the risks and opportunities associated with the transition to green industrial development. In addition, resilience plans should be systematically crafted to ensure a just transition in favour of workers, small businesses and low-income

communities. Institutionally, due to the cross-cutting and far-reaching nature of this work, social dialogue and co-development by a set of multi-disciplinary and varied stakeholders, under the guidance of the PCCCC, should be driving this process.

Conclusion

South Africa’s transition to an inclusive green economy is under way. The road is, however, still long and complicated. This is notably the case with green industrial development. Many “green shoots” supporting the transition to green industrial development are nevertheless present and growing in South Africa. The transformation of both economic and societal systems in favour of more sustainable models of development have definitely started at the policy as well as ground levels. Going forward, tremendous opportunities exist for further aligning industrial development and green economy policies in South Africa and embarking on a just transition to green industrial development.

To foster action, the findings of this review should be actively disseminated for government officials, politicians, private sector representatives, labour unions, civil society and citizens at large to engage with its evidence and recommendations. This work should be particularly channelled through government structures. The current development of the Master Plans offers a unique opportunity to initiate the transition to green industrial development in the country. Considering the transition to a green economy should be a requirement for each and every Master Plan. Such work will also provide an impetus to further bridge existing knowledge gaps and trigger implementation.

1. Introduction

South Africa aims to transition to an inclusive green economy, combining economic development, social progress and environmental preservation. The National Development Plan: Vision 2030 (NDP) targets an average growth rate of 5.4% per annum over the 2010-2030 period and an increase of the GDP per capita from about R50 000 in 2010 to R110 000 in 2030 in constant prices. The country has set further ambitious targets for poverty alleviation and reducing inequality, notably to eliminate income poverty by reducing the proportion of households with a monthly income below R419 a person (in 2009 prices) from 39% to 0%. At the same time, the South African government has pledged to peak the country's greenhouse gas (GHG) emissions between 2020 and 2025 at respectively 34% and 42% below a business-as-usual trajectory, before remaining on a plateau for approximately a decade and then declining in absolute terms thereafter (UNFCCC 2011).

However, economic growth over the last decades has remained far from the stated objective, at 1.8% per annum on a compound annual growth rate (CAGR)¹ basis over the 2008-2018 period. Furthermore, as illustrated in Figure 1, the country remains one of the most carbon-intensive economies. Public policies and strategies have historically supported the development of fossil fuels (primarily coal) and energy-intensive value chains, leading to the entrenched domination of coal-fired electricity generation, carbon-intensive transport systems, and energy-intensive industries. From an inclusivity perspective, in addition to severe levels of unemployment (labour force participation stood at 59.8% in the second quarter of 2019), the South African society is also one of the most unequal. As illustrated in Figure 2, the country had the highest Palma ratio² in the world over the 2010-2015 period.

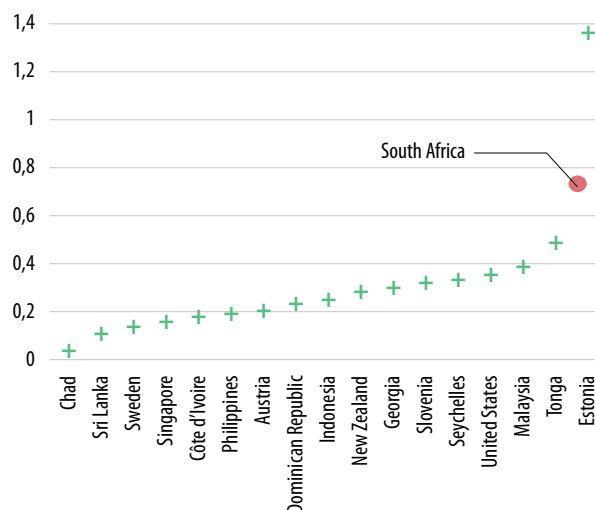
Targeting the transition to an inclusive green economy, and its translation into the public policy arena, therefore signifies a massive and disruptive shift from traditional practices (policymaking and political settlements alike). Indeed, the transition to an inclusive green economy is not only

1 The CAGR is the annualised average rate of growth between two given years.

2 The Palma ratio is the ratio of the richest 10% of the population's share of gross national income divided by the poorest 40%'s share (Palma 2016).

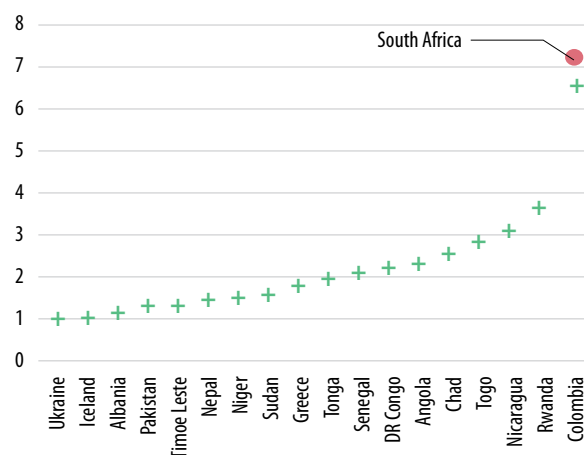
Figure 1: Carbon intensity per country in 2013

(in kilogramme of carbon dioxide-equivalent per GDP (2011 US\$) based on purchasing power parity)



Source: Authors, based on data from the World Bank, Series on carbon intensity per country, downloaded from www.worldbank.org in September 2019.

Figure 2: Palma ratio per country over the 2010-2015 period



Source: Authors, based on Human Development Index data, Series on Palma ratio, downloaded from <http://hdr.undp.org/en/data> in September 2019.

an environmental matter, but primarily a socioeconomic question with core implications for economic development. It requires a new model of development to shape a more sustainable economy and society.

Industrial policy is at the centre of this process, notably to ensure a just transition and manage a balancing act, consisting of maximising the benefits of the transition and minimising the risks associated with not transitioning; but in line with South Africa's capabilities to minimise the short-term trade-offs and threats (such as job losses). In other words, owing to the socioeconomic challenges in South Africa, the imperative of the transition must be balanced with the need to foster economic growth, employment creation and empowerment (Davis Tax Committee 2015).

In the long term, the transition is set to bring about multiple benefits, in the form of stronger, more resilient growth, increased competitiveness, higher and better employment, reduced inequality and increased welfare (UNEP and DEA 2013). In turn, delaying the transition carries substantial risks for the economy and society, by potentially jeopardising competitiveness and curtailing the country's access to markets and finance (Montmasson-Clair 2016b).

The transition remains, however, paved with difficulties and trade-offs to be addressed in the short term, particularly to minimise the cost of transition and ensure that vulnerable groups in society, i.e. workers, small businesses and low-income communities, do not bear the brunt of the negative impacts. For instance, in the short term, the internalisation of the cost of externalities may reduce the competitiveness of local industries compared to firms located in countries with less stringent (or no) socio-environmental policies (Cloete and Robb 2010). Furthermore, the industrial structure of carbon-intensive economies like South Africa is set to go through an adjustment process towards low-carbon (or lower-carbon in some sectors) business models, and some industries, such as aluminium smelting, may not be viable anymore in jurisdictions not transitioning to more sustainable energy systems (Altieri *et al.* 2015; Huxham, Anwar and Nelson 2019).

From a socioeconomic perspective, the challenge therefore lies in the ability to protect workers and other vulnerable groups, create new employment in the short term, and prepare for future opportunities while engaging on the transition. This hinges on managing the short-term cost of the transition and the associated costs and benefits

between and within the state, the private sector and households.

This requires a careful alignment of South Africa's industrial policy with the goal to transition to an inclusive green economy to support the country's green industrial development. Indeed, the overlap between industrial development and green economy realities cannot be ignored. On the one hand, industrial policy has long-term consequences on climate change and other socio-environmental strategies and objectives, through, for example, the patterns of resource use, the energy intensity of the economic structure, energy and transportation requirements, built infrastructure, and waste management-related matters. On the other hand, social and environmental progress has structural implications for industrial development. The transition to a carbon-constrained world has added GHG emissions (and more broadly sustainability) as a new factor of international competitiveness, progressively re-shuffling the cards of international trade and market development. Maintaining access to market and finance means altering products and production methods to remain competitive (Montmasson-Clair 2015a). This will particularly have an impact on a few sectors providing tradable goods and services, such as metals and chemicals but also winemaking.

Ultimately, this requires the shift from industrial policy to green industrial policy. Due to a set of complexities, some of which highlighted earlier, moving from industrial to green industrial policy is not a straightforward endeavour. While it uses similar levers and shares its fundamentals, green industrial policy differs from industrial policy in many respects. It focuses on socio-environmental externalities, adding a level of complexity to traditional industrial policy. As such, green industrial policy grapples with difficult trade-offs. Green industrial policy notably makes a clear ex-ante distinction between "good" and "bad" technologies, based on their socio-environmental impacts (Altenburg and Assmann 2017).

To inform such a transformation, this report reviews South Africa's industrial policy, from an inclusive green economy perspective. It investigates the extent to which South Africa's industrial policy is responding to the country's transition to an inclusive green economy. The policy design and implementation are unpacked in Sections 2 and 3 respectively. Recommendations to move towards a green industrial policy are then formulated in Section 4. Section 5 concludes on the findings of the review.

2. Policy design

This section reviews the extent to which mechanisms associated with the design of industrial policy in South Africa are conducive to the development of green industrial policy. It considers in turn six key components of policy design, namely: 1) existing green elements; 2) the national policy coherence; 3) the global policy alignment; 4) the intra-governmental coordination; 5) the stakeholder engagement; and 6) the monitoring and evaluation (M&E).

2.1. Existing green shoots in the industrial policy framework

A number of broad policy documents have called for the transition to a more sustainable development path in South Africa (Montmasson-Clair 2017). A commitment to a low-carbon, resource-efficient and pro-employment development path has been made in the government's long-term development policy, the NDP (NPC 2011). The transition was also enacted by all social partners with the signature of the Green Economy Accord in 2011 (EDD 2011). Sustainability-related documents, such as the National Strategy for Sustainable Development and Action Plan 2011-2014 (NSSD1) (DEA 2011b) and the National Climate Change Response White Paper (NCCRWP) (DEA 2011a), also make the case for a new model of development. In addition, the transition to sustainable development increasingly features in the design and conceptualisation of key economic policy documents. The Innovation Plan, for example, identifies climate change as one of the key "grand challenges" of the coming decades (DST 2008) while the New Growth Path (NGP) identifies the green economy as a key job-creation driver of the country (EDD 2010).

De facto, such policy documents mention and support (at least in principle) a green industrial transition of the South African economy. Although they all represent starting points, they do not constitute a strategic, coherent, green industrial development vision for South Africa. For instance, the NDP aims to leverage the green economy agenda to "promote deeper industrialisation, energy efficiency and employment" (NPC 2011, p. 150). It even acknowledges that "trade-offs must be made" and that "the careful design and sequencing of decisions [should] ensure that the decline of legacy sectors, such as coal-fired electricity generation, are balanced by concurrent growth in green economy sectors" (NPC 2011, p. 199). But,

problematically, **the NDP still sees the green economy as "a new and growing sector within the South African economy" (NPC 2011, p. 150), failing to paint the picture of a cross-cutting economy-wide transformation.**

Arguably, it is the role of South Africa's industrial policy to provide such a vision for green industrial development. South Africa's industrial policy arises from the National Industrial Policy Framework (NIPF), launched in 2007. The NIPF was developed within the context of the Presidency's 2007 Accelerated and Shared Growth Initiative of South Africa, which elevated "shared growth" as a "national effort". With its strong focus on the manufacturing sector as a key driver of balanced development, the NIPF set a framework and an implementation mechanism – in the form of annual three-year rolling IPAPs – for addressing cross-cutting and sector-specific constraints (and optimising opportunities) to put South Africa on a stronger growth path.

The IPAP essentially concretises the NIPF through its strategic interventions in various sectors (TIPS and FES 2016) and gives life to the country's industrial policy (the dti 2017). The 2019/20 financial year is the first year without an IPAP since the launch of the NIPF, as the government moves to an industrial policy framework structured around Master Plans. The new approach, coordinated by the Presidency's Re-imagining our Industrial Strategy for Inclusive Growth framework, targets the development of Master Plans for key industrial value chains in the country (Dicks 2019). As of October 2019, the future of IPAP within this framework remains unclear but it is likely to move from an annual signposting function to a more strategic purpose, in line with Master Plans.

On the one hand, many green shoots are present in South Africa's industrial policy and the dti has provided leadership for the development of green industries, with key building blocks in favour of renewable energy, resource efficiency, recycling and the circular economy, and e-mobility. The dti has articulated various visions for the growth of green industries in South Africa. The Solar and Wind Energy Strategy (the dti 2012), the Solar Photovoltaic (PV) Localisation Roadmap (EScience Associates, Urban-Econ Development Economists and Ahlfeldt 2013), the Solar Concentrated Solar Power (CSP) Localisation Roadmap (Ernst & Young and enolcon 2013), the Wind Industry Localisation Roadmap (Urban-Econ Development Economists 2014) and the Electric Vehicle Industry Roadmap (the dti 2013) are examples of such strategic

planning. This has been complemented by initiatives led by other developments, such as the Department of Science and Technology's (DST) Bio-Economy Strategy and Waste Research, Development and Innovation Roadmap and the DST-Department of Water and Sanitation's (DWS) Water Research, Development and Innovation Roadmap.

In addition, an important shift can be noted in recent years with the growing focus on the alignment of industrial policy with environmental objectives. A Green Industries Sector Desk was established within the Industrial Development Division (IDD) of the dti in 2010/11.³ Since then, the rolling IPAPs have included a focus on developing green industries, however, mostly in separate, stand-alone chapters. Furthermore, since its 2016/17 iteration, the IPAP stresses the necessity to design a policy roadmap for climate-compatible industrial development in South Africa. In 2017, the IPAP further noted it was fundamental to strengthen "national efforts to implement sustainable economic growth, considering not only the country's current challenges but also anticipating the needs of future generations (including climate change mitigation and food and water security)" (the dti 2017, p. 81).

As per requirements from the National Environmental Management Act No 107 of 1998 (NEMA) for departments exercising functions which may affect the environment, **the dti, with support from DEFF, has also been developing Environmental Implementation Plans (EIPs).** EIPs aim to "describe policies, plans and programmes of a department that performs functions that may impact on the environment and how this department's plans will comply with the NEMA principles and national environmental norms and standards" (DEA 2013, p. 4). Over time, the dti's EIPs have evolved from simply covering the day-to-day operational and logistical impact of the department (e.g. improving the department's waste management and carbon footprint) to meaningfully interrogating how the dti impacts the environment through its core functions (such as trade and investment promotion and support programmes).

³ Sector desks are Chief Directorates within the IDD of the dti. Sector desks are responsible for the various industries falling under the dti's mandate. Main sector desks are: Automotives; Clothing, textile, leather and footwear; Metal fabrication, capital and rail transport equipment; Agro-processing; Forestry, timber, pulp, paper and furniture; Plastics, pharmaceuticals, chemicals and cosmetics; Mineral beneficiation; Green industries; Business process services; Marine manufacturing and associated services; Aerospace and defense; and Electro-technical industries.

Furthermore, the heterogeneity of industrial situations vis-à-vis the transition (i.e. different starting points, abilities and readiness levels)⁴ has started to be internalised. Acknowledging the need to pair the development of green industries with the greening of existing economic activities, **the dti has been developing a set of action-orientated climate-compatible industrial development strategies for various carbon-intensive sectors**, such as iron and steel and petrochemicals (the dti 2017).

Table 1 illustrates this progress by listing top-tier green economy objectives included in the 2018 IPAP.

Most green objectives and key programmes are discussed under the Green Industries section, and general objectives identified mainly speak to energy and water efficiency within industry and buildings; resource efficiency and cleaner production; water sanitation; and development of fuel cells and gas industries. A number of green objectives also feature in sectoral and other cross-cutting programmes.

Industrial policy has also been core to the design and implementation of a just transition. Taking the inclusive growth agenda forward within the green industrial development framework, the 2011 NCCRWP identified the need to develop resilience plans for the most affected sectors and stakeholders. The aim is to ensure that the economic and social burdens resulting from climate change impacts and responses are not shifted onto vulnerable people and communities (i.e. workers, small businesses and low-income communities). The resilience plans respond to the need for a just transition, helping to ensure that the shift to low-carbon and climate-resilient society contributes to reducing inequality, poverty and unemployment. The South African government, under the leadership of the then-Economic Development Department (EDD) and the then-Department of Environmental Affairs (DEA), has initiated the development of a National Employment Vulnerability Assessment and

⁴ Some industries, like light manufacturing, face little intrinsic obstacles to transition and are mostly reliant on the transformation of the country's energy systems. Other industrial activities, such as petrochemicals, cement production and steelmaking, are constrained by infrastructure lock-in dynamics and a manufacturing process itself carbon-intensive (due to process emissions). The degrees of readiness also largely vary, often based on international trends and local market structures and political settlements. The contested nature of the exercise should also not be underestimated, with firms and stakeholders resisting the transition as a result of favourable political settlements, contested social compacts and difficult short-term economic trade-offs (Montmasson Clair 2016b).

Table 1: Key green economy objectives in South Africa's 2018 Industrial Policy Action Plan

Programme	High-level objectives
Science and technology	Bridge the gap between research, development and industrial application at pace and scale
Technical infrastructure	Resolve the energy challenge/supporting Green Industries-Industrial Energy Efficiency Project Collaborate on research support programme on science and technology Water and sanitation standards support programme
Plastics, pharmaceuticals, chemicals and cosmetics	Development of polymers from waste
Minerals beneficiation	Expansion of the Platinum Group Metals beneficiation Industries
Green Industries	A Policy Roadmap for Climate-Compatible Industrial Development Systemised resource efficiency data collection and reporting A national strategy to use appropriate measures and technology to ensure water security, and support the development of a local base of technology and service providers in the sector Industrial Water Efficiency Project Industrial Energy Efficiency Project Resource-efficient and cleaner production skills development Professionalisation of specialist occupations in the resource-efficient and cleaner production fields

Source: Authors, based on the dti 2018b.

Sector Jobs Resilience Plans. As of November 2019, **work is under way in five key value chains: coal (from mining to electricity generation and petrochemicals); metals (from mining to refining/smelting and fabrication); petroleum-based transport systems (including cars and minibuses, petrol stations and auto assembly); agriculture; and tourism.**

More broadly, the South African government adopted the Socio-Economic Impact Assessment System (SEIAS) to help manage the shift to a sustainable development pathway. The SEIAS, approved by Cabinet in February 2015, replaced the Regulatory Impact Assessment system from 1 June 2015, with the objective of strengthening policymaking processes. The SEIAS provides the framework to assess new policies and regulations in South Africa with the aim of improving the formulation of prescripts,

minimising unintended consequences and easing implementation. It requires that the impacts of a proposed legislation and its alternatives on different stakeholders (government, business, society) are considered, through five broad criteria, namely social cohesion, security, economic inclusion (employment creation and equity), economic growth and investment, and environmental sustainability. The SEIAS methodology aims to ensure that the proposal tackles the roots of a problem and constitutes the most appropriate action, taking into account the repartition of risks and benefits and the interactions with other policy and regulations.

The SEIAS represents a valuable initiative and, although the framework cannot perfect the policymaking process, it has already triggered noteworthy improvements. The continual review of the methodology

and the ongoing capacity building programme moreover ensure that benefits are sustained and enhanced over time (Montmasson-Clair 2017; DPME 2015a; DPME 2015b; TIPS 2017).

On the other hand, South Africa's overall industrial policy vision remains fundamentally entrenched on a business-as-usual trajectory from a green economy perspective. It tends to consider the transition to an inclusive green economy as an add-on to other developments in the country, often failing to acknowledge the positive synergies between the transition and other domestic objectives, such as energy security and reduced inequality. Despite some efforts, the green economy as it appears in the various iterations of the IPAP is perceived by key stakeholders as an isolated and standalone objective, responding to the now inevitable effects of climate change as opposed to being pre-emptive and embedded across all policy objectives.

Most importantly, from a trade and industry perspective, the linkages between competitiveness and the green economy remain largely to be unpacked.

This is essentially due to the large focus on immediate climate change mitigation objectives. Competitiveness issues, particularly in the short term, and climate resilience (i.e. climate change adaptation) have not filtered through to the extent required. A detailed understanding of the implications of the transition to an inclusive green economy for the country's key (present and future) value chains, including a qualitative, nuanced and broad-based analysis and understanding of the competitiveness and vulnerability of specific value chains, is largely absent. For example, the extent to which firms can transition while maintaining, if not expanding, their outputs, value added and employment remains misunderstood.



Box 1. Gender issues in South Africa

Since 1994, the South African government, through social policy and the elimination of discriminatory legislation, has facilitated positive shifts in women's labour force participation and business ownership. However, race and gender still define the nature of disadvantage in the economy. As documented by Gqubele (2019), although women represent over half of the population, black women are least likely to own businesses and are more likely to be outside paid employment. When black women are employed, they tend to be clustered in occupations and sectors that are associated with "care work", such as public service occupations, domestic work and retail. Excluding the public sector, the sectors in which women dominate typically offer lower income compared to sectors dominated by men.

These poor outcomes are not entirely explained by differentials in education, as women are at least equally or more educated than men. A legacy of separate and exclusionary development under the apartheid era appears as a key driver of poor outcomes for women. Enterprise activity as well as employment opportunities remain concentrated in urban areas and the scope for employment and self-employment in the non-urban areas remains limited.

The dti, with a relatively small budget, has focused primarily on redistributing economic power by supporting the inclusion of black-owned small businesses into established supply chains of large firms in traditional sectors and does not consistently target women. In addition, excluding clothing and textiles, business process services, and food and beverages, industrial policy does not include strategies for sectors or industries (e.g. non-traditional sectors or public services) in which women dominate. Through the Industrial Development Corporation (IDC), the dti has also targeted women-owned businesses, albeit with relatively small funding allocations.

The transition of a green economy holds great potential to reduce gender inequalities and increase women's economic participation. First, it offers the opportunity to make women's unaccounted contributions (such as domestic work and childcare) to society and the economy visible as well as to revalue them. Second, as it opens the door for new businesses and economic

activities, the transition could provide a platform to increase opportunities for women. Importantly though, without taking a gender perspective on green economy policies and practices, the barriers to women's participation in the brown economy risk being perpetuated in the green economy (McLean 2019). To achieve gender equality, green industrial policy would have to explicitly promote sectors which offer employment for women and/or promote women employment overall through gender-responsive policies.

The National Planning Commission has embarked on a process to develop 2050 pathways for South Africa, which may provide the platform to establish the country's vision for green industrial development (and beyond). The process aims to support the implementation of the NDP.⁵ The ultimate goal of the process is to reach a social compact, understood as a broad agreement on the best pathway for a "just transition"⁶ to a sustainable society, including the modalities for implementation. It aims to build a collective vision for the 2050 end-state, while providing guidance for developing pathways so that the transition is fair and equitable (NPC, SEA, and OneWorld 2018). This economy- and society-wide exercise attempts to identify and take a stance on the key trade-offs associated with the transition and could, in the end, provide a holistic vision for South Africa's economic development.

5 The process builds on Chapter 5 of the Plan, which seeks to foster a transition to an environmentally-sustainable, low-carbon, socially-inclusive and climate-resilient society by 2030. The chapter also provides a set of guiding principles, which demand that the transition be just, ethical, sustainable and transformative, while taking a strategic, regional and ecosystems approach during a managed transition (NPC 2011).

6 The "just transition" refers to strategies to ensure that the transition to a green economy does not impose excessive losses on workers and low-income communities, and in fact generates gains for them. The discourse has evolved substantially over the past decade without much rigour in developing a common conceptual framework or detailed instruments and proposals. See (Makgetla 2019) for an extensive discussion of the concept of a just transition.

Altogether though, the link between green economy and inclusive development is not adequately developed.⁷ While some stakeholders (such as service companies or high-income households) have the potential to quickly and cheaply transition to sustainable practices as well as adapt to related impacts, other actors (such as low-income households or industries in carbon-intensive activities) face inherent challenges. Without such a differentiated understanding, **South Africa's sustainability transition runs the risk of deepening existing socioeconomic challenges, rather than addressing them.** A risk indeed exists that, without adequate policies, new green solutions, such as electric vehicles and solar-based systems, are solely accessed by high-income households and large businesses, deepening the divide and inequalities in society. A conscious alignment with the country's objective of socioeconomic transformation is required to ensure a just and pro-poor transition and transformation (Montmasson-Clair 2017). Box 1 details initiatives on gender-related divides in the economy.

2.2. National Policy Coherence

The underpinning, rationale and indeed long-term objectives of South Africa's industrial and green economy policy frameworks are well aligned and emerge as an opportunity for cooperation and mutual benefits. Looking comparatively at South Africa's industrial policy, i.e. the 2007 NIPF and the rolling IPAPs, and green economy strategy, i.e. the NCCRWP and the NSSD1, a key set of overlapping goals arises (Montmasson-Clair 2015a).

⁷ More broadly, industrial policy has also played a key role in South Africa in fostering industrial development by supporting developmental models focused on radical economic transformation and social inclusion. South Africa's industrial policy targets radical economic transformation with an on-going effort to fundamentally change the structure of the economy through focusing on patterns of ownership to achieve inclusive shared equity, growth and job creation, the empowerment of the previously disadvantaged, gender-positive and small business development (the dti 2017). As defined by IPAP (the dti 2018b), radical economic transformation, the key thrust of this economic reorientation, aims to tackle the long-standing structural fault-lines in the economy. It aims to systematically eliminate race-based economic ownership and control and find effective instruments to address South Africa's problems of unemployment, poverty and inequality. Reviewing the contribution of South Africa's industrial policy to the country's inclusive development is a comprehensive endeavour that is beyond the scope of this paper. Instead, this paper considers the role of industrial policy in linking inclusive development with the transition to an inclusive green economy.

Both South Africa's industrial policy and green economy policy envision a structural shift suggesting a diversification of the domestic economy. The NIPF aims to "facilitate the diversification of the South African economy beyond the current reliance on traditional commodities and non-tradable services" (the dti 2007), while the NCCRWP targets "the transition to a climate-resilient, equitable and internationally competitive lower-carbon economy" (DEA 2011a, p. 11).

Complementing the goal of diversifying the economy, South Africa's industrial and green economy policies both target the transition to a knowledge-based industrialisation. Indeed, the response to climate change and other environmental challenges bears tremendous economic opportunities for the country, largely associated with the transformation towards a knowledge-based economy, as identified by South Africa's Ten-Year Innovation Plan which features both climate change and energy security among the country's five innovation "grand challenges" (DST 2008).

Therefore, both the industrial policy framework and the green economy policies target job creation and increased broad-based economic development.

The NIPF aims to promote labour-intensive industrial development as well as "a broader-based industrialisation path characterised by greater levels of participation of historically disadvantaged people and marginalised regions" (the dti 2007, p. 2). The transition towards a green economy, supported by relevant policies and instruments (as highlighted in Figure 3 and Table 3), goes in the same direction, with the creation of green jobs positioned at its core (Montmasson-Clair 2015b). Accordingly, the NGP targets the creation of 300 000 additional direct jobs by 2020 (and 400 000 by 2030) in the "green economy sectors" (EDD 2010) and the IPAP has identified green industries as a priority sector for job creation since the 2010/11 iteration (the dti 2010; the dti 2011).

Last, but not least, the NIPF aims to "contribute to industrial development on the African continent with a strong emphasis on building its productive capabilities" (the dti 2007, p. 3). The NCCRWP strengthens this goal by targeting multi-disciplinary collaboration at the regional level for financial resources, technical cooperation, and technology and knowledge transfers (p. 41-42), and early warning systems, and achieving climate resilience in the region, notably in the water sector.

As mentioned in Section 2.1, numerous domestic policies, plans and strategies impact South Africa's transition to a green industrial development. Core plans and strategies⁸ having a fundamental impact on the transition to a green industrial development constitute a complex mosaic of general documents incorporating the transition in their holistic or sectoral view of the country, alongside policies directly focused on, and targeted at, promoting industrial development and/or sustainable development (see Figure 3 for an overview). This set of policies is meant to give substance to the constitutional mandate (Section 24 of the Bill of Rights), the principles of the NEMA and South Africa's international commitments,

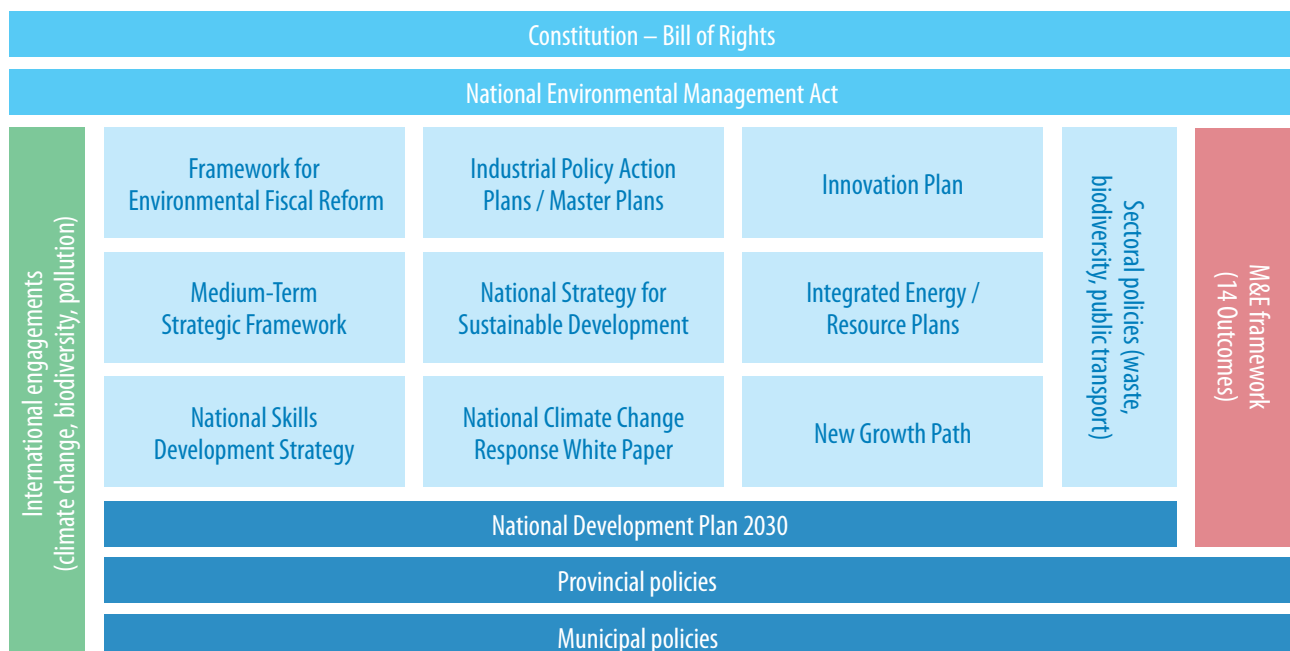
⁸ These core documents are complemented by a myriad of sector-, issue- and time-specific policies. In addition, sub-national initiatives, at both the municipal and provincial levels, are increasingly emerging. The South African government has also implemented a comprehensive monitoring system, the 14 Outcomes framework, developed by the Department of Planning, Monitoring and Evaluation.

providing the instruments for implementation, M&E, and balancing the trade-offs associated with the transition (Montmasson-Clair 2017).

A general coherence seems to emerge, in theory, from national policy documents. The development of renewable energy, the improvement of energy efficiency, and the promotion of green buildings appear as the key focuses of the South African government's green industrial development agenda. Besides these focus areas, sustainable waste management and sustainable transport are also high on the governmental agenda.

In practice, a number of areas lack consensus or clarity. This is the case around key technological choices in the energy space, with substantial implications for the transition to green industrial development. The development of carbon capture and storage, the expansion of nuclear energy, the roll-out of a gas industrialisation programme, and the development of a hydrogen economy are a few

Figure 3: A representation of the key policy documents impacting the transition to sustainable development in South Africa



Source: Mohamed and Montmasson-Clair 2018.

examples of initiatives that do not garner unanimous support.

In addition, a broader misalignment persists between South Africa's green economy objectives and the country's other policies and priorities. Substantial effort is still being unconditionally directed at energy- and carbon-intensive sectors, most importantly through fossil fuel subsidies (see Section 3.2 on industrial finance). Even though the transition away from fossil fuel-based (particularly coal-based) energy systems (for electricity generation and transportation) underpins the transition to green industrial development for most industries, support for coal-fired electricity production (see DoE, 2011) remains prominent.

De facto, as illustrated in Table 2, the double mainstreaming of green economy considerations into economic policy and of socioeconomic development issues into green economy policy, has not occurred yet.

Despite numerous strategies at national and subnational levels, green economy considerations have not yet been meaningfully integrated in other policies and remain largely considered as stand-alone. In turn, sustainability-focused policies (such as the NSSD1 and the NCCRWP), to be truly sustainable, must take stock of the economic and social realities and design objectives in line with these. Climate change policies, particularly, too often fail to meaningfully consider the short-term socioeconomic trade-offs associated with their implementation as well as the heterogeneity of situations. Implementation of environmental policies generally constitute a cost to companies, at least in the short term. However, firms (like households) are not equal in front of environmental challenges. Their ability to internalise environmental externalities differs vastly, partly due to the nature of the industry but also as a result of cyclical economic conditions (see Montmasson-Clair (2016b) for a discussion on this). Strategies (either as part of environmental policy or associated with it) supporting vulnerable stakeholders to adapt to new circumstances are in most cases missing. Importantly, the stream of work on a just transition, mentioned in Section 2.1, has started to address such a gap. Similarly, many technical exercises on the long-term sustainability pathways for the country, such as the DEA-led project on South Africa's Greenhouse Gas Emission Pathways (Lewis *et al.* 2018), approach the transition simply from a technical perspective, without meaningfully considering the socioeconomic realities of the country.

The work spearheaded by the dti on the development of climate-compatible industrial strategies (see Section 2.1) is, in this respect, contributing to addressing this problem.



Table 2: Interplay between key green economy policies and green industrial development objectives

Document	Core objectives of the policy document	Key areas supporting green industrial development objectives	Key areas hindering green industrial development objectives
National Strategy for Sustainable Development and Action Plan 2011-2014 (DEA 2011a)	<ul style="list-style-type: none"> • Enhancing systems for integrated planning and implementation • Sustaining our ecosystems and using natural resources efficiently • Support towards a green economy • Building sustainable communities • Responding effectively to climate change 	<ul style="list-style-type: none"> • Calls for a cross-cutting transition to a green economy • Calls for greater climate change mitigation in industrial sectors 	<ul style="list-style-type: none"> • No consideration of key trade-offs in terms of industrial development
National Climate Change Response White Paper (DEA 2011b)	<ul style="list-style-type: none"> • Mitigation and adaptation to climate change • Water conservation and demand management • Fostering renewable energy and energy efficiency • Fostering lower carbon and efficient vehicles in transport • Fostering waste management, waste to energy 	<ul style="list-style-type: none"> • Calls for the development of vulnerability assessment and resilience plans • Calls for a cross-cutting transition to a low-carbon economy • Calls for industrial resource efficiency and industrial symbiosis • Calls for the development of skills training 	<ul style="list-style-type: none"> • Lack of understanding of the socioeconomic implications of the transition to a climate-compatible economy
Bio-Economy Strategy (DST 2013)	<ul style="list-style-type: none"> • Agriculture innovation to ensure food security, enhance nutrition and improve health, enable job creation through expansion and intensification of sustainable agricultural production and processing • Development of new and improved therapeutics drugs, vaccines, phyto-medicines and bio-pharmaceuticals • Industry and sustainable environmental management through bio-based chemicals, biomaterials and bio-energy • Water and waste as a means of providing environmental sustainability for the industrial bio-economy 	<ul style="list-style-type: none"> • Calls for sustainable agriculture and agro-processing value chains • Initiative to foster localisation of pharmaceuticals and ensure access to local pharmaceuticals • Calls for biomaterials and biopharmaceuticals 	<ul style="list-style-type: none"> • Inadequate policy support for sustainable farming, innovative agricultural production and processing methods

Document	Core objectives of the policy document	Key areas supporting green industrial development objectives	Key areas hindering green industrial development objectives
New Growth Path (EDD 2010)	<ul style="list-style-type: none"> Identifies possible changes to the structure and character of production with a view to generating a more inclusive and greener economy Identifies the green economy as offering potential for creating new jobs 	<ul style="list-style-type: none"> Calls for better interaction between the natural environment and industrial development activities Calls for the development of vulnerability assessment and resilience plans 	<ul style="list-style-type: none"> Lack of clarity on how the employment creation potential will be realised Green economy only considered as a sector, and not a cross-cutting transformation
National Development Plan: Vision 2030 (NPC 2011)	<ul style="list-style-type: none"> An appropriate mix of pricing mechanisms An expanded renewable energy programme An effective mix of energy efficiency and demand management incentives Regulations to promote green buildings and construction practices Investment in an efficient public transport system 	<ul style="list-style-type: none"> Facilitation of investment in an electricity network with greater intelligence to enable the integration of renewable energy technologies, thus supporting the transition towards a productive low-carbon economy Conception of new standard for water and energy efficiency in buildings Key objective for a Strategic Roadmap for green transport manufacturing Support toward a shift away from conventional diesel and petrol-driven road transport industry to development new, greener alternatives 	<ul style="list-style-type: none"> Lack of continuation in alignment with objectives Support for fossil fuels remains embedded No clear suggestion for a mix of policy measures No clarity on the trade-offs in terms of socioeconomic development
Waste Research, Development and Innovation Roadmap for South Africa (2015-2025) (DST 2015)	<ul style="list-style-type: none"> Build logistics, management, technology, jobs, that address more effective responses in water quality management Improving management of contaminated land, remediation, rehabilitation Better management of atmospheric emissions Climate change mitigation and adaptation 	<ul style="list-style-type: none"> Calls for better information management on the waste economy Calls for a cross-cutting transition to a green economy Calls for circular economy, notably through industrial symbiosis 	<ul style="list-style-type: none"> No clear plan on how to leverage the waste economy for industrial development

Document	Core objectives of the policy document	Key areas supporting green industrial development objectives	Key areas hindering green industrial development objectives
Green Transport Strategy 2018-2050 (DoT 2018)	<ul style="list-style-type: none"> • Enabling the transport sector to contribute its fair share to the national effort to combat climate change and manage a just transition • Promoting the development of the efficient integrated transport systems to enable sustainable socioeconomic development • Promoting countrywide behavioural changes towards sustainable mobility alternatives • Minimising the adverse effects of transport activities on the environment 	<ul style="list-style-type: none"> • Calls for identifying opportunities for the deployment of fuel cells in the public transportation sector • Calls the development of the green transport industry. • Ongoing work to design an enabling framework for electric vehicles • Calls for localisation of manufacturing 	<ul style="list-style-type: none"> • Inadequate strategy to promote behavioural changes towards support of public transport • No mainstreaming of green industrial development into the government support programmes for automotive manufacturing • No clear strategy for guidelines for the procurement of vehicles throughout government to procure efficient vehicles, using clean technologies
Water Research, Development and Innovation Roadmap for South Africa (2015-2025)	<ul style="list-style-type: none"> • Increase ability to make use of more sources of water • Improve governance, planning and management of supply and demand • Improve adequacy and performance of supply infrastructure • Run water as a financially sustainable business • Reduce losses and increase efficiency of productive use • Improve performance of pricing, monitoring, billing, metering and collection 	<ul style="list-style-type: none"> • Support for the Water Technologies Demonstration Programme to accelerate diffusion of technologies • Development of a national strategy for water security and support of a local technology and service providers • Support for increased water efficiency 	<ul style="list-style-type: none"> • Lack of integration with industrial policy

Source: Authors.

2.3. Global alignment

A positive step towards a green industrial development vision for the country is to align the country's industrial policy with the 17 Sustainable Development goals (SDGs). While assessing the coherence and alignment of South Africa's industrial policy with SDGs is somewhat difficult and restrictive, due to the mandate for certain developmental objectives lying in the hands of other policy

areas, it remains important to understand the contribution of industrial policy to such global objectives.





Table 3, which summarises key areas of alignment and misalignment with South Africa's industrial policy and SDGs, shows mixed results. The country's industrial policy demonstrates key areas of alignments, where it makes positive contributions towards SDGs. In contrast, many interventions remain in contradiction of some key SDGs.





Table 3: Assessment of the interplay between South Africa's industrial policy and SDGs

Document	Core objectives of the policy document	Key areas supporting green industrial development objectives	Key areas hindering green industrial development objectives
National Strategy for Sustainable Development and Action Plan 2011-2014 (DEA 2011a)	<ul style="list-style-type: none"> Enhancing systems for integrated planning and implementation Sustaining our ecosystems and using natural resources efficiently Support towards a green economy Building sustainable communities Responding effectively to climate change 	<ul style="list-style-type: none"> Calls for a cross-cutting transition to a green economy Calls for greater climate change mitigation in industrial sectors 	<ul style="list-style-type: none"> No consideration of key trade-offs in terms of industrial development
National Climate Change Response White Paper (DEA 2011b)	<ul style="list-style-type: none"> Mitigation and adaptation to climate change Water conservation and demand management Fostering renewable energy and energy efficiency Fostering lower carbon and efficient vehicles in transport Fostering waste management, waste to energy 	<ul style="list-style-type: none"> Calls for the development of vulnerability assessment and resilience plans Calls for a cross-cutting transition to a low-carbon economy Calls for industrial resource efficiency and industrial symbiosis Calls for the development of skills training 	<ul style="list-style-type: none"> Lack of understanding of the socioeconomic implications of the transition to a climate-compatible economy
Bio-Economy Strategy (DST 2013)	<ul style="list-style-type: none"> Agriculture innovation to ensure food security, enhance nutrition and improve health, enable job creation through expansion and intensification of sustainable agricultural production and processing Development of new and improved therapeutics drugs, vaccines, phyto-medicines and bio-pharmaceuticals Industry and sustainable environmental management through bio-based chemicals, biomaterials and bio-energy Water and waste as a means of providing environmental sustainability for the industrial bio-economy 	<ul style="list-style-type: none"> Calls for sustainable agriculture and agro-processing value chains Initiative to foster localisation of pharmaceuticals and ensure access to local pharmaceuticals Calls for biomaterials and biopharmaceuticals 	<ul style="list-style-type: none"> Inadequate policy support for sustainable farming, innovative agricultural production and processing methods

Sustainable Development Goals	Key areas of support	Key areas for improvement
<p>1 NO POVERTY</p>  <p>GOAL 1 <i>End poverty in all its forms everywhere</i></p>	<ul style="list-style-type: none"> • Development of employment vulnerability assessment and resilience plans in line with the just transition paradigm • Acknowledges that radical transformation is needed to address inequality • Objective set that building stronger value chains will give government muscle to broader government efforts to reduce inequality and poverty 	<ul style="list-style-type: none"> • Transformation is one of the routes to ending poverty and inequality, but it does not always translate into implementation. If not well implemented, a transformation bears risks of exacerbating inequality and poverty
<p>2 ZERO HUNGER</p>  <p>GOAL 2 <i>End hunger, achieve food security and improved nutrition and promote sustainable agriculture</i></p>	<ul style="list-style-type: none"> • Support for agro-processing industries and agriculture • Support for biofuels from non-food crop • Objective set to provide reference materials for nutritional content in food in support of new food labelling regulations 	<ul style="list-style-type: none"> • Lack of consideration of socio-environmental externalities • Insufficient assistance for sustainable agricultural and agro-processing value chains
<p>3 GOOD HEALTH AND WELL-BEING</p>  <p>GOAL 3 <i>Ensure healthy lives and promote well-being for all at all ages</i></p>	<ul style="list-style-type: none"> • Support for the local manufacturing of generic medicine • Support for improved health technology innovation capability, R&D, commercialisation of technologies, and skills development 	<ul style="list-style-type: none"> • Lack of efficient assistance for waste management in pharmaceuticals • Lack of alignment between departments for overall health-care systems
<p>4 QUALITY EDUCATION</p>  <p>GOAL 4 <i>Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all</i></p>	<ul style="list-style-type: none"> • Support for skills development and institutional capacity in resource efficiency • Support for professionalisation of specialist occupations in the resource-efficient and cleaner production fields • Ongoing internal capacity building within the dti on green economy and industrial development • Development of tools and platforms for learning and awareness of energy management in industry 	<ul style="list-style-type: none"> • Partial understanding of the implications of the transition on employment and skills • Lack of united strategy bringing employment/skills demand and supply • Lack of a proactive approach in skills development • Lack of tracking of agencies involved in green economy training
<p>5 GENDER EQUALITY</p>  <p>GOAL 5 <i>Achieve gender equality and empower all women and girls</i></p>	<ul style="list-style-type: none"> • Support for research programmes on women in industry • Multiple gender-based support programmes for women entrepreneurs and innovators such as the Isivande Women's Fund for enterprise development, the B'avumile Skills Development Initiative for capacity-building, the Technology for Women in Business for technology development, the Techno Girls Programme on awareness raising and education • Support to the South African Women Entrepreneurs' Network 	<ul style="list-style-type: none"> • Most programmes are reactive and not pre-emptive to existing gender equality issues • Although women represent more than half of the population, women are over-represented outside paid employment

Sustainable Development Goals	Key areas of support	Key areas for improvement
<p>6 CLEAN WATER AND SANITATION</p>  <p>GOAL 6 <i>Ensure availability and sustainable management of water and sanitation for all</i></p>	<ul style="list-style-type: none"> • Support for industrial development (including localisation) in the water and sanitation sectors • Support for water efficiency and water management in industry and buildings • Development of skills training modules for water management and water efficiency in industry 	<ul style="list-style-type: none"> • Continuous support to water-intensive industries • Lack of support to improve industrial water management • Lack of tracking of designated products such as smart water meters
<p>7 AFFORDABLE AND CLEAN ENERGY</p>  <p>GOAL 7 <i>Ensure access to affordable, reliable, sustainable and modern energy for all</i></p>	<ul style="list-style-type: none"> • Support to energy efficiency initiatives (including standards) in industries and buildings • Support to localisation renewable energy, (solar water heaters (SWHs), meters) and local industrial development (SEZs) • Support for energy storage technologies, including fuel cells • Support for structured gathering and collation of information on green industrial development 	<ul style="list-style-type: none"> • Continuous support to fossil fuels and energy-intensive industries still ongoing • Lack of a clear industrial development plan for renewable energy technologies • Lack of tracking and reporting systems for localisation
<p>8 DECENT WORK AND ECONOMIC GROWTH</p>  <p>GOAL 8: <i>Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all</i></p>	<ul style="list-style-type: none"> • Support for targeted sectors to foster economic growth and job creation through grants and incentives • Major incentives to support economic growth and job creation in manufacturing sectors 	<ul style="list-style-type: none"> • Inadequate job creation through administered incentives • Misalignment between support programmes and goals of green economy and just transition • Lack of adequate approach on “decent employment”, including from a green economy perspective
<p>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</p>  <p>GOAL 9 <i>Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation</i></p>	<ul style="list-style-type: none"> • Support for R&D and innovation (tax incentives, innovation programmes) • Support for local green industrial development (SEZs) 	<ul style="list-style-type: none"> • Persistent “valley of death” for innovations • Lack of coordination with other departments and agencies involved in innovation • Lack of support for sustainable local innovation and technology • No cross-cutting approach on eco-industrial parks

Sustainable Development Goals	Key areas of support	Key areas for improvement
<p>10 REDUCED INEQUALITIES</p>  <p>GOAL 10 <i>Reduce inequality within and among countries</i></p>	<ul style="list-style-type: none"> • Development of employment vulnerability assessment and resilience plans in line with the just transition paradigm • Support for “radical transformation” and economic empowerment, by shifting ownership and opportunities to historically disadvantaged populations • Incentive support programmes, such as the Black Industrialist Programme 	<ul style="list-style-type: none"> • South Africa remains a highly unequal society • No clear policy path for informal sector • Just transition plan yet to be established
<p>11 SUSTAINABLE CITIES AND COMMUNITIES</p>  <p>GOAL 11 <i>Make cities and human settlements inclusive, safe, resilient and sustainable</i></p>	<ul style="list-style-type: none"> • Support for Green Transport Strategy • Support of public transport such as the Bus Rapid Transit System (BRT), with some already powered by gas 	<ul style="list-style-type: none"> • Lack of alignment between green industrial development and transport policy
<p>12 RESPONSIBLE CONSUMPTION AND PRODUCTION</p>  <p>GOAL 12 <i>Ensure sustainable consumption and production patterns</i></p>	<ul style="list-style-type: none"> • Support for resource efficiency • Support for responsible consumption through labelling and information campaigns • Design of climate-compatible industrial strategies • Support for green chemistry, including bio-refineries • Support of energy efficiency standards testing 	<ul style="list-style-type: none"> • Overall focus on increasing production without adequate consideration for socio-environmental externalities • Lack of tracking and report of progress of sustainable production of public entities
<p>13 CLIMATE ACTION</p>  <p>GOAL 13 <i>Take urgent action to combat climate change and its impacts</i></p>	<ul style="list-style-type: none"> • Ongoing work on the alignment of industrial policy with green economy • Work on exposure to both direct and indirect climate risks • Building of climate-compatible industrial development strategies • Internal sectoral capacity building within the dti on green economy and industrial development. 	<ul style="list-style-type: none"> • Ongoing support to fossil fuels and energy/ carbon-intensive economic activities counter productive • Lack of integration of sustainability in all forms of policymaking and department performance indicators • Green economy largely perceived as an external standalone sector

Sustainable Development Goals	Key areas of support	Key areas for improvement
<p>14 LIFE BELOW WATER</p>  <p>GOAL 14 <i>Conserve and sustainably use the oceans, seas and marine resources for sustainable development</i></p>	<ul style="list-style-type: none"> • Support for Oceans Economy • Acknowledgment of illegal fishing costing the economy, and unsustainable fishing industry particularly abalone 	<ul style="list-style-type: none"> • Inadequate support for sustainable fisheries
<p>15 LIFE ON LAND</p>  <p>GOAL 15 <i>Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss</i></p>	<ul style="list-style-type: none"> • Acknowledgment of re-forestation and new afforestation as an opportunity • Support for increasing the recovery of recyclable paper to meet local and global demand • Successful roll out of Forest Stewardship Council certification 	<ul style="list-style-type: none"> • Lack of socioeconomic transformation in the forestry sector • Persistent inefficiency in production systems • Negative environmental impact of move toward shorter rotation eucalyptus instead of longer rotation pine
<p>16 PEACE, JUSTICE AND STRONG INSTITUTIONS</p>  <p>GOAL 16 <i>Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels</i></p>	<ul style="list-style-type: none"> • Development of systemised resource efficiency data collection and reporting 	<ul style="list-style-type: none"> • Lack of disaggregation of sustainable development-related data and information at the industrial level • Lack of enforcement for firms to abide in greener and sustainable production and reporting, particularly incentive-receiving firms
<p>17 PARTNERSHIPS FOR THE GOALS</p>  <p>GOAL 17 <i>Strengthen the means of implementation and revitalize the global partnership for sustainable development</i></p>	<ul style="list-style-type: none"> • Continued internal sectoral capacity building within the dti on green economy and industrial development • Engagement in international fora, such as the Forum on the impact of the implementation of response measures 	<ul style="list-style-type: none"> • Lack of unified goals amongst departments for a holistic inclusive green economy

Source: Authors, based on information drawn from the dti 2017; the dti 2018a; the dti 2018b; the dti 2019.

2.4. Intra-governmental coordination

The cross-cutting nature of the transition to a green industrial development leads to institutional responsibilities being scattered among multiple public sector entities and levels. The dti is the lead agency for industrial policy in South Africa, while the DEFF, formerly known as the DEA, has historically driven the green economy agenda. Ultimately, elements of green industrial policy are conducted by a wide array of stakeholders, sometimes with conflicting priorities and interests, including all spheres of government.

Policy interventions aimed at transitioning to a green industrial development are scattered between various departments. Direct support for industries falls under the dti, but fiscal incentives, i.e. taxes and subsidies, are under the mandate of the National Treasury (NT). The EDD, now under the Ministry of Trade and Industry since the 2019 government reshuffle, oversees the IDC, one of the two main state-run development finance institutions instrumental in financing the shift to a green economy. The other main development finance institution, the Development Bank of Southern Africa (DBSA), is governed by the National Treasury. Further, the Department of Science and Innovation (DSI), formerly DST, is responsible for technology policy and fostering R&D in all sectors of the green economy. Since 2019, it is grouped with the Department of Higher Education and Training (DHET) which is spearheading, with the Department of Employment and Labour, the development of the necessary skill force.

Institutionally, multiple official channels aimed at facilitating coordination and alignment exist. Key institutional mechanisms include the government clusters⁹ and the Forum of South African Directors-General (known as FOSAD)¹⁰. The key cluster for green industrial development issues is the one on Economic Sectors, Employment and Infrastructure Development. It is co-chaired by the Minister

⁹ Government clusters are groupings of government departments with cross-cutting programmes. Clusters foster an integrated approach to governance that is aimed at improving government planning, decision-making and service delivery. The objective is to ensure proper coordination of all government programmes at national and provincial levels. The main functions of the clusters are to ensure the alignment of government-wide priorities, facilitate and monitor the implementation of priority programmes and to provide a consultative platform on cross-cutting priorities and matters being taken to Cabinet.

¹⁰ The clusters of the FOSAD mirror the Ministerial Clusters. They provide technical assistance to the Ministerial Clusters.



of Mineral Resources and Energy and the Minister of Tourism and includes 20 Ministers,¹¹ including the Ministers of Trade and Industry, of Small Business Development, of Environment, Forestry and Fisheries, and of Higher Education, Science and Innovation. Ministerial political structures (known as MINMEC) and technical structures (known as MINTECH) complement these settings by coordinating action between South Africa's three spheres of government (i.e. national, provincial and municipal). Several technical working groups,¹² feeding into the MINTECH and ultimately to the MINMEC, bring together senior officials in national and provincial government to discuss on a quarterly basis and advise on technical issues connected

¹¹ Agriculture, Land Reform and Rural Development; Communications; Cooperative Governance and Traditional Affairs; Environment, Forestry and Fisheries; Employment and Labour; Finance; Higher Education, Science and Technology; Human Settlements, Water and Sanitation; International Relations and Cooperation; Mineral Resources and Energy; Ministry in the Presidency; Ministry in the Presidency for Women, Youth and Persons with Disabilities; Police; Public Enterprises; Public Works and Infrastructure; Small Business Development; State Security; Tourism; Trade and Industry; Transport.

¹² Working Groups deal with the following topics: Biodiversity and Conservation (WG1), Air Quality (WG2), Planning and Coordination (WG3), Compliance and Enforcement (WG4), Environmental Impact Management and Water (WG5), Environmental Sector Jobs (WG6), Education, Development and Information Management (WG7), Oceans and Coasts (WG8), Waste and Chemical Management (WG9), Climate Change (WG10), Environmental Policy and Law Reform (WG11), Communications (WG12).

Table 4: Institutions responsible for selected green industrial development programmes in the 2018/19 IPAP

Key Action Programmes	Identified Lead and Support Agency
Technical infrastructure: Resolving the Energy Challenge/ supporting Green Industries	Lead departments/agencies: National Metrology Institute of South Africa (NMISA), South African Bureau of Standards (SABS) Supporting departments/agencies: the dti, National Treasury
Minerals beneficiation: Expansion of the Platinum Group Metals Beneficiation Industries	Lead departments/agencies: the dti, DST, IDC, Department of Energy (DoE), DEA, Department of Transport (DoT)
Minerals beneficiation: Energy Storage Development	Lead departments/agencies: the dti, DST, University of Limpopo Supporting departments/agencies: Technology Localisation Implementation Unit, Council for Scientific and Industrial Research (CSIR), industry associations
Green Industries: A Policy Roadmap for Climate-Compatible Industrial Development	Lead departments/agencies: the dti, DEA Supporting departments/agencies: DoE, EDD, TIPS, National Cleaner Production Centre South Africa (NCPC-SA)
Green Industries: Systemised resource efficiency data collection and reporting	Lead departments/agencies: NCPC-SA, the dti Supporting departments/agencies: South African National Energy Development Institute (SANEDI), DoE, DEA and DWS
Green Industries: A national strategy to use appropriate measures and technology to ensure water security and support the development of a local base of technology and service providers in the sector	Lead departments/agencies: the dti, TIPS Supporting departments/agencies: DST, DWS, Water Research Commission (WRC), Technology Innovation Agency (TIA)
Green Industries: Industrial Water Efficiency Project	Lead departments/agencies: NCPC-SA, the dti Supporting departments/agencies: DST, WRC, TIA
Green Industries: Industrial Energy Efficiency Project	Lead departments/agencies: NCPC-SA, the dti Supporting departments/agencies: DEA, DST, DoE, SANEDI
Green Industries: Resource-efficient and cleaner production skills development	Lead departments/agencies: NCPC-SA, the dti Supporting departments/agencies: DWS, WRC, DoE, DHET
Green Industries: Professionalisation of specialist occupations in the resource-efficient and cleaner production fields	Lead departments/agencies: NCPC-SA, the dti Supporting departments/agencies: SANEDI, DoE, DEA, NT DWS

Source: the dti 2018b.

to green industrial development, such as climate change, impact management, pollution and waste management, and environmental sector jobs (DEA 2018a).

To operationalise cooperative governance in the area of climate change, an Intergovernmental Committee on Climate Change (IGCCC) has also been established.

It fosters the exchange of information, consultation, agreement, assistance and support among the spheres of government on climate change and government's response to climate change (DEA n.d.). For some time (around 2013), a Green Growth Task Team, coordinated by EDD, was also operating at management level to coordinate action within national departments in the economic cluster.

At the industrial policy level, the dti, through the IPAP process, identifies lead and support departments and agencies that are responsible for implementing key action programmes.

As shown in Table 5, IPAP lists government departments, such as the DEA, DoE, DoT and DST, key partner institutions, such as the IDC, the Competition Commission, the National Empowerment Fund, the CSIR, the TIA and Technology Localisation Implementation Unit, as well as technical support institutions, such as NMISA, SABS, the South African National Accreditation System, WRC and TIPS, which are responsible for assisting the dti in achieving its missions. Ad hoc structures also exist to promote coordination, such as a tri-partite partnership between the dti, WRC and TIPS to promote industrial development on the back of development in the water and sanitation sector.

Despite these channels, management of the transition to a green industrial development remains a key challenge.

Institutions often work in silos, developing their own programmes and strategies. Insufficient coordination of supporting institutions, particularly to raise awareness and create buy-in, appears as a key concern of stakeholders. The responsibility for some key cross-cutting issues, such as energy efficiency, remains furthermore contested by several entities. As a result, the coordination of various interventions often comes across to stakeholders as inadequate.

Internal annual processes within the dti, such as the development of IPAPs and annual business plans, have not been fully leveraged to foster a green industrial development agenda, while the potential exists to do so.

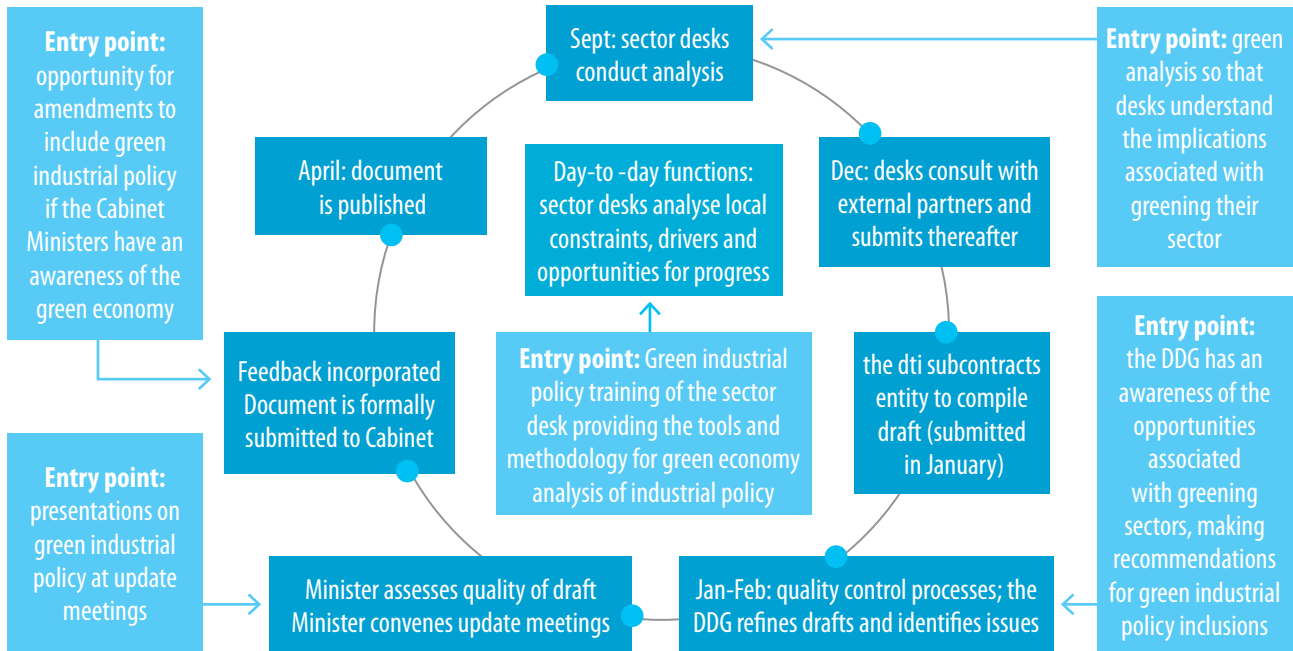
Figure 4 provides a summary of the process and entry points to foster a green industrial development agenda. As

illustrated, multiple entry points are available to introduce a green industrial development agenda into the discourse and ultimately the public policy and business plans:

- Sector desks conduct ongoing research and analysis on their respective industries. They also regularly engage with relevant stakeholders. It is possible to introduce a green industrial policy agenda at this level by shaping the research agenda of the dti, either internally or through its engagement with external stakeholders. Internally, the dti's Green Industries desk, supported by institutions such as TIPS, NCPC-SA, CSIR, SANEDI and WRC has been instrumental in fostering such a change. Externally, green industrial development seems to emerge more reactively as a response to climate change and other environmental regulations.
- The Minister convenes regular meetings to review progress and implementation. Historically, such meetings took place quarterly within the IPAP framework. Going forward, such updates will be shaped by the Master Plan approach, which involves political heads of multiple departments and not only the dti. An opportunity exists for involved stakeholders to bring green industrial development to the fore, raising awareness within the department and its political apparatus, and fostering the inclusion of a green economy lens into the Master Plan process.
- The rolling IPAPs, in each iteration, included a macroeconomic overview of the economy. While high-level in nature, this overview can be shaped to include the green industrial development agenda as a component, or ideally throughout its analysis. As the function of the IPAP evolves, a more strategic approach around green industrial development could be introduced.
- Draft plans (e.g. IPAP and business plans) are reviewed by the relevant Deputy Director-General (DDG)¹³ (i.e. the DDG for the Industrial Policy Division in the case of IPAP and relevant Master Plans). Drafts are refined and an opportunity exists to introduce particular angles or issues. The cross-cutting inclusion of a green industrial development would most likely emerge from the DDG's recommendations, through the review process or ideally pre-emptively as the drafts are being written.

¹³ In national government departments, DDGs are executive-level managers appointed by Cabinet. They fall under the Minister (and Deputy Ministers if relevant) and the Director-General.

Figure 4: Department of Trade and Industry's annual planning process



Source: Authors.

• Drafts then reach the Minister of Trade and Industry and subsequently other Ministers for review, amendments and consensual approval. Ministers have the chance to highlight opportunities for further alignment as well as suggest revisions. As the transition to an inclusive green economy becomes more prominent in the country, Cabinet could request a firmer alignment of the dti's policies with the economy- and society-wide transition.

To improve coordination, industrial policy has been elevated to the Presidency, opening the door for a more coherent approach. A strong push for green industrial development from the Presidency could effectively require the dti and other departments to be more proactive. At this point in time though, the Presidency's Re-imagining our Industrial Strategy for Inclusive Growth approach (Dicks 2019) has not overtly embraced a green economy lens and focusses on traditional sectors and activities. In addition, a key differentiator between IPAP and Master Plans is the involvement of industry players in the co-development

of the Master Plans, potentially providing another entry point for a green economy agenda. To date though, while it includes some green shoots, such as growing renewable energy and platinum-based fuel cells, the overall approach does not include a deep understanding of the cross-cutting nature and importance of embedding the green economy or green industrial development in all Master Plans, and still largely considers the green economy as a sector.

The Climate Change Bill of 8 June 2018, currently under review after a public consultation process, provides for additional coordination mechanisms at national and provincial levels. It provides for the establishment of a Ministerial Committee on Climate Change to be co-chaired by the Minister of Environmental Affairs (now Minister of Environment, Forestry and Fisheries) and the Minister responsible for Planning, Monitoring and Evaluation (now Minister in the Presidency). The composition of the

Committee mainly mirrors the one of the ESEID Cluster¹⁴ at national level but also includes all provincial Members of the Executive Councils responsible for the environment. It is meant to “coordinate efforts across all sector departments and spheres of government towards a transition to a climate resilient and lower carbon economy and society” (DEA 2018b, pp. 18-19). Similarly, the Climate Change Bill envisages the creation of Provincial Committees on Climate Change comprised of relevant departments in a province and all Mayors of municipalities located within a province to coordinate action at the provincial level. Under the joint leadership of the Minister of Environment, Forestry and Fisheries and the Minister in the Presidency, such channels could constitute one additional entry door to promote green industrial development with the Cabinet and the various layers of government.

2.5. Stakeholder engagement

Social dialogue is an important aspect of the transition to green industrial development, particularly due to the socioeconomic implications, and is historically vibrant in South Africa. This is illustrated by the establishment of the National Economic Development and Labour Council (Nedlac)¹⁵ in 1994 and the signing of various quadripartite agreements.¹⁶ In addition, although some decline in representativity and capacity, industrial relations are largely managed through Bargaining Councils and strong trade unions, a key component for a just and fair transition to sustainable development (ILO 2010).

Attempts at creating a social compact in favour of the transition to an inclusive green economy, such as the Green Economy Accord and the Decent Work Country Programme, have, however, failed to deliver their promises. The Accord was signed in November 2011 by the South African government and social partners (organised labour, business and community constituents). It identifies

¹⁴ Agriculture, Forestry and Fisheries; Cooperative Governance and Traditional Affairs; Economic Development; Energy; Health; Human Settlements; Mineral Resources; National Treasury; Public Enterprises; Public Works; Rural Development and Land Reform; Science and Technology; Trade and Industry; Transport; and Water and Sanitation.

¹⁵ Nedlac is a unique statutory body which brings together representatives from government, organised labour, organised business and the community to consider all socioeconomic and labour policy and legislation. Nedlac must consider all significant changes to social and economic policy before being implemented or introduced in Parliament.

¹⁶ It should be noted the IPAP does not historically go through Nedlac.

points of agreement as well as specific tasks to be carried out by each constituency for a series of 12 commitments covering inter alia renewable energy, energy efficiency, solar water heaters, green investment, recycling, public transportation and rail freight, biofuels, clean-coal initiatives, the promotion of localisation and green jobs, and access to electricity for all. Importantly though, commitments were diverse in scope and specificity, with some containing targets and deadlines while others are broad statement of intent. Ten of them were also not new but merely reiterated (and sometimes enhanced) in a more public-facing exercise ahead of the COP17 in Durban, South Africa in 2011. Commitments are also heavily focused on energy-related issues, neglecting other dimensions, such as water, waste, biodiversity and ecosystems. In addition, the Accord still considers the green economy as an add-on to the rest of the economy, focusing only on co-benefits and avoiding controversial topics. Progress towards the targets and other commitments has been inadequately monitored and no enforcement mechanism exists, with the accord being a voluntary measure rather than a regulatory requirement.



As a result, progress has been extremely uneven and essentially linked to other dynamics, specific to each sector (EDD 2011; Montmasson-Clair 2012; Seeliger and Turok 2016; Montmasson-Clair 2017).

At the sectoral level, the degree of stakeholder engagement varies vastly from one industry to the next. Some sectors, such as automotive manufacturing or the chemical industry, have structured, regular engagement with all relevant stakeholders. For example, the dti's Chemicals Sector Desk meets on a quarterly basis with industry, labour and other government departments through the Chemicals Sector Expert Advisory Committee meeting. In most cases though, engagement appears to be more reactive than proactive and if and when particular issues arise. They tend to be structured around a crisis management structure, such as War Rooms, Task Teams and Operation Phakisas.¹⁷ Furthermore, according to key industrial players, even when engagement occurs, stakeholders' concerns and proposals are often not taken into account meaningfully. Often, the outcome of engagements does not reflect the urgency of action. The Master Plan approach, initiated in 2019, may provide the adequate platform for proactive, forward-looking planning and implementation.

The extent to which such engagements are mobilised to discuss issues pertaining to the transition to a green industrial development also seem to depend on the political agenda. Developments on the carbon tax, carbon budgets, the Climate Change Bill, Pollution Prevention Plans, and more recently, on the just transition, vulnerability assessment and resilience plans, have generated a heightened level of engagement on green-related issues. Again, such engagements appear more reactive (to proposed legislation and/or instruments) than proactive and forward-looking in nature.

The NPC process aims to reach a social compact, understood as a broad agreement on the best pathway for a just transition to a sustainable society, including the modalities for implementation. It aims to build a collective vision for the 2050 end-state and guide the

development of pathways so that the transition is fair and equitable. To achieve this aim, it has established a process of consultation at provincial and national levels. The social dialogue had been under way for a year as of mid-2019. Workshops have gathered a wide and large array of stakeholders, with great representation from civil society, government, state-owned enterprises, businesses, and, to a more limited extent, labour unions. Following nine provincial workshops, the process culminated in a national conference in May 2019, to finalise the social compact. In 2020, a high-level summit will kick-start the process to take forward the proposed social compact at a political level. The NPC anticipates that the compact will empower the people to promote a transition that is just, for instance by having it driven by Nedlac (NPC, SEA, and OneWorld 2018; NPC 2018).

The experience of the NPC points to some of the challenges facing social dialogues around the (just) transition to an inclusive green economy. First, whose problems should be addressed? The process aims for a broad social compact, but participants argued for specific solutions to their current challenges, raising for instance problems around coal and mining. A risk of broadening out the concept of the just transition to cover society as a whole is that very broad guidelines rather than specific plans for affected communities might be developed. In these circumstances, the process can ultimately delay solutions rather than promote them. Second, linked to this question is how to decide on which participants should take part in the social dialogue. The decision on whom to include inevitably gives some groups a voice while shutting out others. A trade-off here is between open, grassroots participation, which empowers individuals and communities that often cannot engage in representative processes but may lead to capture by unrepresentative individuals, and representative stakeholder engagements of the type held at Nedlac, where constituencies are expected to designate and mandate representatives. In addition, any policymaking process has to combine expertise with public participation. A central difficulty is always to balance the power of organised constituencies, the desire for participatory and open procedures, and the need to bring in expertise to test diagnostics and proposals against the evidence, and to identify the necessary resources (Makgetla 2019).

At a political level, the future establishment of a Presidential Climate Change Coordinating Commission was announced at the Presidential Jobs Summit in

¹⁷ Crisis management structures have, over the years, taken differently names and shapes. They all aim to provide a platform for fast resolution and results. They generally involve an evidence-based and results-driven approach and bring key stakeholders from the public and private sectors, academia as well as civil society organisations together to collaborate in detailed problem analysis, priority setting, intervention planning and delivery.

October 2018, showing a strong interest by all social partners in improving the coordination of the transition.

As a statutory body, the Commission will coordinate and oversee the just transition, including how to maximise decent employment creation (Republic of South Africa 2018). According to the Framework Agreement, this body should be established after the Jobs Summit and be adequately resourced. It should include representation from relevant departments across the state, the social partners, as well as experts from civil society and relevant research institutions. As of October 2019, the Commission, its scope of work and its composition are yet to be established. If shaped adequately, the PCCCC should, however, provide a powerful avenue to foster green industrial development in the country, by frontally dealing with the socioeconomic trade-offs associated with the transition and promote sustainable solutions for the country's economy and society.

2.6. Monitoring and evaluation

At the M&E level, the knowledge base necessary for evidence-based decision-making and effective implementation of a green industrial development agenda, although growing rapidly, remains largely incomplete. Comprehensive, reliable and up-to-date data and information on implementation progress, market trends, production and consumption patterns, resource use, waste streams, and financial flows are not available.

The Department of Planning, Monitoring and Evaluation (DPME), through the 14 Outcomes framework, is responsible for tracking the operationalisation of national policies. The framework lists (and tracks) outcomes, sub-outcomes, responsible ministers, indicators, baselines and targets for hundreds of items. Outcome 10 on the environment aims to "protect and enhance [South Africa's] environmental assets and natural resources" (DPME 2016, p. 1). It includes five sub-outcomes, namely: 1) Ecosystems are sustained and natural resources are used efficiently; 2) An effective climate change mitigation and adaptation response; 3) An environmentally sustainable, low-carbon economy resulting from a well-managed just transition; 4) Enhanced governance systems and capacity; and 5) Sustainable human communities.¹⁸

From a green industrial development perspective, the framework remains problematic. The focus is mainly on

government outputs rather than outcomes, at times with inadequate indicators to successfully manage the transition. In addition, the dti is completely absent from the framework of Outcome 10 and green industrial development issues are only marginally covered, essentially through an energy efficiency target. This suggests the need to update and enhance the indicator used in the 14 Outcomes framework.

At the industrial policy level, the dti sets both indicators to track progress on various key action programmes through IPAP. Table 5 illustrates the type of indicators and targets used in IPAP. While useful at the programmatic level, such indicators remain quite high level and do not allow tracking progress effectively. IPAP progress reports have further been relatively ad hoc and high level. The binding nature of such targets is also variable depending on the programmes, reducing their relevance. With the transition to the Master Plan framework, it remains to be seen how progress will be tracked and communicated.

At the SDG level, initial tracking efforts provide a view of South Africa's progress, but much more work is required for a meaningful understanding of the country's performance and progress. In 2017, Statistics South Africa published the SDG Indicator Baseline Report 2017 for South Africa. It documents the country's performance in relation to SDGs, reporting on 98 of the 230 proposed indicators. It constitutes to date the most comprehensive attempt at tracking the country's performance against the SDGs. The report does, however, highlight that many indicators remain unavailable due to either data availability challenges or the lack of definition of the indicators (Statistics South Africa 2017).

Complementing the work done by Statistics South Africa at the SDG level, the development of green economy indicators for South Africa is under way. South Africa participated in the United Nations-led initiative on the development of a Green Economy Progress Measurement Framework.¹⁹ The framework tracks progress on a country level and facilitates cross-country or cross-provincial comparisons of achieved progress. It tracks progress in 13 key areas and allows comparison through a weighted index and a detailed Dashboard of Sustainability (PAGE 2018).

On the climate change front, while the GHG Inventories and the Mitigation Potential Analysis conducted by the

¹⁸ Details on Outcome 10 are available here.

¹⁹ See <https://www.un-page.org> for more information on the framework as well as complete datasets.

Table 5: Illustration of outcomes and milestones included in the 2018/19 IPAP

Development of polymers from waste	Paper Recycling Programme for South Africa
<p>Targeted outcomes</p> <ul style="list-style-type: none"> Increased local production and availability of polymers and other important chemicals. Decreased reliance on imported polymers and stabilisation of price fluctuations. Increased competitiveness of the downstream plastics conversion industry, job creation and reduced carbon footprint. <p>Key milestones</p> <ul style="list-style-type: none"> 2018/19 Q1–Q4: Development of a feasibility study to determine the economic viability of using the technology in South Africa. Pilot scale demonstration of the technology to determine the commercial viability of the technology and process locally. 	<p>Targeted outcome</p> <ul style="list-style-type: none"> Improved paper recycling rates and formalised recycling enterprises in the Ekurhuleni Municipality and beyond. <p>Key milestones</p> <ul style="list-style-type: none"> 2018/19: Q2: Implementation of Paper Recycling Programme in Ekurhuleni Municipality. 2018/19: Q4: Implementation of a further Paper Recycling Programme in Gauteng. 2019/20: Q4: Roll-out of Paper Recycling Programmes to other major metros. 2020/21: Q4: Implementation of Paper Recycling Programme to smaller municipalities.
Systemised resource efficiency data collection and reporting	Industrial Energy Efficiency Project
<p>Targeted outcomes</p> <ul style="list-style-type: none"> A database, housed at the National Cleaner Production Centre South Africa, capturing resource (water, energy, raw materials) use and resource savings statistics in industrial sectors and plants. The resulting data will be available for use by the various government departments requiring reporting of such data in national environmental reporting frameworks and for tracking progress against agreed international mitigation targets. <p>Key milestones</p> <ul style="list-style-type: none"> 2017-18 Q4: Launch of an information management system with a web-based front-end to capture energy, water and waste use patterns by companies, populated with data from NCPC-SA assessments since 2009. 2018-2020: Annual analysis of data and publishing of a report on industry resource use and savings patterns. 2018-2020: Reporting of data as and when required by national stakeholders. 	<p>Targeted outcomes</p> <ul style="list-style-type: none"> Mainstreaming energy management standards, based on ISO 50001 in industrial companies, to ensure sustained energy savings. Developing energy efficiency experts in industry with a special focus on increasing the number of women capacitated and empowered as experts in industrial energy efficiency. Measurable energy savings in participating industrial and commercial companies. Developing tools and platforms for learning and awareness of energy management in industry. <p>Key milestones</p> <ul style="list-style-type: none"> 2018-19: Energy audits in small and medium-sized enterprises with trend reports on energy use. 2018-19: Energy baseline studies in selected sectors. 2018-19: Industrial plants demonstrating energy efficiencies and showcasing results through case studies to set best practice and encourage uptake. 2018-19: Number of expert women trained in energy efficiency. 2018-19: Carbon emissions mitigation figures calculated and reported.

Source: the dti 2018b.

South African Government were crucial steps towards better information, the knowledge in these areas is still imperfect. A more comprehensive and disaggregated coverage of economic activities and industrial value chains is still required. This increased exercise can take the form of a larger number of firms in the industrial minerals sector, a disaggregated coverage of firms covering multiple sectors like in the packaging industry, or the separation of primary and secondary production in the iron and steel and aluminium value chains. In the case of mitigation options specifically, a more balanced understanding of possible interventions, reflecting both their technical and economic viability in the South African context and in the identified industries is necessary. The ongoing (as of October 2019) revision of the Mitigation Potential Analysis provides an ideal platform to put forward such a detailed and up-to-date analysis.

The establishment of a Climate Change Response Monitoring and Evaluation System is also expected to fill a number of information gaps on climate change action in the country. As of October 2019, the DEFF is still designing this system. It aims at combining top-down and bottom-up monitoring, by adopting a three-tier approach. The system will combine country-level indicators (tier 1), sector-, sub-sector- and company-level indicators (tier 2) and response-measure-level indicators (tier 3) to provide a comprehensive understanding of South Africa's transition (DEA 2015a).



3. Policy implementation

Building on the analysis of the design of industrial policy, this section focusses on policy implementation, reviewing the extent to which traditional industrial policy tools have been harnessed to support the transition to an inclusive green economy. After a short description of the mix of measures, it reviews key industrial tools, namely industrial finance, R&D support, skills development, regulations and economic instruments, localisation tools, economic zones, and trade policy.

3.1. The instruments

Mirroring the multitude of plans and strategies (discussed in Sections 2.1 and 2.2), numerous measures have already been implemented in South Africa to foster the transition to green industrial development. Table 6 provides a snapshot of the most prominent instruments in the country. Carbon budgets, currently in their voluntary phase, Pollutions Prevention Plans (PPPs) and requirements for Extended Producer Responsibility Plans are the main regulatory measures in place, under the leadership of the DEFF. Standards for specific technologies or processes, through SABS, also form part of the regulatory framework. The mandatory

Table 6: Summary of available instruments targeted at the transition to a green industrial development in South Africa

Category	Sub-Categories	Key measures (Lead entity)
Regulatory measures	<ul style="list-style-type: none"> Legislation Plans Standards 	Standards for specific technologies or processes (the dti-SABS); Energy management systems (Department of Mineral Resources and Energy (DMRE)); Pollution Prevention Plans (DEFF); Carbon Budgets and Sector Emissions Targets (DEFF).
Economic measures	<ul style="list-style-type: none"> Taxes Offsets or Tradable Allowances Subsidies 	Carbon tax (NT); 12L tax incentive for energy efficiency (DoE-SANEDI); Demand-side management programmes (Eskom); 12I incentives (the dti); Manufacturing Competitiveness Enhancement Programme (MCEP) grant component (the dti), Green Fund (DEFF-DBSA).
Direct government action	<ul style="list-style-type: none"> Government Procurement of Public Goods or Services Direct Infrastructure Investment 	Procurement and investment in the public transport and modal shift (DoT); Renewable Energy Independent Power Producer Procurement Programme (DMRE-NT-DBSA); Industrial Symbiosis programmes (the dti-NCPC-SA and GreenCape).
Support measures	<ul style="list-style-type: none"> Government Support for Voluntary Actions Support for Research and Development 	MCEP loan component (the dti); concessional finance (IDC, DBSA and other development finance institutions (DFIs)); Resource Efficiency and Cleaner Production assessments and Industrial Energy Efficiency programmes (the dti-NCPC-SA); Direct funding for R&D centres (DSI); Tax incentive for R&D expenditure (DSI).
Information Programmes	<ul style="list-style-type: none"> Public / Private Programmes 	Energy efficiency labelling programme (DMRE), Training programmes for energy management (NCPC-SA).

Source: Authors' composition, updated from DEA 2015b.

development of Energy Management Plans is also being considered at the time of writing. Economic measures historically consist of subsidies and tax incentives aimed at facilitating investment in energy-efficient technologies. An economy-wide carbon tax was introduced on 1 June 2019. In addition, the government has been instrumental in procuring or providing the platform for a number of initiatives, such as the development of utility-scale renewable energy generation capacity, the roll out of BRT and establishing industrial symbiosis programmes. The government provides further support in favour of voluntary actions (through concessionary loan facilities and the NCPC-SA's Resource Efficiency and Cleaner Production (RECP) and Industrial Energy Efficiency programmes) and R&D investments (through a tax incentive). Last but not least, the government runs information and training programmes, primarily through the NCPC-SA, targeted at raising awareness in industries.

Altogether, while far-reaching, the mix of measures appear to lack coherence and certainty. No agreement exists on the preferred instruments and their design, as the ongoing debates around the implementation of a carbon tax and a carbon budget approach illustrate. **While existing and planned instruments are not mutually exclusive and potentially complementary, the absence of long-term clarity on the instruments to be used and their interface creates policy uncertainty in the country and hampers industrial development.** As of October 2019, discussion on the post-2020 climate change mitigation framework in South Africa had essentially focused on the role of carbon budgets and Sector Emissions Targets (SETs).

Overall, there is also no clarity on the role, scope and impact of the mix of measures and the interaction of its many components. For example, in terms of financial support, lack of clarity persists on the funding available, its adequacy with the requirements of industry and the ambition of the transition, and its complementarity with other instruments.

In addition, the mix of measures does not adequately capture the diversity of industrial situations vis-à-vis the transition and fails to propose tailored solutions. In particular, the industrial development component of the mix of measures, which has to deal with the firms/sectors that will directly benefit from the transition (the "winners") as well as those that will face constraints and difficulties (the "losers"), remains largely unexplored. The Master Plan process would, in this respect, be a pertinent avenue to provide long-term clarity.

3.2. Industrial finance

Industrial finance directed at the transition to green industrial development has steadily increased over the last decades. It is made of a mixed bag of finance sources directly (and solely) targeting green economy-related activities (such as the DEFF-DBSA's Green Fund) and cross-cutting programmes which, as part of their activities, provide some funding to green economy-related projects.

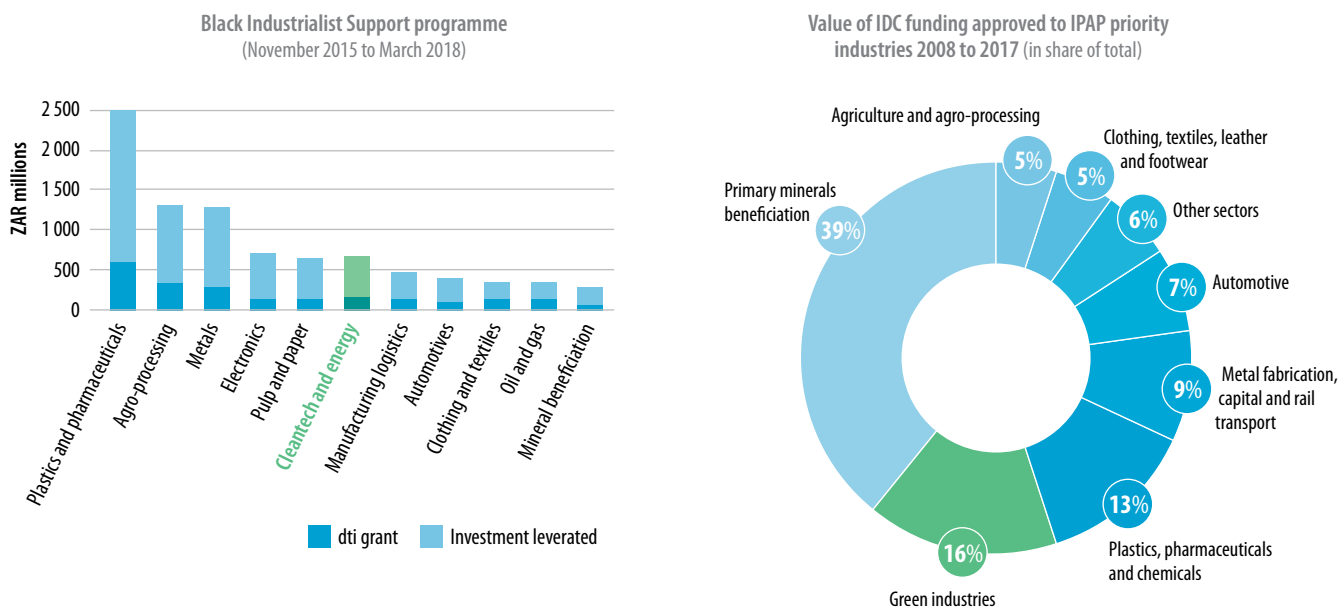
Overall, the energy sector, namely renewable energy and energy efficiency, has garnered the most focus.

The Renewable Energy Independent Power Producer Procurement Programme has played the most significant role by far since its inception in 2011, mobilising more than R200 billion of investment. The REIPPPP, for instance, accounts for the lion's share of the IDC funding to green industries (see Figure 5). Energy efficiency has been the second largest focus, with key contribution from the 12L and 12I tax incentives. The 12I tax incentive, managed by the dti, offers indirect financial assistance for energy efficiency greenfield investment and plant expansion in commercial enterprises. The scheme targets investment projects in relevant manufacturing sectors, such as agro-processing, chemicals, plastics, non-metallic and mineral products, metal products, construction and recycling industries. To access the scheme, brownfield projects must inter alia realise a 10% energy efficiency improvement, while greenfield projects must utilise "modern, viable energy-efficient equipment & processes" (the dti 2015). The 12L tax incentive for energy savings has been implemented by the DoE (now DMRE) since December 2013, allowing businesses to claim a deduction against taxable income equivalent to the monetary value of proven energy efficiency savings. The scheme was further enhanced in March 2015 with an increase in the deduction from R0.45 to R0.95 (US\$0.04 to US\$0.07) for every kilowatt-hour saved (the dti and SANEDI 2016).

Non-specific industrial finance programmes have also contributed, such as the Black Industrialist Support programme, which directed 7% of its funding to clean technologies and energy over the 2015-2018 period (illustrated in Figure 5). The MCEP comparatively only allocated 1.5% of the programme support to "green technology and resource efficiency improvement" investments over the period 2012-2015.

Private sector institutions have also demonstrated some increased interest in funding initiatives in support

Figure 5: Funding breakdown for selected industrial policy programmes



Source: Author, based on the dti 2018b.

of an inclusive green economy. Besides their contribution to the REIPPPP, some institutions have initiated a broader shift in their funding strategy. In 2017, the Johannesburg Stock Exchange launched its Green Bond segment, with property investment holding company Growthpoint and banking group Nedbank as its first listings. Some financial institutions, such as Nedbank, have furthermore made the commitment to phase out funding to the coal sector.

In addition, capacity building activities have had an indirect mobilisation effect on investment. For instance, support for energy efficiency audit programmes, such as NCP-SA's RECP, has helped identify profitable investment opportunities in small and medium-size commercial enterprises, which have then benefited from tax incentives for energy efficiency improvements. Capacity building for policy development may have indirectly mobilised finance over time, while capacity building for industry implementation may have had a more rapid effect (McNicoll *et al.* 2017).

Despite the increasing focus on green industrial finance, material gaps remain. The National Business Initiative (NBI) and KPMG (2013) identified a set of 11 barriers which are hampering the growth of green finance in South Africa and remain to be addressed. They range from policy-related issues (such as the misalignment between the industrial and green economy policy frameworks), to structural problems (such as the lack of funding for some segments), to skill and capacity issues (such as the misunderstanding of green economy by financiers), to fund design problems (such as the focus on renewable energy and energy efficiency). Table 7 summarises the key barriers and their impacts on the roll-out of the green finance in South Africa.

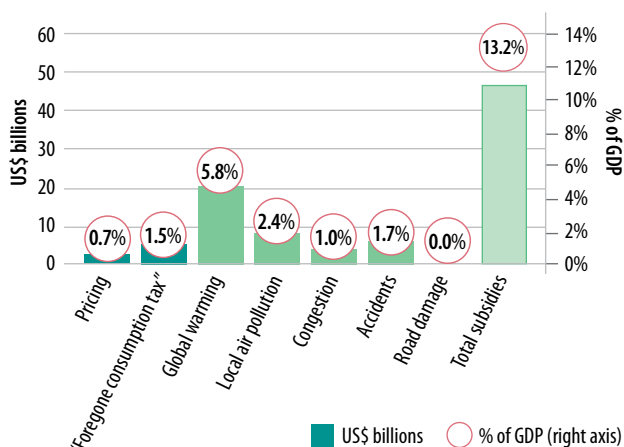
Besides the earlier-mentioned issues linked to financing green economy projects, the amount of support directed at unsustainable activities remains particularly high. Although fossil fuel subsidies have been significantly reduced in the country over the past few years, notably through the increase in electricity

Table 7: Barriers to green finance in South Africa and its impacts on projects

Category	Barrier	Implication
Policy-related	1. Misalignment between green economy vision, industrial policy and structure of the financial system.	The financial system is geared towards an economy that is a fast follower rather than a technology leader, as proposed by the country's industrial policy and green economy visions, hindering funding for small-scale and/or high-risk projects.
Structural	2. Barriers in financing early-stage, high-risk projects and for moving projects from early development stages to commercialisation.	Shortage of funding available for early-stage, high-risk projects and for advancing projects towards commercialisation.
	3. Barriers in funding for medium-size projects.	Shortage of funding available for medium-size projects (R50 million and R250 million in value).
	4. Sub-optimal coordination between commercial banks and development finance institutions (DFIs).	The relationship between commercial banks and DFIs is suboptimal in terms of project selection, term matching and instrument selection.
Skills & Capacity	5. Capacity constraints of implementation partners.	Hindering factor to access venture capital, equity and commercial debt, with negative impact on large-scale, low-risk as well as small-scale, high-risk projects.
	6. Project development skills shortages within project developers.	Hindering factor to access commercial finance sources and to some extent DFIs, with negative impacts on mid-to-large-scale as well as high-risk projects.
	7. Project sourcing and evaluation skills shortages within commercial banks.	Hindering factor to access commercial finance providers (banks, private equity companies), especially in the case of technologies that may be financially viable but are not yet mainstream, with negative impacts on large-scale/low-risk as well as mid-size/high-risk projects.
Fund design	8. Limited focus on non-energy related low-carbon projects.	Hindering factor to access commercial banks in mature project stages, with negative impacts for projects outside of the well-developed market segment for low-risk, large scale projects (within which fall energy efficiency and renewable energy projects).
	9. High transaction costs for commercial finance of low-carbon projects.	Hindering factor for small-scale projects that seek financing instruments in the project lifecycle that are offered by commercial banks and take projects to scale and improve their commercial viability.
	10. Design and structure of concessional credit lines.	The costs and administrative burden of monitoring, evaluation and reporting requirements for concessional finance can hinder access to the financial instruments and market segments typically served by commercial banks, with negative impacts on large-scale and low-risk projects.
	11. Legislative barriers to investing in low-carbon projects.	Hindering access to the instruments and market segments typically served by commercial banks, with negative impacts on large-scale and low-risk projects.

Source: Authors, based on NBI and KPMG (2013).

Figure 6: South Africa's fossil fuel subsidies in 2015



Source: TIPS, based on data downloaded from the International Monetary Fund at www.imf.org in March 2017, Series on Country-level Subsidy Estimates.

prices, and include a share for the assistance of low-income households, substantial support is still directed to the development of fossil fuels in South Africa (Burton, Lott, and Reenkamp 2018; Reenkamp and Burton 2018). The exact amount of fossil fuel subsidies provided in South Africa is difficult to ascertain and numbers largely diverge. Their scale remains nevertheless significant. The International Energy Agency identified approximately US\$1.4 billion (or 0.3% of GDP) in consumer subsidies for 2011 in South Africa (down from more than US\$5 billion in 2007), essentially for coal-fired electricity, representing an average subsidisation rate of 4.6% (OECD 2013).

According to International Monetary Fund data (Figure 6), South Africa is the fifth largest provider of coal subsidies in percentage of GDP terms. The country ranks 12th for subsidies as a percentage of GDP and 23rd for per-capita subsidies. South Africa's energy sector benefitted in 2015 from substantial subsidies, including US\$2.5 billion in pre-tax subsidy and US\$5.4 billion in foregone consumption tax revenue. Direct subsidies, in the form of pre-tax subsidies and foregone consumption tax revenue, amounted to 2.2% of GDP. Indirect subsidies linked to externalities associated with fossil fuels, such as global warming, air pollution, congestion, accidents and road damage costs, reached US\$38.5 billion or 10.9% of GDP. Altogether, pre- and post-tax subsidies totalled

US\$46.4 billion or 13.2% of GDP. Most of these subsidies were allocated to coal (52.0%) and petroleum (37.8%), followed by electricity (9.2%) and natural gas (0.9%).

3.3. Research, development and innovation

R&D and innovation are a vital component in the green industrialisation value chain, as they are the basis on which new products and services are conceptualised and realised. While not every research output, including patented ones, results in a successful commercial product,²⁰ R&D and innovation lay the foundation for new products, services and solutions. As demonstrated by South Africa's Climate Change Technology Needs Assessment (DST 2007), the country's successful transition to a green economy relies on the development (through R&D as well as knowledge transfer) of numerous technologies. The provision of water supply and sanitation, new crop species and cultivars, energy efficiency incentives, control of the spread of vector-borne disease, information technology, solar power, and the promotion of the source reduction, recycle, and reuse were the priority areas identified for technology and knowledge needs in 2007.

South Africa set a target, in the Medium-Term Strategic Framework, to increase R&D expenditure to 1.5% of GDP by 2019. This is promoted by a tax incentive for R&D expenditure (Section 11D of the Income Tax Act). Section 11D allows for a deduction equal to 150% of expenditure incurred directly for R&D as well as an accelerated depreciation deduction (that is, 50:30:20) for capital expenditure incurred on machinery or plant used for R&D. As shown in Figure 7, the country remains far from this target.

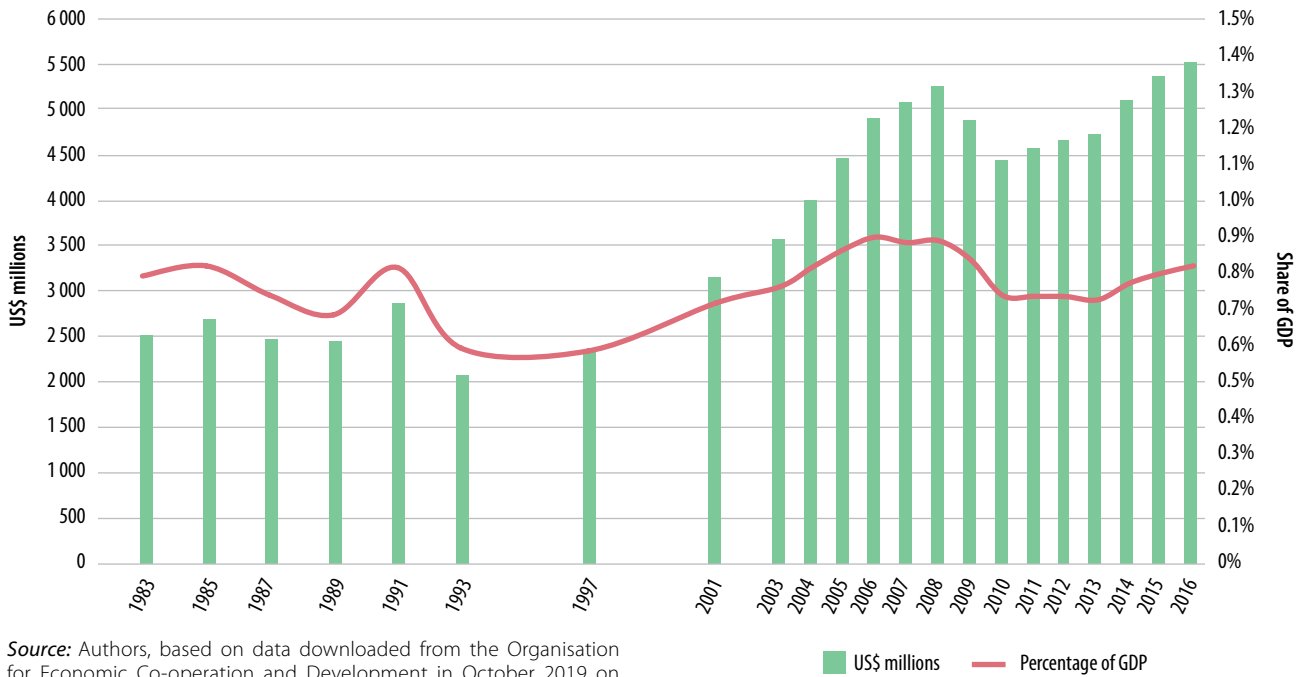
The DSI, in partnership with DEFF and National Treasury, has also committed to maintaining investment in R&D and innovation to support the transition to a green economy.²¹ In 2016/17, green R&D expenditure reached between R6.1 billion and R7.1 billion.²² In real terms,

²⁰ Failure of the new technologies can be associated with challenges relating to the "valley of death" (ASSAf and DST 2014) and the "innovation chasm" (DST 2008).

²¹ While the departments initially targeted a 300% increase by 2019 in the rand value of investments in green economy-related R&D made in 2011, this target was revised following the establishment of a green R&D definition and baseline.

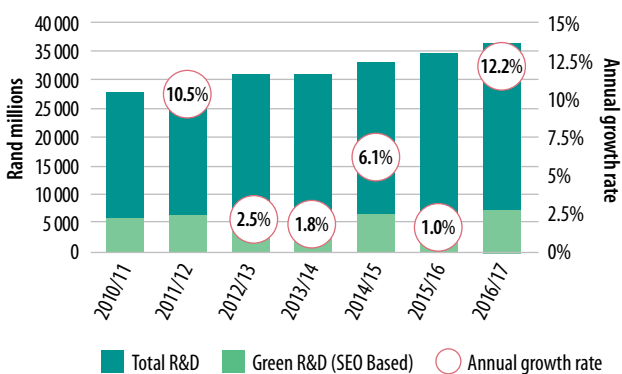
²² For reference, R&D expenditure in the country stood at R20.3 billion in 2010/11, rising to R35.693 billion in 2016/17, at a compound annual growth rate of 8.4%.

Figure 7: R&D expenditure in South Africa



Source: Authors, based on data downloaded from the Organisation for Economic Co-operation and Development in October 2019 on <https://www.oecd.org>, Series on Gross domestic spending on R&D.

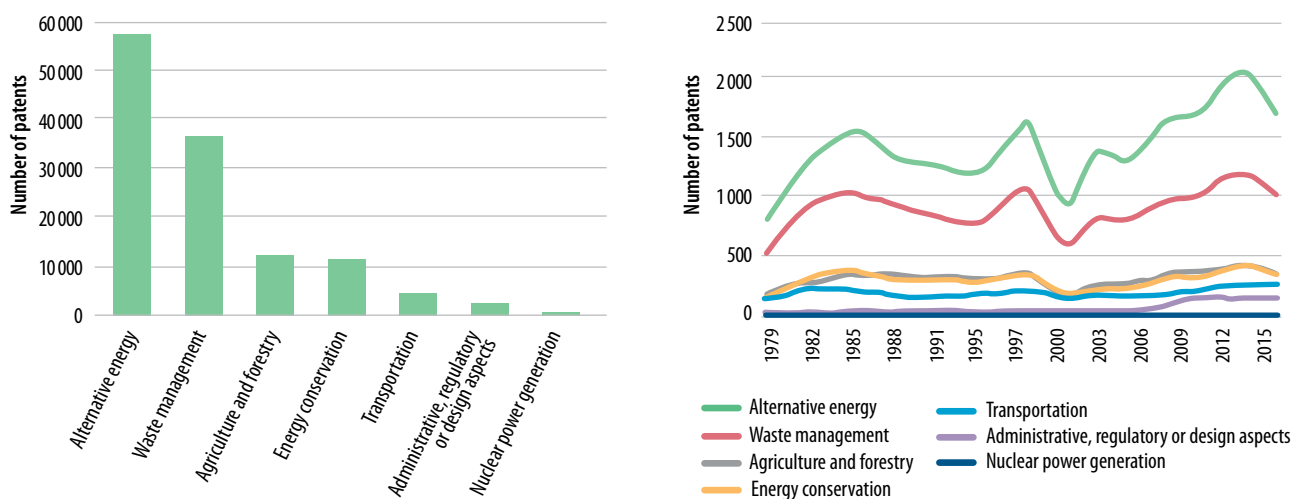
Figure 8: Total green R&D expenditure and green share of R&D based on socioeconomic objectives (2010/11-2016/17), in constant 2016/17 rand values



Source: Montmasson-Clair, Mudombi, and Ryan 2019, based on data obtained from the Centre for Science, Technology and Innovation, deflated with the consumer producer index published by Statistics South Africa.



Figure 9: Numbers of patents (granted and pending) for green technologies across sectors in South Africa from 1977 to 2016



Source: Montmasson-Clair, Wood *et al.* 2017, based on data obtained from the Companies and Intellectual Property Commission in 2017.

Notes: The sum of the categories is larger than the total number of patents due to numerous patents featuring in more than one category. Right-hand graph based on three-year moving averages.

this corresponds to a 35%-39% increase over the 2010/11-2016/17 period²³ or a CAGR of 4.3%-4.8%. The green share of total R&D reached 17%-20% in 2016/17, slightly less than in 2010/11 when it accounted for 18%-22%. Green R&D has been largely driven by the public sector, which accounted for 70%-77% of green R&D (compared to 23%-30% by the private sector) in 2016/17. On the sectoral basis, green R&D has essentially been focused on three research fields, namely agricultural sciences, biological sciences, and environmental sciences, accounting for 72% in 2016/17. In terms of socioeconomic objectives, plant production and plant products, natural resources and environmental knowledge accounted for 48% of green R&D at the end of 2016/17 (Montmasson-Clair, Mudombi, and Ryan 2019).

South Africa's patenting activity similarly shows a dynamic green R&D and innovation field. Over the 1977-2016 period, a total of 100 442 green patent applications were registered in South Africa. Alternative energy is the main focus area, followed by waste management.

Importantly, the sum of the categories is larger than the total number of patents due to numerous patents featuring in more than one category. Over time, annual patent registrations have evolved only marginally, although the increase in the two leading categories, i.e. alternative energy and waste management, is notable. The alternative energy category is dominated by patents related to biofuels, followed by solar energy, waste-to-energy and waste heat recovery. Insulation technologies and storage technologies (for electricity and heat) dominate energy conservation patents. Waste management covers patents for air pollution (for carbon capture and storage, and air quality), the disposal, reuse and treatment of waste, and water pollution. In the agriculture and forestry sector, patenting is focused predominantly on pesticide alternatives, with activity in soil improvement, forestry techniques, alternative irrigation techniques, and organic fertilisers. Other sectors are smaller in terms of patent activity but show some areas of interest, such as clean vehicles and static structure design for buildings.

²³ In nominal terms, this rises to an increase of 88%-94%.

3.4. Skills development

The development of skills that enable a transition to green industrial development rest on the ability to identify and supply green skills that meet demand or objectives to foster a green economy transition. Importantly though, different groups need different skills. In South Africa, the learning opportunities differ widely between “champions” and the broader society.

Rosenberg *et al.* 2016 identified that, for champions driving the transition, “a wide spectrum of learning opportunities relevant to a green economy already exists in South Africa. Most topics or subjects [...] are taught somewhere by someone” (p. 8). For instance, in the case of resource efficiency in industries, the dti has been actively promoting skills development through the NCPC-SA (see Table 8). Moreover, champions tend to have multiple years of experience and are prone to on-the-job learning. A large number of diverse competencies is nevertheless required to drive the transition. In addition, champions require somewhat different skills. Indeed, due to the large array of skills needed, “these competencies occur or are needed not necessarily in individuals, but in teams of people (distributed competencies) who have different roles and who need to work effectively with each other; for this leadership is required” (p. 7). Overall, access to learning opportunities remain constrained in South Africa, largely due to a knowledge gap. No central repository of

learning opportunities exists in the country, hindering the rollout of skills and competencies.

The picture is somewhat different for more general green skills. According to the International Labour Organization (ILO), South Africa does not have a comprehensive approach to green skills development.

The ILO notes that “seldom is consideration given to the question of which occupations are needed to implement a policy effectively, and whether the related skills or qualifications are available” (ILO 2018, 26). In addition, there is “no incentive or requirement for policy-makers to analyse the skills required to give effect to their policies” (ILO 2018, p. 26). For example, the development of South Africa’s energy plans does not consider the employment and skill requirements associated with them, despite the deep implications with the technological transition under way in the sector. While somewhat addressed in policy plans and documents that are green-economy specific, green economy skills development is also not addressed in the general framework of skills development. There is, for example, no mention of green skills in the National Skills Fund 2016/17–2020/21 Strategic Plan (ILO 2018).

Despite an uncoordinated policy framework, a number of green skills forums or bodies exist in the country. A non-exhaustive list is presented below:

- Universities have begun to offer targeted qualifications towards a green transition. For instance, the University of Cape Town provides a Masters degree in Climate



Table 8: National Cleaner Production Centre South Africa's main skills-related programme

Programmes	Skills Offered
Industrial Symbiosis Programme	The NCPC-SA Industrial Symbiosis Programme is a free facilitation service which uses internationally proven industrial symbiosis approaches to enhance business profitability and sustainability. The Industrial Symbiosis Programme managed by the NCPC-SA facilitates matches between companies with "waste" resources with other member companies that can use them to create new business opportunities.
Industrial Water Efficiency Project	Water has always been one of the resources addressed through RECP. Through the work of the NCPC-SA, water savings have been achieved by the RECP expert level and internship programmes.
Resource Efficient and Cleaner Production Project	<ul style="list-style-type: none"> • The end user course equips trainees with the knowledge, understanding and tools that will enable them to initiate the development and implementation of RECP. • The expert level course is aimed at equipping delegates with the necessary knowledge, skills and tools to promote the adoption and implementation of RECP in industry. Delegates gain practical experience in implementing and reviewing RECP, as well as being able to report on its performance.
Industrial Energy Efficiency Project	The Energy Systems Optimisation training programmes include individual courses on a number of energy systems including pumps, compressed air, fans, steam and motors. They combine science and theory and cover management processes, case studies, training on appropriate software toolkits and practical sessions.
Green Chemistry Project	Among other activities, the Green Chemistry collaboration offers training opportunities, develops training materials on best practices in the field.

Source: NCPC-SA n.d.

Change and Development; the School of Architecture and Planning at the University of Witwatersrand offers a Masters of Architecture in Sustainable and Energy Efficient Cities; the North-West University delivers a Master of Social Science in Population and Sustainable Development; Stellenbosch University's School of Public Leadership offers a Masters Programme in Sustainable Development in collaboration with the Sustainability Institute; the University of Pretoria's Centre for Environmental Studies proposes graduate training programmes; and the University of the Free State provides a postgraduate diploma in Integrated Water Management.

- The Centre for Researching Education and Labour at the University of the Witwatersrand has also been looking at skills in hubs, value chains and hotspot areas to pinpoint occupations that will change due to the transition to

sustainable production systems, then identifying needs for reskilling, aligning skills to production and better firm sustainability.

- Under the leadership of the National Environmental Skills Development Planning Forum, which was created as a way to "respond to the absence of a dedicated Sector Education and Training Authority (SETA)²⁴ and an overarching, skills focused professional body for the environmental sector", the Green Skills programme (led by Rhodes University) has been working with SETAs

²⁴ SETAs are responsible for skills development in the context of workplace training. They also provide funding for bursaries for learners, who could be employed or unemployed, enrolled for courses in National Qualifications Framework (NQF) Level 5 or higher. At the same time, the SETAs provide funding to industry and firms in the private sector for skills development and training initiatives in the form of grants.



to incorporate green skills in the respective sectors. Importantly, 17 of the 21 SETAs have recognised the importance of transitioning to a green economy and identifying future shifts in skills. For instance, the sector skill plan for the mining and minerals extraction sector aims to address changes in skillsets required by a greening of the economy and increasing environmental concerns while the Manufacturing, Engineering and related sectors SETA emphasises “the green agenda” and sustainable green skills development as key drivers for skills development in its most recent plan. As such, industrial policy has been urged to be clearer about the expected changes so skills can respond. The programme mainly aims to build and develop skills of educators and trainers in sustainability and the green economy and henceforth combat skills shortages on the supply side.

- DHET and DST run a pilot project aimed at greening Technical and Vocational Education and Training colleges in the country. The initiative, which involved seven colleges, aimed to support qualified lecturers in their continuous professional development through training

in renewable energy and energy efficiency technologies; develop a new optional vocational subject on renewable energy and energy efficiency technologies for students; and initiate various greening of college activities as essential awareness-raising and cross-cutting themes for sustainable development. However, it is not yet clear whether the programme will have an impact on the green focus of colleges beyond the seven institutions involved in the pilot programme (OneWorld Sustainable Investments 2017).

3.5. Regulations and economic instruments

Regulations, through their various forms, can have a fundamental impact on the transition to green industrial development and have been used with various degrees of success in South Africa. They range from command-and-control regulations, to economic (quantity- or price-based) regulation, to rules and frameworks, to performance-based regulation and management-based regulation.

Command-and-control regulation, which is essentially spearheaded by DEFF, is widely used in South Africa to drive the green economy agenda. Such regulations frame the boundaries within which an economic activity must operate. In other words, it is the direct regulation of an industry or activity by legislation that states what is permitted and what is illegal. In South Africa, in line with the NEMA, it includes licensing requirements (notably for atmospheric emissions, water use and waste management), as well as requirements for environmental management and environmental impact assessments (EIAs). Land use is also regulated in South Africa and legal protection is provided in some areas by the Protected Areas and Biodiversity Acts, restricting or preventing certain economic activities (mostly mining). However, implementing command-and-control regulation remains highly imperfect in the South African context. Licensing requirements are poorly enforced and the legal protection of some areas permeable (see, for instance, Montmasson-Clair *et al.* 2015 for the implementation of such regulations in the mining sector).

In some cases, command-and-control regulations have, however, had a hindering effect on the transition. Waste management regulations, as provided by the National Environmental Management: Waste Act (No 59 of 2008), have in some instances been obstructing industrial symbiosis initiatives by limiting the sale and transport of by-products. For instance, steelmaking slag, in various forms, can be used as an input in the cement industry (as a solidifier), as an aggregate in the agricultural (as a liming agent) and road building (where it is qualitatively superior to other stone products) sectors, and as a water cleaning agent (particularly in the case of contamination from acid mine drainage). The classification of by-product material, such as slag, as waste by the Waste Act has concrete implications for industries. Recovery, reuse and recycling of a material is constrained by its categorisation as waste as it requires both the seller and the buyer to obtain a waste management licence, a long and onerous process that can take up to two years (Montmasson-Clair 2016a). Regulations can also prevent the roll-out of new technologies. In the sanitation sector, technical barriers arise as a result of municipal by-laws and regulations (building codes in this case) that might not allow installation of new, next-generation sanitation technologies, as they have to conform to existing sanitation regulations and by-laws (Burger 2015; Mudombi 2018).

From a climate change perspective, economic, quantity-based regulations around GHG emissions have been implemented in various forms in the country. South Africa has committed at the international level to GHG emissions known at the Peak-Plateau-Divide (PPD) trajectory. The PPD pledges to peak the country's GHG emissions between 2020 and 2025 at respectively 34% and 42% below a business-as-usual trajectory, plateau for about a decade and decline in absolute terms thereafter (UNFCCC 2011). The PPD has informed the development of carbon budgets domestically for key industries. The participation in carbon budgets, currently in their first phase, is voluntary. As of October 2019, 26 budgets have been allocated, in sectors ranging from cement, iron and steel, ferroalloy, coal mining, glass, chemical, refineries, pulp and paper, plastics and electricity. Implementation will become compulsory from 2020 onwards. Participating businesses will obtain a rebate (of a maximum of 5%) on their carbon tax liability. The PPD is also informing the development of five-year period SETs, which will be continuously determined for three rolling five-year periods. National government departments (i.e. the dti in the case of industries) will be allocated the responsibility of ensuring that GHG emissions remain within the limits of the first five-year period, notably by developing and implementing policies and measures. The subsequent SETs will serve to provide a signal to sectors on what carbon space will be available to them (DEA 2019).

Economic, quantity-based regulations can materially curb environmental degradation, particularly in the case of GHG emissions, provided they are designed to that effect. If not designed properly, however, (for example, due to a lack of integration with other instruments), they can either generate negative socioeconomic impacts and/or regulatory over-burdening, or lose their meaning. The design and weak integration of the carbon tax and carbon budget is an example of such a problem in the South African context. By choosing a carbon tax as the main instrument, in which carbon budgets are embedded, the carbon budget loses its clout.²⁵ A reverse approach, in which a carbon budget would be the primary instrument and the carbon tax the enforcing mechanism (taxing companies if they exceed their budget) would deliver a strong quantity-based instrument.

²⁵ As indicated, companies achieving their carbon budgets can receive a carbon tax rebate of up to 5%.

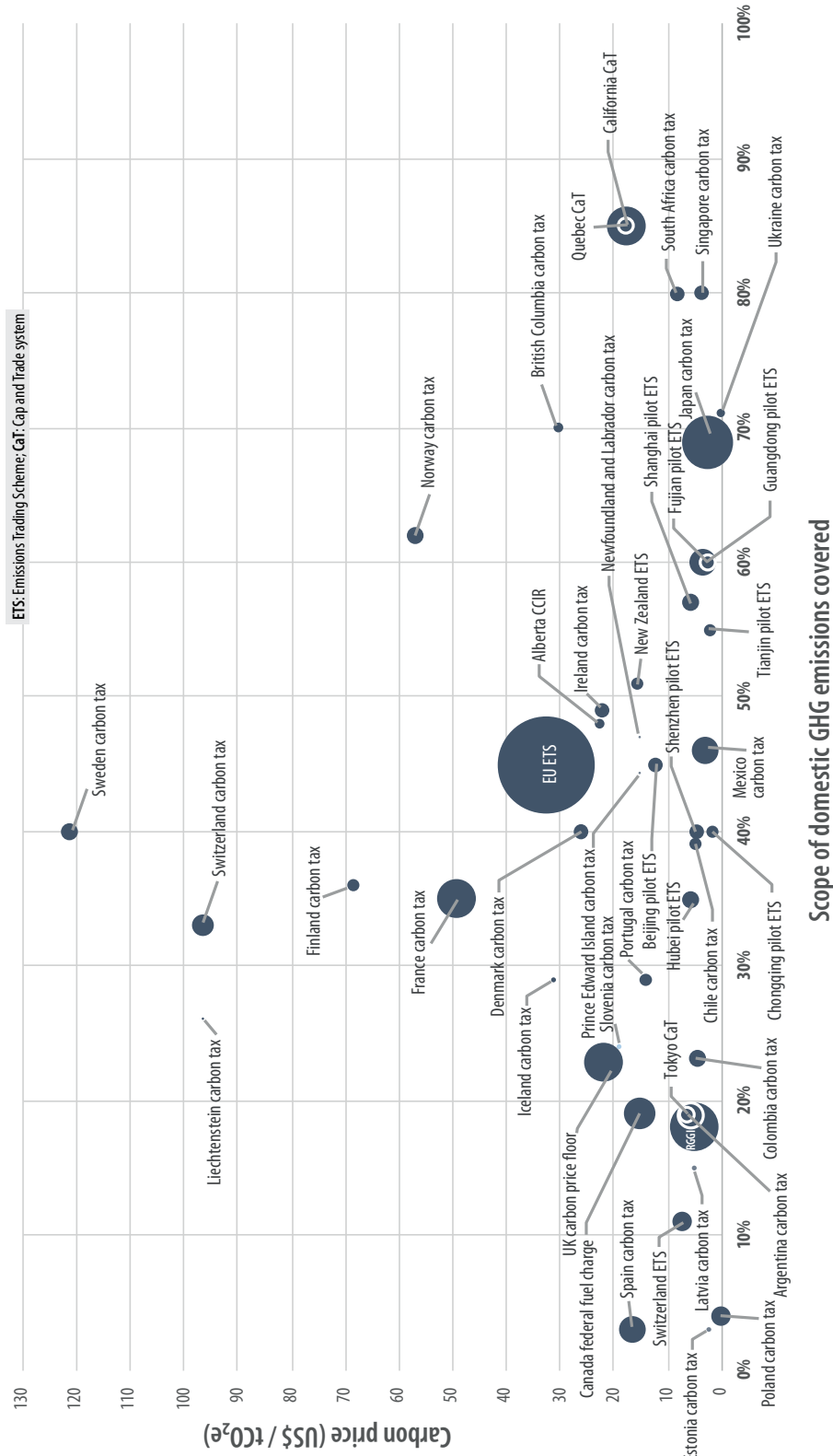


Economic, price-based instruments essentially take the form of carbon taxes or levies in South Africa. They require the polluter to pay a price per unit of emissions (in the case of climate change) in the form of a tax or charges, without prescribing a set quantity of emissions or emission intensity. After about a decade of deliberation, a carbon tax on GHG emissions has been implemented by the National Treasury in South Africa since June 2019. It takes the form of an environmental levy on total combustion, process and fugitive emissions. The tax covers about 80% of South Africa's GHG emissions, positioning it as one of the most ambitious carbon pricing initiatives globally in scope. Tax-free allowances reduce the headline rate of R120 per tonne of carbon dioxide equivalent to R12-R48, depending on the sector and its performance. By contrast, this rate positions the South African carbon tax on the lower-end globally compared to carbon pricing implemented in other countries (see Figure 10). Other taxes include a carbon tax on new vehicles proportional to the vehicle's GHG emissions per km, which aims to incentivise consumers to buy more efficient vehicles, an Environmental Levy on Electric

Filament Lamps, which aims to incentivise the shift to energy-efficiency lighting, as well as a levy on plastic bags, which aims to discourage their use. Figure 11 highlights the positive impact that the levies on incandescent lightbulbs and plastic bags have had on consumption.

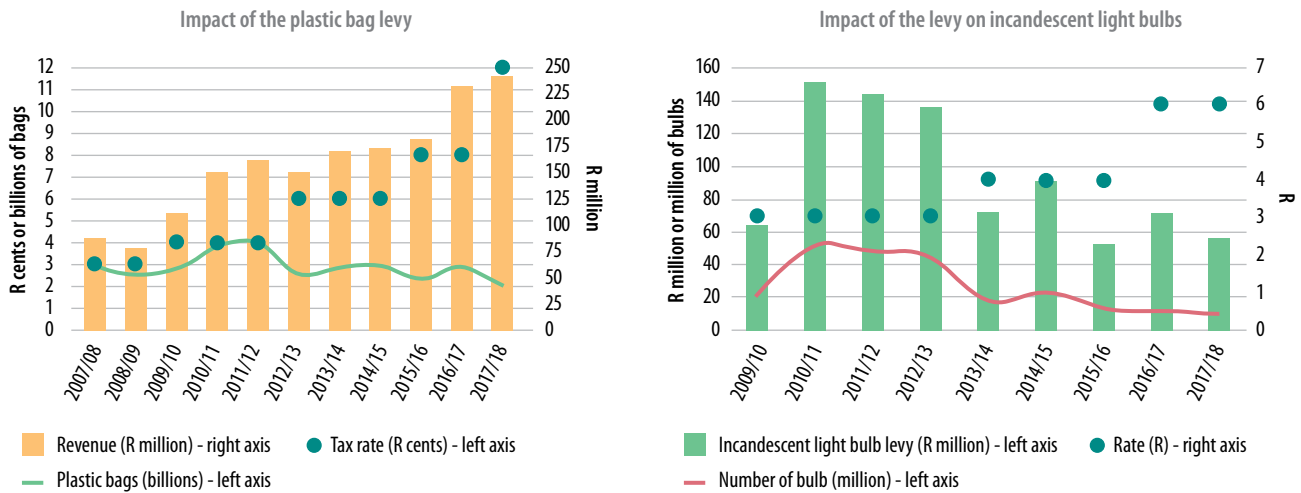
Rules and frameworks, such as the REIPPPP, procurement and fiscal rules, provide the platform and regulatory settings for certain operations and have also been used in South Africa to promote the transition. The REIPPPP, started in 2011 under the leadership of the NT, the DoE and the DBSA, have successfully introduced renewable energy into the South African electricity mix. The country's 2018-2050 Green Transport Strategy aims to "convert 5% of the public and national sector fleet in the first seven years of the implementation of this strategy and an annual increase of 2% thereafter, to cleaner alternative fuel and efficient technology vehicles [...] and environmentally sustainable low carbon fuels by 2025" (DoT 2018, p. 25). According to South Africa's tax regime, Section 37B of the Income Tax Act No 58 of 1962, as amended, provides for the deduction of capital expenditure in respect of environmental treatment

Figure 10: Main carbon pricing mechanisms globally according to their price and scope



Source: Authors, based on data from the World Bank, Series on Climate Pricing Dashboard, downloaded from https://carbonpricingdashboard.worldbank.org/map_data in October 2019.
Notes: the bubbles represent the relative size of the economy in which such mechanisms are implemented. Dark-blue bubbles mark high-income jurisdictions while light-blue bubbles mark middle-income jurisdictions.

Figure 11: Impact of selected environmental taxes in South Africa



Source: Authors, based on data from the South African Revenue Service, series on revenue collection, environmental taxes, downloaded from <https://www.sars.gov.za> in October 2019.

and recycling assets and environmental waste disposal assets. Section 37C provides similar deductions for environmental conservation while Section 12B provides deductions for the commissioning of renewable energy plants. Under Section 12K, the disposal of any certified emission reduction credit derived under a qualifying clean development mechanism also benefits from tax exemption.

Performance-based regulation is a softer approach in which government does not dictate the materials or processes the regulated entity must use to achieve societal goals, but rather sets ultimate production standards that the entity should meet. Such standards may be voluntary or mandatory.

The driving regulation in this respect in South Africa is the National Energy Efficiency Strategy (NEES). Building on the first (2005) and second (2011) iteration, the draft 2016 NEES²⁶ outlines a set of goals for energy efficiency improvements in commercial and public buildings, and the industrial (manufacturing and mining), agricultural, power, transport and residential sectors. For the industrial sector,

NEES targets a 16% reduction by 2030 in the weighted mean specific energy consumption for the manufacturing industry, relative to 2015. It specifies that this objective could be achieved by reducing the energy intensity of process-specific activities (such as blast furnaces and smelters) by 5%; and generic energy using activities (such as air conditioning, lighting and pumps) by 35% (DoE 2016). Pushed by fast-rising energy prices, energy efficiency has dramatically progressed in South Africa over the last two decades, as seen in Figure 12.

Standards, either voluntary or mandatory, also form part of performance-based regulation. The development of performance standards, such as ISO 14001 for environmental management and ISO 50001 for energy management, has been promoted with mixed results in the country. As shown in Figure 13, South Africa lags behind other key industrialised economies in the roll-out of ISO standards. This is particularly clear with energy management. As of November 2019, only 31 firms were ISO 50 001-certified in the country. Mandatory standards in South Africa take the form of technology standards (for smart meters and solar water heaters (SWHs)) and compliance standards (for energy efficiency and thermal insulation in new buildings, as enshrined in the building codes, and for the labelling requirements for energy efficiency).

²⁶ The latest iteration of the NEES was published by the DoE in November 2016 for public comment and is yet to be finalised and adopted by Cabinet.

Figure 12: Energy intensity of the South African economy (in terajoule per R million, in nominal terms)



Source: Authors, based on data from DoE, Series on energy balances and commodity flows, downloaded in October 2019 from www.energy.gov.za and Statistics South Africa, Series on GDP, downloaded in October 2019 from <http://www.statssa.gov.za>.

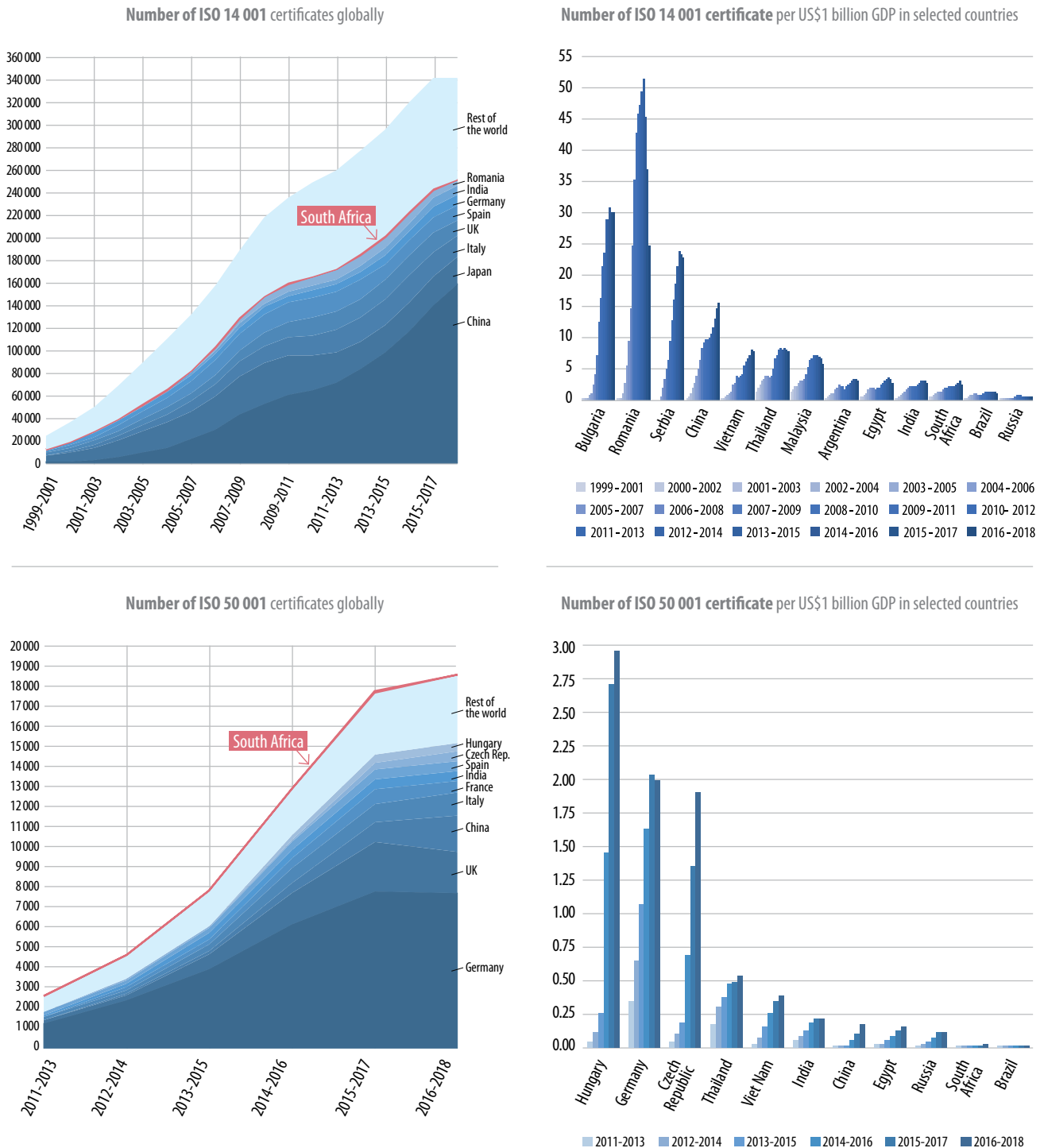
Note: the industrial sector covers manufacturing, mining and construction.

Management-based regulation shifts the focus from the government or regulator to the regulated entity. In this case, government directs private firms to incorporate public goals into their management practices, and provides general guidelines by which private management will be judged. In South Africa, the main management-based regulations related to the transition to green industrial development are the requirements for PPPs and industry waste management plans. The requirement for PPPs, in line with the country's National Environmental Management: Air Quality Act No 39 of 2004, came into effect on 21 July 2017. It requires companies above a certain threshold to report on emissions of certain pollutants, including carbon dioxide,²⁷ and design mitigation plans in line with emissions

reduction targets. In line with the Extended Producer Responsibility approach, a number of sectors, namely the production and/or distribution of paper and packaging material, light equipment, electrical and electronic equipment, or goods wrapped in primary or secondary packaging material, are required since 6 February 2018 (according to the Waste Act) to develop industry waste management plans. In addition, the DMRE is considering introducing mandatory energy management plans for large energy users, on a similar basis to PPPs.

²⁷ The full list of pollutants covered by PPP is: Carbon dioxide (CO₂); Methane (CH₄); Nitrous oxide (N₂O); Hydrofluorocarbons (HFCs); Perfluorocarbons (PFCs); and Sulphur hexafluoride (SF₆).

Figure 13: Number of ISO 14 001 and 50 001 certificates in South Africa and globally



Source: Authors, based on ISO data, ISO survey series, downloaded from <https://www.iso.org> in October 2019.



3.6. Localisation requirements

Local content requirements are an industrial policy tool used to spur demand for locally-manufactured goods and develop the manufacturing capability in the country.²⁸ They encompass tools or instruments, such as manufacturing enhancement programmes, supplier/enterprise development initiatives, competitive supplier development programmes, local content targets and designations.

Green procurement has yet to be rolled out in the country. The Public Sector Education and Training Authority has, however, explored the requisite occupations and related skills to develop green supply chain management in the public sector, highlighting the possibility of leveraging multiple entry points in the public sector supply chain management system (Ward *et al.* 2016).

In the meantime, South Africa's REIPPPP has so far been the main avenue used to localise green goods in the country. The programme objective is to spur

industrial development through increasing local content requirements. Minimum local content requirements, as set by the dti, increased from 35% (for solar PV and CSP) and 25% (for all other technologies) of project value in the first procurement rounds to 50% in the latest rounds.

The design and governance of the programme attracted numerous manufacturers in the country.

Companies, such as Gestamp Renewable Industries (turbines), DCD Group (turbines), SMA (inverters), Jinko Solar (solar panels), SolaireDirect (solar panels) and ARTsolar (solar panels) opened plants in South Africa to meet the growing demand for locally-produced inputs. As of December 2018, a total of R45.3 billion had been spent in local content by project developers, achieving 51% local content for the programme as a whole (DoE, NT, and DBSA 2019).

However, protracted delays in finalising procurement rounds since 2015 (i.e. beyond bid window 3 of the REIPPPP) and the lack of long-term certainty about the future of the programme has forced most facilities established at the onset of the REIPPPP to already close down. In addition, the industrialisation envisioned as part of the programme has remained constrained owing to the limited generation capacity allocated per technology

²⁸ Local content requirements can be challenged before the World Trade Organization, in turn influencing investment decisions. Cases to date only focus on large-scale programmes, such as the United States of America, Canada, the European Union, India and China (Wood 2017).

Table 9: Designated products in line with green industrial development

Designation	Specification
Solar PV (15% to 90%)	Mono/poly-crystalline PV module (25%); Copper Indium Gallium Selenide solar cell (also known as thin-film cell) (75%); Mounting Structure (90%); Inverter (40%).
Solar water heaters	70% (target one million) use of Eskom Rebate Programme.
Residential electric meters	Prepayment and Post-paid Meters (70%); Smart Meters (40%).
Residential electric water meters	50%-70%.
Buses	70% and 80% locally-made content of the bus body for city and commuter buses, respectively.

Source: the dti.

(to create sufficient aggregate demand for international companies to set up manufacturing sites in the country) and the small existing manufacturing base. While the initial allocations represented a substantial volume, the overall capacity spreads across several technologies as well as numerous competing developers and suppliers, thus failing to create enough aggregate demand to encourage large investments in local manufacturing. In addition, all raw (unprocessed) steel and aluminium, regardless of origin, is deemed 100% local in the programme, pushing local content statistics without benefiting local industries.

In South Africa, over and beyond local content requirements, products can be earmarked (“designated” in South African terms) by the dti for local procurement by public entities. At a generous estimate, designations applied to less than 20% of procurement by general government, and to 6% of total sales of intermediate products. The share for state-owned enterprises is likely larger.²⁹ While the impact of local procurement can take time to materialise,³⁰ notably for

new and nascent industries, it is an effective avenue to promote local green industrial development in the long run. Of the 23 designated products as of October 2019, four are directly linked to the transition to an inclusive green economy. These revolve around renewable energy and resource efficiency, as shown in Table 9. Although only four of the designations directly foster a green transition, efforts could be made to transform manufacturing processes and procurement of other designated goods that use green and sustainable methods.

The basis for designation aims at improving manufacturing capabilities of local firms as well as employment creation. Manufacturing of SWH does not require highly skilled labour and thus provides an opportunity for unskilled workers from low-income communities to secure permanent jobs and become part of the formal economy. An initial target of one million SWHs were to be rolled out by government before 2014, as indicated in the South Africa’s Renewable Energy White Paper. A new target of 1.75 million SWH installations by 2019 was then set, in line with the NDP target of five million SWH installed by 2030. Although the designation was set under the dti and industrial policy, implementation fell under Eskom, before being transferred to the DoE. As of May 2018, the programme is effectively stalled and only 400 000 SWHs have reportedly been installed.³¹

²⁹ Since designations were often narrower than the economic categories used in the Supply Use Tables and government budgets, it is impossible to estimate the share of procurement covered with much accuracy. The lack of comprehensive information on SOC procurement makes it difficult to estimate. In addition, a lack of systemised tracking makes it hard to assess progress.

³⁰ It typically takes several years or even decades to establish new productive capacity that can compete with international products. By extension, while the costs of changing to local suppliers typically emerge up-front, the benefits of local-content procurement may only emerge later on.

³¹ See here the Report of the Portfolio Committee on Energy on the Budget Vote No 2 of the DoE, dated 9 May 2018. See also Kritzing and Covary (2016) and TIPS (2015) for the reasons of the under-performance of the programme.

The designation for solar water heaters was reportedly based on an overestimate of the potential for local supply of more advanced inputs. Several local manufacturers of the basic container argued that they could not find competitive local producers of photovoltaic inputs. As a result, they could not benefit from the designation. Moreover, they found the cost of product approval under the designations was unsustainably high. For example, manufacturers had to pay close to R100 000 to have a system tested by SABS to qualify for the Eskom rebate programme. And, until the re-introduction of partial testing from 2018 (initially ceased in 2015), in the case of a single component change, the entire system had to be re-tested at the same cost (Makgetla 2018).

In terms of (smart) water and electric meters, municipalities across South Africa have been intending to switch from post- to pre-paid metering due to increasing levels of non-payment by customers, in particular residential customers. The implication of this is that all existing post-paid meters would have to be replaced, resulting in significant procurement. Roll-out of effective quality water and electricity meters for water and energy management smart metering will assist in reducing leakages and non-revenue water and energy efficiency. Municipalities across major metros have already enacted the roll-out of smart meters, however, it has been difficult to ascertain those that have been locally procured, making it difficult to track effectiveness of designations.

3.7. Economic zones

Industrial parks support, manage and administer industrial activities within a specified area to facilitate socioeconomic benefits for the surrounding area, its tenants and the country as whole. They provide an institutional framework, modern services and a physical and often social infrastructure. Industrial parks can also be eco-industrial parks, bringing multiple economic, social and environmental benefits. They can be defined as “an earmarked area for industrial use at a suitable site that ensures sustainability through the integration of social, economic and environmental quality aspects into its siting, planning, operations, management and decommissioning” (UNIDO 2017, p. 5).

South Africa hosts a variety of economic zones. They range from privately-run industrial parks to government-funded

industrial parks, industrial development zones³² and Special Economic Zones (SEZs).³³

The dti, through the NCPC-SA, runs a programme aimed at greening the country's industrial parks.

The first step is to roll out RECP and industrial symbiosis initiatives in a select number of parks. As of November 2019, Ekandustria, Puthaditjaba and Isithebe industrial parks have been assisted in carrying out high-level assessments and awareness-raising activities. Some private parks, such as the Limpopo Eco-Industrial Park being built in Musina, are also exploring the opportunities associated with green industrial development. The park, whose construction is set to start in 2021, is advertised as Africa's first zero solid waste eco-park.

Some industrial development zones and SEZs have also engaged on the transition to eco-industrial parks.

The East London SEZ is considered a leader in the field in the country. In addition to undertaking RECP assessments and capacity-building activities for park management, significant efforts have been made to identify and evaluate opportunities for industrial synergies, notably for waste management (UNIDO 2019). The Atlantis, Dube Tradeport and Richards Bay SEZs have also included the transition to an eco-industrial park in their design and planning processes. For instance, research on the Richards Bay SEZ has indicated the potential for cogeneration. A 2-gigawatt electricity power plant has been planned for the Richards Bay Industrial Development Zone and, if cogeneration is coupled with this plant, it has the potential to generate at least 600-megawatt of heat for industrial users. This would provide heat for at least 60 commercial-scale breweries, for example. Further, initial research has indicated the potential for exchanges of heat and fuels in the Richards Bay SEZ reducing the fuel usage, GHG emissions, water use by the plant (Von Blottnitz 2016).

In addition to initiating the transition to eco-industrial parks, some SEZs aim to harness the manufacturing opportunities associated with the transition to a green economy.

Examples include the Greentech Atlantis SEZ, in the Western Cape, which aims to attract manufacturers involved in the renewable energy and broader greentech

³² Industrial development zones are purpose-built industrial estates linked to an international seaport or airport, which aim to leverage fixed direct investment in value-added and export-orientated manufacturing industries.

³³ SEZs are geographically-designated areas set aside for specifically targeted economic activities. Firms operating in SEZs receive a number of financial incentives.

sectors, from renewable energy technologies, wind turbines, solar panels, insulation, biofuels, electric vehicles, materials recycling and green building materials. The zone has already attracted large green tech investors, such as Gestamp Renewable Industries (R300 million investment), Resolux (R25 million investment), Kay Technical Services (R130 million investment) and Skyward Windows (R50 million investment). Another example is the Upington solar corridor SEZ, in the Northern Cape, which aims to attract a manufacturing investment in solar-based technologies, among others. Possible investment opportunities include panel production and assembly, a fully integrated silicon wafer production facility, and the local manufacturing of panel frames, lamination materials, wiring, junction boxes and inverters, electronic components and printed circuit boards. The Bojanala Platinum Valley SEZ, in the North West Province, is another illustration of a SEZ attempting to tap into new, green opportunities. Its core mandate will be fuel cell development, platinum recycling and auto catalyst manufacturing, and the development of the hydrogen economy.

3.8. Trade policy

Trade policy, as an important tool for achieving sustainable development, can be used to promote the development of green goods and services globally as well as domestically. South Africa has adopted a stance coherent with its level of green industrial development and the status of global trade negotiations around the issue of environmental goods and services. As shown in Box 2, South Africa's trade balance for green goods could, however, be materially improved, by improving productive capacity and competitiveness in the global market as well as harnessing import-substitution opportunities.

At the global level, South Africa has elected not to participate in the negotiation of the developed country-driven Environmental Goods Agreement (EGA) (Wood 2017). The EGA is plurilateral (a multi-stakeholder set of negotiations that takes place outside the core multilateral process) which aims to remove tariff and non-tariff barriers on a series of environmental goods. It involves 18 parties, including most major developed world economies (such as the US, EU, Japan, Canada, New Zealand and Australia) and two developing countries (China and Costa Rica). The deal is notable in its lack of representation from the Least Developed Countries group, African countries or from the influential India, Brazil, South

Africa bloc. South Africa's absence from the negotiations is based on the concerns that plurilateral trade negotiations may undermine the commitment of all countries to the multilateral trading systems, its potential impacts on smaller and less developed countries, as well as the questionable environmental credibility of the agreement.

At the regional level, leaving aside the Southern African Customs Union (which is already fully liberalised), South Africa's regional trade regime involves three different regional blocs, each with their own complicated relationship with green goods. The Southern African Development Community (SADC) established a comprehensive trade agreement in the form of the SADC Protocol on Trade in 2005, and has since substantially shifted focus away from tariff discussions. The current focus is on developing a regional industrial policy, which does include reference to the need to transition to a green economy as a cross-cutting issue, but which has solidified a view of policy advancement that is very different from the negotiated liberalisation that underpins talks on the EGA. While these newer issues are more difficult to negotiate, they do make sense as a new avenue for progress, since tariffs are not a substantial barrier for trade in environmental goods in the region.³⁴ This opportunity may be enhanced by the two additional blocs in which South Africa is participating or negotiating, namely the Tripartite Free Trade Area, the cooperative deal between the three major Southern, East and Central African trade blocs, and the African Continental Free Trade Area, although these represent more complex and long-term avenues.

³⁴ Overall, tariffs are already low, and may drop further, but they are not the primary barrier to trade in environmental goods in the region. Three key barriers are more pressing. First, the regional market for environmental goods remains quite small. While it is growing rapidly, the short-term prospects are concentrated in a handful of large markets. This means South Africa will need to act as a driver of trade in environmental goods in the short term. Second, well-established regional non-tariff barriers, like logistics, customs, and finance, remain serious barriers to trade, and are likely far costlier than tariff barriers. Third, a set of non-tariff barriers focused specifically on environmental goods, largely to support local manufacturing (over imports), affect the region as well (Wood 2017).

Box 2. South Africa's green trade

The creation of green industries can strategically position South Africa to develop green technologies, reduce dependencies on imports (of green technologies and the conventional technologies they replace) and related ancillary services, and replace or leapfrog brown technology segments, with immense environmental, social and economic benefits.

The International Trade Centre estimates that the global market for environmental goods will grow from US\$866 billion in 2011 to US\$1.9 trillion by 2020. A recent UNEP study (2019) shows that developing countries' share in world trade of environmentally-sound technologies has been growing and a significant potential exists for them to benefit more. However, overall, exports of green goods remain a small part of South Africa's broader export basket. Of the top group, only catalytic converters are a significant export commodity, a result of the strength of South Africa's platinum industry and large-scale support from government. According to Van Niekerk and Viviers (2014), renewable energy technologies, including solar systems (semiconductors), wind power components (towers and lattice masts, gearing and screws), and supporting components like control boards, static converters, represent new, key green export opportunities for South Africa. Over and beyond these green goods, many other products showing export potential reflect their relationship with more conventional (not environment-focused) industries with a strong presence in the country. These include sewage treatment tanks and equipment, pumps, cleaner paints and varnishes (linked to the paint sector), and, potentially, incinerators and parts thereof (linked to the electro-technical and energy sectors) and biomass boilers (Montmasson-Clair, Wood *et al.* 2017).

On the import side, rapid growth from a low base has resulted in several products growing at extremely high rates. As depicted in Figure 14, South Africa's imports of green goods have been about double the size of its exports. Renewable energy components account for at least half of the top 12 products, as sourcing for the REIPPPP, initiated in 2011, has driven a spike in demand for solar and wind power equipment. While the high growth figures partly represent development from a low base, they are still indicative of significant import dependence. Control equipment for electrical power, which includes smart meters and other monitoring systems, and a variety of waste management technologies make up the remainder of the list.

In sum, South Africa could harness material trade-related opportunities. Opportunities associated with renewable energy technologies are notable. The biogas-to-transport value chain, which aims to replace petroleum with waste-based gas, appears as a strong opportunity to leverage a shift of government and public transportation fleets to biogas. More broadly, the development of new, innovative, sustainable, biocomposite materials arises as a potential opportunity across numerous industries, substituting chemicals with natural inputs.

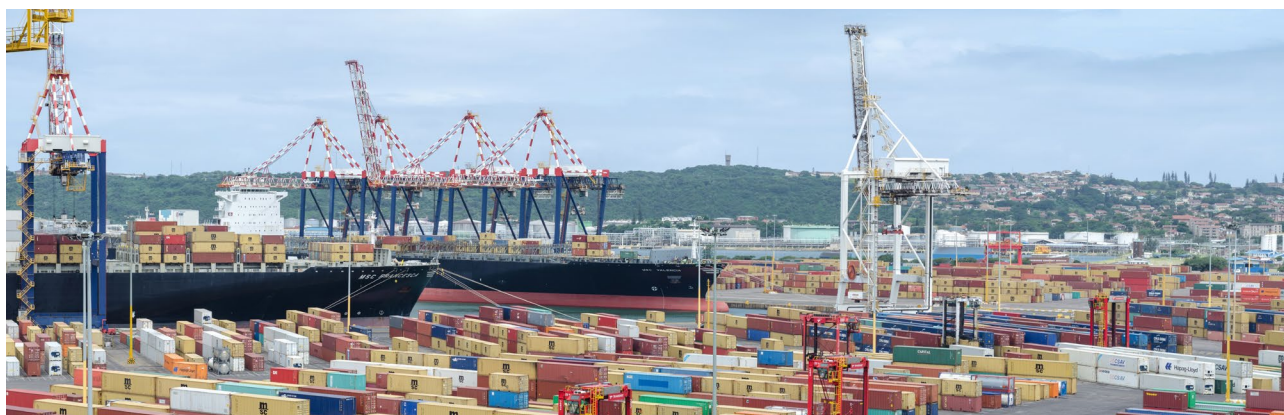
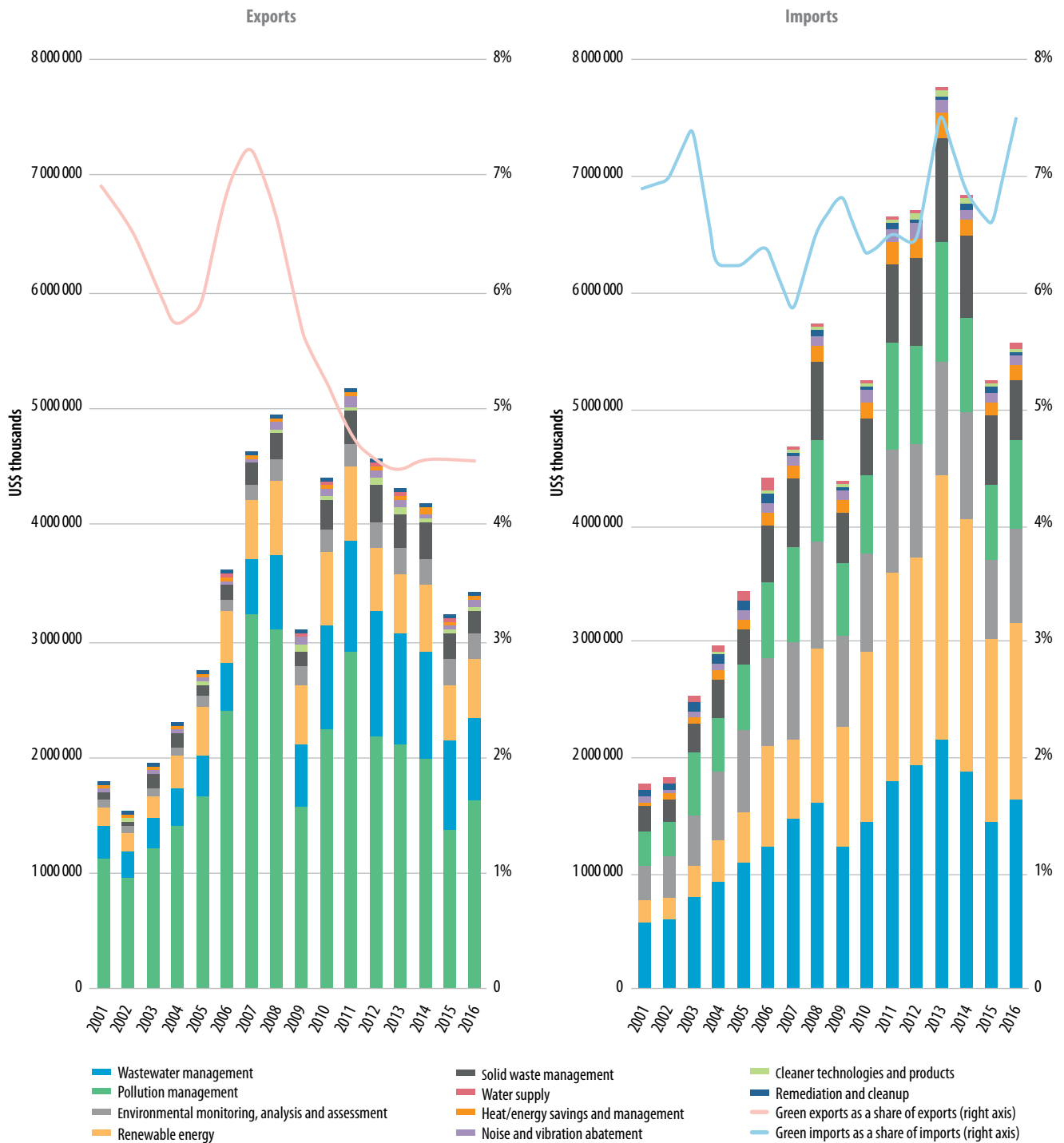


Figure 14: South Africa's trade in green goods



Source: Authors, based on data from Trade Map and Montmasson-Clair, Wood, et al. 2017.

4. Policy implications and recommendations

Building on the diagnostic developed in Sections 2 and 3, this section formulates policy implications and recommendations to foster green industrial development in South Africa. It is split into four complementary components: capacity building; policy mainstreaming; information/data systems; and transition planning.

4.1. Capacity building

Developing a green industrial policy in South Africa is conditioned on building the capability of the state in designing and implementing it. Green industrial policy is, by definition, cross-cutting, complex and challenging of the status quo. As much as policymakers and public sector officials can be assisted by external technical expertise through the development and implementation of a green industrial policy in the country, only empowered and committed politicians and public servants can in the long run ensure a meaningful and longstanding green industrial development.

Efforts should be directed towards building internal capacity on sustainability transitions within the departments of the ESEID Cluster. From the dti's perspective, sustainability issues (including but not limited to climate change) must be mainstreamed beyond the Green Industries Sector Desk into all sector desks. It must also be brought forward beyond the Industrial Development Division into the divisions which oversee the tools and mechanisms through which industrial policy is implemented, such as incentives, trade, regional economic development and enterprise development. Each sector desk and division needs to be capacitated to internalise sustainability considerations. As discussed in Section 4.2, the transformation of existing support programmes is a key avenue to implement green industrial policy. Particular attention should also be paid to the Presidency, as industrial policy gets elevated. Leveraging the team managing

Outcome 10 within DPME³⁵ would be an important first step. By contrast, non-core economic departments, such as DEFF, need to build internal capacity on adopting a broader socioeconomic framework, and align with industrial policy outcomes when tackling climate change and other environmental issues. Proposals and interventions by non-core economic departments often ignore or misunderstand their socioeconomic implications and are, as a result, highly contested (if not rejected) by social partners.

The use of the SEIAS (introduced in Section 2.1) as part of government policy development processes should be further leveraged to improve the understanding of cross-cutting issues throughout the public sector.

Capacity building on the SEIAS methodology of public officials at all spheres of government could be a useful avenue for promoting green industrial development (along with other key national objectives). The SEIAS methodology aims to integrate all considerations as well as consider the costs and benefits of specific interventions, forcing government to take into account co-benefits and trade-offs.

In addition, capability building should be actively pursued to raise awareness as well as build the necessary skills and expertise among politicians and public sector officials.

As raised in Section 3.4, a range of training workshops is available nationwide on these issues from universities and research institutions. Training on the green economy could be used as a relevant platform to start sensitising sector desks on climate change. A partnership with the National School of Government could provide the adequate platform to deliver such training. Active on-site technical assistance (through secondments) could be considered by departments. A number of public institutions, such as the dti, DEA, DoE, the South African Local Government Association and the DBSA, have received on-site technical assistance on related issues over the years.

Complementing individual capabilities, institutional capabilities should be built by enhancing intra-governmental coordination at the strategic as well as design and implementation levels. The central idea is to encourage co-development (at governmental level) of policies and strengthen coherence of the policy framework.

³⁵ As a reminder, as part of the 14 Outcomes M&E framework, Outcome 10 aims to protect and enhance South Africa's environmental assets and natural resources.

At the technical level, for example, the NCPC-SA could be used as a technical backstop to pre-screen proposals received by the various incentives and support programmes. Both the IDC and the DBSA could also be used to strengthen the application review process from a financial perspective. The dti, as the lead department for industrial policy, should drive this exercise with the assistance of all implementing agencies (such as the IDC, the DBSA, SANEDI and the NCPC).

At the policy level, this could be achieved through enhancing the IGCCC, as recommended by DEA (Giordano *et al.* 2011) or the re-establishment of the Green Growth Task Team. The newly-announced PCCCC could also play a role in this. In any case, it is recommended that the Presidency plays a leadership part, with the aim to increase intra-governmental coordination and structure active collaborative planning and policymaking on sustainability issues (particularly the dti, DEFF and DMRE).

More broadly, stakeholders active in the field should further promote informal channels of communication. Coordination often happens through inter-personal relationships, outside of formal mechanisms. The value of networking (in all its forms, from workshops, sideline events, social media and digital platforms) should be further recognised.

To ensure continued progress, sustainability issues should be embedded in personal, team and institutional performance management systems. Sustainability-related indicators should be included in personal performance agreements (through KPIs), units' annual business plans and departments' multi-year strategic plans. EIPs, which have to be developed by each department, should also be further enhanced to incorporate not only what departments can do in terms of their administrative operations (such as procurement and waste management) but also their core functions (i.e. the achievement of their mandate).

4.2. Policy mainstreaming

In building on the capacity development interventions suggested in the previous section, **a double mainstreaming of sustainability in industrial policy and industrial development in environmental policy should take place.** This should prelude the full alignment of environmental and industrial development policies.

Sustainability objectives should become an integral pillar of South Africa's industrial policy. Industrial policy

should be reviewed and revised to include sustainability considerations in all sectoral strategies with the aim of moving each industry towards a competitive, sustainable pathway. This means considering sustainability in every aspect of industrial development. Rather than restraining sustainability issues to the development of green industries, mainstreaming the transition to a green industrial development aims at greening all economic structures in the long run. This should be reflected in the upcoming Master Plans, which should in effect be Sustainability Master Plans, incorporating sustainability issues (understood as economic development, social progress and environmental preservation) at their core. Such plans should ensure that support to key industrial value chains is strategic, time-bound and conditional to green performance improvements (and linked to potential sanctions in case of non-compliance).

The integration of sustainability into industrial policy should ultimately lead to greening the support programmes that form industrial policy.

A detailed assessment of industrial policy programmes from a sustainability perspective should be conducted, focusing on their contribution to green industrial development (in terms of accessibility, sectoral distribution, firm size and type repartition, quantity and quality of interventions). In addition to economic growth and competition, and social cohesion and job creation/preservation, such an assessment should consider environmental sustainability/climate compatibility, with the aim of moving industrial policy support to sustainable activities. This should enable a greater share of industrial policy programmes to be directed towards activities supportive of the transition. This could, for example, be achieved by including a "resource efficiency" criterion and mandatory performance standards for new operations (such as electric motors). In addition, new areas, such as the extent to which local content and government procurement could be used to promote green industrialisation, should be further explored. Another area of work is the possibility for government (through the NCPC-SA) to provide a complete solution for project identification, design, financing, implementation and M&E, in collaboration with other departments and the private sector.

More broadly, such a review should include a complementary analysis, highlighting the incompatibilities of certain measures with the transition. Identified measures, such as fossil fuel

subsidies, should be progressively phased out. This process should inform the development of an enabling framework for green industrial development. The main avenue is to further the decarbonisation of the South Africa's energy sector. Most companies' sustainability is preconditioned on the access to low-carbon electricity and fuel sources. While unlocking the opportunity for companies to directly procure low-carbon energy would be important (see next paragraph), most firms would rely on national systems (such as the electricity grid) for the foreseeable future.

Complementarily, policy and regulatory bottlenecks for industries to move towards a sustainable development pathway should be identified and unlocked. Multiple policy and regulatory factors are currently preventing industries for harnessing the full potential of available sustainability initiatives. Renewable energy, where the regulatory framework inhibits industries from procuring electricity from independent power producers or installing grid-tied independent energy systems, is one example. The regulations around waste reuse and recycling, which constitute an obstacle to industrial symbiosis programmes and the broader diversion of waste from landfill, are another example.

Similarly, the realities of industrial development should be taken into account in all sustainability-related policies and strategies. This means factoring socioeconomic considerations, such as competitiveness, business cycles, infrastructure lock-ins, technology development and implementation, trade dynamics, and employment and skills into sustainability-related plans, strategies and regulations. When integrating such a perspective at the strategic level, the environmental mix of measures should be reviewed from an industrial development angle. It is crucial to develop an in-depth understanding of the socioeconomic impacts of existing as well as upcoming regulations and how to include competitiveness (and any carbon/environmental leakage risk) in their design (options include the coverage of industries, the tax rate, the long-term certainty, and the alignment with mitigation potential). The core idea is to gain a nuanced understanding (both quantitative and qualitative) of the implications of particular measures as well as the whole regulations framework on the economy and society.

An important step in that direction should be providing long-term clarity on the climate change policy framework (and more broadly environmental

regulation), including carbon pricing. This means working towards consolidating existing regulations into one coherent and integrated framework. In this respect, the establishment of the One Environmental System for the mining sector, although imperfect, is a step in the right direction.³⁶ In addition, long-term certainty should be provided on the nature and level of sustainability-related policies in the country. This includes carbon pricing and carbon budgets but extends to other sustainability areas such as pollution prevention plans and mandatory energy management plans.

Another important area of alignment is skills development and the commercialisation of local innovation and R&D. Further collaboration between the dti, DSI and DEFF is required on technology development and commercialisation to bridge the "valley of death" preventing new innovation reaching the market. Further institutional alignment within the R&D and innovation value chains should be pursued to ensure that innovators are supported adequately and continually throughout the development process all the way to commercialisation. This is particularly important to ensure that appropriate local innovations are available in South Africa to embark on the transition to green industrial development. The opportunities associated with indigenous and traditional knowledge should be paid specific attention in this respect. At the same time, further efforts are required to develop the green skill base in the country. Skills development should take two complementary directions in the short term. First, awareness-raising programmes at firm level should be enhanced. The NCPC, which already provides such services, could take the lead in collaboration with a number of other business-orientated and technically-included institutions (such as SANEDI and NBI). Second, developing skills at the service provider level should be structured and promoted

³⁶ The One Environmental System for the environmental management of mining has been implemented since 2015. This single environmental system replaced the fragmented, contradictory and ineffective model constituted by rules and institutional arrangements that developed in separate mineral development and environmental laws. The single environmental system, framed by the overarching concept of cooperative government in the South African Constitution, shifts the statutory authority for environmental management of mining to the environmental laws, but gives effect to a unique splitting of implementing authority between the authorities responsible for mineral resources and environment respectively. Concerns, however, remain over whether the new system adequately honours the constitutional environmental right and respects the original legislative and executive authority of the provincial sphere of government (Humby 2015).

in a coherent way. As recommended by the NCPC-SA, establishing professional bodies for relevant professions (such as resource management) should be encouraged and supported by government. Long term, it is also essential to start developing green skills throughout the country's education system.

4.3. Information/data system

Both capacity building and policy mainstreaming interventions, in order to be successful and sustainable, need to rely on up-to-date, accurate information and data. A just transition to green industrial development cannot happen without evidence-based policymaking.

Establishing a robust and extensive information base underpins evidence-based policymaking and should be prioritised. Data on firm-level dynamics relevant for the transition should be systematically collected, collated and analysed. Industry-specific dynamics, particularly in terms of employment, small business activity and the community which rely on such industries, should also be prioritised. A review of the available information should be conducted with the goal of identifying data holders and reporting formats. This should constitute a first step towards establishing a central, public repository of all useful firm-level, country-level and administrative data. It will also provide an opportunity to streamline data collection (and reporting) processes by standardising and systematising information systems (i.e. institutionalising data collection in the long term) and identifying data and information gaps to be filled.

Importantly, such a data collection process should be coupled with a review of the existing M&E systems, particularly the 14 Outcomes framework. The indicators used in the framework should be revised to ensure that: a) they are policy relevant (i.e. aligned with policy processes and linked to actual or potential public concern; b) analytically sound (i.e. reflecting the best available science); c) measurable (i.e. obtainable at reasonable cost; reflect reality on a timely and accurate basis, and allow for comparison); and d) cover green industrial development in a meaningful fashion.

This exercise could go hand-in-hand with the streamlining of reporting requirements to create one integrated information system, ensuring that businesses report solely to one entity on all environmental matters and related issues (such as energy and water use). Such a consolidation would contribute to facilitating industrial development

while enhancing compliance and data gathering. The DEFF, in collaboration with other relevant government departments, should play a driving role in this.

Complementarily, economic data and information should be further disseminated and understood, notably by non-economic departments and stakeholders. Economic departments, and primarily the dti, supported by key research institutions, have a key role to play.

A one-stop-shop platform dealing with the interplay of sustainability and industrial development should also be established in the country, similarly to the United States or British models. Such a free and easily accessible platform would gather all relevant information related to sustainability and industrial development, such as available technologies per sector, available finance, incentives and support programmes, and current and upcoming laws, regulations and standards. A particular emphasis should also be put on innovative business models in line with the development of a green and/or social economy. Multiple, new sustainable business models exist in both the public and private spheres (see, for example, Montmasson-Clair, Kritzing, *et al.* 2017 for work on municipalities and renewable energy or Krige and Silber 2016; Myres and Silber 2018 for work on social entrepreneurship). In addition, the platform could be used to promote initiatives (events, programmes of work, etc.) and companies (through numerous case studies and business cases) engaged in sustainability and enhanced resource management (energy, water, waste, carbon).

In the longer run, systems for the co-development of policy (in its broad sense) by government, the private sector, labour and communities should be established. This should aim to facilitate social dialogue (see Section 4.4) and would not need to be formal systems. Evidence-based research, aimed at levelling the playing field and building a common knowledge base, is crucial. It has, for example, been a core component of the various Phakisa hosted in the country.³⁷ Establishing a pool of instruments and tools

³⁷ Operation Phakisa is a fast-result delivery programme launched in July 2014 to help implement the NDP, with the ultimate goal of boosting economic growth and create jobs. It is a cross-sector programme in which various stakeholders engage to implement initiatives and concrete actions to address constraints to delivery in a prioritised focused area for public accountability and transparency. Operations Phakisa have been held for the oceans economy; health; education; mining; the biodiversity economy; agriculture, land reform and rural development; and the chemicals and waste economy.

to be used by all stakeholders could also contribute greatly to this work. This could include methodologies, analytical frameworks, analytical templates (for sectoral/value chain analysis), guidelines, a common national repository of relevant data and information, and a common economic model. A requirement is the update and enhancement of the initial mitigation potential analysis. This seminal exercise constituted a cutting-edge step in South Africa's transition to a low-carbon economy. As highlighted in Section 2.6, its coverage and robustness (i.e. the reflection of industrial development realities) should, however, be improved to reflect a true and fair picture of South Africa's mitigation potential, particularly in the near future. Reporting against the SDGs should also be materially enhanced. While this will require defining and generating entire datasets, this is crucial for tracking South Africa's sustainable development performance and progress.

4.4. Transition planning

In addition to all policy interventions aimed to fostering South Africa's sustainability transition, further attention should be paid to managing the transition process within a just transition framework.

A long-term vision aligned with the country's sustainability objectives should be developed for the country. For any transition process to be successful, an idea of the end state should be established. **South Africa lacks a long-term integrated, sustainability-orientated vision for the country.** While the objective of a low-carbon, climate-resilient, environmentally-sustainable and inclusive society and economy has been heralded multiple times (most notably in the NDP), it has not yet triggered the development of a coherent vision (i.e. cognisant of the inherent choices and trade-offs at stake) for the country. This is true of the economy and society as a whole as well as the industrial development component. Arguably, the industrial development component should be informed by the broader economy- and society-wide vision, but this should not prevent relevant institutions, led by the dti and the Presidency, providing their vision for a green industrial development in the country. Ideally, all relevant stakeholders should jointly conduct this exercise to ensure buy-in, commitment and ultimately implementation.

Sectoral roadmaps should accompany the vision and flesh out the implications for each economy activity in the country. The dti has initiated some of this work internally with the development of climate-compatible

industrial strategies for key industrial value chains. The Master Plans being developed as part of the Presidency's Re-imagining our Industrial Strategy for Inclusive Growth framework, would be a timely avenue. Such Master Plans should be fully aligned with the transition to a green industrial development in South Africa.

Such roadmaps should particularly focus on unlocking and/or stimulating market demand for green solutions.

The public sector can play a first-mover role to stimulate market demand in some sectors, such as renewable energy, e-mobility and the biodiversity economy. This can take the form of green procurement, localisation requirements, pilot projects and technology development assistance. Importantly though, a meaningful transition hinges on growing market demand from the private sector and households. This can be incentivised by public policy in the short term, either directly by schemes such as subsidies or taxes or indirectly by awareness-raising and labelling campaigns. Such support mechanisms should, however, only be temporary until the intrinsic value proposition becomes the main driver of demand for green solutions.

In addition, the development of sectoral roadmaps should be informed by a clear understanding of the risks and opportunities associated with the transition to green industrial development in South Africa.

A number of initiatives have started to identify such implications for the South African economy (see, for example, (Montmasson-Clair, Wood, *et al.* 2017; TIPS 2018; Maia *et al.* 2011; Camco and TIPS 2010; GreenCape 2018; Dane, Wright, and Montmasson-Clair 2019; Mohamed 2018; Godfrey, Lozza, and Mohamed 2016)). Much more work is nevertheless required to gain a comprehensive understanding of the risks and opportunities for each sector/value chain of the economy, including the implications of transitioning as well as not transitioning to a green economy. This should be rooted in an understanding of firms' capabilities (industrial audit), behaviour, positioning and attitude. It should identify strengths and opportunities (positive green linkages, new products, new markets, new technologies/processes, cost saving and/or competitiveness enhancement initiatives) as well as weaknesses, risks and constraints (negative linkages, trade barriers, response measures, resilience issues, resource/input security, access to finance, access to markets). This analytical work should then result in specific strategies for each value chain to maximise opportunities while minimising risks.

Systematically, resilience plans should be crafted to ensure a just transition in favour of workers, small businesses and low-income communities. This is evident in the case of the coal and liquid fuel value chains, which are forecasted to downsize. It is required in many other sectors which are set to undergo deep transformation as a result of environmental impacts and/or the (global) sustainability transitions, such as mining, metals, agriculture and tourism.

Due to the cross-cutting and far-reaching nature of this work, it is recommended that the PCCCC drives this process, with support from the Presidency, the dti, DEFF, the NPC and relevant sectoral departments. A number of other departments, particularly from the ESEID Cluster, should be closely involved in the process. For this work to be successful, it should, however, be co-developed with relevant stakeholders in business, labour and civil society. A joint steering committee for the various components of this work (be it cross-cutting or industry specific) should be established to drive the conceptualisation, development and ultimately implementation of the diverse workstream. A consortium of research and academic institutions including TIPS, the Institute for Economic Justice, the University of Cape Town, the CSIR, the Human Sciences Research Council, the NBI, the National Labour and Economic Development Institute and World Wide Fund for Nature South Africa, would be particularly relevant to carry out the technical work, bringing a multitude of complementary prisms of analysis. Ideally, a number of pilot projects aimed at testing and improving proposals and solutions as well as kick-starting implementation should complement such a research process.

In addition, as already highlighted in the previous section, **social dialogue is at the core of designing and managing South Africa's transition to a green economy.** Initiatives are required to foster inter-stakeholder dialogue on the management of the transition. Existing consultation platforms tend to focus on specific regulations or policy proposals (such as the carbon tax or carbon budgets) and are not conducive to constructive discussion and co-development. Other dialogue forums between government, business, labour and civil society on the management of the transition and its implications on the economy are crucial. In this respect, government is encouraged to leverage the multiple initiatives already taking place in the country, such as the NPC's stakeholder engagement process.



5. Conclusions

South Africa's transition to an inclusive green economy is under way. The road is, however, still long and complicated. This is notably the case in terms of green industrial development. South Africa's economy remains highly path-dependent and unsustainable, with deep entrenched economic and political structures favouring energy- and carbon-intensive activities. These compound an extremely unequal and excluding society, rendering inclusive growth particularly difficult in the country.

Many green shoots supporting the transition to green industrial development are nevertheless present and growing in South Africa. The transformation of both economic and societal systems in favour of more sustainable models of development have definitely started at the policy as well as ground levels. Going forward, tremendous opportunities exist for aligning industrial development and green economy policies in South Africa, and embarking on a just transition to green industrial development. The underlying rationales of industrial development and green economy policies reinforce each other, and many areas of alignment exist. Many industrial policy tools have also been used to some extent to support the transition. Multiple channels moreover exist to design and implement such a full alignment.

Four key avenues emerge to foster the transition to green industrial development in South Africa. First, capacity building is required to ensure that all stakeholders (coming either from an industrial development or from a green economy background) operate on a level playing field, with a common understanding and knowledge of the issues at hand. Second, a double policy mainstreaming (of industrial development into sustainability-related policies and of sustainability into industrial policy) should be operated. Third, significant efforts are required to ensure that the evidence necessary to inform the transition is available, up-to-date and credible. Last but not least, transition planning needs to be significantly ramped up and coordinated, be it to define and manage a 'just transition' for workers, women, small businesses and low-income communities, ensure an inclusive roll-out of green solutions or provide the platform for the progressive transformation of the carbon-intensive economic structure of the country. To that effect, social dialogue, while already active in the country, should be further enhanced to build trust between stakeholders and establish a common vision for the country.

In addition, to foster action, the findings of this review should be actively disseminated for government officials, politicians, private sector representatives, labour unions, civil society and citizens at large to engage with its evidence and recommendations. To facilitate this project, findings could be formatted into more communication-friendly media, such as newspaper articles, infographics and videos. Additional engagements with different stakeholder groups would also be beneficial in disseminating and strengthening the findings.

This work should be particularly channelled through government structures, including the ESEID cluster, Cabinet and the Portfolio Committee on Trade and Industry in the South African Parliament. The current development of the Master Plans offers a unique opportunity to initiate the transition to green industrial development in the country. Considering the transition to a green economy should be a requirement for each and every Master Plan.

Such work will also provide an impetus to further bridge existing knowledge gaps. Further research is required to clearly understand the implications of the transition to an inclusive green economy on South Africa, and:

- its economy (in terms of competitiveness, industrial structure, business models, market trends, access to technology),
- its society (in terms of employment, community livelihoods, service delivery, inequality and social cohesion, technological diffusion),
- its environment (in terms of natural resource management, ecosystem preservation, natural capital conservation and enhancement) and
- its governance (in terms of management of trade-offs, co-development of policy, policy enforcement, M&E).

Ultimately, the transition to green industrial development is a long-term endeavour which will unfold across several decades. It is conditioned on the transition of the country's policy frameworks, economic structure and societal behaviours. It is moreover highly dependent on a substantial shift in South Africa's energy systems towards cleaner sources. Existing building blocks, however, show that the transition is already under way in South Africa. Whether or not it will be sustainable (in all its meanings) depends on seizing the opportunity to pro-actively design and implement a green industrial policy in South Africa.



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Annex: Methodological considerations

This research was part of a European Commission-funded project on Inclusive Green Economy Policy Making for SDGs, which aims to develop a green economy policy review methodology and pilot-test it in three countries/provinces in order to revise the methodology based on the country experiences.

The methodology is laid out in a manual (UN Environment Programme forthcoming) which provides a step-to-step guide on how to conduct a review of the existing policy framework according to the following criteria: coherence with other policy frameworks, particularly national frameworks, the SDGs and the Paris Agreement of the UNFCCC, including Nationally Determined Contributions; and effectiveness.

The methodological framework, as presented in UN Environment Programme (forthcoming), aims to cover three

levels of analysis: the policy process; the policy design; and the policy implementation. The manual looks at two levels of achievement by analysing if the policy design supports meeting commitments to international frameworks, and the policies are designed in such a way that they can meet their objectives. The process that led to each stage of the policy cycle will be analysed as a cross-cutting element.

In the South African context, rather than a green economy policy, the analysis focuses on the country's industrial policy and analyses how it is aligned (or not) with green economy objectives domestically and globally. The analysis was conducted by combining policy review, data analysis and engagement with key informants through both interviews and workshops. Table 10 lists the informants who have participated in the research process, through interviews and workshops.

Table 10: List of key informants who participated in the research process

Name	Organisation	Date
Andiswa Sibhukwana	Trade & Industrial Policy Strategies	21 November 2019
Andri Swanepoel	Council for Scientific and Industrial Research	21 November 2019
Annelize van der Merwe	Department of Trade and Industry	13 June 2019 and 21 November 2019
Ayanda Hlatshwayo	National Treasury	21 November 2019
Barry Bredenkamp	South Africa National Energy Development Institute	13 June 2019 and 21 November 2019
Bennitto Motitswe	Letsema Centre	21 November 2019
Bernd Oellermann	Department of Trade and Industry	21 November 2019
Bhavna Deonarain	Trade & Industrial Policy Strategies	13 June 2019
Brent Cloete	DNA Economics	26 June 2019
Brian Day	2 Day Innovation / South African Independent Power Producers Association	21 November 2019
Busisiwe Mashigo	Independent Communications Authority of South Africa	21 November 2019

Name	Organisation	Date
Carmen Armstrong	Gender Research Alliance	21 November 2019
Chantal Ramcharam-Kotze	Water Research Commission	13 June 2019
Christian Prins	Economic Development Department	21 November 2019
Conrad Kassier	United Nations Industrial Development Organization	13 June 2019
Ernest Mulibana	Department of Environment, Forestry and Fisheries	21 November 2019
Ernest Ndasonwampangi	South African Revenue Service	21 November 2019
Esther Mkhwebane	Council for Scientific and Industrial Research	13 June 2019
Eureta Rosenberg	Rhodes University	13 June 2019
Fiona Tregenna	University of Johannesburg	21 November 2019
Gabriele Wagner	German Development Institute	21 November 2019
Garth Williams	Technology Innovation Agency	13 June 2019
Gerhard Fourie	Department of Trade and Industry	13 June 2019 and 21 November 2019
Godwell Nhamo	University of South Africa	14 June 2019
Hameda Deedat	National Labour and Economic Development Institute	19 June 2019
Henri Labuschagne	City of Tshwane	21 November 2019
Henry Roman	Department of Science and Innovation	13 June 2019
Hiten Parmar	uYilo e-Mobility Programme	21 November 2019
Hlmalani Mnengwani	Gauteng Department of Economic Development	21 November 2019
J Mnisi	Mpumalanga Department of Economic Development and Tourism	21 November 2019
Jarredine Morris	Business Unity South Africa	07 August 2019
Jeanique Pretorius	Webber Wentzel	21 November 2019
Jenitha Badul	Department of Environment, Forestry and Fisheries	13 June 2019 and 21 November 2019
John Wade-Smith	British High Commission	21 November 2019
Kelello Mashiane	Trade & Industrial Policy Strategies	21 November 2019
Kent Buchanan	Department of Environment, Forestry and Fisheries	21 November 2019
Kgomotso Gaobepe	North West Treasury	21 November 2019
Khodani Mulaudzi	WWF-SA	21 November 2019
Kudzai Mataba	Trade & Industrial Policy Strategies	21 November 2019
Leanne Richards	Department of Environment, Forestry and Fisheries	13 June 2019 and 21 November 2019
Lesego Moshikaro	Trade & Industrial Policy Strategies	21 November 2019
Liako Mofo	Trade & Industrial Policy Strategies	21 November 2019

Name	Organisation	Date
Lidia Afonso Gallegos	Delegation of the European Union to South Africa	21 November 2019
Louise Naude	WWF-SA	17 July 2019
Lucia Sithole	South African Revenue Service	21 November 2019
Lutendo Maiwashe	Trade & Industrial Policy Strategies	21 November 2019
Mahlori Mashimbye	Department of Science and Innovation	21 November 2019
Malele Mogoane	North West Treasury	21 November 2019
Mapula Tshangela	Department of Environment, Forestry and Fisheries	13 June 2019
Mbofholowo Tsedu	Trade & Industrial Policy Strategies	17 May 2019 and 21 November 2019
Melisizwe Tyiso	National Labour and Economic Development Institute	19 June 2019 and 21 November 2019
Morongwa Masemula	Mmualehe	21 November 2019
Mosotho Kgaka	Mpumalanga Department of Economic Development and Tourism	21 November 2019
Mpe-Mpe Monyane	Department of Trade and Industry	21 November 2019
Mudzunga Thangavhuelelo	Gauteng Department of Economic Development	21 November 2019
Muhammed Patel	Trade & Industrial Policy Strategies	21 November 2019
Nepeti Nicanor	University of Johannesburg	21 November 2019
Neva Makgetla	Trade & Industrial Policy Strategies	14 May 2019
Nishal Robb	University of London	21 November 2019
Nokwanda Maseko	Trade & Industrial Policy Strategies	21 November 2019
Nombulelo Ngcamu	South African Revenue Service	21 November 2019
Nondumiso Dumahede	German Development Institute	21 November 2019
Ntombi Jim	Department of Trade and Industry	21 November 2019
Ntombi Radebe	The Innovation Hub	21 November 2019
Nyakallo Dlambulo	Department of Trade and Industry	21 November 2019
Passmore Dongi	Garden Route District Municipality	21 November 2019
Peter Lukey	Department of Environment, Forestry and Fisheries	13 June 2019
Prathima Garbharran	Department of Basic Education	21 November 2019
Presha Ramsarup	University of the Witwatersrand	18 June 2019
Queen Dhlamini	Auditor-General of South Africa	21 November 2019
Ravini Moodley	Council for Scientific and Industrial Research	21 November 2019
Reinhardt Arp	WWF-SA	21 November 2019
Rendani Mamphiswana	Presidency	21 November 2019
Renee Grawitzky	Independent	21 November 2019

Name	Organisation	Date
Rhulani Hobyani	Trade & Industrial Policy Strategies	21 November 2019
Robert Simmonds	Embassy of Japan	21 November 2019
Roelof Van Huyssteen	Promethium Carbon	21 November 2019
Rudzani Mashangu	Presidency	13 June 2019
Saloshnee Naidoo	Council for Scientific and Industrial Research	21 November 2019
Sam Ashman	University of Johannesburg	18 June 2019
Samuel Mashimbi	IOIS(Pty)Ltd	21 November 2019
Sandra Makumbirofa	Trade & Industrial Policy Strategies	21 November 2019
Sara Eliasson	United Nations Environment Programme	21 November 2019
Saul Levin	Trade & Industrial Policy Strategies	16 May 2019 and 21 November 2019
Shailendra Rajkumar	Sasol / Energy Intensive User Group of Southern Africa / Industry Task Team on Climate Change	20 June 2019 & 21 November 2019
Shakespear Mudombi	Trade & Industrial Policy Strategies	21 November 2019
Shamini Harrington	Sasol / Business Unity South Africa	07 August 2019
Siyanda Siko	International Labour Organization / Partnership for Action on Green Economy	13 June 2019 and 21 November 2019
Steve Nicholls	National Business Initiative	20 June 2019
Surprise Mmotong	Auditor-General of South Africa	21 November 2019
Tebego Makube	Department of Trade and Industry	13 June 2019
Thabo Motsepe	Department of Agriculture, Forestry and Fisheries	21 November 2019
Thembisile Mahlangu	Council for Scientific and Industrial Research	21 November 2019
Umeesha Naidoo	Department of Trade and Industry	13 June 2019
Varsha Harnath	Department of Trade and Industry	21 November 2019
Velaphi Msimang	Waste Bureau	13 June 2019
Victor Munnik	Wits University Associated Researcher, Institute for Water Research, Rhodes University	21 November 2019
Vuyo Mjimba	Human Sciences Research Council	14 June 2019
Wendy Nyakabawo	Trade & Industrial Policy Strategies	21 November 2019
Witness Mkwana	Gauteng Department of Economic Development	21 November 2019

Source: Authors

