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Skills for Green Jobs in **South Africa**





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Abbreviations and Acronyms

ACDI	African Climate and Development Initiative
AFRICEGE	African Centre for a Green Economy
ALMP	Active Labour Market Programme
BMZ	German Ministry of Economic Cooperation and Development
BUSA	Business Unity South Africa
CC	Climate Change
CHE	Council of Higher Education
COSATU	Congress of South African Trade Unions
CPUT	Cape Peninsula University of Technology
CSIR	Council for Scientific and Industrial Research
CSP	Concentrated Solar Power
CSR	Corporate Social Responsibility
DEA	Department of Environmental Affairs
DoE	Department of Energy
DoL	Department of Labour
DHET	Department of Higher Education and Training
DPME	Department of Planning, Monitoring and Evaluation
DST	Department of Science and Technology
DTI	Department of Trade and Industry
EE	Energy Efficiency
EGP	Enel Green Power
EnMS	Energy Management Systems
EPWP	Expanded Public Works Programme
ESO	Energy Systems Optimisation
ESSP	Environmental Sector Skills Plan
EDD	Economic Development Department
GE	Green Economy
GoSA	Government of South Africa
HCDS	Human Capital Development Strategy
IEE	Industrial Energy Efficiency
ILO	International Labour Organisation
IPAP	Industrial Policy Action Plan
IRP	Integrated (Energy) Resource Plan
IWMI	International Water Management Institute
LOHD	List of Occupations in High Demand
LTAS	Long-Term Adaption Scenarios
LTMS	Long Term Mitigation Scenarios
M&E	Monitoring and Evaluating
MOOC	Massive Open Online Course

MTSF	Medium-Term Strategic Framework
NBI	National Business Initiative
NCCRWP	National Climate Change Response White Paper
NCPC-SA	National Cleaner Production Centre South Africa
NDC	Nationally Determined Contribution
NDP	National Development Plan
NESDPF	National Environmental Skills Development Planning Forum
NEVA	National Employment Vulnerability Assessment
NGP	New Growth Path
NPC	National Planning Commission
NQF	National Qualifications Framework
NRMP	Natural Resource Management Programme
NSDS	National Skills Development Strategy
NTPFPs	Near-term Priority Flagship Programmes
NWU	North-West University
OECD	The Organisation for Economic Co-operation and Development
OFO	Organising Framework for Occupations
PPP	Public Private Partnership
PSETA	Public Services Sector Education and Training Authority
QCTO	Quality Council for Trade and Occupations
RECP	Resource Efficiency and Cleaner Production
REI4P	Renewable Energy Independent Power Producer Procurement Programme
S4GJ	Skills for Green Jobs
SJRP	Sector Jobs Resilience Plans
SA	South Africa
SANBI	South African National Biodiversity Institute
SAQA	South African Qualifications Authority
SARETEC	South African Renewable Energy and Technology Centre
SCM	Supply Chain Management
SDL	Skills Development Levy
SETA	Sector Education and Training Authority
SMME	Small, Medium and Micro Enterprises
SSP	Sector Skills Plan
SWPN-SA	Strategic Water Partners Network – South Africa
TLS	Training and Layoff Scheme
TVET	Technical and Vocational Education and Training
UCT	University of Cape Town
UFS	University of the Free State
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
Waste RDI Roadmap	Waste Research, Development and Innovation Roadmap
WfW	Working for Water
WSP/ATR	Workplace Skills Plan and Annual Training Report

Abstract

In 2010 OneWorld completed a country case study on South Africa (SA) for the ILO-CEDEFOP's Skills for Green Jobs: A Global View Report. The report explored opportunities for developing skills in response to climate change interventions and the green economy development in SA and considered new skills that might emerge from these drivers. It also examined opportunities for retraining people diverted from industries in decline due to climate mitigation policy decisions. The 2010 report found that policy was inconsistent and market forces are more effective in driving change. However, it also found potential for policy to direct significant structural changes, given a cohesive approach to green skill anticipation across sectors.

The current report updates the 2010 case study with subsequent and planned future developments, focusing on key policy drivers and emerging greening policies and strategies. The report highlights the extent to which SA's skills response is effectively organised to meet the challenges associated with greening the economy, based on training planning, institutional frameworks and delivery channels. Its key finding is that SA is not ready for a comprehensive approach to green skills development, primarily because the overarching policy framework does not allow this. Recommendations include addressing of information gaps and definitions for green skills development, strengthening of green skills development in the National Skills Development Strategy (NSDS), and scaling-up of M&E systems and programmatic interventions, including in municipalities.

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Programme) contributed to the studies' implementation on behalf of the ILO Green Jobs Programme. Alena Zukersteinova and Stelina Chatzichristou from Cedefop's Department for Skills and Labour Market coordinated studies among the participating EU countries. Valuable inputs were provided by the ILO colleagues: Christine Hoffmann, Laura Brewer, Maria Ilca Lima Webster, Alvaro Ramirez Bogantes, Hassan Ndahi, Fernando Vargas Zuñiga, Patrick Daru, Akiko Sakamoto, Mikhail Pouchkin, Gabriel Bordado, Julien Magnat, Kanae Tada, Tendy Gunawan, Bolotbek Orokov, Gwyneth Anne Palmos, Georginia Pascual, Badiane Cheickh and Kishore Kumar Singh. Solveig Boyer (ILO Green Jobs Programme), Massimiliano Leone, Ana Buzdugan (International Training Centre ILO Turin) and Manuela Flamini (Edizioni Retrò s.r.l.) were responsible for editing and design.

1. Introduction

In 2010 OneWorld completed a country case study on South Africa (SA) which contributed to the ILO 2011 Skills for Green Jobs: A Global View Report. At that stage the aim was to explore opportunities for developing skills as a result of climate change interventions and green economy development in SA. The report had to consider new skills that might emerge from these drivers, as well as opportunities for retraining people who may be diverted away from industries in decline due to climate mitigation policy decisions, such as clean energy *versus* high-emitting coal-based energy. At the time of the 2010/2011 work, the ILO's objective was to identify good practice examples of how national policies for greening economies are complemented by identification of skills needs and efficient skills response strategies. The 2010 report found that policy was inconsistent and market forces more effective in driving change. At the same time the report found that there was potential for policy to direct significant structural changes if a cohesive approach was taken to addressing anticipation of green skills across sectors (OneWorld, 2010).

The purpose of this current report is to update the 2010 case study on developments that occurred after 2009/2010 and any planned developments in the future. The main driver of climate change response, and therefore a main focus of this report, has been South Africa's Nationally Determined Contribution (NDC) to the 2015 Paris Agreement, as well as the greening policies and strategies that stemmed from it (noting that the 2011 National Climate Change Response White Paper underpins the NDC). This report identifies the key sectors with greening potential and which are also sectors affected by green skills packages and programmes. Furthermore the report aims to assess the extent to which skills response strategies are incorporated into wider 'greening' policies and programmes such as the Green Economy Accord.

The updated report addresses skills needs for new occupations, new skills for greening existing occupations and retraining needs in sectors undergoing structural changes, as a result of policy implementation and the introduction of greening technologies and practices. Along

with these aspects, the report considers the institutional frameworks, systems, methods and tools that are anticipated, or are already in use, to ensure that skills development and provisioning corresponds to current and future labour market demand for workers, as SA transitions to a green economy (hereafter referred to as GE). Ultimately the report attempts to assess whether or not SA's skills response is effectively organised so as to meet the challenges associated with greening the economy, with specific reference to training planning, institutional frameworks, and delivery channels such as the Technical and Vocational Education and Training (TVET) colleges.

Both qualitative and quantitative information is applied at several levels – regional, national, sectoral, company, training/skills development provider – noting that data availability on green skills development is often limited. The underpinning study did not collect primary statistical data. Stakeholder interviews conducted across the different data collection levels validated or re-informed study findings. Examples of good practice initiatives and interventions for green skills development are provided through the case studies, which form Annex II of this report.

Based on the findings, this report draws conclusions and makes policy recommendations for green skills policies and strategies for SA. This is useful at a time when SA is facing high and rising unemployment, underpinned by an overall skills scarcity. At the same time SA is also making progress towards delivering its international commitments in terms of the Paris Agreement and the Vision 2030 Sustainable Development Goals Agenda. This assessment is helpful in increasing the overall understanding of whether or not GE provides an opportunity for helping address SA's unemployment and skills crisis. However, it is important to note that development of skills in general, and green skills in particular, is not firmly entrenched or well incorporated in the policy that characterises the changes and shifts that are taking place, as will be seen throughout this report.

2. The green transition: Changes in the economy and employment shifts

An important insight is that the green economy is not an 'add-on' economy or a parallel economic pathway. It is rather a different version of South Africa's traditional and current economy. The country therefore does not "adopt" a green economy. Rather it transitions to becoming a green economy, necessitating structural or transformational change. While such change appears inevitable, the transition is likely to be messy and inconclusive. Furthermore, to be socially inclusive it will need coherent policy frameworks that not only embrace change but prioritise pathways for transformation.

Furthermore it is important to note at the outset that although there are signs of a shift towards implementation of a greener economy, these signs are more visible in policy than they are in changes in employment. This report will show that there is a lack of coordination around identifying requirements for employment shifts and translating policy into jobs, in particular green skills.

2.1 Economic status and outlook

In 2017 SA experienced its first recession since 2009, as both trade and manufacturing recorded negative growth rates in the first quarter of 2017. The greatest contraction was evidenced in trade, catering and accommodation which contracted by 5.9%. Manufacturing fell for the third straight quarter, resulting from a decrease in production of petroleum, chemical, rubber and plastic products. Downward pressure also came from finance, real estate and business services, as well as from transport, communication and utilities. Mining, on the other hand, rebounded in the same period, boosted by increased production of gold and platinum, among other metal ores. This has been on the back of a recovery in global commodity prices and growth in export markets. Agriculture also returned to growth, following eight straight quarters of decline, with a 22%

surge. This is partially attributable to a recovery from one of the toughest droughts in SA's recent history across most of the country.

Unemployment - currently at 27,7% according to the Quarterly Labour Force Survey, Stats SA, 3rd quarter - and inequality continue to be high in SA, reflecting skills gaps and low quality education. Investment is needed in improving the education system, requiring bold structural reforms (OECD, 2017). Structural reforms are also considered necessary for boosting growth through enhanced regional integration that broadens access to markets and resources.

The outlook is that low growth rates are likely to continue. Political uncertainty remains high, impacting on business and consumer confidence. It is anticipated that investment will continue to be low in 2017 and household consumption will be reduced by high levels of indebtedness and persistent high levels of unemployment. Overall, confidence in the economy is fragile. At the same time the policy environment in SA has deteriorated. The primary driver is the credit rating downgrades which are plaguing the country as a result of political uncertainty, with implications for fiscal and monetary policies. Inflation was high in 2016 as a result of the prolonged and deep drought, volatile exchange rates and rising oil prices.

Knock-on effects of decreased household consumption and declining growth have been felt in the energy sector, with implications for the GE. Demand for electricity has fallen. This has placed SA's power utility, Eskom, in a situation of having more power supply than demand, in contrast to the very recent energy crisis. This has come at a time of bringing two large new coal-fired power plants on-stream, as well as power from the renewable energy power plants (wind and solar) under the Renewable Energy Independent Power Producer Procurement Programme (REIPPP). Eskom has been using this as their rationale for stalling on connecting more recent RE IPPPs, even though the prices of renewable energy have fallen considerably. This,

accompanied by delays in approving projects recently submitted by the Department of Energy (DoE), has caused a wave of uncertainty among investors and manufacturers in the renewable energy sector.

Furthermore, rising unemployment is causing concern that structural changes in the energy sector, as well as low-carbon development in other sectors, will result in fewer rather than more jobs. Coal-based energy production has, historically, certainly created employment throughout the value chain, from mining through to electricity generation and maintenance activities. However, REI4P has created many decent jobs, requiring in some instances new skills. Moreover, the opportunities for selling related skills and technologies beyond SA's borders into countries such as Zambia, where electricity access is as low as 15%, are perceived to be vast, but are not yet sufficiently well understood to inform long-term decisions.

The policy environment has evolved significantly since 2010. A rather sophisticated suite of policies demonstrates alignment between climate change-driven, GE transition objectives and policy instruments, with national development plans and instruments for their implementation. However, the slow economic growth and political uncertainty, as outlined, have impacted on their implementation. These policies, albeit joined-up as they are, have not yet translated into proactive skills development frameworks and new or replacement jobs. Nonetheless there has been progress that is well worth considering.

2.2 Job creation and enterprise development in a climate-driven green economy

According to the International Labour Organisation (ILO), jobs can be defined as green when they help reduce the overall negative environmental impact, ultimately leading to environmentally, economically and socially sustainable enterprises and economies (ILO, n.d.). Green jobs are decent jobs which protect and restore ecosystems through reducing their consumption of energy

and raw materials, limiting their carbon emissions and minimising waste. The private sector plays a key role in greening the economy, especially in terms of innovation and job creation opportunities.

Job creation as a central national objective is a stated goal of SA's low-carbon and climate-resilient growth path. The creation of green jobs (i.e. jobs and enterprises created through low-carbon and climate-resilient growth) is a topic of discussion and analysis, seen for example in the National Climate Change Response White Paper (2011), in the Green Economy Accord (2011) and in the National Green Jobs Dialogue (2014). During the Dialogue the Department of Environmental Affairs (DEA) stated that the four identified areas for creating green jobs "... as our economy transitions to a green, low-carbon, resilient, resource-efficient and job-creating trajectory..." are:

- Development and growth of new green sectors and industries;
- Retrofitting of industrial efficiency processes and clean production technologies in existing sectors and industries;
- Growth of existing GE sectors such as renewable energy, waste recycling and biodiversity;
- Incentivisation and acceleration of private and public-sector investment in restoring critical ecosystem services and land productivity, water conservation, wetland rehabilitation and fire management.

As seen in the regulatory review, the Government of South Africa (GoSA) recognises the importance of small and medium enterprises (SMEs) in achieving the country's development objectives. However the volume of entrepreneurial activities in SA is very low, a quarter of that in other countries in sub-Saharan Africa (GEM, 2014). A lack of appropriate skills and a suitable enabling environment are the primary reasons.

As informal actors are often situated close to their communities, they have a better understanding of the issues they face and can provide context-relevant solutions. Therefore the informal economy creates opportunities for greening and building of climate change resilience through delivery of environmentally-

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sustainable goods and services. Within the South African context the DEA recognises such informal green activities as climate change coping strategies, which also link to the GE.

Closely linked to the process of creating green jobs, through the concepts of inclusiveness and sustainability, is the concept of social entrepreneurship. South Africa's socio-economic context speaks of the potential and need for development of social enterprises. Yet a recent report estimates that only 2.3% of the working age population in SA is engaged in post-start-up-phase social entrepreneurial activity (GEM, 2016). While a number of national policy documents and various programmes and initiatives exist in SA to promote development of these enterprises, the statistics show that there is scope for more to be done to provide an enabling environment for social enterprises.

It is evident that SA is on a greening trajectory. The policy framework, which is discussed in more detail in the next section, indicates that there is political acceptance that economic growth must be less carbon intensive. The political objectives of increasing jobs and SME opportunities through climate-compatible development are paramount. For instance, the REI4P has created in the region of 4,000 jobs in manufacturing, installations and maintenance, and has brought about an increase in foreign direct investment in SA.

As outlined in SA's New Growth Path policy and as discussed in Box 1, the GE framework aims to achieve inclusive green growth through addressing poverty, social justice and equality, whilst reducing environmental risks. The GE framework is seen as promoting activities that provide an entry point for broader-based black economic empowerment and addressing the needs of vulnerable population groups, such as women and youth entrepreneurs (Smit and Musango, 2015).

SA has in fact created a programme that links inclusiveness and the GE and develops new green skills, namely the Expanded Public Works Programmes (EPWP). Under this umbrella the DEA runs a Natural Resource Management Programme (NRMP) which envisages a prosperous and equitable society living in harmony with its natural resources. The

set of 'Working for' programmes, part of the NRMP, combines South Africa's environmental management and inclusiveness targets. They have a crosscutting social development objective and a clear focus on creating jobs for the most vulnerable population groups, such as women, youth and people with disabilities.

South Africa's climate change response strategies are therefore closely aligned with promoting the country's transition to a Green Economy. The National Climate Change Response White Paper (NCCRWP) frames the green economy and this has become a dedicated focus within DEA's capacity.

"The climate change response will attempt to reduce the impact of job losses and promote job creation during the shift towards the new green economy". (DEA 2011)

In the South African policy space the GE is outlined as a sustainable development path which addresses the interdependence between economic growth, social protection and natural ecosystems. This view is rooted in South Africa's broader sustainable development vision, which envisaged the country as 'a sustainable, economically prosperous and self-reliant nation state that safeguards its democracy by meeting the fundamental human needs of its people, by managing its limited ecological resources responsibly for current and future generations, and by advancing efficient and effective integrated planning and governance through national, regional and global collaboration' (Green Economy Summit, 2010). Based on this vision, some of the key drivers of GE implementation in SA have been the macroeconomic risks posed by the increasing negative impacts of climate change and the unsustainable utilisation of natural resources.

2.3 Transformational change and employment shifts

From the perspective of climate change response measures, transformational change is an important emerging theme. Experts in the debate seek to understand whether effectively addressing climate change impacts requires a

Box 1: What does an inclusive green economy look like in South Africa?

Like many countries in the world, South Africa's national development framework has increasingly emphasised inclusivity and its importance for understanding how the country's economic growth can benefit all its citizens and reverse the pervasive inequalities of the past. Although the notion of "inclusiveness" is taken forward by different role players in different ways, the UNDP emphasises that central to these different definitions is the recognition that, in working towards expanding national economies, we need to consistently strive to reach the most vulnerable people in our society (UNDP, 2016). We need to ensure, as South Africa's National Development Plan (2012) emphasises, that the "fruits of growth are shared equitably". In SA such vulnerability is strongly related to high levels of unemployment, poverty and inequality and their impact on particular groups of people in our society, especially on their ability to engage in viable economic activity and benefit equitably from the country's development. It is estimated that 20% of the population are living in conditions of extreme poverty (StatsSA, 2014) and that women, children and young people, as well as people with disabilities, are disproportionately represented within this group. These patterns of inequality continue to be reproduced even where inroads have been made into reducing poverty (StatsSA, 2014). There is also a significant development cost of such ongoing exclusion. The UNDP's recent Africa Human Development Report (2016) estimates that gender inequality is costing sub-Saharan Africa on average \$95 billion a year or 6% of the region's GDP. All this means – as the National Development Plan (NDP) emphasises – that proactive strategies are needed that actively seek to break down the barriers that perpetuate this vulnerability and exclusion and create the conditions for sustainable participation by all in South Africa's growth and development.

This recognition of heightened vulnerability within South Africa's society and its importance for the nature of the economic growth strategies pursued is especially important in the context of the GE. In particular the GE is coupled with improved human wellbeing and social equity as well as a reduction of environmental risks (UNEP, 2014), particularly risks arising from climate change. Understanding the GE through this lens means recognising that the impacts of climate change are more severe on those people who experience the greatest levels of economic marginalisation and inequality.

paradigm shift in the way our society functions, including a change in societal values and the way development decisions are made. In the context of green skills development, the theory of transformational change is useful in understanding the mechanisms through which such shifts in the economy and society could occur, as well as how these shifts will affect the jobs sector and the need for new skills and occupations. The IPCC Fifth Assessment Report defines transformation as "adaptation that changes the fundamental attributes of a system in response to climate and its effects". The report suggests that transformational adaptation could include adaptation at a greater scale or magnitude than is currently taking place. The definition also provides for the introduction of new technologies or practices, the formation of new structures or systems of governance, and changes in the location of activities.

Given South Africa's climate change response commitments, as well as its policy imperative for a transformation to a green economy, green skills become both a necessary driver and a tool for adapting to the shifts in production and consumption patterns. In this context, it is through developing mechanisms for anticipation and development of green skills that an appropriate transition to a green and sustainable economy can be achieved.

South Africa is attempting to achieve transformational change in its economy through adopting low-carbon and climate-resilient growth pathways. The country needs a closely aligned skills system in order to achieve transformation. This is challenging because the skills system is relatively new, given the country's recent democratic status. As a result it is also constantly changing. The challenge is exacerbated by the cross-sectoral nature of

the emerging green economy. Meeting these challenges necessitates a coherent approach that considers all the ongoing debates on the green economy currently taking place on an *ad hoc* basis. In terms of green skills development, a Theory of Change that defines the change desired from the current baseline, along with a pathway for achieving that change, would lend coherence to the strategies being implemented by entities such as the Department of Higher Education and Training (DHET), the Green Skills Project and the ILO.

2.4 Sector analysis

Since climate change is a major driver of a green economy transition in SA, the sectors considered here are those that require significant adaptation to climate change, such as water and ecosystems, and those that need to adopt low-carbon approaches in areas such as energy. Although other sectors such as transport, the built environment, agriculture and waste management are highly relevant, this section concentrates on water and energy on account of report length constraints. Energy and water are at the heart of South Africa's economic and livelihood development constraints and are both deeply affected by climate change. This is evident in the national policy framework.

Across both sectors municipal service delivery sectors and municipal operations are understood to present significant opportunities as a springboard for green skills stimulus and development. Municipalities own substantial assets such as energy and water infrastructure and transport fleets, which afford potential for greening (eThekweni Municipality, December 2016). At the same time municipalities deliver basic services (water, waste management, energy), all of which are compromised by climate change if it is not addressed. This section considers each of the sectoral opportunities in terms of municipal operations, while the conclusions section outlines possibilities within them.

2.4.1 Water and ecosystems

With climate projections pointing to increased variability and the continuation of current water

utilisation patterns, shortages have the potential to escalate into a water crisis within the next 15-20 years. This is already being experienced in parts of the country. SA has been classified by the International Water Management Institute (IWMI) as a Group II country, meaning the country does not have sufficient resources to meet its projected 2025 needs (Naidoo et al., 2013). Water is a stress multiplier, or the medium through which climate change expresses itself, in SA. It is a recognised water-scarce country, having the greatest population pressure on available water resources, *per capita*, of all southern African countries (Petrie et al., 2014). Water scarcity acts as a multiplier on other environmental problems, such as destruction of ecosystems, desertification and deforestation, worsening their effects. The recent spate of droughts in SA is indicative of the problem. Social and economic effects of the drought include loss of livelihoods for farmers and farm workers across the country, and food price inflation for all consumers, affecting the poorest the most.

Climate change impacts on SA are likely to be felt primarily *via* effects on water resources (LTAS, 2013). Thus the nature and extent of the problem is reflected in the review of the climate change risks identified as priority issues in the national climate change (CC) strategic and analytical framework. This strategic framework reveals that ecosystems *and essential ecosystem services*, particularly water, are a top priority for climate adaptation for the SA government. Water availability is thus widely recognised as one of the biggest climate change risks in SA, and is acknowledged as an essential service yielded by healthy ecosystems.

Water has critical 'knock on' effects on other sectors such as agriculture and food security, terrestrial biodiversity and ecosystems, which in turn are also impacted by climate change. Climate-impacted ecosystems and services have knock-on effects on rain-fed agriculture, human settlement patterns, water supplies and sanitation, as well as irrigation. These in turn result in impacts on human health, education, human and national security, and poverty. Population growth and rapid urbanisation exacerbate the problem as these are among the factors that affect water demand. Both

supply and demand factors are therefore at play when looking at future water and ecosystem development.

Should the supply-and-demand gap widen as expected, water costs are likely to increase accordingly. This will eventually pose risks for SA's economic development and people's well-being. A business-as-usual scenario for water use is no longer a viable option. Closing the gap necessitates transformational adaptation to climate change in the most important ecosystems for water, with significant investments in water infrastructure, management and efficiency improvements and in protecting and rehabilitating biodiversity in these ecosystems.

Current initiatives

In a developing country such as SA biodiversity is more likely to be protected if it creates jobs and generates income. The public works programmes are a powerful tool in this regard, as demonstrated in the "Working For" programmes, which have created tens of thousands of jobs. A relevant example is the Working for Water Programme, which focuses on clearing invasive alien plant species in climate-threatened ecosystems, while creating thousands of green jobs. A similar stratagem is the water and climate change programme of the National Business Initiative (NBI), which is fully inclusive of the private sector. Diversification into horticulture crops as an avenue for poverty alleviation for many farmers is a worldwide example of a value-added agricultural activity that is dependent on healthy ecosystems. The United Nations Industrial Development Organization (UNIDO) and the Department of Trade and Industry (DTI) are currently promoting such an initiative in the iLembe district of KwaZulu-Natal.

Many of the priority adaptation solutions provide the green economy co-benefit of green skills development and deployment. These adaptation solutions range from building climate resilience in climate-stressed ecosystems in order to sustain or improve the yield of essential ecosystems services to introducing innovative technologies and new procedures for conserving water, including in highly water-dependent sectors such as agriculture, thus improving

biodiversity and increasing food security. Among the key determinants of adaptive capacity are appropriate technologies, soft and hard infrastructure, and capacities for enhancing resilience to climate change.

Congruently, water is high on the adaptation agenda defined by DEA. Two of the flagship programmes specifically relate to water, and others are closely related. The sector also features strongly in the country's NDC. Although water is central to public service delivery as a public good, there are important and evident opportunities for the development of green skills to support jobs and enterprise development in the water economy.

2.4.2 Energy

The opportunities for green skills development in the energy sector are much easier to understand than those for water. Energy has been central to economic development and employment for decades in the South African economy. The economy's long-term dependence on minerals has included exploitation of significant coal (fossil fuel) reserves. These reserves have fed numerous coal-fired power generation plants (95% of South Africa's electricity is derived from coal and 77% of the country's total energy needs are supported by coal) and continue to do so. Both the coal-mining and the coal-dependent electricity sectors have, over decades, spawned various skills and thousands of jobs (around 130,000 according to Eskom's website as at 15 September 2017).

Changes to this *status quo* will most certainly result in structural change in South Africa's economy, resulting in the need to redeploy or retrain those in related occupations and skills. It is widely recognised that such a structural shift is unavoidable, for closely-linked global environmental, climate diplomacy (encompassing the the global climate change negotiations and related agreements and decisions), and economic reasons; for example South Africa is a significant contributor to global carbon emissions and is a signatory to the global climate agreements; coal-based energy is affecting air quality at local level, with health impacts; and South Africa's economy is showing signs of no longer being able to sustain the costs of current, highly centralised and monopolised

electricity solutions.

While there are concerns as to the socio-economic implications of such a structural shift, many recognise the inevitability of change, along with related opportunities. Minister of Economic Development Ebrahim Patel's keynote address at the May 2010 Green Economy Summit predicted that if SA was able to capture 2% of the estimated global green economy in the next five years, "we can expect to create up to 400 000 jobs in energy, manufacturing, agriculture, mining and services".

It is the responsibility of TVET to respond continuously to significant structural changes in the economy. The transition to a low-carbon economy is a particularly pervasive structural change. This means that TVET, in responding to the low-carbon transition, must consider that the entire economy is affected, even though some sectors may experience more acute change than others.

The implementation of REI4P is indicative; new skills, retraining based on existing skills, and application of existing occupations, are all demonstrated in the jobs created. As experienced in Europe's transition to low-carbon energy and a green economy, low-carbon energy transitions in South Africa are showing signs of employment being concentrated in higher-level occupations (i.e. those associated with higher qualifications) than has been the case with the coal-based energy value chain.

A positive outcome has been the building of local managerial capacity in running the IPP projects. Local entrepreneurs and investors realised that combining land with project development expertise was more attractive to foreign capital. They began building productive development capacity, with spin-offs for increased local employment (Morris, M. & Martin, L. 2015). This creates a tangible opportunity for government to change the regulatory bidding rules to incentivise increased local procurement, and hence increase jobs, with green skills development needs, through the IPPs (Morris, M. & Martin, L. 2015).

While the REI4P provides a useful example, it is still part of a highly centralised, if less monopolistic, energy solution. As indicated, the

economy is struggling to sustain this system as electricity prices continue to increase, despite the fact that renewables are now priced well below any other sources of electricity in this country. Coal continues to dominate, as does Eskom, the country's vertically-integrated utility. Yet business and domestic users alike are baulking at rising prices in the face of increasing pressures on consumer spending power and responding by seeking off-grid solutions. Should this trajectory continue to scale up, electricity sales for Eskom (and municipalities) will drop, potentially reducing skills deployment in the sector. This situation, coupled with climate diplomacy and environmental drivers, implies that a shift to low-carbon and decentralised energy solutions in SA's economy is inevitable.

A higher concentration of decentralised energy solutions that devolve power delivery to local authorities (municipalities) and communities can provide a coherent policy response that guides change, responds to market realities and demonstrates responsiveness of TVET to structural shifts in the economy.

To facilitate this and other necessary policy shifts, South Africa needs a deepened understanding of the tradeoffs between occupations and skills in the traditional coal-based economy, and skills trajectories in low-carbon domains. Scenarios developed for 2020 on low-carbon trajectories in Europe showed that the principal trend in the baseline, and after policy intervention, is towards more employment being concentrated in higher-level occupations (i.e. those associated with higher qualifications). The key message that emerged from comparing the two scenarios with the baseline case is that any shifts in occupational and qualifications structure in either scenario are relatively modest in their net effects. However greater effects may occur at a more disaggregated level. For SA, it will be useful to consider a 'business as usual' scenario (continuing on prevailing energy pathways with their associated skills losses and gains), and a 'with policy intervention' scenario that reflects decentralised energy solutions with associated skills losses or gains. Both scenarios need to consider differing forecasts of economic growth or decline.

Conclusions

Decentralised energy solutions demonstrate potential for more decent and better-paying jobs, even if not as many as those secured across the coal energy value chain. Energy is a central component of municipal service delivery, while municipalities also have a responsibility for stimulating local economic development. There are associated challenges. The national policy environment does not fully favour decentralised and independent energy supply and sales although some progress has been made. Most of South Africa's metropolitan municipalities are exploring the socio-economic cobenefits of decentralised solutions that establish energy independence, reduce costs and increase social inclusion.

Should this pathway gain greater traction, which is likely, skills will be needed for high-end occupations of IPP project management, energy financing, engineering for municipal and mini grid solutions, and legal aspects of licensing, wheeling (the transportation of electric energy) and power purchase agreements. Skills will also be needed for installation, maintenance and operational occupations, alongside skills necessary for community development and local procurement management.

Improving water resilience yields a skills development trajectory that is less well understood but has significant potential. As with decentralised energy, water services delivery that is of an acceptable standard and is socially inclusive needs also to be integrated into local economies through municipalities where higher levels of storage and supply will enhance climate resilience. It is evident from the sector analysis that as much, if not more, emphasis needs to be placed on managing water demand as on maintaining and improving water system infrastructure. Water pricing needs to be more reflective of the cost of water, while recognising the social limitations surrounding a commodity that is a public good.

Enhanced skills are critically needed in the water and related sectors. This is true whether or not decentralised water solutions based on an ecosystems approach are introduced beyond the initiatives already in operation under the EPWP, the DEA, the NBI and a handful of

metros, notably eThekweni. Water engineering skills that have been lost over the past 20 years in South Africa need to be replaced, while additional skills are needed for integrated water resource and eco-system management, financial management for alternative water revenue structures, and for operational management of decentralised solutions. Skills for maintenance of hard water infrastructure (rehabilitating and maintaining pipes, pumps, storage, etc.) and for soft water infrastructure (rehabilitating and maintaining ecosystems through clearing invasive alien species, restoring degraded land, rotating crops, etc.) are needed across the water system and value chain. In addition, new skills need to be developed for building climate resilience into hard and soft water infrastructure. These range from engineering skills (developing engineering standards for climate-resilient water infrastructure) to construction and maintenance skills (building and maintaining a new set of engineering codes and standards).

In conclusion, the sectors in South Africa that provide the most compelling arguments for greening also show great promise, if under-explored, for green skills development. Municipalities stand to play a central role in stimulating skills development in both cases, in addition to the other sectors mentioned.

3. Key policies and regulations

As mentioned earlier, the green economy is not an ‘add-on’ economy, but rather a different version of SA’s traditional economy. Within South Africa’s comprehensive policy framework lie elements that suggest pathways to transformation towards a greener economy – mostly within the national development, climate change and environmental policy framework. These are outlined within the overall policy framework detailed in this Section 3. The skills development framework is outlined in Section 4 below, with conclusions summarised in each section.

An over-riding finding of this study is that, despite the shift towards environmentally-friendly policy, skills development measures are not well incorporated into policies and plans. There are two primary reasons for this: i) there is an overarching lack of coherence between South Africa’s employment realities and national policy priorities; and ii) there is no incentive or requirement for policy-makers to analyse the skills required to give effect to their policies in terms of availability and the qualifications needed. Policy-makers thus possess little insight into skills requirements. Such insight would be particularly helpful in understanding transformative pathways for climate adaptation and its links with development or business as usual.

3.1 Policy Framework

Since 2010 a number of strategic papers and policies have been released, from both central government and various government departments which pertain to South Africa’s transition to a green economy. In most cases the green economy is highlighted as a key source of employment in the future, but this does not always translate into coherent green skills development policies. Below is a summary of the green economy content - particularly green economy skills - of some of the aforementioned papers and policies.

National growth and development policy, as well as policy relating to the GE and climate change, are applicable. The relevant policies are summarised in Table 1, the most pertinent being further discussed below. These policies are framed by the Constitution of the Republic of South Africa (Act No. 108 of 1996), Section 24 of which states that:

“everyone has the right:

- to an environment that is not harmful to their health or well-being; *and*
- to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:
 - prevent pollution and ecological degradation;
 - promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”

3.1.1 South Africa’s climate and development priorities and the NDC

The Nationally Determined Contribution (NDC) is a key document, outlining South Africa’s commitment to implementing climate change mitigation and adaptation measures. However, it does not specifically address the skills implications of these actions, although it provides the basis for other policy documents such as the National Climate Change Response White Paper (NCCRWP), which discusses in more detail the jobs and skills implications of South Africa’s transition to a low-carbon economy through specifically targeted programmes.

SA is a high global greenhouse gas emitter, and must take action to reduce its carbon footprint. At the same time the country is already experiencing impacts of climate change and needs to take action to adapt development, economic and livelihood approaches. SA’s national climate change response to the

UNFCCC (and thus its NDC) is built on the core principles of equity, responsibility, capability and sustainable development. As a developing country the NDC recognises that South Africa must consider climate change commitments within the context of acute challenges such as poverty, unemployment, and food and energy insecurity.

SA submitted its NDC ahead of the Paris Agreement in 2015. Predicated on sustainable development goals and objectives, the NDC includes adaptation and mitigation objectives and targets, setting a greenhouse gas emission reduction target of 34% by 2020, and 42% by 2025. The NDC positions international financial support as a critical condition for achieving or making progress with its mitigation targets and highlights that financial support is also needed for adaptation to dangerous climate change. Furthermore the NDC outlines sectors and specific actions involved in the implementation of adaptation and mitigation goals and targets. South Africa's NDC is thus comprised of three components — mitigation (M-NDC), adaptation (A-NDC), and investment and support (S-NDC) — which are summarised below.

Mitigation

South Africa's mitigation component moves from a "deviation from business-as-usual" form of commitment to the absolute PPD GHG emissions trajectory range proposed in its Copenhagen pledge of 2009. South Africa's NDC is consistent with the country's long-term goal of achieving a PPD trajectory, which will see emissions peaking between 2020 and 2025, plateauing between 2025 and 2035, and declining to 212-428 MtCO₂e by 2050. To achieve these objectives South Africa aims to use the 2016-2020 period to develop and implement a variety of policy instruments and measures, including a carbon tax, the desired emission reduction outcomes (DEROs) for sectors, company- level carbon budgets, along with regulatory standards and controls for specifically identified GHG pollutants and emitters.

Achieving coherence between SA's policy framework and employment situation will depend on policies such as the NDC and the NCCRWP specifying the requisite skills

development measures, thus progressing from the present tendency to make only generic references to jobs and skills. If this does not happen, the various policy instruments and measures will continue to bear little relationship to those needed for skills development.

Adaptation

South Africa's A-NDC sets six goals, which include the following: development of a National Adaptation Plan (NAP), currently underway; integration of adaptation into national and subnational development planning and implementation processes; institutional capacity-building; and development of climate risk management, emergency and recovery responses.

Job creation, rather than clarity on the specific skills required, is considered in the context of the NDC. As previously indicated, skills development measures are not well incorporated.

Investment Support

Central to implementation of the NDC is financing and investment in SA's transition to a low-carbon, climate-resilient economy. The NDC outlines the required investment in the scaling-up of key adaptation programmes, including Working for Water (US\$1.2bn per year) and Water Conservation and Demand Management (US\$5.3bn per year). The document also outlines the total required cost of realisation of South Africa's long-term mitigation targets, including the estimated cost of expanding REI4P over the ten-year period (US\$3bn per year), and decarbonisation of electricity by 2050 (US\$349bn from 2010).

The investment and capacity-building components of SA's NDC infer (rather than specify) skills development but dependence is placed on multilateral and bilateral finance to achieve this, thus moving the policy instrument further away from the national skills development framework. This tendency to refer only vaguely to jobs and skills implies a lack of specific information and analysis, alongside an unintegrated and uncoordinated approach to skills development. Indeed South Africa's centralised and sector-based skills development

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framework seems rather to draw skills analysis and skills development responsibility away from key institutions responsible for evolving and implementing South Africa's critical economic policies. There is ample opportunity for the status quo to change. For example, South Africa will resubmit its NDC with the progress review, and the NAS is still under development.

The NDC is closely aligned with the NCCRWP 2011, outlined below. Since submitting its NDC, South Africa has undertaken an extensive research and consultative process to develop the National Adaptation Plan and Strategy (NAP and NAS - still under development). The NAS aims to deepen the provisions of the NCCRWP and the NDC insofar as it aims to identify and formalise enabling CC policy and legal frameworks and to establish appropriate institutional arrangements for implementation, planning, research, and monitoring and evaluation. The key objective of the NAS is to enhance adaptive capacity and thus reduce vulnerability, in line with the adaptation goal of the Paris Agreement.

As such, the NAS is positioned to respond to the country's triple challenges and generally discusses the related job creation opportunities but, again, without analysing the skills required to give effect to the strategy. There is still time as the NAS is expected to be launched in 2018. Particularly relevant is that the NAS aims to build economy-wide resilience to climate change, including through strengthening of appropriate EPWPs which all relate to job creation. Through this approach the NAS aims to support climate resilience in ecosystems and people and ensure sustainable land management in the long term.

3.1.2 National Climate Change Response White Paper, 2011

The 2011 National Climate Change Response White Paper (NCCRWP), published by DEA, sets out the government's vision on how to address climate change effectively, as well as how to ensure the just transition into a low-carbon and climate-resilient economy and society in the long term. In short, South Africa's response to climate change as laid out in the White Paper can be summarised in two main points:

- Managing its impacts, particularly its impacts on the more vulnerable groups in society; and
- Contributing to the global efforts of stabilising greenhouse gas concentrations in the atmosphere.

In terms of jobs, the NCCRWP is perhaps clearer than some of the other government policy documents that pertain to the green economy. It acknowledges the active role government must play if the green economy and employment goals are to coincide, as follows:

"Growth in new sectors alone will be no guarantee of net job creation and government will promote conditions that will increase the mobility of labour and capital out of carbon-intensive sectors to greener productive sectors" (Department of Environmental Affairs, 2011, p.34).

While there is some focus on green jobs in the NCCRWP, there is remarkably little mention of skills development. *There is certainly no coherent skills development strategy present in the document. Rather, there is a brief mention that climate change elements must be integrated into the National Skills Development Plans and the sectoral skills plan of each Sector Education and Training Authority (SETA). How this is supposed to be done is not clear, but it is stated that resources will be reallocated for these purposes (SETAs are discussed in more detail in Section 4.)*

However, in terms of job creation in the green economy, the NCCRWP identifies two related policy instruments: The National Employment Vulnerability Assessment (NEVA) and Sector Jobs Resilience Plans (SJRPs). These are discussed in more detail in Section 3.1.4. NEVA aims to assess the impacts of, and responses to, climate change on jobs and the labour market by sector and location, as well as to identify interventions that can be put in place to ensure that the switch towards a green economy is one that also benefits jobs. The SJRPs aim to identify sustainable job opportunities in the mitigation and adaptation strategies sectors, and include programmes such as expanding the EPWP and other national poverty alleviation and job creation programmes, promoting job opportunities in green industries, and developing mentorship programmes within SETAs.

The NCCRWP envisages the promotion and expansion of green sectors, while creating conditions for increasing the mobility of labour and capital away from carbon-intensive sectors into green sectors. The policy outlines the economic risks associated with the impacts of climate change regulation, such as distortions arising from shifts in investor priorities and consumer preferences, as well as possible application of trade barriers. At the same time the NCCRWP points to the opportunities that arise from new or expanded green markets, such as enhanced efficiency and improved competitiveness of South African industries and the significant socio-economic benefits that could follow from the development of low-carbon infrastructure. It notes that climate change can increase unemployment and reduce livelihoods but that climate change responses can also create jobs, absorbing mitigation-related job losses.

The NCCRWP provided for a set of eight Near-Term Priority Flagship Programmes (NTPFPs) deemed as urgently needed in response to adaptation and mitigation priorities. They also cover sectors that have been relatively better researched, with experience in implementing policy measures in response to climate change. The flagship programmes are:

- i. The Climate Change Response Public Works Flagship Programme
- ii. The Water Conservation and Demand Management Flagship Programme
- iii. The Renewable Energy Flagship Programme
- iv. The Energy Efficiency and Energy Demand Management Flagship Programme
- v. The Transport Flagship Programme
- vi. The Waste Management Flagship Programme
- vii. The Carbon Capture and Sequestration Flagship Programme
- viii. The Adaptation Research Flagship Programme.

One of the imperatives of the NTPFPs is the implementation of policies and measures with proven socioeconomic and job creation benefits (DEA, 2011). Some of the initiatives arising from

such measures show promise for green skills development. The Climate Change Response Public Works Flagship Programme, now the EPWP which is run by the DEA, includes projects such as the Working for Water (WfW) and Working for Fire initiatives, discussed earlier.

One of the advantages of the CC Response Public Works Flagship Programmes is that the skills development taking place targets a largely unskilled and typically vulnerable segment of the population, thus meeting both the greening and inclusivity goals of national policy¹. In terms of the WfW initiative, much of the skills training is in the clearance of invasive alien plants. However, some projects which innovatively use the cleared alien plants (for instance, to create eco-furniture and eco-coffins) have also come out of it.

The Water Conservation and Demand Management Flagship Programme also provides an example of ways in which the flagship programmes can spur skills development within green sectors. The programme “aims to stimulate action and opportunities in industry, mining, power generation, agriculture and water services sectors” (OneWorld, 2016, p.45) and uses SME-related technology to aid water conservation. An example of how this flagship programme has translated into skills development is in the training of young unemployed people as “water agents” who then visit communities and educate them on water conservation strategies. Hence the flagship programmes have the potential to be drivers of green skills development, but it remains to be seen at what level and whether it will be done strategically, as opposed to on an *ad hoc* basis.

3.1.3 The Renewable Energy Independent Power Producer Procurement Programme

The REI4P is a subset of the Independent Power Producers Procurement Programme, a competitive bidding programme created to secure grid-connected electrical energy from the private sector. To date there have been five bid windows, between 2011 and 2014. Together these five bid windows have secured a total of 6 327 MW of contracted capacity from 102 renewable energy projects.

¹ As referred to in the National Development Plan

REI4P was a very promising initiative in the South African renewable energy policy landscape. Globally, the South African Programme was lauded as one of the most successful renewable energy measures in the world (Eberhard and Naude, 2017). However, despite its success, it has long been hindered by Eskom dominance and South Africa's complicated bureaucratic landscape. Unfortunately REI4P's progress is currently severely endangered by Eskom's stalling in signing IPP contracts. Hence, the programme which was previously lauded as one of the best public-private partnerships in Africa came to a standstill. The future of this programme depends entirely on the government creating a stable environment for its development.

REI4P has created jobs and has the potential to continue to do so, and to provide green skills development opportunities (discussed in more detail in Case Study 1 in Annex 2). It in fact has the potential to be an important driving force behind employment and green skills development. One of the factors coming into play here is the shift away from project finance to corporate financing in REI4P. Morris and Martin (2015) discuss solutions to the challenges that have arisen around how investors disburse the regulated amount dedicated to social development:

"...limit the variety of acceptable investments, link them to renewable energy projects so as to make the relationship to wind farms clearer, and hence specify what would be acceptable expenditure. For example, requiring the development expenditure to fit all houses in the local community with solar geysers; or to set up local factories to build solar water heaters and PV panels for sale nationally" (p65, Morris M. and Martin L., 2015).

These suggested investments would have the potential to promote and foster development of green skills. In 2015 the South African Renewable Energy Technology Centre (SARETEC) was launched, with the main purpose of harnessing job creation opportunities and developing the necessary local green skills in response to the demand created by REI4P. SARETEC's story and potential for skills development is discussed in Case Study 1 (in Annex 2) of this report.

3.1.4 National Employment Vulnerability Assessment and Sector Jobs Resilience Plans

The NEVA is a collaboration effort between the DEA and the Economic Development Department (EDD). It aims to assess the impacts of climate change mitigation and adaptation measures taken by South Africa on its jobs market, investigating potential job losses as well as underlying opportunities for job creation (van Meelis, personal communications, 20 September 2017). The assessment involves the scoring of each sector of the economy against a vulnerability index, comprised of a holistic set of indicators, against which the five most vulnerable sectors of the economy are identified. The SJRPs are sectoral plans which provide recommendations and identify measures for addressing the projected job losses and job creation potential in each of the most vulnerable sectors. The process of developing the NEVA and SJRPs was started in 2015 and is due to be completed before the end of 2017. The outcomes are expected to serve as the evidence base for decision-makers and policy-makers to plan adequate responses to expected shifts in the job market in each sector.

Once the consultation process has been completed, the NEVA and five SJRPs will be released, detailing the key impacts on the five most vulnerable sectors, identified as agriculture, chemicals and chemical products, electricity, mining, and transport (van Meelis, personal communications, 20 September 2017). The SJRPs will identify key activities (identified as adaptation opportunities) and will also include recommendations as to which government activities the private sector can draw on when implementing these measures.

Although the aim of the NEVA and SJRPs is not to identify or plan for the skills implications of climate change impacts, the importance of skills development for addressing projected shifts in the jobs market is understood by the DEA and EDD. The methodology of the NEVA itself included skills considerations, noting that less-skilled workers across sectors were more vulnerable to impacts than workers with high-level skills, meaning that they are more likely to suffer job losses as a result of any shifts in

the job market. The NEVA and SJRPs identify several key skills-related findings and make recommendations which can help promote a just transition towards a climate-resilient economy in South Africa. As such, these can be understood as green skills implications, which are largely expected to be addressed through the South African Sectoral Education and Training Authorities (SETAs), described in more detail in section 4.2.

The NEVA identified different skills gaps in each of the five most vulnerable sectors. At the same time certain skills gaps, such as those relating to energy efficiency, are considered to be cross-cutting, as they have implications across all five sectors. Therefore one aspect of the recommendations is expected to address the role of all five relevant SETAs in addressing these gaps. One example of a skills-specific recommendation, expected to emerge from this process, is the creation of technological hubs and training centres, with the support of the DoE, for implementation of the Post-2015 National Energy Efficiency Strategy (2016). Another cross-cutting recommendation is a stronger focus on the development of skills related to improving water efficiency.

3.1.5 The South African Carbon Tax

After featuring prominently in the NCCRWP (DEA, 2011) as a market-based instrument for addressing climate change, the South African Carbon Tax Bill has been in the pipeline for many years. A draft version was published by the National Treasury for comment in November 2015. A revised version was to be published by mid-2017, and further discussed by parliament, but this has not yet happened. If and when the carbon tax is implemented, its impact on reducing South Africa's greenhouse gas (GHG) emissions is highly promising. The intention is for it to act as an instrument for changing the behaviour of high-emission industries, possibly resulting in redeployment of skills to other sectors such as low-carbon transport or energy.

3.1.6 Long-Term Adaptation Scenarios Flagship Research Programme (LTAS), 2013

The LTAS aimed to respond to the 2011 NCCRWP

discussed above, by “developing national and sub-national adaptation scenarios for South Africa under plausible future climate conditions and development pathways” (DEA, 2013, p. 2). It projects the potential impacts of climate change on key sectors, as well its socioeconomic impact. It identified different plausible climate scenarios for South Africa over three different time frames: 2015-2030, 2040-2060 and 2080-2100. The climate projections are divided into two future energy pathways, mitigated and unmitigated. The report made clear that even in the case of successful mitigation strategies, one can expect large socio-economic impacts on vulnerable groups in South Africa, largely through changes in water resources (including flooding and droughts, decreased food security and impacts on human settlements). The LTAS thus calls for “multi-sectoral collaboration in research and developing and implementing adaptation plans” (DEA, 2013, p.17).

One of the 14 key recommendations laid out in the (main) LTAS report is to “increase education and capacity-building” (DEA, 2013b, p.31). While details of how this is to take place are lacking, skills training for adaptation at all levels (community/local/provincial/national) are key responses. Highest priority is to be given to community-based organisations and municipalities, and it is recommended that databases and toolkits are created and maintained for sharing insights and mainstreaming climate change.

3.1.7 Post-2015 National Energy Efficiency Strategy (NEES), 2016

NEES is published by the DoE as a response to South Africa's increasing energy needs combined with the country's need to increase sustainability and reduce its ecological footprint. The post-2015 NEES builds on the 2015 targets for reductions in energy-intensity and the 2014 Energy Efficiency Targeting Monitoring System, and aims to “stimulate further energy efficiency improvements through a combination of fiscal and financial incentives, a robust legal and regulatory framework, and enabling measures” (DoE, 2016, p. 7). The goals as outlined in the NEES are divided by sector: public, residential, commercial, industry and mining, agriculture,

transport, and production and distribution. All sectors are expected to reduce their energy consumption. The public sector is encouraged to lead by example, through having a target of a 50% reduction in specific energy consumption by 2030 relative to a 2015 baseline. There is no specific discussion in the policy document on the skills development required for the energy consumption reduction, but one can assume that some of the energy efficiency measures laid out in the document would necessitate skills development. Again we see that there is little integration of skills development strategies in many of the green economy policy documents presented by various branches of government.

3.1.8 National Development Plan (NDP), 2011

The NDP clearly states the necessity of prioritising a shift towards a green economy. However the plan also identifies what is perceived as a central challenge to green economy policymaking in South Africa, namely the conflict between the wish to use mineral wealth and the mining industry to raise living standards, and the wish to reduce emissions and improve energy efficiency (NPC, 2011b, p.38). This conflict means that many green economy policies focus on greening existing industries and developing new green industries, in addition to high-emission industries, rather than replacing them.

To improve the green profile of the mining industries, cleaner coal technology is mentioned as a key driver. The substitution of gas for coal is suggested as another future strategy for cutting South Africa's carbon-intensity and reducing greenhouse gas emissions.

A key tenet of the green economy policy held out in the NDP is that the country has no choice but to address its developmental challenges "in a manner that ensures environmental sustainability" (NPC, 2011a, p.197) and to increase the resilience of poor communities to the impact of climate change. On a large scale the NDP understands this to mean increased investment in skills, technology and institutional capacity that can assist in the transition to a low-carbon economy. The plan further draws attention to the need for "focused, institutionalised capacity

and management structures" (NPC, 2011a, p.197). The NDP also mentions some specific initiatives and policies that will drive the green economy forward, including carbon-pricing mechanisms, consumer awareness initiatives, a better infrastructure for recycling to make South Africa a zero-waste society, and the development of green products and services. The NDP identifies renewable energy technologies as being a key area for job creation and skills development.

3.1.9 The National Strategy for Sustainable Development and Action Plan (NSSD1), 2011

NSSD1 builds on the South Africa National Framework for Sustainable Development (NFSDD) from 2008 and sustainability initiatives run by key stakeholders in government, civil society, the business sector, NGOs, and academia. It is a "proactive" and "long-term" strategy released by the DEA, and is centred around five strategic priorities (DEA, 2011): enhancing systems for integrated planning and implementation; sustaining ecosystems and using natural resources efficiently; the green economy; sustainable communities; and responding to climate change.

These five strategic priorities have sub-goals. The third goal, "towards a green economy" is particularly relevant in terms of green skills as it situates government's employment objectives within the sustainability goals, envisioning "a just transition towards a resource-efficient, low-carbon and pro-employment growth path" (DEA, 2011, p. 7). Under this sub-goal is the implementation of skills development in the green sector, focusing particularly on youth. The goal in this regard is to "ensure a well-maintained and resourced training academy that produces quality graduates with skills relevant to the green economy through relevant stakeholders, for example, the National Youth Development Agency (NYDA)" (DEA, 2011, p. 26). More specifically, the NSSD1 sets a goal of creating 40 permanent jobs for youth in the green industries per year, and training of 500 youths per quarter.

Box 2: The National Development Plan, the trade union movement and green skills development

The NDP mentions skills development and the importance of improving skills development in various places. However, the statements are general, with few indications for policy prescription. Furthermore little is said about green skills development or about how to adapt skills development strategies to meet the demands of the green economy. The closest the NDP comes to addressing green skills development explicitly is by stating that South Africa must “[align] the national skills development strategy with the requirements of the green economy” (NDP, 2011, p. 213).

At the same time, the NDP acknowledges that South Africa faces urgent developmental challenges in terms of poverty, unemployment and inequality, and will need to find ways to “decouple” the economy from the environment so as to break the links between economic activity, environmental degradation and carbon-intensive energy consumption. The NDP vision is therefore that “by 2030, South Africa’s transition to an environmentally sustainable, climate change resilient, low-carbon economy and just society will be well under way” (NPC, 2011:199).

Noting that the NDP is a plan for South Africa rather than a government plan, and that in its development the National Planning Commission (NPC) aimed to build a social consensus around its central tenets and provisions, the references to a just transition to a low-carbon economy are highly instructive in terms of skills development. Labour, led by the Congress of South African Trade Unions (COSATU), is a central player in such social consensus-building. The country has seen a shift in the labour movement’s attitude, over the past decade, towards a much more cautious approach to the low-carbon and green economy transition. Labour increasingly raises concerns about significant job and skills losses in the national economy (and possibly their membership base).

3.1.10 The New Growth Path and The Green Economy Accord, 2011

The New Growth Path (NGP), released by the EDD, is a strategic framework for how South Africa can reach its goals of creation of decent work and increased labour absorption while promoting growth in its economy. It identifies key drivers and opportunities in terms of job creation, economic growth and good institutions, and attempts to set out a plan for moving forward.

The green economy is identified as one of the five key drivers for future job creation and is thus identified as a sector in which the South African government will prioritise efforts to support employment creation. The NGP specifically sets a target of 300 000 additional direct jobs in the green economy by 2020, of which 80 000 are in manufacturing and the rest are in “construction, operations and maintenance of new environmentally friendly infrastructure” (EDD, 2011a, p.31). By 2030 the NGP expects the number of jobs in the green sector to have increased to 400 000. To reach these goals the

main change required in industrial policy is identified as “comprehensive support for energy efficiency and use of renewable energy” as well as “strategies to encourage domestic production of inputs” (EDD, 2011a, p.74). Furthermore, the NGP states that increased focus on education and training, greater support for research and development, and development of learning organisations in enterprises and state agencies, is required for new economic developments in the green economy sectors.

Four separate accords evolved from the NGP, namely: the National Skills Accord; Basic Education and Partnerships with Schools; Local Procurement Accord; and the Green Economy Accord. The Green Economy Accord, signed on behalf of government and its partners in organised labour, business, as well as community constituents, outlines the specific commitments the parties have made in terms of growing the green economy. Specifically, the following twelve commitments, all of which have implications for green skills development, were identified: rollout of solar water heaters; investment in the

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green economy; rollout of renewable energy; energy efficiency; waste recycling, reuse and recovery; biofuels; clean-coal initiatives; retrofitting; reducing carbon-emission on our roads; electrification of poor communities and reduction of fossil-fuel open fire cooking and heating; economic development in the green economy: promotion of localisation, youth employment, cooperatives and skills development; and cooperation around the United Nations COP17 and its follow-up.

The Green Economy Accord is more specific about green skills policies than many other government policies mentioned in this report. Specifically, the 11th commitment, “economic development in the green economy”, sets out specific commitments made by the different stakeholders in terms of skills development for the green economy. Examples of this are:

- Organised labour commits itself to forming cooperatives to train retrenched employees in solar geyser installing and maintenance
- Government, through the Department of Higher Education and Training (DHET), commits itself to expanding training programmes relating to green economy needs
- Elevation of the importance of GE needs in the National Skills Framework
- Social partners commit themselves to working with TVET colleges to increase their green economy focus and train educators to be skilled in green economy technologies.

Some of the other twelve commitments also include an explicit skills development component, for instance the third (rollout of renewable energy) commitment. It states that the solar PV, wind and Concentrated Solar Power (CSP) industry will work together with government to

“strengthen and contribute to the skills development initiatives aimed at training up artisans, technicians and technical professionals ... to increase the number of skilled South Africans qualified to build and operate plants in South Africa” (EDD, 2011b, p.18).

The Green Economy Accord is meant to be a turning point in South Africa’s green economy policies as it brings together various stakeholders

in the economy to work towards a common goal. To monitor the goals set out in the accord and ensure compliance, the partners have committed themselves to regularly meeting to assess progress and discuss updates or additions to the Green Accord.

3.1.11 Medium-Term Strategic Framework (MTSF), 2014

MTSF is the strategic plan of government for the 2014-2019 electoral term. In terms of the green economy and skills development, it does not supply much that is new - rather it emphasises its commitment to the NDP and the election manifesto of the governing party, as based on the NDP itself. On jobs and skills in the green economy, it does not say very much. It states that “new opportunities in the green economy ... will be created” (DPME, 2014, p.7). It also confirms that the government is still committed to implementing the New Growth Path from 2011 by promoting the sectors identified as having large-scale employment potential, such as the green economy.

3.1.12 Industrial Policy Action Plan (IPAP) 2016/17 – 2018/19, 2016

IPAP is an action plan for industrial growth and unemployment reduction published by the Department of Trade and Industry (DTI). In IPAP 2016/17 – 2018/19, green industries are listed as a central priority under Sectoral Focus Area 2, together with gas-based industrialisation, primary minerals exploitation, and business process services (DTI, 2016). While previous IPAPs have focused more on the greening of existing industries, the 2016 IPAP focuses on green industries themselves. The strategy outlined in the report is four-pronged, addressing strategic industrialisation through the IPP; industrial development in a green economy; an electric vehicle project; and the development of green skills (DTI, 2016).

The first component of the plan emphasises that a “more strategic approach to localisation” is required within the REI4P to optimise its impacts. The IPAP then sets out issues that must be addressed to achieve this, among them a minimum threshold of local content as a bidding condition. The focus of the fourth component,

the development of green skills, lies in the Resource Efficiency and Cleaner Production (RECP) area. It aims to train RECP practitioners to improve efficiency and resource consumption in industry by developing training materials in three energy efficiency disciplines: refrigeration, solar thermal efficiency, and water efficiency. The DTI is responsible for this, together with the National Cleaner Production Centre – South Africa (NCPC-SA), with support from DHET. The RECP training programmes are being implemented by the NCPC-SA, with funding from the DTI. These and other training courses relevant to green skills development are discussed in more detail in Section 4 below and in Case Study 3, Annex 2.

That the green skills section of IPAP 2016/17-2018/19 focuses solely on RECP skills is rather disappointing and indicates a missed opportunity. This reflects the general lack of focus on skills development in green economy policies.

3.2 Concluding remarks

Skills development measures are not well integrated into the national policy framework although all policies make mention of job creation (as they do for equality and poverty alleviation), driven by the requirement to align policies with the country's triple challenges. Few policies, as indicated, specifically define what creating jobs means in terms of the policy to be effected, or define the skills required to facilitate it. In SA, and as set out in the next section, the skills development framework is highly centralised, with sectoral disaggregation. Institutionally the framework is primarily located within DHET, with links to the Department of Labour. This institution does not have the political power, nor is it sufficiently cross-cutting in respect of South African society and institutional structures, to give comprehensive meaning to the function of skills development in SA. The SETAs have the means to provide the closest mechanism for ensuring comprehensive, relevant, and inclusive skills development but they too lack the institutional power to do this effectively.

In addition, SA has had frequent, recurring

experiences of instituting policy that cannot be realised because the enabling skills and capacities are absent. 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. There appears to be no incentive or requirement for policy-makers to analyse the skills required to give effect to their policies. Instead, when serious questions are raised by actors in South Africa's society that are taken seriously (such as "can we redeploy skills resultant to jobs lost through implementing a new economic policy pathway?"), South African policy-makers react - albeit usefully - by setting out to answer the question through detailed analyses. This does not always happen, however. A positive reaction is emerging through the NEVA and the SJRPs and this should provide policy-makers with robust information on job and skills trade-offs in the transition to a green economy, thus providing the tools for facilitating a 'just transition'. The development of the Integrated Resource Plan (IRP) in 2016 for South Africa's energy future, although based on highly sophisticated modelling, made no attempt to model the jobs and skills associated with the pathways it considered. Despite public consultations and expert advisory comments calling for this to be addressed, a year later the IRP remains silent on the topic.

Between 2010 and now, progress towards closing the gap between skills development policies and environmental sustainability and climate change policies is evident. In the seven years that have passed, the skills development framework has transitioned to a new set of institutional arrangements that have stalled developments within that framework. However, the new structures are arguably no more able to provide coherence between national environmental and development policies and skills development frameworks. Policy-makers continue in the main to pay lip service to skills development. It is noteworthy that this is happening in an environment of high economic instability and high levels of unemployment. Until policy-makers, environmental or otherwise, take responsibility and are held accountable for skills development, this function, central to South Africa's economy, will continue to lag behind

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critical economic developments, and may in fact hinder the potential for achieving any economic development.

Mitigating this situation is possible through the ILO's unique tripartite structure that typically brings together government, employer and worker representatives in developing labour mobilisation policies. The tripartite representation has been evident in some of the policies discussed in this section - most notably in the NDP and the Green Economy Accord. As a result, the Green Economy Accord has a significant focus on green jobs and skills across all the sectors it discusses. Meanwhile, the NDP's 'environmental' chapter on low-carbon development and climate resilience seeks to ensure that such a transition does not impact negatively on jobs and skills. For this reason, the NPC has embarked on the development

of scenarios and an 'end state' vision for a just transition to a low-carbon and climate-resilient economy. The intention is to inform a comprehensive and high-level social dialogue process across society. This process is designed to bring together the four South African social partners, being government, labour, industry and civil society (National Planning Commissioner, Tasneem Essop. Personal communications. October 2017) and aims to map, among other aspects, jobs and skills requirement for the transition.

4. Skills development measures

Overview

In the 2010 Skills for Green Jobs in South Africa report (OneWorld, 2010), it was emphasised that the drive behind greening of skills and industries was mostly reactionary – in response to market forces, economic crisis or changes in demand – rather than driven by any strategic policy. This is to a certain extent changing, as green economy concerns increasingly become a part of national policy. The greater concern is that while many policies and overarching goals of greening of skills exist, strategic policies for achieving these goals are lacking. The policies and programmes that do facilitate green skills development are scattered and seem largely a result of individual initiatives.

An important observation is that green economy skills development is not addressed in the general framework of skills development, but is rather addressed in policy plans and documents that are green-economy-specific. A notable example is that there is no mention of green skills in the National Skills Fund 2016/17–2020/21 Strategic Plan. This is despite the fact that the green economy has been identified as a key sector for job creation in various government plans, including the 2011 Framework for a New Growth Path.

In the report on how to integrate environmental drivers into the SETA framework and sector skills policies, the DEA notes that

“South Africa’s capacity to use new development opportunities associated with the ‘sustainable development’ paradigm ... is currently hampered by a reactive approach to skills development for environmental functions” (DEA, 2010, p.2).

The DEA also notes that a more proactive approach is required. This is reflected in the lack of a systemic mechanism dedicated to skills identification and anticipation of green jobs. While the National Skills Development

Strategy (NSDS), in its current third iteration, identifies the development of skills for the support of the green economy as a key priority, in practice it does not provide specific measures to address this. In fact, the NSDS rather focuses on a different transformational agenda: one that more broadly addresses South Africa’s “inequities linked to class, race, gender, age and disability” through increased access to training and skills development opportunities, while also addressing the challenges of skills shortages and mismatches (DHET, 2011). To this end the Strategy identifies seven key developmental and transformation imperatives by which it is guided and measured: race, class, gender, geography (rural/urban), age, disability, and the HIV/AIDS pandemic. From this perspective, green skills identification and development becomes part of the objective of ensuring an inclusive transformation.

The Environmental Sector Skills Plan (ESSP) (DEA, 2010) aims to change the lack of specific focus on green skills in national skills development strategies. However, its usefulness is somewhat hampered by the fact that it is published by the DEA as a separate, SETA SSP-like, document rather than as a national green skills strategy. The ESSP can be divided into two quite separate topics: the integration of GE concerns into sectoral skills plans, and the identification of skills development and strategies for the so-called “environmental sector”. The ESSP does acknowledge the difference between the two, but including them both in the same document and strategy contributes to the view of a separate “green” or “environmental” sector in the economy, rather than the view that other major policy documents seek to promote, namely of a society in which GE concerns are an integral part of all sectors. Lastly, it is unclear to what extent the ESSP findings have been integrated into the greater skills development framework. The ESSP is discussed in more detail in the following section.

In addition to the above, an important factor

in the changes that have (or have not) taken place since 2010 are changes in the institutional arrangements relating to national skills development priorities and strategies. These have been almost completely transformed since 2009/2010. This was a complicated process in itself, having knock-on effects in terms of implementing moves towards the green economy and the pace at which this could take place. Summarised briefly, until 2010 the Department of Labour was responsible for most aspects of vocational and sectoral training. In 2009 the Department of Education was dissolved and restructured into two separate departments: the Department of Basic Education, and the Department of Higher Education and Training (DHET). DHET took over the function of Technical and Vocational Education and Training (TVET) and also became the main coordinating body for all SETAs instead of the Department of Labour (DoL).

The following section looks at the institutional framework and some of the measures and policies for GE skills development identification currently in place in SA. Various measures for green skills anticipation and development which have emerged or which have seen change since 2010 are discussed. Where possible, examples of projects and programmes across sectors have been identified and developed as case studies (Annex 2 of this report).

4.1 The Skills Development Policy and Institutional Framework

4.1.1 DHET and Sectoral Education and Training Authorities (SETAs)

As mentioned above, the institutional arrangements relating to national skills development priorities and strategies have undergone a major reorganisation since 2009/2010. From 2010 the DHET became the main coordinating body for all SETAs. In addition, since 2010 the SETAs are no longer only responsible for skills development in the context of workplace training; they now 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.

The SETAs are overseen by the DHET through the National Skills Authority (NSA) under the National Skills Act (No. 97 of 1998), and are guided by the NSDS. The third NSDS (NSDS III), designed to guide South Africa's skills development initiatives until 2016, was extended for two years until 2018. The NSDS IV is now under development, with an extensive consultation process currently ongoing. The SETAs coordinate and fund skills development initiatives in their particular sectors, with each of the 21 current SETAs responsible for the development of its own Sector Skills Plan (SSP). The aim of the SETA SSPs and SETA initiatives is to help bridge the divide between education and training supply and demand in South Africa. As such, one would expect them to play a significant role in the development of green skills and the adaption of existing skills for greening of the economy. This is particularly the case because the SETAs are responsible for providing quality assurance through the accreditation of South Africa's skills development and training institutions and organisations.

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. The SETA activities and grant provisions are funded by the Skills Development Levy (SDL). The SDL is applied in the formal employment sector as a deductible percentage (1 per cent) of salaries (where the employer's salary bill exceeds R500,000). The ensuing funds are targeted on learning and skills development. In addition to paying the SDL, companies are required to submit annual Workplace Skills Plans and Annual Training Reports (WSP/ATR) to their respective SETA. Only companies which have paid their SDL and have submitted their WSP/ATR are eligible to apply for grant funding for skills development initiatives from their SETA.

Since its inception the DHET has had two main objectives with regard to improving the skills development system in South Africa: i) to strengthen cooperation and coordination between SETAs and between different stakeholders, and; ii) to achieve this through

two main channels, namely the NSDS and the ongoing consultation process with key stakeholders involved in skills development (for example DoL and other relevant departments such as DEA). The NSDS was initially conceived as a way for DHET to help SETAs better align their skills identification and development initiatives with national policy priorities. Before the development of the NSDS, there was no overarching policy framework, and therefore every SETA had a different approach to priority setting based on different national policy documents, including the NDP.

At the same time, DHET has focused on improving skills development in South Africa through strengthening the SETAs' research capacity and therefore the empirical evidence feeding into their Sector Skills Plans (SSPs). To this end the DHET developed the SSP Framework, which was aimed at providing guidance for SETAs in developing their SSPs in accordance with the relevant provision of the Skills Development Act (1998), as well as with the DHET SSP evaluation requirements. Through the Framework DHET was aiming to improve the consistency of SSPs across sectors.

As SETAs are meant to play the role of an intermediary between the education sector and the labour market by closing the gap between demand for, and supply of, skills, they also cooperate with the DoL on employment related initiatives. The DoL is one of DHET's key partners in ensuring that people who have been trained through the SETA system are able to find employment. The DoL and DHET work together as part of an interdepartmental committee which also includes the Departments of Basic Education, Social Development and Public Service and Administration. This committee is responsible for the overall coordination of career development services. This cooperation gave rise to Khetha – the National Career Development Services Unit. Other key stakeholders are involved through the National Career Development Forum which consists of two main sub-structures: i) the Government Forum and ii) the SETA Forum. While a specific focus on green skills in these structures is missing, they provide evidence of increasing cooperation between departments in relation to improving skills

development and creating the interface between education and labour.

The SETAs provide funding based on their strategic plans, which are informed partially by sector policies and partially *via* consultations with stakeholders (firms and employers in those sectors) through the submission of their WSP/ATR. At the same time the allocation of funds is guided by the overarching objectives identified in the NSDS III. However, owing to evidence of the widely recognised dysfunctionality of the SETAs, many of the firms whose status as stakeholders would be key informants for the sector plans were alienated from the process. This has led to many of them effectively ignoring the SETAs and taking responsibility for their training needs themselves. For these firms the SDL effectively becomes another tax rather than an investment from which they expect to derive benefit.

This communication breakdown resulted in the SETAs struggling to create sector plans that truly reflect market needs, partly also due to a very low level of submission of the companies' WSP/ATRs. Furthermore many of the SETAs do not have the in-house skills to develop these sector plans, which require a great sense of competency both in terms of research skills and good relations with business. Consequently there is a disconnect between sector policies, the needs of the market and the SETAs' strategic plans, which hinders the SETAs' potential for green skills development.

4.1.2 The National Environmental Skills Development Planning Forum

The National Environmental Skills Development Planning Forum (NESDPF), was first convened by DEA in 2010 in response to skills development needs identified during the development of the ESSP. The Forum has therefore played an important role in changing the green skills development landscape since then. It was created as a way to “respond to the absence of a dedicated SETA and an overarching, skills focussed professional body for the environmental sector” (DEA, n.d.b). Although the institutional setup remains largely uncoordinated, some improvements have been made in engaging stakeholders from government agencies and

partner institutions and encouraging a dialogue between them on the development of green skills. Through advising and assisting the DEA's Sector Education, Training and Development unit, the NESDPF has acted as a catalyst for the identification and addressing of gaps in rolling out the ESSP.

In 2010 the Forum, together with DEA, developed an enabling document for all SETAs, aimed at helping them identify and integrate “environmental drivers” into SSPs (DEA, 2010). The Enabling Document's main objective was to promote a more proactive approach to environmental skills development by all SETAs, as a way of driving progress towards the achievement of the 2009-2014 MTSF Goal 9: Sustainable Natural Resource Use and Management. The document made specific recommendations to each SETA (based on the SETA setup at that time) as to how a green growth path is relevant to its sector and possible entry points (specific occupations) for skills development. The document also made recommendations for specific programmes and interventions for each SETA, through which skills needs could be addressed. In addition, research and innovation, as well as flagship programmes, were recommended for each SETA.

The Forum, together with partners from DEA, Department of Science and Technology (DST) and SANBI, is responsible for organising the National Skills Summit. The latest Summit was convened in 2015 in Midrand.

4.1.3 Green skills identification and the Organising Framework for Occupations (OFO)

The main mechanism through which DHET guides the SSP process, including the process of green skills identification, is the Organising Framework for Occupations (OFO). This is the DHET's coded occupational classification system and its “key tool for identifying, reporting and monitoring skills demand and supply in the South African labour market” (DHET, 2013). New versions of the OFO framework are officially released every two years. The latest dates from 2015. DHET also engages daily with SETAs and has regular engagements with a stakeholder forum (all government departments, including

DEA). This process informs DHET decision-making with up-to-date information and ensures that the qualifications developed by the Quality Council for Trade and Occupations (QCTO) are relevant and informed by the latest information from SETAs in terms of skills needs. QCTO was created in 2010 with the aim of transferring the functions and processes of qualification development and quality assurance into one institution (a process which is still ongoing), as opposed to having each SETA develop its own qualifications. SETAs utilise the OFO to identify skills development needs as part of their SSPs.

Since 2012, through a stakeholder consultation process with the DEA as a key stakeholder, it was decided that the OFO needs to include “green occupations” and “green skills” to enable the SETAs to reflect demand for green skills and therefore support development of the green economy in SA. The OFO framework defines green skills as follows:

“Green occupations have as their direct purpose the nationally identified priorities and initiatives of reducing negative environmental impact and contributing sustainably to environmental, economic and social sensitive enterprises and economies. This includes occupations with descriptors that directly reflect and contribute to the maintenance of processes related to national initiatives to: develop and adopt renewable sources of energy; reduce consumption of energy, fossil fuels and raw materials; enhance energy and resource efficiency; reduce greenhouse gas emissions; decrease waste and pollution; recycle materials; prevent the loss of biodiversity and restore ecosystems” (DHET, 2013).

The OFO identifies that greening of skills will happen through two main channels: i) through the creation of new green occupations (which are categorised in the OFO as “scarce skills”); ii) through the development of new skills sets (categorised as “critical skills”) in existing occupations. The 2013 OFO therefore also identified a category of “critical green skills” which do not meet the above requirements but are aimed at maintaining a specific occupation's relevance and contribution within the context of the green economy, and require a certain degree of upskilling of an additional set of skills. As a result, more than 90 occupations were

identified as green in the 2015 OFO, 14 of them newly-added occupations. (See Table 2, Annex 3). For existing occupations, 51 occupations and 17 specialisations were identified as requiring “critical green skills” (DHET, 2015b) (Table 3, Annex 3).

4.1.4 Which skills are needed?

Each SETA is responsible for identifying the needs for green skills within its respective sector, in accordance with the OFO categories, and must feed this information to DHET through its SSP. In addition, each SETA includes a Scarce Skills List relevant to its sector within its SSP.

Although progress has been made since 2010, insofar as 17 of the 21 SETAs now recognise green skills in their SSPs, this has happened to varying degrees only. For example, perhaps surprisingly, the Construction Education and Training Authority (CETA) makes virtually no mention of green skills or green economy adjustments in its SSP. This is a matter of concern, considering the prominent role that energy efficiency plays in public and residential buildings in the post-2015 National Energy Efficiency Strategy (DoE, 2016).

During a training seminar organised by the Green Skills Initiative (see section 4.5), SETA representatives shared a concern that some challenges in identifying green skills may lie within their skills identification model, known as the Frequency Model. The model is designed to pick up skills only if they are identified by a certain number of employers through their WSP/ATR submissions. Another concern raised was the lack of a common definition and a common understanding of green skills.

A review of the SSP's of various sectors provides some insight:

- **The SSP for the mining and minerals extraction sector** (MQA, 2016) addresses changes in skillsets required by a greening of the economy and increasing environmental concerns. One of the five key priorities listed is to “develop skills for sustainability” (MQA, 2016, p. 57). The SSP recognises that a range of skills will be required in the future, especially regulatory skills, and further recommends collaboration with industry to pool funding for research into cleaner energy production.

Lastly the SSP emphasises the need for more research into which specific green skills are needed for the mining sector in the future.

- **The agricultural sector** SETA's SSP mentions that green economy skills are at present largely focused at the skilled labour level. Therefore the report points to several specific skills needs required for green economy purposes in its sector, including the up-skilling of farm workers in energy-efficient methods, as well as agro-processing, resource sustainability and green technologies more generally (AGRISETA, 2017).
- **The 2016/17 Services SETA** SSP focuses on cleaners and hairdressers as professions with high greening potential (Services SETA, 2015). The SSP also highlights the role of the services sector in the green economy value chain in terms of its assistance with sales, project management and so on, but does not further elaborate on the skills needed to reach full greening potential.
- **The Manufacturing, Engineering and related sectors SETA** (merSETA) emphasises “the green agenda” and sustainable green skills development as key drivers for skills development in its most recent SSP (merSETA, 2014), but is not very specific about what exactly this means. It does however refer to a Sustainable Green Skills Development framework for the sector that is currently in the making, suggesting that it is indeed a key focus area for the sector.
- **The Public Services SETA** (PSETA) adopted a proactive approach by commissioning a report which investigated the skills needs related to greening of public sector Supply Chain Management (SCM) (Green Skills, September 2016). The report identified specific occupations needed in the process of greening and investigated how these could be included within the OFO framework. Four key entry points for the transition to green SCM were: i) strategic alignment of national-level and local-level policies relevant to environmental sustainability and SCM; ii) alignment between provincial and departmental SCM strategies and bid specifications; iii) promotion of better understanding of how strategic sourcing

can be used to support implementation of provincial and departmental sustainability strategies; iv) development of a monitoring and evaluation system for green SCM through information-sharing initiatives (Green Skills, September 2016). Based on the four focus areas, specific occupations and skills were identified in the OFO framework, which are closely related to green public SCM. The report recommends collaborations in skills development to support implementing green SCM in the public sector. It also recommends specific skills development interventions, including seminars for high-level public-sector officials and development of massive open online courses (MOOCs), to make the high-level strategic sourcing work available to a broad spectrum of SCM professionals. Recommendations have not yet been fully implemented, but there has been interest from various bodies in implementing the report findings.

- **There is currently no SETA for the environmental sector.** However as mentioned in the previous section, in 2010 the DEA produced an Environmental Sectors Skills Plan (ESSP) to address the issues of skills development for the green economy. The reasoning for such a plan was that “environmental skills planning in South Africa is ... *ad hoc*, fragmented, and re-active, and ... characterised by inefficiency” (DEA, 2010, p.5). The ESSP identified key skills for the environmental sector, as: “leadership skills – supply and stability; supply and development of scarce skills where skills gaps exist; more strategic planning and provisioning for re-skilling and updating of capacity in key areas where critical skills needs were identified; development of new skills for greening the economy, sustainable development planning and managing risk, e.g. sustainable development planning and climate change risk assessment (new green skills); skills for mainstreaming environment into development (greening of existing skills); and skills to develop and expand the sector, which include Environmental Education and Training skills to ensure that there is adequate capacity to deliver environmental training to an emerging and rapidly growing

sector” (DEA, 2010, p. 17). In alignment with the ESSP, the South African National Biodiversity Institute (SANBI), developed the Human Capital Development Strategy (HCDS) for the Biodiversity Sector (2010), aimed at developing a skilled workforce of biodiversity professionals by 2030 (SANBI, 2010). The focus of the Biodiversity HCDS is on high-level skills in biodiversity conservation, management and related research.

While the SETA system has been criticised for inefficiency and corruption, it has arguably improved its coordination in recent years. At the same time, owing to lack of resources it still struggles to fulfil its mission of servicing the skills needs of all employers in a given sector, while at the same time providing quality control for the large numbers of training service providers for which they are responsible. A key reason for this challenge could lie in the fact that SETAs were initially created as a funding mechanism, but increasingly are required also to conduct research activities. While some SETAs outsource research services to research institutions, other SETAs still need to conduct research in-house, for which they have not been well resourced and capacitated.

4.1.5 Skills scarcity and occupations in high demand

South Africa is at present facing a skills scarcity in various sectors and occupations. DHET regularly publishes the List of Occupations in High Demand (LOHD), as well as the List of the Top 100 Occupations in High Demand (DHET, 2015a). The aim of the lists is to provide indicators for directing policy in terms of supply-side skills development, training and education, and targeted interventions in the labour market. The list is used by various stakeholders as a tool for improving decision-making with regard to meeting education and training needs in the post-school system (Rasool, 2015). The methodology used by DHET for compiling this list is a combination of data analysis (Quarterly Labour Force Surveys and the Job Opportunities Index), Econometric Modelling (The Linked Macro-Education Model) to project occupation growth trends until 2025, literature review, and stakeholder engagement (Rasool, 2015).

One of the criteria used by the DHET in compiling the LOHD are the Scarce Skills Lists included in the SSPs of each SETA. Each LOHD includes the occupations from the previous years, as well as newly-identified skills. A recent case study conducted as part of the Green Skills Project (see Case Study 7, Annex 2) concluded that there is scope for improvement of this methodology, pointing out the lack of resources, capacity and quality data in South Africa as key obstacles (Rasool, 2015). The study further recommended a clearer definition of the institutional arrangements required for skills development, focusing on the improvement of the SETA in identification of skills needs (Rasool, 2015). The study, however, does not make any reference to or recommendations for a methodology specifically for the identification of green skills.

According to the 2015 LOHD, skills needs arising as a result of the development of the green economy are inherently defined as being in high demand, if they:

“...are new and expected to emerge in the near future as a result of innovation, technological advancements and the development of new industries (for example, the establishment of new occupations in “green” industries)” (DHET, 2015a).

The list is organised in categories, in accordance with the DHET OFO codes. However, it does not indicate which occupations are considered “green” according to the definition above. Neither does the list quantify the skills, as per the Scarce Skills list, used in the 2010 report.

The 2010 Skills for Green Jobs in South Africa case study (OneWorld, 2010) notes that many occupations of which there is a significant shortage also happen to be particularly relevant to the green economy, which does not bode well for either existing or new green skills, or the greening of existing skills. Among these occupations are engineering professionals, scientists, and science technologists, but also, teachers and lecturers with maths and science competencies. This challenge is again reflected in the 2015 LOHD list: of the 100 occupations listed as being in high demand, 13 are engineering professionals. Again the list contains

both science and engineering professionals as well as teachers and lecturers in those fields, which suggests that the continuing challenge of producing enough qualified professionals in these fields can at least be partially explained by inadequacies within the schooling system.

The LOHD replaced the Scarce Skills List identified in the 2010 report. A significant difference is that the LOHD does not quantify the needs as the previous Scarce Skills List did. Furthermore, the quality of the methodology for skills categorisation as green skills is a source of concern when analysing the skills identified as green in the OFO (annex 3). The issue may lie with the dysfunctionality of the SETA as opposed to the methodology devised. Nonetheless, the green skills identified are far from being a conclusive list and, since this informs the LOHD, it is assumed that this is also not a conclusive list.

4.1.6 Conclusions regarding identification of skills / green skills

The mechanism would benefit from greater levels of engagement by sector and national policy-makers, as discussed. This could be through a process whereby policy-makers are required to analyse the skills needed to give effect to their policy, at both the inception and updating stages. Such analysis should disaggregate skills needed from skills available and should identify the qualifications required, at a minimum level as well as at the desired level. This level of detail is what is usually used to populate related job advertisements or terms of reference for consultants, implying that some insight is readily available. Collating and adding value to this process will facilitate stronger information flows into the SETAs and the OFO and LOHD instruments. In turn, the DHET and SETAs could more readily advise policy implementers of skills shortages and collaborate on means of resolving these gaps.

Monitoring and evaluation (M&E) of the mechanism does not take place through a structured system. Future, effective advancements of the skills development and green skills development mechanism will need to draw on effective M&E of progress defined indicators in a structured, cross-cutting M&E system that effectively disaggregates green skills

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developments. The system will need to facilitate M&E across sectors, levels of government and include academia along with the private sector and civil society and NGO activities and initiatives. For this reason the DHET is not the appropriate institution to house and coordinate such a system, which needs to go well beyond the parameters of higher education. A possible institution is the Department for Planning, Monitoring and Evaluation (DPME) which is also the institutional home for government's NDP activities. This lends credibility and strength to the idea; however, clear institutional relationships would need to be established between DHET and DPME for this arrangement to be effective.

Moreover, the M&E plan currently under development by DEA for the NCCRWP would need to be integrated with a skills development M&E system. In the interim the DEA's system should establish a robust set of indicators for monitoring and evaluating green skills developments in South Africa.

4.1.7 Universities

As highlighted in the 2010 report, many South African universities provide courses and degrees with a green curriculum at a high level. This has remained and is increasingly the case, and in 2017 many of these courses have an interdisciplinary approach relevant to issues of the green economy and skills development. Examples of such programmes currently available are:

- From 2012 onwards, the African Climate and Development Initiative (ACDI) at the University of Cape Town (UCT) has provided an MSc/ MPhil in Climate Change and Development, which is an interdisciplinary one-year degree aiming to provide knowledge of climate change and sustainable development for an African context.
- The School of Architecture and Planning at the University of Witwatersrand offers a Masters of Architecture (MArch) in Sustainable and Energy Efficient Cities.
- The University of the Free State (UFS) has from 2017 provided a postgraduate diploma in Integrated Water Management. From 2018 it will also provide an MSc degree in Integrated

Water Management, based at the Faculty of Natural & Agricultural Sciences, in cooperation with Law, Humanities, & Economic & Management Sciences.

It should be noted that this list is by no means exhaustive, but rather an example of the increasing availability of green curricula at university level which approach the challenges of climate change and sustainability from a variety of perspectives. This is highly encouraging.

Furthermore, some universities either support or host more technical, formal qualification centres. An example of this is the SARETEC which is located at the Bellville campus of the Cape Peninsula University of Technology (CPUT). This centre was specifically created in support of skills development for REI4P, and is discussed in more detail in Case Study 2. It provides specialised training to the renewable energy sector in South Africa through formal training and short courses. At present the formal training available is for Wind Turbine and Solar Photovoltaic Service Technicians, while the short courses also develop competency within the wind and solar power industries.

4.1.8 TVET institutions

The 2017 OECD report *Getting Skills Right South Africa* (OECD, 2017, p.63) notes that “Vocational education in South Africa is [...] generally perceived as low quality” and that “whereas vocational training should prepare students for working life, employers report that vocational graduates lack necessary workplace skills and experience”. This overall issue with quality is a source of particular concern for the future of the green economy in South Africa. Crucially, the DHET List of Occupations in High Demand not only notes the dire need for engineers and engineering professionals, but also technicians and artisans in related fields. This issue is likely to be exacerbated in the future, as the technicians and artisans needed for new green economy needs and technologies will be in addition to those already demanded in the current context.

While there is a general need for more technicians and artisans in all sectors of the economy, there is also a need for more specialised green economy curricula in TVET institutions.

Since 2013 the German Ministry of Economic Cooperation and Development (BMZ) and Skills for Green Jobs (S4GJ) programme have, in cooperation with the South African DHET and DST run the pilot project of The Greening of TVET colleges' initiative. The pilot project involves seven TVET colleges across the country, and aims to:

- "1. Support qualified TVET lecturers in their continuous professional development through training in renewable energy & energy efficiency technologies;*
- 2. Develop a new optional vocational subject on renewable energy & energy efficiency technologies for NC(V) students; and*
- 3. Initiate various greening of TVET college activities as essential awareness raising and cross-cutting themes for sustainable development."* (Green Skills for Jobs, 2014, p. 7).

The approach is based on five "dimensions": green campus, green curriculum, green research, green community, and green culture. For the purpose of skills development, the most relevant is the green curriculum dimension, whose purpose is to "meet [...] upcoming skills for green(er) jobs by *integrating green issues in already existing curricula and/or providing new green training programmes and projects*" (Green Skills for Jobs, 2014, p.14). An example of a green curriculum project is a course in solar thermal installation and maintenance at Northlink College. The Greening of TVET colleges' initiative is an encouraging sign that the green economy focus that has long been present at university level is now also reaching the vocational education sector. It remains to see whether this project has an impact on the green focus of TVET colleges beyond those in the pilot programme. For more details on the Northlink College, please see Case Study 3 in Annex 2 of this report.

4.1.9 Active labour market policies and other green initiatives

The Expanded Public Works Programme (EPWP) stands out as an active labour market policy and includes green sub-programmes or initiatives. The EPWP aims, as its primary objective, to create jobs and develop skills. It is important as a case study, as outlined in Case Study 6 (Annex 2).

Promoting Small, Medium and Micro Enterprises (SMMEs) in the inclusive, green economy is critical to skills development and uptake. The National Development Plan (2011) states that SMMEs will play an increasingly important role in the economy and job-creation, but acknowledges that State efforts to promote this have had limited success thus far. Furthermore there seems to be little overlap between green economy policies and policies to promote the development of SMMEs. While both are identified as key sectors for future economic growth and employment, policies that join the two are remarkably absent. The report SMMEs and the Green Economy (J.P. Morgan and Gordon Institute of Business Science, 2017) explores sustainable practices at SMMEs in Gauteng province, where almost half of all South African SMMEs are located. Over two-thirds of the respondents "indicated that government is not doing enough to support SMMEs in their desire to be more sustainable" (J.P. Morgan and Gordon Institute of Business Science, 2017, p. 22). This indicates that there is a gap to be filled at the intersection of green economy and SMME policies, and for skills development within it.

The Training Layoff Scheme should include a greening component. The 2010 report mentions that the (then recent) Training Layoff Scheme could act as a "strong opportunity for firms to train employees in sustainable working practices if they so choose" (OneWorld, 2010, p.61). Thus far, however, there is little to indicate that it has served this purpose.

Other government initiatives and collaborations for green skills development have come into play since 2010, such as the **National Cleaner Production Centre** for South Africa, outlined as Case Study 7 in Annex 2 of this report.

4.1.10 The Role of the Private Sector and Civil Society

There is relatively little participation from the private sector, or of Civil Society, in green skills development. As discussed, the private sector became frustrated with the SETAs, and rely more and more on their own strategies for the in-sourcing skills needed, or for training for occupations as they see fit.

Often the environmental skills needed by the

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private sector to facilitate their compliance with national regulations, such as waste water treatment and pollution management, require high-level technologies and associated skills. These skills are often bought in from international firms and expertise, or foreign companies investing in SA, where they see adequate opportunities. One such example is European Veolia Water Technologies which offers water treatment technologies and services to the South African market.

South-African-based organisations such as Sappi conduct internal training for their own needs, in accordance with their sustainability strategy, although this does not necessarily require new green skills. In some instances these training programmes draw on the skills development fund facilitated by the SDL, although most companies align their training spending with corporate social responsibility (CSR) expenditure, on which they are also required to report if they are listed companies on the Johannesburg Stock Exchange or are part of large multinational corporations.

The NBI plays a key role in integrating business into targeted green initiatives such as the national Energy Efficiency (EE) initiative and in water sector developments. On the EE initiative, the NBI supported EE audits and implementation plans for private sector members over a period of five years. Although the initiative was not specifically intended to develop related green skills and thus had no explicit plan for doing so, capacities and skills were built within the respective private sector institutions on energy efficiency audits, technologies and solutions.

In terms of water programming, NBI initiatives include stimulation of private public partnerships (PPPs) in water resource management. This is through a process that builds on previous National-Treasury-driven projects that involve partnerships between municipalities and the private sector for enhanced water management and service delivery. Through these PPPs, skills are developed within the municipality and outside (in the project-established special purpose vehicles), for operational management, maintenance, project management, project finance and tariff structure design and

management. NBI is also spearheading an ecosystem-based water services initiative in the Richards Bay area. This project is similar to the approaches of eThekweni Municipality and of the WfW invasive clearing to rehabilitate ecosystems and their biodiversity so as to increase water flows. In Richards Bay the initiative involves large corporations who are supplying land and CSR investment, and the local municipality, which is also supplying land while stimulating local jobs in managing the clearing of invasive species. Among the new skills being developed are those for ecosystem rehabilitation or soft infrastructure management.

As articulated these initiatives are not a result of coherent institutional arrangements or policy coherence. They do however reflect possibilities and opportunities, highlighting the scale that could be achieved with policy coherence. In the same way there are signs of innovation at the micro level, with a number of very small projects emerging that could also drive change, but particularly without policy drivers. Importantly, the private sector and micro-level initiatives can provide critical lessons for policy development through, for example, highlighting possibilities and policy entry points.

4.3 Concluding remarks

As established in Section 3, policy coherence on greening or the green economy is inadequate to drive the structural change needed in South Africa's economy. This means that the country is not in the state of readiness necessary for driving coherent green skills development; policy-makers are neither setting the scene for green skills development through coherent, green policies nor, on the occasions when they follow the green economy road, do they define the skills they need to make their policies real. This means that skills development mechanisms can only go so far in articulating green skills, or in identifying scarce green skills, otherwise referred to as occupations in high demand. The institutions responsible for coordinating the skills mechanism have little to work with in defining green skills, and they only have clues as to which of the skills currently and awkwardly defined as

green are scarce.

Moreover, the institutions responsible for any policies, activities, or mechanisms that fall into the 'green' category do not coordinate much with each other in identifying or anticipating the green skills required or in designing and implementing training provisions or mentoring initiatives needed to attain these skills. For instance, there is no tangible relationship between the DEA and DHET on green skills identification or in analysing scarce skills. Furthermore, within the skills development framework there appears to be little institutional coordination on developing green skills – or scarce skills for that matter. This lack of coordination applies across the skills development system. For example there is little evidence of coordination between green Active Labour Market Programmes (ALMPs, which in South Africa primarily reside within the EPWP), the SETAs, the TVET system and the continuous vocational training, and on-the-job training activities that are underway in various sectors at various levels, including in the private sector.

Inter-ministerial coordination between the DHET, ostensibly primarily responsible for skills and green skills identification and development,

and the DEA, mandated to guide the green and climate-resilient economy for South Africa, is weak. As it is, there is little coordination between DEA and the Green Economy Accord, developed under the Economic Development Department (EDD), although the two departments are coordinating on the NEVA and the SJLPs. It is evident that these departments are playing important roles; but it is also clear that they are not doing so in a coordinated manner. As things stand, the best mechanism for coordinating the social partners or stakeholders involved in skills development is through implementation of the NDP for 2030, under the guidance of the NPC. (Chapter 5 of the NDP is entitled 'Environmental sustainability, an equitable transition to a low-carbon economy'. This chapter paves the way for this coordination, with the NPC about to embark on a process aimed at deepening South Africa's understanding of the implications of an equitable transition to a low-carbon and climate-resilient economy.)

5. Case studies – Analysis

The seven case studies elaborated in Annex 2 are briefly analysed in this section to give texture to the findings from Sections 3 and 4. The case studies also provide details of visible developments and progress on green skills developments across South Africa. Although these case studies do not necessarily emerge from coherent policy interactions and implementation, they do in some cases signal coherence, and individually and collectively they highlight plausible actions and pathways for driving a coherent, green skills agenda. The case studies were also selected to demonstrate possibilities within the sectors analysed in Section 2 of this report (energy and water and ecosystems), as well as more broadly to facilitate consideration of possibilities in other sectors such as waste management.

The themes that emerge from the case study analysis, relevant to this report, are summarised in **Table 2**. These are discussed in more detail below.

The REI4P case study (1) was designed as a green procurement programme rather than as a skills development programme, and yet skills development, particularly at high-end skills levels, has been an important outcome. This is because the programme stipulated a requirement of 40% South African ownership and required that a percentage of the investment made be directed to local social development. Consequently, strong partnerships were formed between local developers and foreign investors, resulting in international skills and knowledge being transferred to the local sector. This, coupled with the social development requirement, increased local participation. As a result, “a significant amount of knowledge-sharing” took place during implementation of these projects, involving numerous local legal firms, banks, engineers and other advisors (WWF, 2014).

A concentrated effort to exploit this positive outcome emerged through the establishment of the South African Renewable Energy Technology Centre (SARETEC) in 2015. The institution was specifically founded to cater for the REI4P’s

skills requirements and was developed as a collaboration between the DHET, GreenCape, and several universities, supported by GIZ. It was funded entirely from the National Skills Fund. Further coherence between this green development and a green skills programme is demonstrated through the links between SARETEC and the formal education system. SARETEC plays an important role in green skills development in that it operates in a skills development niche between the relevant technical qualifications NQF Level 4, offered by TVET colleges, and high-level qualifications NQF Level 6, offered by universities.

Observation

Green programmes that create incentives for investments are effective in stimulating skills development and transfer, through collaborative efforts at multi-levels.

The REI4P, although currently stalled by national government, sends positive signals for green skills development. **The Greening TVET Initiative (Case Study 2)**, which has taken hold in the Western Cape, also home to SARETEC (of which this initiative is part), aims to develop green curricula through a learning-by-doing approach. The TVET college that has spearheaded this initiative is doing so through focusing on greening its own campus, affording students the opportunity to get hands-on experience in relevant technologies related to energy consumption and environmental footprint management. Most of the classroom and practical training is done with the aim of the setting being as realistic as possible for future work situations, and all installations are done to a world quality standard. The college has been able to establish strong relationships with the private sector in the industry, resulting for example in student placements at energy companies in the province. Although the numbers of participating and subsequently employed students are small, the pilot college aims to scale its learning and experience through the TVET system and to surrounding communities. This in turn should stimulate learners’ interest in developing

Table 2. Case study analysis summary

#	CASE STUDY	KEY THEMES
Energy, Energy Efficiency & Manufacturing		
1	Renewable Energy Independent Power Producer Procurement Programme (REI4P) & the South African Renewable Energy Technology Centre (SARETEC)	› Local content and ownership requirements stimulate jobs and skills development › Strong partnerships between local and international stakeholders result in skills transfer › Dedicated training and skills development initiatives stimulated by green procurement policy-driven programmes › Multiple local stakeholders incentivised to collaborate in developing dedicated green skills initiatives in support of a functional policy incentive programme › Concentration of high-end skills requirements › Little evidence of SETA involvement
2	Greening TVET Initiative	› Signalled by REI4P › Development of green curricula through learning by doing › Strong but few links to industry creating skills uptake opportunities for students › Potential for upscaling throughout the TVET system
3	National Cleaner Production Centre	› Stimulated by IPAP II (DTI) in support of industry's green skills needs › Stimulating interest of other Departments (DEA) › Builds capacities for linking resource efficiency to industry efficiency (mainly energy and water) › Aims to work with young graduates to develop greener production skills and experience (internship programme) › Combines training, mentorship and internships (industry experience) › Not clearly linked to TVET system or SETAs
Water and Ecosystems		
4	EPWP and WfW	› Establishes strong links between resolving ecosystems and water management problems and job creation/skills development › EPWP is government-driven and large-scale – 1,15m and 6m jobs created in the environmental and culture sectors respectively › WfW created 55 000 jobs in the 2014/2015 financial year › Mostly low-end skills required › Stimulated a new biodiversity-oriented EPWP aimed at youth (DEA & DBSA's Job Fund) › Not clearly linked to the sector SETA or the TVET system
5	Water Resource Management	› The WRM landscape is dominated by technical and engineering approaches to resource management problems; transdisciplinary skills are needed now › The National Water Resource Strategy (NWRS, 2013) recognises the need to develop a multi-disciplinary WRM skillset across the public and private sectors › The International Water Association, together with the Water Institute of Southern Africa, initiated a Young Water Professionals Programme in SA to foster career development and networking opportunities › The focus is on high-level skills development › Partnerships in complex WRM facilitate skills transfers from international to national levels
Waste		
6	Waste Management	› Establishes strong links between resolving an environmental problem and job creation/skills development › National Waste Management Strategy goal: 69,000 jobs by 2016 › Shifts the strategy from landfill solutions to labour-intensive recycling › Skills development needed from low-to-high-level skills › Not clearly linked to the sector SETA or the TVET system

General Green Skills Development Support

- | | |
|------------------------|---|
| 7 Green Skills Project | <ul style="list-style-type: none"> > Brings multi-level/scale stakeholders together > Marks transition from sectoral to cross-sectoral approach towards green skills development > Builds capacity in national skills system to integrate green skills needs across all sectors > Focuses on post-school development system > Aims to strengthen green skills research methodologies (e.g. water, mining) > Aims to directly support sector SETAs |
|------------------------|---|

skills in the renewable energy sector while increasing skills support for a growing sector in South Africa's economy, should it adopt the decentralised energy supply pathway.

The National Cleaner Production Centre (NCPC) (Case Study 3) was also stimulated through a policy programme. In this instance IPAP II, driven by the DTI, gave rise to the NCPC with the objective of supporting industry's green skills needs. Specifically it brings improved resource efficiencies (energy efficiency, water consumption) closer to the private sector drive to achieve industrial efficiencies. It does so through building capacities for greener production skills through training, mentorship and job experience (internships) for young graduates. As such the focus is also on high-end skills development.

Observation

Skills development is understood to be most effective when combining training, mentorship and internships.

Skills development initiatives have existed for more than two decades in South Africa under the Expanded Public Works Programme (EPWP), established specifically to stimulate employment across various sectors. Creating jobs through improving ecosystem-based waste services is among these initiatives, with the Working for Water (WfW) programme established around 1991. WfW has strengthened the links between job creation and skills development and **improved ecosystems management (Case Study 4)**. The concept has gained traction beyond the programme, with similar private sector and municipal initiatives underway. Both WfW and the EPWP demonstrate scale: WfW created 55,000 jobs in the 2014/2015 financial year and over 1 million jobs have been created in

the environmental and cultural sector under the EPWP umbrella. Most of the jobs are at low-end skills levels, meaning that redeployment of skills lost through coal-mining, for example, is possible with some retraining.

The water sector has traditionally been based on technical and engineering approaches to **water resource management (WRM) (Case Study 5)**. However the latest National Water Resource Strategy (NWRS, 2013) addresses the need for a multi-disciplinary skillset in addressing WRM, and the need to diversify this approach. To this end the Young Water Professionals Programme (YWP-ZA), initiated under the International Water Association (IWA) and the Water Institute of Southern Africa (WISA), brings together a range of people working in the water sector, with the aim of fostering networking and career development opportunities. The South African WRM landscape is complex and requires a range of skills as well as a developed workforce, with strong leadership (Burgess, 2010). The YWP-ZA works with public and private institutions in SA to provide skills development opportunities, including shared learning opportunities, for example through an association with the Water Research Commission. Another example of a water partnership in sustainable water management is a collaboration between the World Wildlife Fund (WWF-SA) and the Danish Embassy, to improve water security, job creation and skills development. One initiative is a collaboration between a Danish company and Eskom which aimed to reduce levels of sulphur oxide (SOx) in Eskom's coal power plants. South African partnerships were identified as a key factor in ensuring skills transfers and local development of technical green skills.

Case Study 6 – Green skills and waste management, considers skills development

in waste management, demonstrating how green policy can evolve from national priorities. In this case waste management was targeted by the DEA as an environmental challenge that presents difficulties for the country in terms of managing waste sustainably in a rapidly urbanising and population-growth environment. In considering how to respond to this challenge, the DEA coupled the solution to job creation, and the national Waste Management Strategy (not discussed in Section 3) established a job creation goal of 69 000 jobs in the sector across the country by 2016. The objective has not been met, but routes for achieving it have been devised. Moving away from predominant waste disposal at landfills towards recycling and reuse (the circular economy) is a key identified pathway, in which analysis shows formal and informal job opportunities, with skills development needs across high and low skills levels. This means that unskilled and semi-skilled labour can be redeployed to this sector from sectors in decline, while new or retrained skills can be developed at the higher skills levels.

Observation

Few of these case studies demonstrate any tangible links to the SETAs and the overall skills development framework in South Africa. Rather, they have arisen in spite of this framework.

General support for green skills development is a recent development in South Africa, which is embodied in the **Green Skills Project (Case Study 7)**. This is a project of the National Environmental Skills Development Planning Forum (NESDPF), led by Rhodes University and funded through the Green Fund. The Department of Education, Training and Development at DEA is home to the NESDPF. As such, the Forum and the Green Skills Project mark a shift in the way green skills development is perceived by DEA. While in 2010 DEA's approach to green skills development was mainly based on the ESSP, today there is an understanding that it requires a cross-sectoral approach. This is why the project brings together various stakeholders in skills development across all sectors such as research institutions, private sector employers, funders, government departments and SETAs. The purpose of the

platform is to build up the capacity of the national system to identify and integrate green skills needs and development, focusing specifically on the post-school development system (Green Skills, n.d.a). The project offers various initiatives in support of this objective, such as the Mapping of Green Occupations and the OFO, which aims to support employers, SETAs and DHET in developing a better approach to identifying green skills in specific segments of the green economy.

Another initiative is the Green Skills Research New Knowledge Field Development, which maps the green skills methodologies currently being used by various sectors and institutions. A set of case studies was developed and used to provide examples of green skills research methodologies across sectors, as well as skills mechanisms such as the DHET Occupations in High Demand mechanism. An important output is a toolkit to complement the Enabling Document - "A Source Book to Support Skills Planning for Green Economies" (2017). The purpose of the source book is to equip skills planning institutions (mainly targeting SETAs) with methodologies and analytical frameworks to help them work with employers to identify and anticipate green skills needs and to incorporate these into OFO occupational descriptors and SSPs (Ramsarup and Ward, 2017). This year, through the Green Skills Project, the first Green Skills Course was organised, for developing the ability of stakeholders from various skills development institutions (such as SETAs, NCPC and other relevant government entities) to make the case for "greens". The course is aimed at strengthening the system's ability to coordinate the anticipated development of green skills. One of the main challenges identified by the stakeholders is the lack of a common definition and method of categorising green skills.

6. Conclusions and recommendations

Key Messages

- Since 201 South Africa has considerably evolved and strengthened its green policy environment
- In parallel South Africa has also evolved its skills development policy and institutional framework
- South Africa has not officially embarked on a transformative pathway that will inclusively transition the country from its traditional, minerals and energy-based economy to a green economy
- South Africa does not have a clear plan in place to address perceived gaps in the labour market that result from a low-carbon transition
- There are tangible (albeit ad hoc) instances of skills development being linked to green policies, providing some evidence of change; however green policies have yet to show that jobs can be created on a large scale through increased demand for new or redeployed skills
- Green skills are often termed scarce skills and South Africa's labour market is characterised both by high unemployment and at the same time skills shortages in certain occupations

6.1 Conclusions

South Africa's skills development frameworks neither emphasise the development of skills in high demand for the South African economy, nor coherently promote green skills development. However, there is evidence of progress since 2010 in terms of three key aspects of South Africa's policy framework, pertinent to this assessment: i) Overarching national development plans make links to low-carbon development and climate resilience (green); ii) the green policy framework is much stronger than it was in 2010; and iii) the skills development policy and institutional framework has moved on since 2010. These aspects are outlined below in more detail in terms of green skills development.

National development and green policy frameworks

Since 2010 South Africa has considerably evolved and strengthened its green policy environment. As a result the country has a relatively

sophisticated green policy framework. There are links between the country's overarching development policy framework and the climate change and environmental (green) policy frameworks. While this reflects positively on the policy environment, these links are not coherent across the development policy framework, and are often weak.

The skills development policy and institutional framework has also evolved since 2010, side by side with the green policy framework. The parallel nature of these developments is evident in the low levels of integration between the two policy frameworks. This is not surprising. South Africa has not officially embarked on a transformative pathway that will inclusively transition the country from its traditional, minerals- and energy-based economy to a green economy. Doing so would necessitate a structural change in South Africa's economic foundations – and the country appears to believe it is not ready for this. This is evident for example in the structure and tone of the NDP, reflected in Box 3.

The way in which the NDP has addressed the green economy is indicative of the fears surrounding an integral transition. COSATU,

Box 3: The NDP and the Green Economy

The NDP is a development plan for the country rather than a government plan, and is instructive in terms of how South Africa locates the green economy. The title (and content) of Chapter 5 is “Environmental Sustainability – an equitable transition to a low-carbon economy”. This chapter sends two important signals: i) that low-carbon development is an environmental issue which is not integral to the central economy; and ii) low-carbon development can only be fully entertained if the transition is equitable - i.e. the transition does not exacerbate the country's triple challenges (poverty, inequality, unemployment) or compromise the marginalised groups of society.

Correspondingly Chapter 4, on economic infrastructure, includes a section on the energy sector which articulates six key policy issues and planning priorities. None of these imply lower carbon intensity in South Africa's energy sector, instead favouring issues in the areas of private investment, improved services and pricing, and energy diversification. Notably this chapter frames infrastructure as “the foundation of social and economic development” (NDP, subtitle of Ch.4.). The chapter does refer to the need to reduce carbon intensity, noting that carbon emissions contribute to climate change.

and others with vested interests in labour mobilisation and employment, continue to express concerns that too many jobs will be lost, through for example reduced or displaced coal-based energy generation. These organisations claim that there is no plan for absorbing these occupations elsewhere. At present there is not enough detailed and coherent quantitative information available for policy-makers to address these concerns adequately. Certainly an alternative plan is necessary, but establishing such a plan is only likely to happen if the political signals for doing so are strong.

At the same time the overarching policy environment lacks coherence, although it has advanced from 2010 and is sophisticated for an emerging or developing economy. For example South Africa has two development plans in addition to the NDP, namely the Framework for a New Growth Path (NGP) and the Industrial Policy Action Plan (IPAP II). However the relationship between them, and how they come together to promote economic growth and create employment, is not clearly articulated.

Alleviating poverty, reducing inequality and stimulating employment are cross-cutting themes in all three aforementioned plans. However each of the plans has its own orientation and falls under different ministries or departments. Starting with the most specific, IPAP II emphasises economic diversification and intensification of industrialisation and is driven by the Department of Trade and Industry (DTI).

The NGP focuses on addressing South Africa's triple challenges through six identified sectors and is driven by the Department for Economic Development (DED), while the NDP aims to eliminate poverty and reduce inequalities through inclusive growth, with government's participation in its implementation coordinated by the DPME. As with the NDP these plans do not envision a transition to a green economy for South Africa. They do not highlight green pathways to more intensive industrialisation, for stimulating employment through greening of identified sectors, or for deepening social inclusion in South Africa's economic growth.

Although these and other relevant plans and policies refer to greening through the use of concepts such as low-carbon development, climate resilience and green economy or green skills, these themes are only central to climate or green-economy-specific policies and plans. The situation reveals a path dependence in SA, or the continued application of a practice that is based on historical preference or use rather than being aligned to current and future circumstances and expectations. In other words, the country is stuck in organising a long-established regime and is showing no signs of meaningful transformation.

It is therefore not surprising that skills development frameworks in South Africa do not prioritise or emphasise the development of green skills in support of the country's economic development.

Green skills and the institutional and skills development frameworks

There have been some significant, if costly, changes to the skills framework since 2010. The transition of the skills development and SETA framework from the Department of Labour to DHET probably cost South Africa around three years of progress. However, the transition has now been made and, according to the DHET, “significant changes have happened in the skills development landscape between 2011 and 2013”. Notably the SETA framework has been rationalised and the SETA administration controls have been strengthened. The more streamlined framework eases the navigation and functionality of the SETA framework, while tightened administrative controls are likely to result in enhanced information and accountability from and within the SETA framework.

Other important changes include the establishment of the Quality Council for Trades and Occupations and the establishment of a consolidated national qualifications framework, which includes the List of Occupations in High Demand (LOHD). Critically, the National Skills Development Strategy (NSDS) has shifted from being a target-driven strategy to an outcomes-driven strategy in a move intended to highlight DHET’s focus on shifting South Africa towards a Green Economy (DHET, n.d.).

These developments are significant in terms of advancing the overarching skills development framework in South Africa. If these initiatives are successful they will be central to closing the gap between unemployment and South Africa’s short supply of skills for occupations in high demand.

But what does this mean for green skills development?

In some instances links are made between green policies and skills development. Thus, there are tangible, if *ad hoc*, results of job creation and skills development emerging from the policy landscape. An important example is the set of skills requirements related to implementation of internationally-acclaimed policy instruments

such as the REI4P. Where implementation of instruments such as REI4P and the EPWP initiatives have been successful, there is evidence of green skills development and, in some instances, inclusiveness being achieved through green initiatives.

However there is little, if any, evidence of coherent translation of green policies into jobs and enterprises at scale. There is also little evidence of coherence between green policy implementation and skills development frameworks, with a few exceptions. At the same time green skills are often termed scarce skills or occupations in high demand. This is notable in that South Africa’s labour market is characterised by high unemployment at the same time as experiencing skills shortages in certain occupations. The situation is in turn instructive. It points to mismatches between available qualifications and occupations.

Accurate information on occupations in high demand is critical as it provides useful insights into the skills needs of the economy. At the moment clear insight into what the green skills are, and will be, is not available. Analysis of the skills framework shows that this responsibility resides with DHET, through the SETAs. However both the research underpinning this study and the case study analysis reveals that the SETAs and the skills development system are not much engaged in existing green skills development initiatives. This is both indicative of their status and influence in South Africa’s economy, and raises questions as to the efficacy of the information and analysis on green skills produced through this system.

For instance there is little evidence of TVET colleges running with the green curricula and skills development baton. The SETAs seem to lag behind some of the shifts toward greening that are evident in South Africa’s economy, in not driving initiatives to produce the skills needed to feed green economy industries and sectors. SMMEs do not have access to up-to-date and relevant information on green enterprise opportunities (universities could play a key role in acting as green SMME information hubs). Although funding is available for small enterprises, the thrust to stimulate and support green enterprises is not strong, further

demonstrating inadequate alignment with green policies and economic developments, and inadequate levels of commitment to and information for SMMEs.

Cooperation and communication has improved to a degree between relevant departments. This is evident through the collaboration between DHET and DEA on updating the OFO, as well as through bringing together cross-sectoral stakeholders under the Green Skills Project. However no formal channels or mechanisms for such cooperation for green skills development exist as yet and more work remains to be done in this regard. According to Green Skills Project (see Case Study 7), some progress, albeit small, has been made in the sphere of green skills development. The establishment of the National Environmental Skills Forum is putting pressure on the skills development framework and system and is thus acting as the primary driver for progress. The Green Skills Project has developed a tool for green skills identification. As a result green skills now feature in the codes established for the LOHD and the OFO and there is a stronger policy imperative for the SETAs to drive changes in the private sector. At the time of writing this report, 17 of the 21 SETAs recognise green skills in their SSPs. Thus the green policies and skills frameworks are more joined up than they were in 2010. However, progress is insufficient to identify good practice in green skills development in South Africa.

It is not helpful that the definition being applied for green skills is not clearly articulated. A review of green skills identified in the OFO and the LOHD highlights confusion between green skills, the skills required of environment-based occupations and the skills which overlap South Africa's traditional economy and a future, green economy. The NDP, which was developed through stakeholder consensus across the country, probably sets the scene. It notes that South Africa faces urgent developmental challenges in terms of poverty, unemployment, and inequality. In responding to these challenges the NDP highlights the need to break the links between economic activity and environmental degradation and carbon-intensive consumption and production patterns, while remaining competitive within the global economy. This

lies at the heart of what is meant by sustainable development, that is development which is not only economically and socially but also environmentally sustainable, and is central to what the NDP aims to achieve.

Notably, a transformation of South Africa's economy to one that is low-carbon or less carbon-intensive, and more climate-resilient, will not necessarily be built on improving environmental management standards as envisaged in a very specific suite of policies such as those for air and water quality management and mining and exploration activities. Rather, it is built on transitioning South Africa's economy to one predicated on low-carbon intensity and climate resilience. Little guidance is forthcoming in this regard from the Green Economy Accord or from the National CC Response White Paper. While both refer to skills development and job creation as important cobenefits, neither seek to define green skills in the context of South Africa's growth and development pathways. Importantly, the surveys the SETAs receive from employers do not highlight green economy drivers in the private sector, meaning that the private sector is not driving a green economy transition.

Effective M&E will be central to identifying, evolving and articulating good practice, definitions and needs in green skills development in South Africa. Solid M&E practices and standards also stand to improve policy coherence and to drive key changes needed in advancing the green skills development agenda. However, an M&E framework for green skills development is lacking. This is probably because it is difficult to establish a coherent framework for green skills development that is more cross-cutting than DHET's scope of work and mandate allows for – meaning that the development of a green skills M&E framework cannot go beyond what DHET envisages. A coherent M&E framework that is cross-cutting can also assist in responding to the prevailing institutional fragmentation and poor inter-ministerial and departmental coordination.

A related and substantial issue is lack of information around green skills needs and definitions, as indicated earlier. As discussed, the NEVA process is underway and this should advance national understanding of trade-

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offs between traditional and green economy approaches in South Africa, where they exist. Jobs in the coal industry for example may be threatened by shifts toward renewable energy; but there is little or no information on alternative routes of employment, the skills required and the quality of the jobs such a transition may yield. Ideally this analysis and others will inform the skills development institutions and their responses in generating a ‘fit for purpose’ workforce.

At the same time the climate-driven, green economy transition is highlighting significant potential for job creation and enterprise development. This is discussed briefly for the priority sectors considered in earlier sections of this report, and is given specific consideration in the recommendations section below. These recommendations build on the progress that is being made in closing the skills gap. Although, as already highlighted, this is mostly taking place in a fragmented and *ad hoc* manner, it is nonetheless useful for informing future policy developments, as evidenced by the sample of case studies elaborated in this report.

6.2 Recommendations

The recommendations recognise that South Africa is not ready to establish the policy coherence required as the foundation for green skills development. Fragmented information flows and institutions, and inadequate information, are the main reasons for this lack of readiness.

Specifically, South Africa is not ready to develop skills that will facilitate the desired just transition to a green economy. Scaled-up green skills development relies on coherent policies that pave the way to transforming South Africa’s economy from its traditional structure into one that facilitates a transition to a green economy. This in turn relies on the South African policy framework being better informed. Policy-makers need to understand which skills will be lost through a green transformation, and which skills would replace them. This lies at the heart of a ‘just transition’.

According to the LOHD, South Africa has an extensive portfolio of green skills in high demand. This report’s analysis is that the LOHD, in terms of green skills, is inadequately informed. Research and the case studies reveal that a range of green skills development initiatives are operating alongside, rather than with, the SETAs. These initiatives are therefore not necessarily informing the green skills categorisation to which the SETAs contribute in compilation of the OFO and the LOHD. At the same time it is not clear that the SETAs are able to close critical or high-demand skills gaps across the economy.

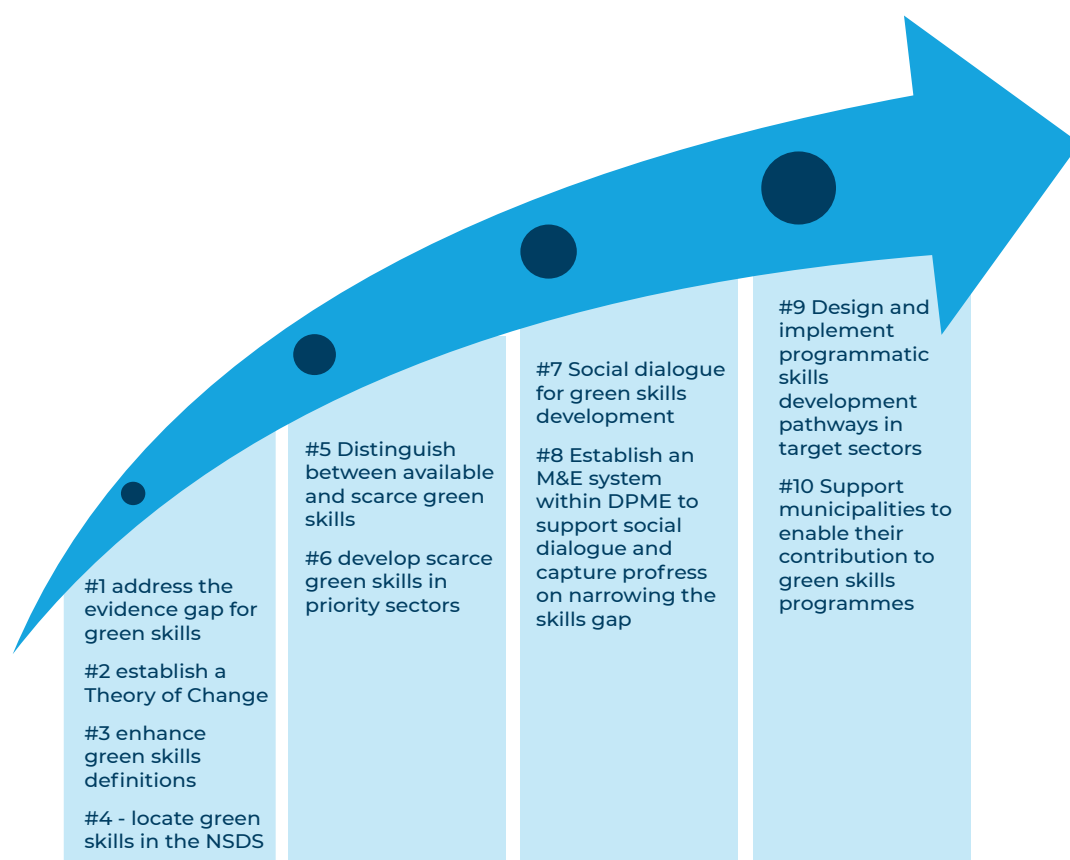
This lack of readiness for a comprehensive green skills development programme that aligns with economic drivers and policy needs to be addressed in parallel with addressing immediate and anticipated green skills needs in the country. The ten recommendations outlined below are designed for parallel implementation, as they are implemented in an iterative manner through the adoption of a learning-by-doing approach.

Figure 1 summarises the recommendations, showing possible sequencing.

Recommendation # 1

Address the **evidence gap for green skills**

Well-informed **skills transition pathways** will highlight opportunities for new skills, enhanced skills or redeployment of existing skills as a result of a green economy transition. Supporting and expanding the NEVA or SJLP study processes, through for example inclusion of all the ILO tripartite partners, is an important departure point. It is specifically recommended that: i) this study is accelerated; ii) the study is well aligned with the South African policy framework in terms of the principles established under the NDP, the priorities established by the NCCRWP and the NDC, and with the sectors identified under the Long Term Adaptation and Mitigation Scenarios (LTMS and LTAS); and iii) the phased findings of the study underpin **a coherent and structured social dialogue** that cuts across South Africa’s public and private sectors and across the growth and development **policy and skills development framework structures and institutions**.

Figure 1: Implementing the recommendations for green skills development**Recommendation # 2**

Establish a realistic **Theory of Change** for advancing green skills development with social (tripartite) partners

A Theory of Change (ToC) that outlines the pathway to achieving greater coherence between green policy and skills development, reviewed every five years, will articulate a strategy for the country that meets the needs of critical social partners. The ToC should aim to align with current development plans and policies, and inform future iterations.

Recommendation # 3

Enhance the **definitions of green skills** and align these closely with the overarching policy frameworks

Noting that the NDP frames the current definitions applied, mechanisms should be established for disaggregating between skills related to environmental degradation (e.g.

pollution, waste management, mining effluent treatment), low-carbon development (e.g. reduced emissions from clean energy, transport, agriculture) and climate-resilient development (e.g. building fire- or flood-resilient roads and houses and transitioning to drought-resilient crops and livestock). Consider enhancing the existing tool for green skills identification established under the Green Skills Project.

Recommendation # 4

Strengthen the place and role of green skills development in the revised **National Skills Development Strategy (NSDS)**

This necessitates an iterative approach aligned with the evolving national growth and development policy environment, in order to locate green skills development centrally in the NSDS. The present version of the NSDS makes brief mention of green skills. It is our recommendation that the revised version makes a clear statement about what green skills mean

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for the national economy, for skills development and for responding to skills in high demand.

Recommendation # 5

Establish a methodology for distinguishing **green skills in high demand** from readily available green skills

Consider new skills, enhanced skills and re-deployed existing skills under both available and high-demand green skills categories. Consider needs established through known developments in South Africa while also anticipating needs emerging from future trends. Build on the OFO as the key tool for green skills identification and development. In making this recommendation we note the feasibility of augmenting the OFO tool; the flux of information and change is resulting in continuous work by the DHET on the OFO, even though provision is made for revision every two years.

Recommendation # 6

Establish a mechanism to support the **SETAs** in developing scarce green skills in priority sectors

Priority sectors are as identified in the policy frameworks, LTMS and LTAS (see priority examples outlined in recommendation #9). and the primary sectors are discussed in the sector analysis in Section 2 of this report. Specifically, support the SETAs in: i) mapping out the requirements for meeting scarce green skills (qualifications, experience); ii) identifying institutions that support - or could support - the qualifications needed; and iii) establishing internship and mentoring programmes that support the experience-based requirements of green skills in high demand.

Recommendation # 7

Establish and facilitate **social dialogue platforms** that raise and align awareness of available and scarce green skills between sectors and between policy platforms

Ensure that dialogue platforms are designed to inform and enhance existing knowledge and to stimulate participation in green skills updating and development. Consider innovative initiatives that are happening at the micro level, which contribute to green skills development

in the absence of nationally-coherent green skills frameworks. Build and augment the work conducted under the Green Skills Project, such as the first Green Skills Course, with the aim of strengthening the system's ability to coordinate, involving stakeholders from SETAs, DEA, NCPC and other skills development institutions.

Recommendation # 8

Support the design, development and implementation of a **national M&E system** for green skills development

The M&E system needs to be closely aligned with the South African economy and flexible enough to accommodate economic change and transitions. Ideally it is anchored in the same institution that oversees the coordination of the NDP, the Department for Planning, Monitoring and Evaluation (DPME).

Recommendation # 9

Design, validate and scale up **programmatic interventions** that create or diversify skills in critical sectors

At least initially, focus on developing skills that support the acceleration of: i) climate-resilient water resources; ii) low-carbon or less carbon-intensive and decentralised, inclusive energy solutions; iii) low-carbon and socially-inclusive transport solutions; iv) climate-resilient and low-carbon infrastructure, and; v) sustainable waste management solutions that are labour-intensive, promote social inclusion and reduce carbon emissions.

Recommendation # 10

Support targeted **municipalities** to contribute to the implementation of green skill promotion programmatic interventions

Municipalities require support that ensures their integration so as to facilitate their delivery of skills diversification interventions into low-carbon development and climate-resilient pathways. In this way municipalities can contribute to South Africa's meeting of its green and climate-change objectives, while potentially realising socio-economic development enhancements.

Concluding remarks

It is evident that both the green policy and the skills development frameworks in South Africa have evolved considerably since 2010. This is welcome progress and the range of case studies assessed in this report attest to the progress that has been made. It is also evident that a comprehensive approach to developing green skills is being advanced by coherent policy programmes. Although South Africa has implemented some successful policy programmes, coherence in the overarching policy framework is lacking. An approach that drives improved coherence is needed in parallel with interventions that support the more 'bottom-up' level of developments seen in the case studies.

Recommendations 1 and 2 are made in support

of approaches toward overarching policy coherence, while recommendations 3-10 support parallel, bottom-up approaches. The latter aim to create capacities within and around the skills development framework for enhanced green skills development that aligns closely with green policies and programmes in priority sectors. Cooperation between the tripartite social partners, in accordance with ILO's strategy, is provided for as a critical success factor for achieving both the high-level and bottom-up objectives in this recommendation framework.

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Annex 1 – Stakeholder Interviews

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Annex 2 – Case Studies

Energy, Energy Efficiency and Manufacturing

Q Case Study 1: REI4P and Renewable Energy Skills Development

The Renewable Energy Independent Power Producer Procurement Programme (REI4P) is South Africa's flagship programme for increasing renewable energy in the country's energy mix. To date 31 207 job years have been created through REI4P projects for South African citizens, with 28 152 in construction and 3 055 in operation (DoE, 2017). While construction jobs tend to be temporary, the programme also has requirements for local content, which are aimed at stimulating manufacturing of renewable energy components and require skilled local workers in the long term. The programme has consistently exceeded its employment targets and thresholds. The project developers also have a contractual obligation to support socioeconomic development through contributions over the project lifetime (usually 20 years), which are used for education and skills development, among other things. These contributions amount to R357 million to date, of which 40% has been spent on education and skills development activities, engaging with local communities and initiatives. However, it is not clear if this is invested specifically in the development of skills for green jobs (DoE, 2017).

Project developers are required to specify a minimum of 40% South African ownership. As a result, strong partnerships were formed through the REI4P between local developers and foreign investors, resulting in international skills and knowledge being transferred to the local sector (Eberhard and Naude, 2017). A number of foreign project developers have sent employees to South Africa – across the spectrum of services, including negotiations and contract agreements, construction, supply chain development,

financing and legal services (WWF, 2014). Since the majority of these specialist renewable energy skills were scarce in South Africa, owing to the fact that a renewable energy industry had not existed before in the country, “a significant amount of knowledge-sharing” took place during implementation of these projects, involving local legal firms, banks, engineers and other advisors (WWF, 2014).

The South African Renewable Energy Technology Centre (SARETEC)

As part of a more concerted effort especially aimed at the development of mid-level technical green skills required by the renewable energy industry, the South African Renewable Energy Technology Centre (SARETEC) was created in 2015. SARETEC is managed by the Cape Peninsula University of Technology, Cape Town. The institution was specifically founded to cater for the REI4P's skills requirements, particularly in the long-term operation and maintenance phases of projects (GreenCape, 2017). The concept was developed in 2008 and the centre was finalised in June 2015. It was developed as a collaboration between the Department of Higher Education and Training (DHET), GreenCape, several universities, and GIZ. The project was funded entirely through the National Skills Fund.

In 2016 SARETEC piloted the first Wind Turbine Technician Programme, with a curriculum developed via the Manufacturing, Engineering and Related Services SETA (merSETA) through the QCTO process (SARETEC, 2016). In addition to short courses on solar PV systems and biomass technologies, SARETEC now offers internationally-accredited courses for technicians in wind turbine and solar photovoltaic services. The qualifications are accredited through merSETA. The process of developing and accrediting the qualifications took close to 3 years, starting in 2011. During rollout since 2015, centre managers have realised that some changes are required to the qualifications, which will be made after the 5-year review period.

SARETEC plays an important role in green skills development in South Africa, as it operates in a skills development niche between the relevant technical qualifications NQF Level 4 offered by TVET colleges, and high-level qualifications NQF Level 6 offered by universities. By offering NQF Level 5 qualifications for technicians and engineers, with a specific focus on renewable energy technologies, SARETEC is closing a green skills development gap. At the same time the Centre prides itself that its trainees are receiving skills qualifications which can be applied not only to systems installations and project implementation but could also easily translate into manufacturing skills and support the development of local renewable energy component manufacturing facilities.

Since it opened, the centre has up until June 2017 provided training and qualifications for 499 trainees in a total of 629 courses, with some trainees taking more than one course and receiving additional qualifications (S. Pietrangeli, pers comm, 2017). The Centre's output has increased between 55% and 68% year-on-year since its inception in 2015. 2017 was expected to be the first year in which this level of growth will not be reached, as the effects of the stalling of REI4P are being felt. According to the Operations Manager, Mr Sven Pietrangeli, while this significant dip is a consequence of the political uncertainty surrounding the REI4P, it does not mean that the shortage of green skills in the renewable energy sector has been satisfied. While in the past the majority of training provided by SARETEC was for wind technician qualifications, the small-scale solar PV market is now starting to grow, resulting in a significantly increased demand for solar PV technician qualifications.

The centre is currently in the process of looking for ways to become financially self-sustaining. One possible option is the creation of a fund, from which REI4P investors can invest part of the socioeconomic development funds as part of their REI4P requirements. To this end a working group has been set up, together with the IPP office, which will discuss working this option into new REI4P contracts. It is envisaged that this fund will be managed by an independent

institution - which has not yet been identified - as opposed to a public-sector entity, owing to trust and efficiency concerns. Apart from funding concerns, SARETEC is also generally concerned about its uncertain future, given the loss of political support for renewable energy projects and programmes in South Africa.

Private Sector Initiatives and Solar PV

On the one hand, the REI4P is stalling and causing demand for green jobs and skills to decrease, but on the other hand small-scale solar PV projects have been on the rise, compensating and even outperforming it in terms of volume of demand for green skills (S. Pietrangeli, pers comm, 2017). For this reason, during last year the private sector has been focused on the development and implementation of small-scale solar PV projects. Driven by the persistent scarcity of the necessary green skills, the private sector has created its own skills development initiatives. While some companies offer in-house training, others are less willing to do so because of fears that they will later lose these employees, so instead provide product-specific training.

Some private sector companies offer free training courses in South Africa. In May 2017 Enel Green Power (EGP) sponsored and conducted a PV Skills Training course. The company currently has five large solar PV projects and two wind power projects within the Eastern Cape, with an installed capacity of over 500 MW. In addition, EGP aims to dip into the market for small solar PV residential (rooftop) plants within South Africa. In order to prepare the local market for this demand, EGP has developed two skills programmes, together with the Master Artisan Academy SA. These skills programmes are initiated by EGP, licensed by Enel University (Italy), and delivered by the Master Artisan Academy SA. The programme will offer two courses, free of charge: a PV Rooftop Installer Course and PV Enterprise and Sales Development Course (Enel Green Power, n.d.).

Q Case Study 2: Greening TVET Initiative, Northlink College

The Greening TVET Colleges Initiative in South

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Africa, jointly implemented by DHET and GIZ, aims to incorporate a variety of green skills into TVET colleges in South Africa. While the initiative is still small-scale, the successful implementation of its pilot programme points to a hopeful future for green skills development at all levels. It remains to be seen whether the project is scaled up and whether it will kickstart a greener focus of the sector. Since 2013 Northlink College in Cape Town has been one of the seven TVET colleges participating in the initiative, with green skills development becoming a key element of Northlink's profile and priorities (H. Snyders, pers comm, 2017). The employees participating in the initiative were sent for training in Germany, funded by GIZ.

Green curriculum and learning-by-doing

The curriculum design for the Greening TVET Initiative was drawn up by DHET and GIZ in collaboration, so that the colleges are (at least in principle) following the same curriculum. Northlink College offers the NC(V) Renewable Energy Technology programme, which includes training to install and maintain solar PV systems, solar thermal systems, and wind turbines. Additionally, the college offers a number of short courses on these technologies for already qualified technicians who wish to upgrade their skills levels.

Much of the focus at the college is on the institution's own energy consumption and environmental footprint, leading to several initiatives including power saving for lighting and computers, and recycling of most teaching materials. Taking advantage of the learning-by-doing principle of TVET colleges and the switch towards greening of its own facilities, Northlink allows students to design and implement many of the changes towards more environmentally-friendly technologies on the campus. Students thus get hands-on experience in relevant technologies. Examples include replacement of conventional lights with LEDs, a GIZ-sponsored installation of two wind turbines, and a solar PV installation. Classroom and practical training is designed to create a realistic work setting to illustrate future work scenarios. Currently underway is the construction of a building with a roof dedicated to solar PV instalment training to simulate a real-life instalment situation. Students

also receive hands-on training with e-mobility technologies (generating power from a bicycle - later planned to be converted into an electric bicycle), and fuel cell technology. The college is currently experimenting with development of water desalination technology.

Employability

Given the relatively small renewables sector in South Africa and with few suppliers of the technology used in the renewable energy training at the college, Northlink has been able to build strong connections with these businesses. The college is also part of SARETEC, located nearby, which facilitates networking of likeminded people, including employers. There are several examples of students being offered employment at renewable energy companies after training or visits, including:

- ▶ Class of four brought to the Klipheuwel-Dassiesfontein Wind Energy Facility (BioTherm) outside Caledon, after which the company offered all four students employment
- ▶ Students placed at an electrical company for solar PV in Saldanha; after the placement the company offered all 12 students employment
- ▶ 11 students who helped build a wind farm in Caledon for CAPEAFRICA are now employed by the company and working in Mozambique

Feedback from companies indicated that students trained at the college are adequately trained for the industry. Given that the renewables courses and programmes are also based on electrical training, students who graduate from them end up with a versatile skillset. The examples given and the feedback from employers suggests that the renewable energy training and green skills developed at the TVET college increases students' employability and hence points to the success of the programme.

Knowledge dissemination

Northlink College is committed to spreading the knowledge and skills obtained from the Greening TVET Colleges Initiative to other TVET colleges and the community surrounding the college. For instance, during the last school

holidays Northlink trained lecturers from other TVET colleges across the country in solar thermal technology. Furthermore, with the help of the Philips group, the college filmed an instructional video on solar PV technology. This video is intended to be shared widely in other developing countries to spread knowledge of the technology.

Challenges

The number of students participating in the greening programme and courses is still very small: since 2013 only about 120 students have undergone training in renewable energy technology. (In contrast, about 2 000 students regularly attend Northlink College at the Belhar campus). One reason given for these small numbers is the cost of these programmes, which is said to be too high to allow the school to cater for more students. It requires new and costly technology, as well as expensive overseas training for the educators. Despite financial support from GIZ, the college itself contributed ZAR 600 000 to setting up the programme. Acquiring and keeping competent personnel is also an issue; some of the personnel who have received the renewables training transfer to other sectors. Lastly, lack of capacity is a challenge. There is high demand for renewables training both for prospective students and for businesses who wish to place employees at Northlink for short course training, but the Northlink campus is too small to meet the demand.

Q Case Study 3: National Cleaner Production Centre of South Africa

The various training programmes hosted by the National Cleaner Production Centre of South Africa (NCPC-SA) are an example of a government programme which successfully uses its competencies in research and practice, as well as its connections with business, to develop green skills in the economy. The NCPC-SA heads both an internship programme, as well as training programmes aimed at various levels: introductory, technical, and expert levels. NCPC-SA identifies skills needs based on whatever is relevant for the industry, in another skills identification process that appears to fall

outside the SETAs. Identification of green skills is specifically guided by the DTI and the IPAP. The Centre has trained about 4 000 people since 2006. The NCPC-SA's main focus is on working with industry to meet its need for skills, but in recent years the Centre has also been receiving requests for skills development partnerships from DEA, the commercial sector and local government.

Internship programme

The NCPC-SA internship programme is a capacity-building programme which aims to equip young graduates with skills and experience aimed at greener production. It places engineering graduates in companies to “evaluate and monitor energy, water and material usage ... [and] waste management, whilst being mentored by industry experts” (NCPC-SA, 2014). The six-month programme was launched in 2009 and aims to equip unemployed graduates with experience and skills in “the implementation of resource efficiency and cleaner production methodologies and techniques” (NCPC-SA, 2014). It focuses on four key sectors: i) clothing, textiles, footwear and leather; ii) chemicals, plastic fabrication, cosmetics, and pharmaceuticals; iii) automotives; and iv) agro-processing.

The combination of training, mentoring, and industry experience is designed to increase the interns' chances of obtaining future employment. Between 2010 and 2013 83% of the interns had found employment within the RECP space (Engineering News, 2013). Not only do the host companies improve the green profile, but the interns identify saving opportunities (mostly in terms of energy and water) which benefit the companies.

Training courses through the Industrial Energy Efficiency Improvement (IEE) Project

The IEE project was initiated in 2010 and is a collaboration between the DTI, the DoE, the DEA and Business Unity South Africa (BUSA), together with the UNIDO and the Swiss State Secretariat for Economic Affairs. It is hosted by the NCPC-SA. Through the IEE project the NCPC-SA offers training courses in energy management systems

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(EnMS) and energy systems optimisation (ESO). The courses are available at end-user and expert levels. The end-user courses are shorter courses aimed at technical professionals, while the expert-level courses span several months, with candidates becoming UNIDO-certified energy experts.

RECP Training Courses

Resource Efficiency and Cleaner Production (RECP) training courses offered by the NCPC-SA are currently subsidised by the IEE project. These courses were developed and funded by the DTI, as mandated in the IPAP 2016/17-2018/19. The training courses are focused on providing industry with a systemic and integrated approach to more efficient utilisation of resources, mainly focusing on water, energy and waste management. RECP's ultimate goal is meeting human consumption needs while also respecting the capacity of the environment, through producing more with fewer resources. Successful implementation of RECP is measured by the reduction of resources and environmental impact per unit of production of goods and services over their life-cycle (NCPC-SA, n.d.). Similar to the IEE courses, the RECP Training Courses are offered at both end-user and expert levels. The end-user level courses give trainees skills that enable them to initiate the development and implementation of RECP, while expert-level courses provide skills for adoption of RECP within industry (NCPC-SA, n.d.). Specifically, expert-level trainees are expected to gain practical experience in implementation and review of RECP, as well as RECP performance reporting.

Environment, Water and Ecosystems

Q Case Study 4: Expanded Public Works Programmes and Working for Water

Much government policy is focused on addressing South Africa's large and persistent problems of unemployment and

underemployment. Existing active labour market policies include promotion of SMMEs, a youth wage subsidy, the Expanded Public Works Programme (EPWP) and the training layoff scheme (TLS). Of the foregoing, the EPWP is South Africa's active labour market intervention with the strongest "green economy profile", as many of the projects and job opportunities that are part of the scheme have a clear environmental focus. It is a longstanding programme which is currently in its third phase (2014-2019). Phases 1 and 2 took place between 2003/4 and 2008/9 and between 2009/10 and 2013/14 respectively.

While phase 1 met its goal of creating 1 million work opportunities a year ahead of time (its final number of work opportunities was 1.6 million), phase 2 fell short of its ambitious goal of 4.5 million work opportunities. At the end of the phase it had created approximately 4.07 million. Phase 3 of the EPWP aims to have created 6 million work opportunities, of which 1.15 million are in the Environment and Culture Sector. This sector employs people to "work on projects to improve their local environment", and includes programmes such as Working for Water (WfW) and Working for Wetlands. An integral part of EPWP is skills development. Currently the DEA is in the process of negotiating a collaboration agreement with the Energy and Water SETA (EWSETA), aimed mainly at accessing funds for skills development under the WfW programme through the SETA mechanism.

WfW is a programme created through a consultation and collaboration process involving stakeholders from civil society, academia and government. At the same time several aspects of the national policy environment contributed to its momentum, such as the development of the National Water Act (1998), which was innovative in that it included a wide variety of social and ecological considerations (PAGE, 2016). WfW is a labour-intensive programme focusing on mechanical clearance of mountain catchments and riparian zones of water-thirsty alien invasive species, whilst creating jobs at the same time (Turpie et al., 2008). The success of the programme has been largely attributed to the 'poverty-relief focus', although water users also contribute through water tariffs.

The importance of this work is significant, not only in terms of job creation, but for ecosystem preservation, which is critical for vulnerable rural communities. Given South Africa's water scarcity discussed in Section 1, the country is becoming increasingly dependent on the preservation and rehabilitation of water catchments and natural "water factories" (WWF-SA, 2012). However, alien invasive species have been identified as water guzzlers, consuming considerably more water than indigenous species. This makes the large-scale clearing of alien invasive species critical for ensuring the conservation of valuable water resources. The WfW programme thus simultaneously promotes job creation and social enterprise opportunities for some of the most vulnerable people in South Africa, whilst also protecting the fragile ecosystems that sustain them. For instance, the WfW programme promotes jobs and skills in low-income communities, through setting up furniture manufacturing from invasive alien species.

The WfW programme created over 55 000 jobs in the 2014/2015 financial year and the family of EPWPs have altogether created more than 227 100 person years of employment across South Africa. During the 2012-2015 period more than half of the employment opportunities created were for women and more than 60% of women involved were younger than 35 years of age (DEA, 2015). The WfW programme has more than 300 ongoing projects across South Africa through which more than a million hectares of invasive plants have been cleared (PAGE, 2016). Apart from creating jobs and developing competencies at low skills levels, WfW is also considered a success in promoting green skills development at a higher level, with "one of the key competencies identified being the ability of its leaders and senior managers to 'make the case' that it should be supported" (PAGE, 2016).

Stimulated by the success of the Working For programmes such as WfW, the DEA is adding a new initiative aimed at youth to its EPWP portfolio in the ecosystem services, biodiversity and water domain. The Groen Sebenza (meaning "green work") initiative is particularly interesting in terms of green skills development. It is a skills development and job creation programme run by the DEA and SANBI with the aim of "developing skills and bridging the gap

between education and job opportunities in the biodiversity sector" (DEA, n.d.). The initiative includes partnerships with 33 environmental and biodiversity-focused organisations from the government, business, academia and NGO sectors. The R300 million project is funded by the Development Bank of Southern Africa's Job Fund. It is based on an "incubator" model, and provides a structured 2.5-year programme for its 800 pilot project participants which includes mentorship, skills development and training opportunities.

Q Case Study 5: Water Resource Management in South Africa

Trans-disciplinary water resource management (WRM) skills have been, until recently, largely neglected in the South African water sector. The water resource management landscape is dominated by technical and engineering approaches to resource management problems. The institutionalisation of this dominant knowledge paradigm has undermined alternative forms of knowledge and disciplinary skillsets relevant to WRM (Swatuk, 2011). The latest National Water Resource Strategy (NWRS, 2013) recognised the dire need to develop a multi-disciplinary WRM skillset throughout the public and private sector in South Africa.

Young Water Professionals Programme

The Young Water Professionals South Africa (YWP-ZA) programme was initiated under the International Water Association (IWA) and Water Institute of Southern Africa (WISA). YWP-ZA is focused on bringing all people working in the water sector together in a meaningful way to foster career development and networking opportunities. The programme's objective is to contribute to the present and future needs of the water and wastewater industries, which require the continuous development of a workforce which is adequate in size, appropriately skilled and possessing strong leadership (Burgess, 2010). Graduates working or studying in the water sector who are under the age of 35 years can apply to join YWP-ZA free of charge. The focus on high-level skills and career development (i.e. graduate and higher) is highly relevant to the

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complex South African WRM landscape that requires the integration of a range of skilled backgrounds.

YWP-ZA works closely with numerous public and private institutions around the country to provide skills development opportunities to its members. A recent association with the South African Water Research Commission led to the production and publication of a Publishing for Young Water Professionals Guide (Olsson and Maherry, 2017). Numerous YWP Publications Workshops were held to simultaneously promote skills development through shared learning and ultimately develop a practical guide to navigating the convoluted nature of academic and professional publishing in the global water sector.

Water Sector Partnerships

Numerous partnerships between public, private and non-governmental organisations are contributing to the development of the South African economy through sustainable water management, while simultaneously developing sorely-needed green skills. A key example of this is the collaboration between the World Wildlife Fund (WWF-SA) and Royal Danish Embassy to improve water security, job creation and skills development in South Africa (WWF, 2015). Numerous projects focused on innovation and skills development at different scales were funded and implemented through this partnership. One such initiative is the collaboration between the Danish company Haldor Topsoe and Eskom to integrate the trademarked SNOX process into Eskom's coal power plants to reduce levels of the greenhouse gas sulphur oxide (SOx). South African partnerships were identified as a key factor in ensuring skills transfers and local development of technical green skills.

Waste Management

Q Case Study 6: Skills Development in Waste Management

South Africa faces significant challenges in relation to sustainable waste management owing to a number of factors such as high population growth and rising levels of urbanisation. These issues are placing increasing pressure on the country's available landfill space. On the other hand new business opportunities have opened up, arising from issues with current regulatory processes such as the long time it takes for a new landfill to be licensed, as well as in determining the types of waste which can legally be disposed of at a landfill (Earthworks, 2015). However, new attitudes to the perception of waste – as a resource, as opposed to simply as a burden on the environment – are required for these opportunities to be tapped into (Earthworks, 2015).

Considering the high unemployment levels in South Africa, the waste sector has also been targeted by the government with a job creation objective: the National Waste Management Strategy (2011) set a goal for 69 000 new jobs to be created in the waste sector by 2016 (DEA, 2011). This highlights the fact that in South Africa the waste sector has been recognised as an emerging sector with the potential to create employment, while also absorbing unskilled labour (DST, 2014b). The key to unlocking this potential is in creating initiatives along the entire waste management value chain, while at the same time moving up the waste hierarchy from the predominant waste disposal at landfills towards recycling and reuse (i.e. the circular economy and life cycle approach).

Initiatives relating to improved waste management can contribute to the green economy in a number of ways: i) by contributing to resource efficiency through re-use and recycling; ii) by contributing to economic growth and job creation, fostering innovation and business development; and iii) by reducing the environmental and socioeconomic (health) costs of landfill disposal (DST, 2014a). Addressing waste

management along the entire value chain has implications at both low- and high-skill levels.

Low-level Skills Development: Informal Recycling

In a recent report by the Department of Environmental Affairs (DEA, 2016), it is estimated that approximately 62 147 people work as waste pickers in South Africa. Of this total 36 680 operate at landfills, while 25 467 are ‘trolley pushers’ who move around built-up areas collecting useful waste and recyclables using a supermarket trolley. The report further finds that the majority (88%) of waste pickers are working on an individual basis, while 12% belong to a cooperative (of which 9% belong to the Waste Pickers Collective). This means that the work is mostly informal and unorganised. These waste pickers work primarily in urban areas, and fill a gap in the country’s waste management system arising from the disconnect between the formal legislative framework for waste collection and the reality on the ground (Sentime, 2014). Thus waste pickers play an important role by increasing the level of recycling in cities and towns and reducing the amount of landfill. However, informal waste collection is not recognised by the legislative framework and waste pickers are often stigmatised by the public rather than seen as an important resource and key players in the waste economy.

One of the four key policy recommendations from the Green Fund/ITC-ILO course on Green Jobs in the South African waste sector is to “integrate the informal sector into the waste economy” (Green Fund, 2016, p.8). An important part of this is to recognise and integrate the work of informal waste pickers, something that has been successfully been done in, for instance, Brazil (ILO, 2013). Doing so has the potential to fulfil several important developmental objectives as recognised in the 2011 National Development Plan (NDC, 2011), including establishing South Africa as an inclusive society, creating more jobs for unskilled workers, and developing a zero-waste economy.

A recent CSIR study reported that, while the informal sector plays an important role in the recovery of recyclables at little to no cost, and creates direct benefits for government and

industry, there is currently no formal method for integrating the informal waste sector into the economy (Godfrey et al. 2016). The study outlines possible scenarios of integration, while taking account of the fact that the approach will probably combine several options. There are different suggestions as to who will be responsible for training and skills development, ranging from government to business, in the formal waste sector.

Despite the job creation and development potential, there is currently no national-level mechanism for skills development in the informal waste sector. Currently there are a number of small-scale local-level initiatives, often organised by Civil Society, aimed at training and building up the capacity of informal waste pickers. Examples of these are the Sediberg Recyclers Association, which runs workshops to provide waste pickers with soft skills, and the Waste Recycler’s Project in Gauteng, which develops initiatives for capacity-building and skills transfer to informal waste recyclers, with the aim of improving their sustainable income-earning potential (Mail and Guardian, 2016 and Daily Maverick, 2017).

High-level Skills Development: RDI Roadmap

South Africa’s Waste Research, Development and Innovation Roadmap (Waste RDI Roadmap) is guided by the National Waste Management Strategy (2011) and the Waste Management Act (2008) and it supports the country’s developmental goals as outlined in the NDP, IPAP and Green Economy Accord. The objective of the Roadmap is to stimulate innovation, research and development, and human capital development in the waste sector. Through investments in science and technology, the Roadmap is aimed at maximising the economic, social and environmental benefits from a move up the waste hierarchy. The Roadmap is a strategic initiative of the Department of Science and Technology (DST), and the process of its development was started in 2012 and led by the Council for Scientific and Industrial Research (CSIR). The process involved stakeholder consultation as well as a number of baseline studies which, among other conclusions, identified a lack of the necessary skills and

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capacity to address the objectives outlined above.

To address this issue, the DST and CSIR Capability mapping report engaged with universities to develop a number of post-graduate degrees. Seed funding for two degrees was provided by the DST. Target universities were identified based on a capacity assessment, with a specific focus on universities with existing degrees in the field of environmental management. The North-West University (NWU) was selected, as it was already offering a degree which formed a basis for the new BSc Honours Environmental Sciences with specialisation in Waste Management. The Honours degree has been on offer at NWU since 2015. The second selected university was the University of Kwa-Zulu Natal, where a MSc Eng in Waste Management was developed as a new degree, which was approved by the South African Qualifications Authority (SAQA). However, this degree is still under consideration by the Council of Higher Education (CHE). Among other stakeholders the private sector was involved in the development of the curricula and materials for the courses and has also provided experts who teach some of the classes offered in the degree courses.

According to the head of the Roadmap Implementation Unit, Dr Godfrey, the skills development aspect of the Roadmap process has already had positive outcomes. Since the development of the degrees in 2015, more than 50 students have gained postgraduate degrees in Waste Management. The Roadmap as a whole has been successful in increasing the levels of RDI funding in the waste sector. At the same time it has faced challenges in influencing a larger number of public sector stakeholders involved in Waste Management, owing to a qualifications gap. Despite a high level of interest in the postgraduate degrees, people are often not able to apply for them because they lack the necessary undergraduate degree, despite having extensive knowledge and experience gathered through years of working in the waste management sector.

General Green Skills Development Support

Q Case Study 7: Green Skills Project (2015-2017)

Green Skills is a project of the National Environmental Skills Development Planning Forum (NESDPF), led by Rhodes University and funded through the Green Fund. The project has brought together various skills development stakeholders such as research institutions, private sector employers, funders, government departments and SETAs across all sectors. The purpose of the platform is to build up the capacity of the national system to identify and integrate green skills needs and development, focusing specifically on the post-school development system (Green Skills, n.d.a). The project offers various initiatives in support of this objective, such as the Mapping of Green Occupations and the OFO, which aims to provide assistance to employers, SETAs and DHET in developing a better approach to identifying green skills in specific segments of the green economy. The work of the NESDPF through the Green Skills Project marks a shift in the approach to green skills development specifically by DEA, as one of the lead institutions in this initiative. In 2010 DEA's approach to skills development was largely based on the ESSP as a sectoral plan. Today the work of the Green Skills Project indicates DEA's understanding that there is a need for a cross-sectoral approach to green skills development. That is why the main focus of the work that NESDPF is doing is working with SETAs to enable them to identify and develop green skills in their respective sectors.

Another initiative, part of the Green Skills Project is the Green Skills Research New Knowledge Field Development, which maps the green skills methodologies currently being used by various sectors and institutions. A series of seven case studies was developed through this initiative, which is led by researchers from Rhodes University and the African Climate and Development Initiative (ACDI) at the University of Cape Town (UCT). These case studies provide examples of green skills research methodologies across various sectors such as water and mining,

as well as various skills mechanisms such as the DHET Occupations in High Demand mechanism.

Under all initiatives of the Green Skills Project, a green skill is understood as any skill which is needed in support of better management of and care for the environment (note that this definition is broader than what is understood by green skills in the current report.) Most significantly, this definition does not address the need for a drive towards sustainable development and ensuring that green skills “contribute to preserving or restoring the quality of the environment while also meeting requirements of decent work - adequate wages, safe conditions, workers’ rights, social dialogue and social protection” (UNEP, ILO, IOE, ITUC, 2008).

The Green Project Initiative was involved in an assessment of the degree to which green skills development featured in the SSPs of each SETA, which fed into the 2010 Enabling Document by the NESDPF. Among the main outputs by the initiative is also a toolkit, complementing the Enabling Document - “A Source Book to Support Skills Planning for Green Economies” (2017). The purpose of the source book is to equip skills planning institutions (mainly targeting SETAs) with a range of methodologies and analytical frameworks. These can assist them in working with employers to identify and anticipate green skills needs and incorporate them into OFO occupational descriptors and SSPs (Ramsarup and Ward, 2017). The source book is intended to be complemented by a set of templates and checklists, which will assist during fieldwork as part of the skills identification process.

This year, through the Green Skills Project, the first Green Skills Course was organised for the purpose of developing the ability of stakeholders from various skills development institutions (such as SETAs, NCPC and other relevant government entities) to make the case for “greens”. The course is funded by the Green Fund and is ultimately aimed at strengthening the system’s ability to coordinate the anticipated development of green skills. While some progress has been made through similar initiatives since 2010, with 17 out of 21 SETAs today referring to green skills considerations in their SSPs, challenges still remain. One of the main challenges identified by the stakeholders is the lack both of a common definition of green skills and of a method of categorising them.

Annex 3: Green Occupations and the 2015 OFO

Table 2. Green occupations identified in the 2015 OFO

OFO Green Occupations

	OFO CODE	DESCRIPTION
1	2015-132105	Power Generation Production / Operations Manager
2	2015-134901	Environmental Manager
3	2015-143901	Facilities Manager
4	2015-211101	Physicist
5	2015-211401	Geologist
6	2015-211402	Geophysicist
7	2015-213105	Biotechnologist
8	2015-213201	Agriculture Consultant
9	2015-213202	Agricultural Scientist
10	2015-213301	Conservation Scientist
11	2015-213302	Environmental Scientist
12	2015-213304	Earth and Soil Scientist
13	2015-213305	Air Pollution Analyst
14	2015-213306	Water Quality Analyst
15	2015-213307	Park Ranger
16	2015-213308	Brownfield Redevelopment Specialist
17	2015-214101	Industrial Engineer
18	2015-214102	Industrial Engineering Technologist
19	2015-214201	Civil Engineer
20	2015-214202	Civil Engineering Technologist
21	2015-214301	Environmental Engineer
22	2015-214302	Environmental Impact and Restoration Analyst
23	2015-214401	Mechanical Engineer
24	2015-214402	Mechanical Engineering Technologist
25	2015-214501	Chemical Engineer
26	2015-214502	Chemical Engineering Technologist
27	2015-214601	Mining Engineer
28	2015-214602	Mining Engineering Technologist
29	2015-214603	Metallurgical Engineer
30	2015-214604	Metallurgical Engineering Technologist
31	2015-214605	Metallurgist
32	2015-214607	Petroleum Engineer

33	2015-214904	Quantity Surveyor
34	2015-214905	Agricultural Engineer
35	2015-214906	Agricultural Engineering Technologist
36	2015-214907	Materials Engineer
37	2015-214908	Materials Engineering Technologist
38	2015-214909	Microsystems Engineers
39	2015-215101	Electrical Engineer
40	2015-215102	Electrical Engineering Technologist
41	2015-215103	Energy Engineer
42	2015-215104	Energy Engineering Technologist
43	2015-215201	Electronics Engineer
44	2015-215202	Electronics Engineering Technologist
45	2015-216101	Architect
46	2015-216201	Landscape Architect
47	2015-216401	Urban and Regional Planner
48	2015-216502	Surveyor
49	2015-263101	Economist
50	2015-263203	Geographer
51	2015-311101	Chemistry Technician
52	2015-311102	Physical Science Technician
53	2015-311201	Civil Engineering Technician
54	2015-311202	Surveying or Cartographic Technician
55	2015-311203	Town Planning Technician
56	2015-311301	Electrical Engineering Technician
57	2015-311302	Electric Substation Operations Manager
58	2015-311401	Electronic Engineering Technician
59	2015-311501	Mechanical Engineering Technician
60	2015-311601	Chemical Engineering Technician
61	2015-311702	Metallurgical or Materials Technician
62	2015-311704	Geophysical Technician
63	2015-311905	Industrial Engineering Technician
64	2015-313102	Fossil Power Plant Process Controller
65	2015-313103	Hydro Power Plant Process Controller
66	2015-313104	Nuclear Power Plant Process Controller
67	2015-313105	Wind Turbine Power Plant Process Controller
68	2015-313106	Concentrated Solar Power (CSP) Plant Process Controller
69	2015-313107	Geothermal Technicians

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70	2015-313108	Weatherisation Installers and Technicians
71	2015-313201	Water Plant Operator
72	2015-313202	Waste Materials Plant Operator
73	2015-313301	Chemical Plant Controller
74	2015-314102	Environmental Science Technician
75	2015-314201	Agricultural Technician
76	2015-314301	Forestry Technician
77	2015-314302	Forestry Research Technician
78	2015-325701	Environmental and Occupational Health Inspector
79	2015-325702	Marine Safety Officer
80	2015-325703	Agricultural / Horticultural Produce Inspector
81	2015-332202	Sales Representative (Building and Plumbing Supplies)
82	2015-335905	Water Inspector
83	2015-335906	Environmental Practices Inspector
84	2015-335912	Fisheries Officer
85	2015-335913	Building Inspector
86	2015-642401	Building Insulation Installer
87	2015-642601	Plumber
88	2015-642602	Solar Installer
89	2015-642605	Plumbing Inspector
90	2015-642606	Heat Pump Installer
91	2015-671101	Electrician
92	2015-671102	Electrical Installation Inspector
93	2015-831309	Lagger
94	2015-852101	Street Vendor
95	2015-861101	Recycling or Rubbish Collector
96	2015-861201	Refuse Sorter

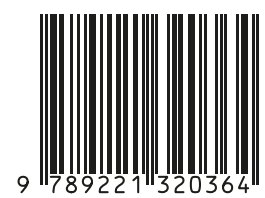
Table 3. Occupations Requiring Green Skills, Identified in the 2015 OFO**Green Skills**

	OFO CODE	DESCRIPTION
1	2015-121909	Sustainability Manager
2	2015-122103	Director of Marketing
3	2015-122301	Research and Development Manager
4	2015-131101	Agricultural Farm Manager
5	2015-132101	Manufacturer
6	2015-132102	Production / Operations Manager (Manufacturing)
7	2015-132104	Engineering Manager
8	2015-132201	Production / Operations Manager (Mining)
9	2015-132202	Mineral Resources Manager
10	2015-132203	Rock Engineering Manager
11	2015-132301	Construction Project Manager
12	2015-132302	Project Builder
13	2015-132401	Supply and Distribution Manager
14	2015-132403	Road Transport Manager
15	2015-134915	Operations Manager (Non Manufacturing)
16	2015-211201	Meteorologist
17	2015-214103	Production Engineer
18	2015-214104	Production Engineering Technologist
19	2015-214403	Aeronautical Engineer
20	2015-216402	Transport Analyst
21	2015-226301	Environmental Health Officer
22	2015-226302	Safety, Health, Environment and Quality (SHE&Q) Practitioner
23	2015-242207	Compliance Officer
24	2015-242208	Organisational Risk Manager
25	2015-242402	Occupational Instructor / Trainer
26	2015-243301	Sales Representative / Salesman (Industrial Products)
27	2015-243302	Sales Representative (Medical and Pharmaceutical Products)
28	2015-311303	Energy Efficiency Technician
29	2015-311901	Forensic Technician (Biology, Toxicology)
30	2015-311906	Environmental Engineering Technician
31	2015-313913	Chemical Waste Controller
32	2015-313916	Manufacturing Production Technicians
33	2015-325705	Safety Inspector
34	2015-351302	Geographic Information Systems Technicians

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35	2015-524904	Energy Broker
36	2015-541102	Hazardous Materials Removal Workers
37	2015-621102	Forest and Conservation Workers
38	2015-641101	House Builder
39	2015-641502	Carpenter
40	2015-642607	Pipe Fitter
41	2015-642701	Air-conditioning and Refrigeration Mechanic
42	2015-653101	Automotive Motor Mechanic
43	2015-653109	Automotive Engine Mechanic
44	2015-653202	Aircraft Structures Worker
45	2015-653301	Industrial Machinery Mechanic
46	2015-653306	Diesel Mechanic
47	2015-671206	Electrical Equipment Mechanic
48	2015-671301	Electrical Line Mechanic
49	2015-714202	Plastic Compounding and Reclamation Machine Operator
50	2015-718201	Boiler or Engine Operator
51	2015-821403	Indoor Plant Worker

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