



Employment and Labour Market Analysis (ELMA) in South Africa

Focus on Just Transition



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TABLE OF CONTENTS

Executive Summary	8
1.Introduction	14
2. Framework Condition	17
2.1 Geography	17
2.2 Governance, Political and the Institutional Situation	17
2.3 Economic Development	18
2.3.1 General Economic Output	18
2.3.2 Economic development trajectory trend with implicants for employment	18
2.3.3 Deindustrialisation	21
2.4 Business Environment	21
2.5 Macroeconomic Stability and Economic Development	22
2.6 Wage Formation	22
2.7 Environmental Issues	23
2.8 Gender issues in South Africa	24
2.9 Demography and Migration	24
2.10 Green Economy	26
2.11 Summary of Constraints & Opportunities	28
3. Labour Demand	31
3.1 Employment Situation	31
3.1.1 Unemployment Rate	31
3.1.2 Employment Elasticity	31
3.1.3 Race Groups	32
3.1.4 Women	32
3.1.5 Youth	33
3.1.6 Labour Force Participation	34
3.2.1 Spatial Employment Situation	35
3.2.2 Urban and Rural Unemployment	36
3.2.4 Employment in Formal and Informal Sector	36
3.3 Sectoral Employment	37
3.3.1 General	37

3.3.2 Green Sector Labour Mket Trends.....38
3.3.2.2 Renewable Energy	40
3.3.2.3 Green Hydrogen	45
3.3.2.4 New Energy Vehicles	47
3.3.2.5 Agriculture	48
3.3.3 High Level Synthesis related to JET sectors demand	52
3.3.3.1 Renewables (Wind and Solar).....	52
3.3.3.2 Green Hydrogen	53
3.3.3.3 NEVs	53
3.3.3.4 Agriculture	53
3.4 Summary of Constraints and Opportunities.....	55
4. Labour Supply	57
4.1 Overview and Key Issues.....	57
4.2 Framework and Permeability of Education and Vocational Training.....	58
4.2.1 Overview of the skill formation system.....	58
4.2.2 School System.....	60
4.2.3 Technical and Vocational Education and Training.....	60
4.2.3.1. The qualifications issue:	61
4.2.3.2. Changing institutional forms	61
4.2.4 Universities.....	64
4.2.5 Other Formal, Non-Formal and Informal Training.....	65
4.2.5.1 Community Colleges	65
4.2.5.2 Skills Development Providers.....	65
4.3 Provision Oriented to Green Jobs.....	66
4.4 Constraints and Opportunities.....	70
5. Matching	72
5.1 Information on Labour Market	72
5.1.1 Institutions for coordinating the alignment of skills supply and demand	72
5.1.2 Labour Force Information (Skills Anticipation)	73
5.2 Active Labour Market Measures	76
5.3 Passive Labour Market Measures.....	79
5.4 Sample of Interventions by Green Sector	81

5.5 Constraints and Opportunities.....	86
6. Recommendations: Plans,Projects and Possibilities	88
6.1 Areas of the Labour Market.....	89
6.1.1 Framework Conditions.....	89
6.1.2 Labour Demand	92
6.1.3 Labour Supply	94
6.1.4 Matching.....	96
6.2 Next Steps	98
Annex 1: Glossary	99
Annex 2: List of Identified Renewable Energy, Green Hydrogen and Electric Vehicle Courses	107
Annex 3: Occupational Changes/ potential occupations in the new energy vehicles, renewable energy, green hydrogen and agriculture sectors	134
Annex 5: Artisan through put	143
Annex 6: References.	146
Annex 7: Resourse Persons	157

LIST OF FIGURES AND TABLES

List of Figures

Figure 1: ELMA Scope and Limitations.....	16
Figure 2: Employment in Agriculture in South Africa (share of men & women's employment) 2008-2022.....	20
Figure 3: Number of employed and unemployed (millions) 1995-2019.1.2 Employment Elasticity.....	31
Figure 4: Employment Shares by Occupation and Gender, 2022.....	33
Figure 5: Employment Expansion by Sector, 1995-2004.....	37
Figure 6: % of employees that reported having a permanent position in the coal mining sector in 2017.....	44
Figure 7: Skill levels of green hydrogen occupations in demand.....	46
Figure 8: Agricultural jobs by subcategory.....	49
Figure 9: Employment by Gender.....	50
Figure 10: Percentage distribution of informal employment by sector and sex, 2013 and 2019.....	50
Figure 11: Gross value-added evolution between planned energy scenarios & 1.5 C Scenario in US\$ 2019 million (left panel), in percentage (right panel), by sector.....	51
Figure 12: South Africa's skill formation system.....	59
Figure 13 South Africa's National Qualification Framework.....	59
Figure 14: Gender distribution across fields of Education.....	64.
Figure 15: Total Courses Offered by Topic.....	66
Figure 16: Geographical Distribution of Total Courses Identified.....	67
Figure 17: Courses Offered by Provider Type and Course Topic.....	67
Figure 18: Levels of Qualification and Number of Courses Offered.....	68
Figure 19: Sustainable agriculture related courses by level of qualification.....	69
Table 14: Sample of SETA Interventions.....	84

List of tables

Table 1: Migrant numbers in the SADC region	25
Table 2: Constraints and Opportunities of Framework Conditions	28
Table 3: Employment Elasticity to Economic Growth.	32
Table 4: Unemployment Rate by Province	35
Table 5: Employment by Industry, 2023	38
Table 6: Employment estimates by green economy categories and segments	39
Table 7: Selected energy employment figures, with a focus on electricity.	41
Table 8: Employment per area during construction of each solar facility	44
Figure 9: Agricultural jobs by subcategory	49
Table 10: Constraints and Oppurtunities of Labour Demand	55
Table 11: Constraints and Opportunities of Labour Supply	70
Table 12: Sample of Interventions by Sector	81
Table 13: Sample of Interventions by Development Agency	82
Table 15: Constraints and Opportunities of Matching	86
Table 16: Recommendations Framework Conditions	91
Table 17: Recommendations Labour Demand.	93
Table 18: Recommendations Labour Supply	95
Table 19: Recommendations Matching.	97
Table 20: List of Identified Courses on Renewable Energy, Green Hydrogen and Electric Vehicle	107
Table 21: Occupations at Risk of Elimination as the Automotive Sector Shifts to New Energy Vehicles.	135
Table 22: Transforming Occupations in the New Energy Vehicles Sub-Sector.	136
Table 22: Transforming Occupations in the New Energy Vehicles Sub-Sector.	137
Table 23: Emerging Occupations in the New Electric Vehicles Sub-Sector	138
Table 24: Required occupations for the renewable energy sector	139
Table 25: The potential occupations and skills required for green hydrogen	140
Table 26: List of agriculture-related occupations that could play a key role for the just transition.	142
Table 27: Resources Persons	157

ACRONYMS

ERRP	Economic Reconstruction and Recovery Plan
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit German Corporation for International Cooperation
JETIP	Just Energy Transition Partnership
NDC	Just Energy Transition Investment Plan
VET	Nationally Determined Contributions
CBAM	Carbon Border Adjustment Mechanism
DEA	Department of Environmental Affairs
ELMA	Employment and Labour Market Analysis
EU	European Union
GDP	Gross Domestic Product
ILO	International Labour Organisation
JET	Just Energy Transition
JETP	Just Energy Transition Partnership
JETIP	Just Energy Transition Implementation Plan



Executive Summary

This report determines the key challenges to matching supply and demand in the South African labour market related to a sustainable and socially just energy transition. Its goal is to determine which interventions could support the sector's job creation.

To do this, it provides three sets of information and analysis about the workings of the green economy. The report discusses South Africa's employment generation challenges, how the labour market is evolving, and what factors enable or inhibit the just transition. These comprehensive labour market and employment analyses highlight the most important sectors contributing to just job creation and identify possible opportunities and barriers to realising these objectives. Second, it analyses the education and training system to understand how it supports labour market needs.

The central reference is the enablement of a green and just transition, and the mechanisms and institutions for matching supply and demand. Part of the recommendations focus on where provision is currently responsive and how responsiveness can be improved. The report outlines how supporting institutions can create flexibility and dynamism in their governance and regulatory systems to enable a just transition.

What emerges clearly from this employment and labour market analysis (ELMA) is that while changes can be made to the 'supply side' as well as the 'matching' mechanisms for people exiting the education and training system, the challenges of job creation in South Africa are not primarily about the skills and other capacities of jobseekers. Indeed, unemployment is due to a lack of worker demand, with increasing unemployment across all educational levels. The report proposes high-level recommendations to systemically address the root causes of the lack of jobs, with a view to solving this and building a green and just transition.

There have been some positive improvements in certain sectors of the economy, and an extensive social grant system has been implemented. South Africa has a progressive constitution that enshrines socioeconomic rights. It has implemented good socioeconomic policies like free schooling, social grants, and free basic health-

care. Nevertheless, South Africa's economy faces many entrenched crises, including unemployment, high levels of crime, extreme gender-based violence, a highly unequal education and training system, large backlogs in infrastructure and social services, corruption and maladministration.

There is a relatively strong education and training provision system and a complex regulatory system for coordinating that provision to make it responsive. These systems seem fairly responsive to the needs of the green economy, particularly in private provision and higher education, but the foundational and technical vocational system is weak.

South Africa has crude and complex tools for determining what is needed now and in the future. Implementing these tools requires key outputs, including a list of occupations in high demand to determine which programmes should be prioritised for delivery and which occupations should be included in the critical skills list to inform visa allocations. A particular problem is a lack of differentiation between short-term and medium/long-term skills needs and concomitant funding and provision. The country has a few good labour market programmes, but they are disjointed and don't reach the scale required. The challenges of creating employment and growing the economy are rendered more complex given the changing world of work.

South Africa's Green Economy Inventory shows economic sectors with high potential for greening: energy, transport, agriculture, natural resource management and waste (The Presidency, 2023). Wind energy, solar energy, waste-to-energy, biofuels, energy efficiency, electric vehicle value chain development, and solar water heating are under-developed from a 'new green' jobs perspective (see also the Just Energy Transition (JET)-Investment Plan (IP) for South Africa). Other areas can still be developed

- Green buildings development
- Water system management (e.g. war on leaks, grey water systems for irrigation, water reticulation, water auditing and monitoring, wastewater monitoring and management, catchment management),

- Food systems (e.g. agroecology, climate-smart agriculture, and local food economy development)
- Oceans and coastal economies
- Informal settlement area upgrading

Expansion of recycling and circular economy programmes and opportunities (e.g. tyre recycling) (Mohlamed, 2017)

South Africa's JET IP clearly articulates gender priorities as central to the transition, foregrounding black women's participation, ranging from focused skills programmes and leadership positions to procurement from women-owned businesses.

The causes of unemployment do not primarily lie in the labour market.

Policies and interventions need to transform structural impediments to job creation to tackle South Africa's unemployment challenge.

Labour market information and ALMPs are complex and are not optimally delivering

There are a myriad of active labour market policies and systems, including complex measures for obtaining labour market information and matching information about demand it with education supply, but they are over-designed and often do not address the achieving matching.

In summary, the chapters in this document include:

Chapter 2: there are several barriers in the environment. Critically, this includes challenges relating to the environment and, specifically, the country's infrastructure (transport, logistics, electricity). This has two big implications: 1) it is difficult for green economy work to progress, and 2) a lack of capacity, which leads to infrastructure problems, will also hamper the delivery of the interventions related to the just transition.

Chapter 3: there are three key findings. The first is that the South African labour market is characterised by insufficient demand for employment, which is systemic and enduring. While there are problems with skills and qualifications on the supply side, they are not the primary constraint on employment growth. Secondly, the performance of four key areas of economic activity central to the low-carbon transition (agriculture, energy,

automotive manufacturing, and construction) has been mixed in recent years. The projections of the just transition sectors suggest that these can perform better than the economy in the coming years, but this should not be taken for granted. Careful policy implementation and stewardship of these sectors are required. Thirdly, and to reiterate, South Africa lacks key local-level economic and employment data, which would improve the understanding of labour demand.

Chapter 4: the extent of the gearing up in the provision system towards the green economy is to develop the requisite skills. There is likely a match at higher skill levels, but at lower skill levels, there is a geographic mismatch in where provision is taking place and where the skills are needed. There is further fragmentation due to a rapidly emerging short-course culture. In addition, the funding mechanisms do not facilitate the requisite scaling up, even at the level of universities; the system is bureaucratic and slow to respond.

Chapter 5: no sound system for skills anticipation makes it difficult for new entrants to know the skills required to enter the economy. Further, the absence of sufficient levels of demand and the weak data on supply and demand undermines existing platforms that support matching. Thus, while there are large numbers of people on matching platforms, especially young people (e.g. SAYouth), these are constrained by a lack of opportunities and limited information. Further, given the large numbers of those unemployed, despite active labour market and public employment programmes, graduates have few opportunities to transition.

Based on these findings, the following recommendations are made:

Framework Conditions

1. Focus on critical infrastructure and enabling policies and programmes to address the most pressing priorities (especially transport and specifically rebuilding the road to rail system) ports, electricity, and water.
2. While there has been a focus on coordination to take forward the imperatives of the Just Transition, there is a need for more integrated policy and implementation to centralise skills within economic and technological planning (rather than having skills as an add-on at the end). This requires:
 - Supporting the strengthening of current mecha-

nisms to collate and disseminate information on current and imminent pipeline JET investments to support improved planning and transparency in the system.

- These mechanisms will also allow for stronger monitoring of progress against milestones, creating the space to determine the technical support needed to support the delivery of projects in the anticipated time frame and costs.

3. Ensure appropriate standards and ‘license to practice’ requirements for new and emerging sectors are in place. For example, the formalisation of the hydrogen sector through the establishment of standards and labels is necessary to ensure quality and safety and to bolster investor confidence and market legitimacy. In another example, licensing to install solar panels coupled with associated qualifications or short courses is important for individuals and the public.

4. Build incentives and enablers vital to supporting key sectors of the green economy’s rollout as planned. For example, given the importance of regulatory and policy facilitators in driving the green hydrogen sector and making immediate capital expenditures feasible, there is a need to incentivise hydrogen uptake.

5. Ramp up carbon pricing, in scope and value and integrate it into a coherent climate framework

6. Establish and maintain a public knowledge-sharing platform for open access to information (official documents, public announcements, policies) on just transition for all vulnerable groups. Utilise these platforms to conduct open and public engagement processes on key national just transition decisions and re-ignite community grassroots structures in affected areas.

7. Establish structured firm and sector-level social dialogue in new value chains, e.g. renewable energy and hydrogen.

8. As mentioned throughout this report, analysis and policymaking are constrained by key gaps in the data, a lack of coordination between databases, inconsistent classification of industry and sec-

tor, and a lack of local data on labour demand and supply. Addressing these data challenges is essential to supporting improved economic planning in terms of the green economy sectors.

Labour Demand

1. The green economy’s systemic, structural, and institutional design must, at a conceptual and implementation level, be able to respond progressively to socioeconomic challenges and areas of concern. This is particularly relevant to creating innovative, resilient, and alternative forms of work in communities affected by high unemployment, inequality, and the decline of traditional industries like coal mining. This can be achieved through the development of renewable energy projects (including community-based projects), support for green entrepreneurship, expansion of accessible green skills education and training, and the promotion of sustainable agriculture practices (to improve food security, create jobs and protect the environment). Further, new climate adaptive streams of work could be investigated:

- Community-based water quality monitoring practitioners who are crucial to supporting both communities and municipalities to help monitor and manage water quality.
- Agroecology streams of work to drive a more integrative and inclusive approach to food system development.
- Support restoration enterprises that can generate new jobs and create new workstreams for workers who may lose their jobs. Work on pollution remediation and ecosystem rehabilitation fits within the rubric of climate jobs, as it helps to address communities’ growing vulnerability to climate change impacts.

These generate developmental pathways that allow for occupational transitions and development, as well as the ability to create new avenues for employment. This requires:

- Centralising just transitions in sectoral plans, e.g. masterplans for traditional value chains through decarbonisation of energy supply and transport and optimise production processes (energy, water, waste, carbon) for low carbon and climate resilience.
- Responsive, economy-wide, labour demand plan-

ning requires analysing the jobs required to support shifting technologies and the enabling processes. It is suggested that the initial focus of this demand-side planning should include:

- A focus on design, construction and installation-related jobs linked to renewables.
- Operations, maintenance, and evaluation jobs in later phases, albeit in lower numbers; this is to ensure installed infrastructure and the associated system are effectively managed and maintained
- Policy-related jobs (including policy development, management and implementation, research and analysis, and topic specialists) are critical short-term occupations, although again in small numbers.
- Financial and governance-related jobs
- Social scientists (e.g. anthropologists, sociologists, gender specialists, community development coordinators, environmental education and inclusivity specialists, social workers, and trade union officials). The initial emphasis will be on dealing with affected communities, whether due to mine closures or the closing of new renewable and clean energy facilities.

2. Priority must also be given to finding policies and projects that incentivise the just component of the transition (or finding the points of justice in each intervention). This requires:

- Pro-active, innovative, and responsive work to identify value chains that can advance the just transition. This could be supported through the development and, in some instances, the use of already existing, contextual and internationally viable good practices that speak to the imperatives of JET.
- Ongoing analysis of value chains to ensure that as regulations come on stream (around solar installations, for example), they must ensure that small players can still compete. The extent to which spaces are being created for small, medium and microenterprises (SMMEs) should be built into the monitoring and evaluation being set up by the Project Management Unit.
- Interventions to be accompanied by engaging community educational programmes to challenge misinformation and change perceptions.

Labour Supply

1. Ensure sophisticated anticipatory skills development systems that work with labour market intelligence. In particular, information from the tracking mechanisms will provide insight into the opportunities arising across several sub-sectors of energy and water (i.e. the JET, the green economy, renewable energy, and innovative technological advancements)

2. There is a need for a sustained focus on developing education and training providers so that they can flexibly respond and provide training interventions that address gaps identified to meet both immediate and medium to long-term demand. This includes:

- Identifying quick and responsive funding mechanisms through the levy system (SETAs and NSF). This includes strategic allocations to key institution-building programmes such as infrastructure, hiring and training of lecturers, and the allocation of bursaries
- Developing requisite vocational skills development interventions through the cultivation of strategic private-public partnerships
- Augment existing curricula—This includes updating and adapting current courses and curricula, such as engineering, physical and social science, business science and administration, public sector management, and law, to cover topics such as renewables, clean energy, energy efficiency, and climate change
- Focus on strengthening skills system innovations across the energy value chain and its associated ecosystem, i.e., not relegating them to a narrow band of technical skills only

3. Moving towards a just transition requires rethinking municipalities' structures and skills.

- For example, decentralisation of the energy system will significantly impact the district and local municipal workforce. Activities that were once the domain of Eskom will become the responsibilities of local governments, e.g., energy planning, integration, distribution, trade, and maintenance. Upskilling the current workforce and employing more energy-related staff will be critical. This will require human resource practitioners within the local government to be knowledgeable of these new job demands and associated skills requirements

- This decentralised approach also requires focusing on building providers in local ecosystems where projects are being implemented.
4. Additional initiatives to ensure a dedicated focus on skills required for the green economy:
- Energy efficiency: Identify key sectors and occupations and, fast-track and review the energy systems skills programme to include energy systems integration, battery installation, and energy management and optimisation so energy efficiency practices are built into broader energy transition.
 - Develop a structured programme for electricians to get apprenticeships in organisations focussing on energy efficiency and renewable energy.
 - Support foundational skills development. The pipeline from basic education is poor and this is impacting the throughput of students in the relevant STEM courses at tertiary education level.
3. Scale up public employment in key green areas.
- make it difficult for women to access and rectify these opportunities.

Matching

Workers in at-risk jobs and inexperienced youth require different matching interventions and strategies. These include:

- Mechanisms that link emerging demand and supply to enable matching platforms to source the relevant individuals and flag where training is required
- Using current matching systems for youth (the National Pathway Management Network and SAY-outh) and working to ensure that they can support young people to transition from learning to earning opportunities in the green economy and can track the extent to which new programmes enable young people to access, and remain in, the labour market
- Building capacity in the National Pathway Management Network to support young people in local communities to understand the services and opportunities available in the community.
- Ensuring similar capacity is in place to support workers to transition into jobs and remain in the labour market (Employment Services of South Africa with the support of the UIF)

2. Implementing these interventions to support transitions needs to specifically focus on the barriers that



1. Introduction

This report uses the Employment and Labour Market Analysis (ELMA) methodological tool to provide an overview of South Africa’s employment generation challenges. It aims to show how the labour market changes and what factors are potential enablers or inhibitors of the just transition process.

The South African economy has been characterised by low economic growth, a high unemployment rate, extreme inequality, and low levels of investment. In response, the South African Government published a National Development Plan (NDP) in 2013, outlining a long-term strategy for obtaining key development goals by 2030. The NDP provides an overall framework to alleviate the country’s socioeconomic problems, such as poverty, unemployment, and inequality (National Planning Commission, 2011). The plan was widely critiqued as incoherent (for example, Fine, 2012) and the National Planning Commission’s own analysis is that implementation has been poor. The plan was to grow the country’s economy by 5.4% per annum over 20 years to create 11 million new jobs and increase total employment from 13 million to 24 million jobs by 2030 (NDP, 2010, National Planning Commission, 2023). Fourteen years after the adoption of the NDP, there are about 15,8 million employed people (National Planning Commission, 2023).

In 2021, in response to the growing crisis—in part because of COVID-19—the Economic Reconstruction and Recovery Plan (ERRP) was released to stimulate equitable and inclusive growth. The ERRP sought to prioritise certain interventions identified within the NDP and emphasised realising the imperative for a fast-growing, sustainable, and inclusive economy as a key ingredient for employment creation. Energy security, green economy interventions, aggressive infrastructure investment, and industrialisation through localisation are among some of the interdependent priority areas.

South Africa is a high-carbon economy and the worst polluter in Africa. To address this challenge and the specific imperatives required to facilitate the country’s transition towards a just, low-carbon, climate-resilient economy and society, South Africa also established the Presidential Climate Commission (PCC). It submitted

its first report outlining the Nationally Determined Contributions (NDCs) in 2021. Key sectors and areas impacted include mono-economy towns (e.g. small towns dependent on mining, farming electricity, petrochemicals and smelting), sectors that need to decarbonise, including the electricity sector, liquid fuels, the automotive value chain and heavy industry, and sectors impacted by climate change including agriculture and tourism.

In November 2021, South Africa joined an international partnership called the Just Energy Transition Partnership (JETP) with Germany, France, the UK, the US and the EU. This partnership aims to support a just transition to a low-carbon economy and a climate-resilient society in South Africa through a US\$8.5 billion collective contribution from the above-mentioned countries (and international organisations). Germany is contributing €700 million to the initial US\$8.5 billion. The JET IP focuses on three sectors – renewables, electric vehicles and hydrogen.

A core feature of a just transition is that no one negatively affected by the decarbonisation of the economy is left behind. New employment and income-generation opportunities are identified and offered to those whose jobs might not last through the transition. Moreover, the persons concerned are qualified accordingly.

Therefore, significant efforts are underway to facilitate a just transition in South Africa. This prioritisation is reflected as one of the core areas of focus and support for GIZ in South Africa (and Lesotho and eSwatini). It features prominently in projects under the following three thematic clusters:

1. Climate
2. Energy
3. TVET, skills development and employment

Just Transition

Humanity is facing a task that is vital to its survival: to ensure that the consequences of climate change remain manageable, global life and economic activity must become climate-neutral by the middle of the century. This transition can only succeed together with the emerging and developing countries - and it must be organised in a socially just way (“Just Transition”). No-one must be left behind on the path to a climate-neutral, resilient and just social and economic order.

Source: German Federal Ministry for Economic Cooperation and Development (BMZ)

[HYPERLINK](#)

1. Preparation: identification of user groups, resources, purpose and focus.
2. Research: desktop analysis of existing documents.
3. Assessment: identification of the most important constraints and promising opportunities, including interviews with resource persons.
4. Consolidation and validation of information, strategy and measures.
5. Final Report and discussion. While the analysis can be flexibly applied to the information needs of the respective user groups, there are some general aspects of its scope and limitations:

The projects in these thematic clusters all focus on a just transition and require an understanding of how they will affect the labour market.

Conducting an ELMA helps to better understand country-specific challenges to employment generation. It aims to identify the most important constraints and the most promising opportunities to increase productive and decent employment in a country.

The ELMA is a methodological guideline for a comprehensive overview of the labour market and the employment situation in a country. Conceptually, it follows the Integrated Approach to Employment Promotion of the German Development Cooperation with its three pillars of labour demand, labour supply, and matching. In addition, there is an overarching framework of employment conditions.

Conducting an ELMA is typically organised in five phases:

Figure 1: ELMA Scope and Limitations

ELMA'S Scope: can do.....	ELMA'S Limitation: Cannot do or needs additional effort/resources
<ul style="list-style-type: none"> • Identify and prioritize employment and labour market constraints and opportunities in participatory processes. • Generate facts and figures to support strategic dialogue processes with national politics and the international donor community to systematically develop recommendations, employment strategies, and measures • Flexibly adapt to various information needs of different user groups and purposes. • Apply a national, regional, or local focus to develop suitable implementation measures for more and better jobs in a country/region/municipality. • Apply a sectoral focus on employment creation to identify those economic sectors which have the greatest potentials for the creation of productive and decent employment. • Adjust to different situations (e.g., available data and research) by explicitly allowing methodological flexibility (use approximation and secondary data and rapid assessment). • Analyse and visualize the basic landscape of important stakeholders. 	<ul style="list-style-type: none"> • Generate primary statistical data and produce research outcomes that meet top academic standards. • Serve as a baseline for evidenced-based monitoring of detailed action planning for projects. • Completely replace an in-depth appraisal for developing intervention measures in a technical cooperation project. • Provide an in-depth institutional analysis and capacity assessment of important actors or an in-depth analysis of the relevant national regulatory framework. • Determine and specify detailed skills and qualification needs for workers in specific sectors or subjects. • Analyse the situation of forced labour and exploitative child labour in a country and develop appropriate measures. • Ensure collaboration of national and international actors to participate actively in the process.

Source: *Employment and Labour Market Analysis (ELMA)*, GIZ, 2022, p.12.

This report provides an overview of South Africa's challenges regarding employment generation. Its aim is to understand how the labour market is changing and what factors may serve as possible enablers or inhibitors of the just transition process.

2. Framework Condition

This chapter provides an overview of the framework conditions for employment generation in South Africa. It describes the challenges and opportunities associated with the country's geography, political and economic situation, demography, and environment.

South Africa is a middle-income country and one of the largest economies on the African continent. It possesses many attributes that could support economic growth and employment creation. However, in the post-apartheid period, growth has been slow, and unemployment has risen. Conditions could facilitate job creation, and there are many possibilities latent in the transition to a green economy, but they have not been successfully harnessed.

2.1 Geography

South Africa is somewhat isolated, situated on the southernmost end of the African continent. It has high levels of inequality and informality, low per capita income, and limited industrial development.

However, South Africa's geographic location has several economic advantages; it is positioned along major global trade routes and is integrated into global value chains. The Southern African region is more heavily integrated into global value chains than the rest of the continent (Morris et al., 2021). However, underinvestment in infrastructure- ports, railways, rural internet capacity and water infrastructure, has compromised these resources, and climate change is undermining them.

South African weather is highly variable. Climate change is expected to cause increasing droughts and higher temperatures in the Western Cape and Limpopo, with forecasts suggesting a 30% decline in rainfall in the Southern Cape by 2050. However, other provinces, particularly the Eastern Cape, could see higher rainfall and improved crop opportunities.

2.2 Governance, Political and the Institutional Situation

South Africa has a relatively robust democracy with strong institutions, including a well-regarded constitution and a well-regulated labour market. A well-regarded constitution is the supreme law and ultimate provider of

fundamental principles, human rights, and framework for government structures and processes (Malan, 2012).

However, its development is hampered by high levels of corruption and maladministration. The country transitioned to democracy from the apartheid system 30 years ago, in 1994, and holds both national and provincial general elections every five years, with 2024 being the 7th democratic general election. The country's elections since the political breakthrough in 1994 have been democratic, free, and fair.

South Africa is a unitary state with three tiers of government. While there is a reputable and independent judiciary, there are serious challenges in the criminal justice system (Prinsloo, 2013). However, the state is not sufficiently strengthening capacity at the pace and scale a developmental state requires (National School of Government, 2022). Both the National Planning Commission (2023) and the National School of Government (2022) acknowledge that South Africans have low trust in state institutions, except for media broadcasters. State capacity deficiencies lead to a lack of accountability, poor productivity, rampant corruption, and fruitless expenditures, all undermining efforts to build an inclusive economy (National Planning Commission, 2023). The country is currently ranked 72nd least corrupt out of 180 nations (Corruption et al., 2023; Pon GWeni, 2024) and so is not on track to reach its target of a ranking of 68th by 2024. It also has not improved its ranking significantly (National Planning Commission, 2023).

South Africa also has a well-regulated labour market with various policies, legislations, and institutions. This includes the Labour Relations Act No. 66 of 1995, which is central to the country's labour law, and seeks to promote and advance economic transformation, social development, and workplace democracy. Other legislation that addresses labour standards include the Basic Conditions of Employment Act no 75 of 1997, the Occupational Injuries Diseases Act, the Occupational Health and Safety Act and the National Minimum Wage Act 9 of 2018. There is also legislation designed specifically to promote the transformation of the workplace, including the Employment Equity Act No 55 of 1998 and the Skills Development Act. South Africa (expanded upon

in Section X). The National Economic Development and Labour Council (NEDLAC) was established to enable social partners, namely government, business, labour and community constituency, to engage and agree on legislation impacting the labour market and broader community development.

The above-mentioned legislation also creates a basis for establishing industry-level bargaining councils. These councils include representatives from employer associations and worker organisations and are responsible for discussing wages and other associated industry issues. Agreements reached in these bodies can also be extended to non-parties on request by the Minister of Labour and Employment. In addition, the National Minimum Wage Commission can determine minimum wages in sectors where no bargaining council exists, thereby protecting more vulnerable workers. Another institution central to the protection of workers includes the Unemployment Insurance Fund, which provides individuals with an income if they cannot work for a period of time, such as in the case of retrenchment as well as maternity leave.

2.3 Economic Development

Structural economic crises underpin South Africa's unemployment crisis. South Africa remains the most unequal nation globally, with income gaps increasing over time (World Bank, 2018). The earnings distribution continues to depict the high racialised and gendered disparities in the labour market (National Planning Commission, 2023). In the past decade, South Africa has witnessed stagnating real gross domestic product (GDP) growth and declining per capita income. While the country has a relatively small informal sector compared to countries with similar income levels, informal employment still accounts for approximately one-third of all employment. Over the past decade, declining per capita income has seen poverty levels rising for the first time since the end of Apartheid.

2.3.1 General Economic Output

South Africa is one of the most industrialised economies in Africa, with a large services sector contributing a significant share of GDP and accounting for almost all the country's recent growth in employment. South Africa is classified as an up-

per-middle income country.

South Africa's services sectoral share of GDP is at 63% (compared to 25% for industry, and approximately 3% for agriculture) and 70% of the South African employed population works in the service sector (Bhorat et al., 2018; O'Neill, 2024). Since 2000, the services sector has been responsible for almost all of the country's growth in employment, adding over 3 million jobs, while the primary sector (agriculture and mining) has experienced a decline in total employment, and secondary sector (manufacturing and industry) employment increased by 126,734 jobs (Bhorat et al., 2018). This picture seems to be prevalent in Africa as the post-2000 growth period has seen the declining value of agriculture, stagnating manufacturing and a surge in the importance of services (Bhorat et al., 2018).

2.3.2 Economic development trajectory trend with implicants for employment

Due to a combination of factors, including low average growth rates, low labour absorption, and a net decline in employment in key sectors, South Africa's economy has not been able to create jobs sufficiently to absorb new entrants to the labour market.

This is due to low average growth rates and relatively low labour absorption even when growth occurs. There is little evidence to suggest that this has improved meaningfully in the post-Apartheid period. Where there has been growth in net employment, it has been in low-paying service jobs. A radical change in the country's development path would be required to alter the employment structure fundamentally. Not only has unemployment risen, but there has been a net decline in employment overall, discussed in more detail in the following chapter.

Shifts in local or international trends to greener technologies and fuels would likely impact the value chains of key sectors such as coal, metals, petroleum-based transport, tourism, and agriculture. Shifts would likely impact the full region as the value chains touch all nine of South Africa's provinces. The most vulnerable from an employment perspective are lower-skilled workers, small businesses, and local communities.

Examining key value chains in the South African economy gives insight into regional economic development patterns, as well as employment vulnerabilities. This section is organised by value chain, providing regional analysis for each chosen chain. The selected value chains are coal, metals, petroleum-based transport, tourism, and agriculture.

Coal

The coal value chain is primarily located in Mpumalanga. A transition away from coal could directly and indirectly affect 150,000 jobs, with the most vulnerable being miners, small businesses and communities.

The coal mining industry in South Africa employed around 87 000 people in 2018, with Eskom's (the national power supplier) generation workforce employing over 12 000, and Sasol employing around 26,000 (Makgetla, et al., 2019). Despite growth in total employment, the last four years have shown steady increases in contract employment within the mining sector. Overall, workers in the coal value chain fare better economically than the rest of the economy, despite lower qualifications.

The coal value chain is primarily centred in the province of Mpumalanga, in South Africa's east, and is heavily reliant on coal mining, electricity generation, and petrochemical production. Nearby sectors like retail, food, and accommodation largely support this chain. Climate change risks, internal due to energy policies or macro-economic, e.g., declining export demand, threaten the value chain's economic contributions. While influential stakeholders, such as mining firms and skilled workers, may find alternate employment, the most vulnerable in the value chain, including miners, small businesses, and communities, could be severely impacted (Makgetla, et al., 2019).

Metals

The metal value chain stretches through five of South Africa's provinces. Employment in the gold mining industry has seen a large decline over the last few decades. However, some losses have been offset by increased employment in platinum-group minerals (PGMs) and iron ore.

Gold, PGMs, iron, manganese, and chrome primarily dominate South Africa's metals value chain. The industry is concentrated in several provinces: North West

and Limpopo for PGMs; Gauteng, Mpumalanga, and Free State for gold; Northern Cape and Limpopo for iron ore; North West and Mpumalanga for chrome; and Northern Cape for manganese. Half of the employment is in mining and a quarter in metals and metal products, machinery, and equipment.

Petroleum-based transport

A transition to electric vehicles, locally and internationally is likely to affect the petroleum-based transport value chain which is centred in three provinces in South Africa. The main vulnerable groups are employees, small businesspeople, and autoworkers.

South Africa's mooted transition to electric vehicles could impact employment in various segments of the value chain, including freight and taxi businesses, petrol stations, and repairs and maintenance. The impact depends on the rate of change in car technology and the management of adaptation. If the auto industry, which employs 100 000 workers locally, shifts to producing electric vehicles overseas, the country could lose key markets. If the industry delays adaptation, production could contract, similar to the impact of cleaner petroleum. The value added by province is not available for most industries in the value chain, but manufacturing is concentrated in Gauteng, the Eastern Cape, and KwaZulu-Natal (Makgetla, et al., 2019). Transport services are distributed more evenly, with Gauteng having a disproportionately large share in almost every industry. The main vulnerable groups in the value chain include employees, small businesspeople in petrol retail, repairs, sale, transport, taxi drivers, and autoworkers, with the impact likely to be dispersed across the country (Makgetla, et al., 2019).

Tourism

Reduced rainfall and desertification due to climate change create key employment vulnerabilities in the country's tourism sector, which is concentrated in three cities.

Tourism is primarily concentrated in Cape Town, Durban, and Johannesburg, with the provinces of Gauteng, KwaZulu-Natal, and the Western Cape contributing to two-thirds of accommodation and food service employment. Food service and accommodation employment is higher in the Western Cape, Northern Cape, Free State, and North West provinces, and em

ployees in these provinces could be vulnerable as a result of reduced rainfall and desertification due to climate change (Makgetla, et al., 2019).

Agriculture

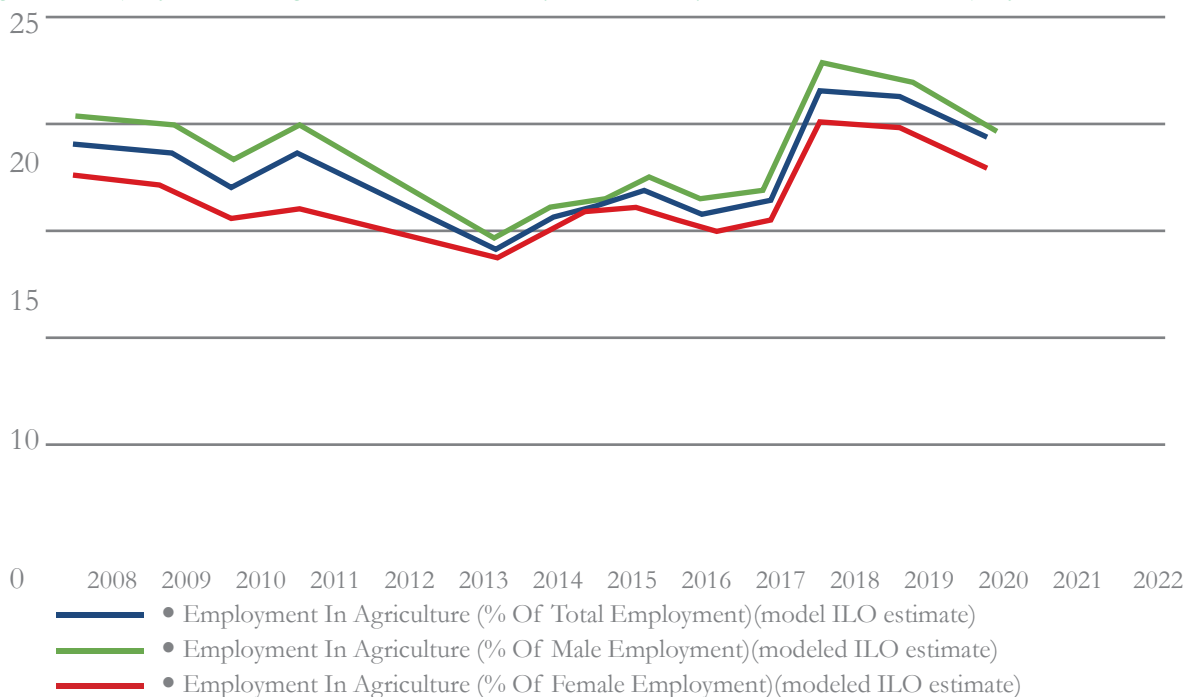
The agricultural value chain is among the most unequal in the economy, with a strong and highly concentrated agro-industrial sector supported by poorly paid and financially vulnerable farmworkers.

Agriculture accounts for approximately 20% of all employment in South Africa (ILO, 2024). While overall, 66% of all those employed in agriculture are men and 34% are women, agriculture accounts for a higher share of women’s total employment: according to the ILO, in 2022, 19.88% of all employed women worked in agriculture, compares to 18.74% of men.

The Western Cape and KwaZulu-Natal dominate agro-industrial production accounting for over 40%. The share of agriculture in GDP has decreased over the years from 4% in 1994 to 2.5% in 2005, thereafter stabilising to an average of 2.9% from 2005-2018. (Makgetla, et al., 2019). In 2021, the sector contributed 3.2% to GDP, showing an increase from the previous 10 years.

Agriculture also uses the largest share of South Africa’s land (38%) and water (60%) and has a disproportionate spatial and environmental impact. The sector is also particularly vulnerable to climate change, as higher temperatures, changing rainfall patterns, and droughts will impact crop production and the raising of farm animals. Water scarcity could shift water allocation towards households, impacting commercial agriculture and food processing. Rising fossil fuel costs could affect productivity and expenses. (Makgetla et al., 2019).

Figure 2: Employment in Agriculture in South Africa (share of men and women’s employment) 2008-2022



Source: ILO Modelled Estimates (2024) own calculations.

Climate change will also adversely impact employment in the sector. For example, climate change has significantly impacted farmworkers in regions like the Western Cape and Limpopo, leading to job losses in horticulture, field crops, and mixed farming sectors. Between 2015 and 2017, around 40,000 jobs were lost in these sectors, with a 24% drop for women and an 18% decrease for men.

The agricultural value chain is among the most unequal in the economy, with a strong agro-industrial sector and poorly paid labour. The agro-industrial sector is highly concentrated. Over 90% of agricultural products sold in South Africa's formal retail outlets came from around 50 000 agro-industrial farms with around 800 000 employees in 2017. The agro-industrial value chain is even more concentrated in storage, processing, and retail, with the top five supermarket chains accounting for almost 60% of the industry's 2015 income.

Farmworkers face significant challenges due to limited resources, inferior financial situation, education, and organisational support. They often live in housing tied to their work, leading to homelessness. Despite legal minimum wages, they struggle with retirement savings and rely on social grants. Their living conditions are substandard, and they have unstable employment relations, low union membership, and temporary jobs (Makgetla et al. 2019). The agricultural sector is highly dependent on energy. Load shedding has led to lower food supply and higher production costs. In January 2023, annual consumer inflation decreased to 6.9%, but food price inflation increased to 13.4%, which is the highest rate of increase since 2009 (StatsSA, 2023).

2.3.3 Deindustrialisation

Since the 1980s, South Africa has been in a slow process of deindustrialisation. Although the introduction of formal industrial policy since 2007 has averted even deeper deindustrialisation, these policies have been weakly implemented and undermined by misalignment with other policies.

Some analysts suggest that the apartheid economy was built around a 'mineral-energy complex' that distorted industrialisation and prevented diversification (Fine & Rustomjee, 1996; Roberts & Rustomjee, 2010; Rustomjee, 2013; Zalk, 2021). Since 1994, South Africa has had limited success in diversifying its industrial base and has further deindustrialised (Andreoni, Mondliwa, et al., 2021; Morris et al., 2021), with Zalk (2021) describing it

as a high-profit, low-investment economy dependent on capital-intensive chemicals and metals and unsatisfactory diversification of manufacturing.

Mondliwa and Roberts (2021a) argue that industrial policy has also been undermined by the fragmentation of the state, leading to misaligned policies. Goga and Mondliwa (2021) argue that the existing advantages of powerful firms, as well as the lack of a clear and well-implemented policy agenda for transformation, have reinforced the failure to diversify and develop downstream capabilities in manufacturing and reinforced patterns of accumulation with persistent inequality in income and wealth.

2.4 Business Environment

South African businesses must contend with several challenges, including an electricity crisis, high business operating costs, increasing lending rates, freight and logistics constraints, and policy uncertainty (particularly around policy attempts to drive the racial transformation of the economy). Small businesses, in particular, face a regulatory burden that needs to be addressed to facilitate access to the labour market.

South Africa has been fighting an extreme electricity crisis for the past 15 years, constraining the country's growth prospects due to back-to-back power cuts. The severe energy problems have disrupted the country's economy, and functioning costs for many industries have increased as they now rely on costly diesel generators (World Bank, 2022, 2023).

South Africa has a stock market with the second-highest level of capitalisation over GDP in the world and high levels of profitability across several economic sectors. Nevertheless, the financialisation of non-financial corporations in South Africa has resulted in low investment performances and instability (Andreoni, Robb, et al., 2021; Mohamed, 2017). Andreoni, Robb, and Huellen (2021) argue that financialisation dynamics in the distribution of power in the domestic political economy and the subordinate nature of South Africa's integration with global finance have undermined the translation of profits into domestic investment.

A range of shifting policy instruments have attempted to drive the racial transformation of the economy and are seen as having had a limited impact, with some progress, false starts, and misaligned policies (Morris et al., 2021;

Vilakazi & Bosiu, 2021).

For South Africa to respond and facilitate access to the domestic labour market for the youth and semi-skilled labour force, it is important to address the regulatory burden on small businesses (Department of Employment and Labour, 2021; International et al., 2016; Marais, 2023). In the 2022 Global Competitiveness Index, South Africa's ranking improved in business efficiency (from 58th to 56th), in economic performance (from 61st to 59th) and infrastructure (from 61st to 60th).

Violent crime remains high, including gender-based violence and femicide, especially among women, children, the elderly, and people living with disabilities who constantly feel unsafe and live in fear (National Planning Commission, 2023). These social ills negatively affect business confidence.

Digitalisation remains an ongoing challenge, although with some 'islands of excellence'—firms using digitalisation to achieve greater efficiency, process innovation, and supply-chain integration (Barnes et al., 2021). This has implications for the conditions of doing business in South Africa.

2.5 Macroeconomic Stability and Economic Development

South Africa has good macroeconomic stability through its advanced fiscal system, relatively high tax-to-GDP ratio, and deep capital markets. However, a critical vulnerability is the Rand, which is highly traded and prone to rapid valuation changes.

The Rand is often a bellwether for global economic sentiment. This has implications for the exchange rate, balance of payments, interest rates, and overall economic growth.

2.6 Wage Formation

Wages and income in South Africa are highly unequal along race, gender and education lines. Over recent years, the gender wage gap has widened with an increasing unexplained gap, which is thought to be related to discrimination in the labour market. Women are also overrepresented in low-pay and low-status sectors. There is also a persistent race gap in earnings.

Regarding gender and wage formation, the International

Labour Organisation (ILO) global wage report finds that the gender wage gap on the global level is about 20%: that is, there is a gap in earnings of 20% between men and women. Prejudice, stereotyping, cultural norms, the unequal distribution of unpaid care work, and direct or indirect pay discrimination are among the primary factors contributing to pay inequality between women and men, and South Africa is no exception (International Labour Office, 2018). The apartheid regime in South Africa resulted in significant racial and gender inequalities in various labour market outcomes, including disparities in employment rates and wages.

According to Bhorat and Goga (2013), the wage gap demonstrates a phenomenon known as the 'sticky floor' effect, whereby a particular group remains predominantly at the bottom of the job scale. This is evidenced by the highest proportion of women workers in the bottom decile of earners. Additionally, the gender wage gap is most pronounced at the top 10th percentile, indicating that South African women seldom hold the highest-paying positions in the economy. There has also been evidence to suggest that since 2007, South Africa has experienced an increasing glass ceiling effect, reflected by the significant rise of the gender pay gap at the 90th percentile.

Sectoral segregation is the biggest driver of the gender pay gap in East and Southern Africa, followed by individual characteristics. Women are overrepresented in low-pay and low-status sectors and occupational categories (Alarakhia et al., 2023). Occupational segregation remains prevalent in the South African labour market, as demonstrated by the continued challenge for women to enter male-dominated occupations. This may contribute to the ongoing persistence of the gender pay gap.

In 2016, Espi, Francis and Valodia (2019) found that the gender wage gap is wider between white women and white men and was more pronounced at the unskilled and top management levels, implying that men at the top and bottom of the distribution get paid relatively higher than women. However, among black workers, the gender pay gap was narrower, with women earning, on average, 94% of men's incomes. Black women earned significantly more than men across various levels, including top management, skilled, and unskilled positions. The gender pay gap among coloured, Indian, and foreign national workers fell between these two extremes, ranging

from 70% to 89%.

When examined separately for men and women, analysis of wage trends across the life cycle reveals a consistent pattern of earnings increasing with age. Furthermore, trends observed among different age cohorts indicate that younger cohorts have seen an increase in wages over time. Younger cohorts of women have on average, more education than the cohorts before them and men from the same cohort. Additionally, these younger cohorts of women are more inclined to pursue skilled professions than women born 30 years before who entered the labour market during the Apartheid era (Mosomi, 2019).

2.7 Environmental Issues

South Africa's numerous environmental issues—predominantly related to air, water, and chemical pollution—are situated along racial lines and disproportionately affect low-income, marginalised, and migrant communities. This situation remains intact despite progressive legislation. Climate change also poses significant challenges and could result in large losses of GDP.

The senior official of trade union 1, the biggest movement in South Africa, revealed that 'it's mine-workers and electricity workers, including surrounding communities, who suffer the most from this horrendous pollution, which negatively affects the human health of workers because of coal generation emissions.

Land and water use were also racially structured; the legacy of pervasive air, water and chemical pollution disproportionately impacts marginalised and poor communities. Environmental issues are, therefore, also social justice issues. Despite progressive environmental legislation, these legacies remain largely intact.

The Just Transitions Framework for South Africa (PCC, 2022) highlights that South Africa is facing significant challenges related to climate change. Igamba (2023) reports that South Africa may incur GDP losses of R217 to R651 billion by 2050 due to climate change. These losses are exacerbated by extreme weather, disasters and long-term climatic shifts that impact water security, food security, and human health. These issues will have a particularly negative impact on vulnerable groups, particularly rural communities, the poor, women, the youth, and children.

The harmful pollutants in greenhouse gas emissions drive

climate change. However, transitioning to a low-carbon economy offers possibilities for South Africa:

... the alignment of South Africa's industrial policy with the programme of electricity infrastructure investment would allow integrated exploitation of upstream and downstream industrial linkages to the green energy complex, including through localization of renewable-energy technology and through the promotion of new export oriented green industries. This should include the accelerated implementation of Renewable Energy Development Zones— including in coal-producing areas to streamline environmental authorization processes and assist in the establishment of new upstream and downstream renewable-energy industries in such zones. The correct alignment of South Africa's industrial and energy policy in such a manner would unleash significant investment and employment potential and would be a key driver to overcoming the structural constraints currently weighing down the country's rate of economic growth. (Morris et al., 2021, pp. 129–130)

2.8 Gender issues in South Africa

Gender inequalities persist in almost every sphere, from access to education and healthcare to employment opportunities and land access. Crucially, women are underrepresented in fields required to facilitate a just transition, such as science, technology, engineering and maths (STEM) fields. This has implications for the just transition as policy, and developmental interventions will need to explicitly include women in the green economy to prevent perpetuation of exclusion.

In South Africa, gender issues intersect with the just transition, particularly concerning economic and social transformations that seek to address environmental sustainability and inequality. Chidzingu & Wafer (2024), in their study of the South African mining communities of Kriel and Carolina in Mpumalanga, found that more men were in senior management positions, had technical skills, and were more qualified than women. Women were excluded from skill upgrades in the renewable energy sector because they were not coal mining employees, and in some cases, linked directly to gender discrimination (e.g. employers not trusting women to handle certain equipment).

These gender disparities are more pronounced in rural areas where women are often responsible for household food security and water collection. Masuku et al. (2023), in their work on the gendered effects of land access and ownership in South Africa, highlight that rural women's access to land continues to be governed by patriarchal institutions. As such, women continue to be seen as secondary rights holders, where women work on land owned by their male relatives and compete for arable land and irrigation water. Such a gender gap hinders productivity and reduces women's contribution to "the agricultural sector and to the achievement of broader economic and social developmental goals" (FOA 2011, p. 3). Closing the gender gap in agriculture will positively reduce poverty and household food insecurity, increase agricultural productivity, and promote economic development and growth. As such, more concerted effort is needed concerning policy making, public administration, and service delivery in all rural development and agricultural policies.

MacLean (2019) highlights that failure to incorporate a gender perspective on green economy policies and practices can perpetuate barriers to women's participation. Therefore, there is a need to explicitly and actively promote the inclusion of women in the green economy through policy and developmental pathways that offer employment for women and promote women's employment overall.

While it cannot be disputed that gender disparities in South Africa exist as a result of both non-inclusive regulatory frameworks and inclusive frameworks that have not achieved substantial societal and economic change, the disparities are also a result of pervasive socio-cultural roles and norms that govern and tend to pose limitations on the productivity of females in the academic and professional spheres. Societal expectations seemingly dictate more traditional roles for females, limiting their access to education, employment opportunities, and decision making positions.

While, in 2016, there were more females than males graduating from tertiary institutions, the majority of male graduates were in the fields of Science, Engineering and Business and Commerce, while the least number of female graduates for 2016 were in the fields of Science, Engineering and Technology (Department of Women, 2019).

Overall, gender considerations are crucial for the realisation of a just transition, as this would ensure that the shift to a more sustainable and equitable economy accounts for the unique roles, experiences, needs and vulnerabilities of women and other gender minorities.

2.9 Demography and Migration

South Africa has a youthful, predominantly urbanised population with relatively high infant and under-5 mortality.

South Africa has a population of 62 million as per the latest 2022 Census, (Statistics South Africa, 2021, 2022). Overall, the South African population is relatively young, with the majority (61%) concentrated in the age groups 0–39 years (Social Progress Imperative, 2021; Statistics South Africa, 2022).

Gauteng is the most populous of the nine provinces, with 15.1 million residents recorded as living there in the 2022 census report. South Africa is regarded as an urbanised nation, with 68.34% of the total population currently living in urban areas (O'Neill, 2024; Statistics South Africa, 2022). South Africa has a growing population, although its fertility rate seems to have declined from 2.37 in 2021 to now 2.291 births per woman (Binney et al., 2021; Macrotrends, 2024). The South African Demographic and Health Survey of 2016 conducted by Statistics South Africa in partnership with the National Department of Health shows that, on average, South Africa's households have 3.4 members. Infant and under-five mortality rates for the five years before the South African Demographic Survey (2016) are 35 and 42 per 1 000 live births, respectively, meaning that

about 1 in every 24 children does not survive his/her fifth birthday. Childhood mortality varies by residence and province, with under-five mortality higher in rural settings (49 deaths per 1 000 live births) than in urban areas (38 deaths for the years before the survey) (Statistics South Africa, 2016).

In 2019, the total number of migrants in the SADC region was estimated at 7,877,165. Angola, DRC, South Africa and Tanzania accounted for 6 366 734 or 81% of the total migrant numbers in the region as shown in the table below¹. There are more than 4 million migrants in South Africa.

Table 1: Migrant numbers in the SADC region

Country	Number of migrants
South Africa	4 224 256
Democratic Republic of Congo	963 833
Angola	669 479
Tanzania	509 166
Total	6 366 734

Source: Final report for Southern African Migration Management (SAMM), 2020

¹Final report for Southern African Migration Management (SAMM) project stocktaking of work on labour migration in the southern African region, 2020

2.10 Green Economy

South Africa has a progressive constitution that connects environmental issues to human rights and social responsibilities. The intention outlined in the constitution is supported by many policies, plans, and strategies for green industrial development.

The early 1990s led to a more people-centred, participatory approach to ecological concerns. ‘Green politics’, which sees people and the environment as intimately connected, became a central feature of emerging politics. These ideas laid the foundation for the South African Constitution, which was adopted in 1996. It linked environmental issues to human rights and social responsibilities. Giving recognition to every citizen’s right to an environment that is not detrimental to their health or well-being, the Constitution, therefore, signalled a national commitment to environmental action as stated in the Bill of Rights in the new Constitution.

The Green Economy Policy Review of South Africa’s Industrial Policy Framework, produced in 2020 by the Department of Environmental Affairs (DEA) and Trade and Industrial Policy Strategies (TIPS), outlines the numerous domestic policies, plans and strategies that impact South Africa’s transition to a green industrial development. These core plans are outlined as having a fundamental impact on green industrial development. This set of policies is meant to give substance to the constitutional mandate (Section 24 of the Bill of Rights), the principles of the National Environmental Management Act (NEMA) and South Africa’s international commitments. These core documents are complemented by many sector-, issue- and time-specific policies. In addition, sub-national initiatives at both the municipal and provincial levels are increasingly emerging.

South Africa recently released the JET IP for the five years 2023-2027, which sets out the scale of need and the investments required to achieve the decarbonisation commitments for the NDC. In October 2023, the Climate Change Bill was passed by the National Assembly. Given climate change’s complex and interconnected nature, the Bill ambitiously seeks to unify the nation’s response through a comprehensive framework law. It achieves this through several mechanisms, including the formal recognition and regulation of the PCC and the mainstreaming of climate change governance, assessments, and responses at the provincial and local levels.

This approach ensures that climate change is no longer viewed merely as a national ‘environmental’ matter (ACF, 2023).

Internationally, the Carbon Border Adjustment Mechanism (CBAM) is set to drive green reform within the South African economy. CBAM is a tariff on the import of carbon intensive products into the European Union, due to relatively high embedded emissions in export products to the EU, the potential risk is being estimated at a value of US\$3.2 billion for the South African economy in the short term. This is an important contributing driver to the energy transition in South Africa.

It is important to note that the emerging green economy does not have a regulatory framework that speaks to and seeks to address employment equity for women, youth, and people living with disabilities (Terblanche, 2023). This raises concerns about JET’s ability to absorb and create equitable and enabling occupational corridors that allow for an inclusive transition from the coal mining sector to alternative renewable energy.

Constitution - Bill Of Rights			
National Environments Management Act			
International engagements (Climate Change, biodiversity, pollution)	Framework For Environmental Fiscal Reform	Industrial Policy Action Plans/ Master Plans	Innovation Plan
	Medium-Term Strategic Framework	National Strategy for Sustainable Development	Integrated Energy/ Resource Plans
	National Skills Development Strategy	National Climate Change Response White Paper	New Growth Path
	Master Skills Plan of South Africa	Consolidated Environmental Implementation and Management Plan	National Framework for Sustainable Development
	Master Plan for the Commercial Forestry Sector in South Africa	Oceans Economy Master Plan	National Biodiversity Strategy and Action Plan
	Forestry Sector Master Plan	National Water and Sanitation Master Plan	Industrial Policy Action Plan
	Firm-level Technology Assistance Packages (FTAPs)	2016 National Integrated ICT Policy White Paper	Presidential Commission on the Fourth Industrial Revolution (2020)
	SA Connect Broadband Policy	2016 National Integrated ICT Policy White Paper	White Paper on Post-School Education and Training
	Digital Skills Strategy	National Human Resources Development	ICT Strategy
	ICT Disaster Recovery Policy	Marketing and Communication strategy	Digital Futures: South Africa's Digital Readiness for the Fourth Industrial
	Just Energy Transition Investment Plan (JET-IP)	Climate Change Bill	Revolution (NPC 2020)
National development Plan 2030			
Provincial Policies			
Municipal policies			

Sectoral policies
(waste, biodiversity, public transport)
M&E Framework (14 Outcomes)

Figure 2: South Africa’s green sector-related policies
 Source: Adapted and redrawn from Mohamed & Montmasson-Clair, 2018.

2.11 Summary of Constraints and Opportunities

Table 2: Constraints and Opportunities of Framework Conditions

Aspect	Constraints	Opportunities
Geography	<ul style="list-style-type: none"> • Isolated location linked to underinvestment in infrastructure • The semi-arid country puts agriculture at risk 	<ul style="list-style-type: none"> • Potentially economically strategic location along with major global sea trade routes • Natural resources that lend themselves towards a just transition
Governance	<ul style="list-style-type: none"> • Poor implementation of policies and plans • Population has lost trust in state institutions • Insufficient capacity development in state institutions 	<ul style="list-style-type: none"> • Relative stability with some relatively strong institutions
Macro-economic stability and economic development	<ul style="list-style-type: none"> • Deindustrialisation with lack of industrial diversification • Electricity crisis for the past 15 years • Other serious challenges in the business environment • Increase in poverty • Limited impact of black economic empowerment • Violent crime • Lack of proactivity regarding climate change issues 	<ul style="list-style-type: none"> • Well-developed financial system with deep financial markets • Macroeconomic stability and a highly developed fiscal system
Demography, Migration	<ul style="list-style-type: none"> • High levels of xenophobia 	<ul style="list-style-type: none"> • Good workforce: the population is young • Urbanised nation, accessibility of labour force
Employment Situation	<ul style="list-style-type: none"> • Structural problems of unemployment • Unemployment increased across every education category • Black African unemployment rates have consistently remained higher than that of other population groups • Women experience higher unemployment rate than men • Youth's unemployment rate has been increasing for all age groups since 1995 	<ul style="list-style-type: none"> • Unemployment rate slightly decreasing • High labour force participation rate • Labour force is getting more educated • Labour force available in mostly urban agglomerations

Green economy	<ul style="list-style-type: none"> • Uncoordinated policy- links between industrial policy and environmental policy not consistent • Activities concentrated in Western Cape, Gauteng, and KZN, with increasing activity in Mpumalanga • In the short term, some job losses are a risk if the transition is not well-managed 	<ul style="list-style-type: none"> • Potential job creation • Long-term potential of job growth
Gender	<ul style="list-style-type: none"> • High levels of gender-based violence and patriarchal social/cultural norms • Policies on gender are not implemented • Gender wage gap existent, also “Sticky Floor Effect” 	<ul style="list-style-type: none"> • Policies are very gender aware



... can't
afford
to live

3. Labour Demand

This chapter provides an overview of the demand side of South Africa’s labour market. It outlines the employment situation, such as employment rate, employment elasticity, and demographic nuances in the labour market. It describes the various dimensions of employment related to skills, education, and spatial location and concludes with an analysis of employment-related opportunities and constraints in various key sectors.

3.1 Employment Situation

3.1.1 Unemployment Rate

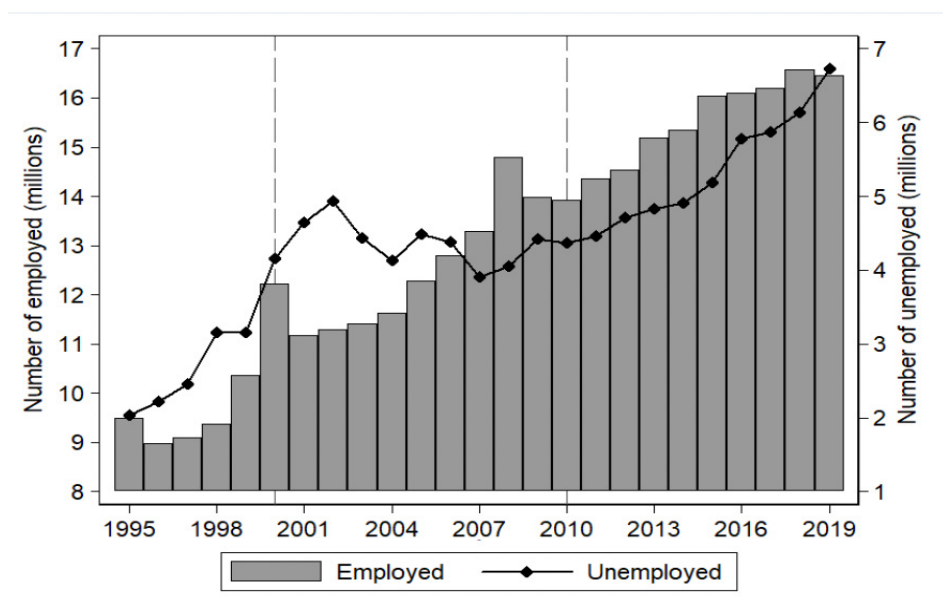
South Africa has a high unemployment rate, which has followed an upward trend since the end of the apartheid era. The high rate has been attributed to issues around structural unemployment, and a low-growth economy which has not been able to create enough jobs for the growing population. Unemployment rates are higher for women, youth and the

black population. Recent data shows that the unemployment rate (according to the narrow definition, which excludes discouraged work seekers) is around 32% (StatsSA, 2024). Youth unemployment remains severe.

3.1.2 Employment Elasticity

Growth in South Africa’s economy is often referred to as “jobless growth.” However, this has not always been the case and from 1995 to 2005, the period experienced positive economic growth but negative employment growth, whereas from 2005 to 2015, employment growth outpaced economic growth.

Figure 3: Number of employed and unemployed (millions) 1995-2019



Source: Adams & Yu, 2022, p.6

Table 3: Employment Elasticity to Economic Growth.

	Employment Elasticity to economic growth		
	OHS 1995	LFS	QLFS 2015
Employment	9 499 1995	12 287 798	15 866 852
Real GDP (seasonally adjusted, 2010 prices, R million)	1 707 524	2 381 486	3 046 807
	1995 vs 2005	2005 vs 2015	1995 vs 2015
Annual percentage change of Employment	24%	29.1%	67.0%
Real GDP (seasonally adjusted, 2010 prices, R million)	39.5%	27.9%	78.4%
Employment/real GDP	0.74	1.04	0.85

Note: GDP = Gross domestic product; OHS = October House Survey; LFS Labour Force Survey; QLFS = Quarterly Labour Force Survey.

Source: Author's own calculations using the OHS 1995, LFS 2005 September and QLFS 2015Q3 data as well as the South African Reserve Bank Quarterly Bulletin data.

Source: Festus, Kasongo, Moses & Yu, 2016, p.590

3.1.3 Race Groups

Black people make up most of the employed population; however, white people have the greatest likelihood of being employed (that is, employment is proportionally far higher for white people compared to black people), followed by Indians and the coloured population, with unemployment the highest among Black people.

Over the past 10 years, from 2013 to 2023, Black unemployment rates have consistently remained higher than those of other population groups. Specifically, the unemployment rate among the Black African population group stands at 36.0%, which is notably higher than the national average, and the rates observed among other population groups. In comparison, the unemployment rates for the white, Indian/Asian, and coloured populations are 7.6%, 11.8%, and 21.5%, respectively (Statistics South Africa, 2023).

Between 1995 and 2015, employment increased by 6.3 million, with most of this increase (5.6 million) occurring among Black people. In 2015, Black people made up 73.9% of the employed population. The surge in African employment can be attributed to the improved educational qualifications of African job seekers. This encouraged greater participation in the labour market among Africans and enhanced their likelihood of securing employment. Whites remain the group most likely to be employed, followed by Indians and coloureds (Festus et al., 2016).

3.1.4 Women

Across all race groups, women experience higher unemployment rates than men, however Black women are hardest hit. Women are also overrepresented in low-paying and low-status jobs.

Women experience higher unemployment rates than men, with 35.7% of South African women in the labour force currently without work and actively seeking employment. This is true across each racial group. In addition, the gap has widened from 2009 to 2019, aligning with the increased participation of women in the workforce (Adams & Yu, 2022). Of particular concern is the situation of Black women, who face even higher unemployment rates. In Q2:2023, the unemployment rate among Black women stood at 39.8%, surpassing the national average and rates observed among other population groups (Statistics South Africa, 2023).

The apartheid migrant labour system compelled black men to leave their villages temporarily to seek work in cities or the mining industry, while women and children remained in rural areas. This historical context helps to explain the higher incidence of poverty among female-headed households, driven by their concentration in rural areas and the presence of fewer working-age adults. South African women are often overrepresented in elementary, low-paying jobs, such as domestic helpers, cleaners, street vendors, or housekeepers. Additionally, they tend to be concentrated in middle-level occupational roles, such as clerks (tellers, office, or client information

clerks) and occupy positions at the top of the occupational hierarchy, including professionals or technicians (teachers and nurses, for example (Gradín, 2021).

In 2022, men maintained a greater share of employment across all industries except for community and social services and private households compared to women, as illustrated in Figure 4.2. Specifically, men held over 80% of the employment share in construction, transport, and mining. In comparison, women represented 75.7% of employment in private households and 62.3% in community and social services (Statistics South Africa, Labour Market dynamics in South Africa, 2022).

In 2022, women were more likely to work as domestic workers (95,5%), clerks (70,4%) and technicians (56,2%) than men. About 66,8% of men were employed in managerial occupations compared to 33,2% of wom-

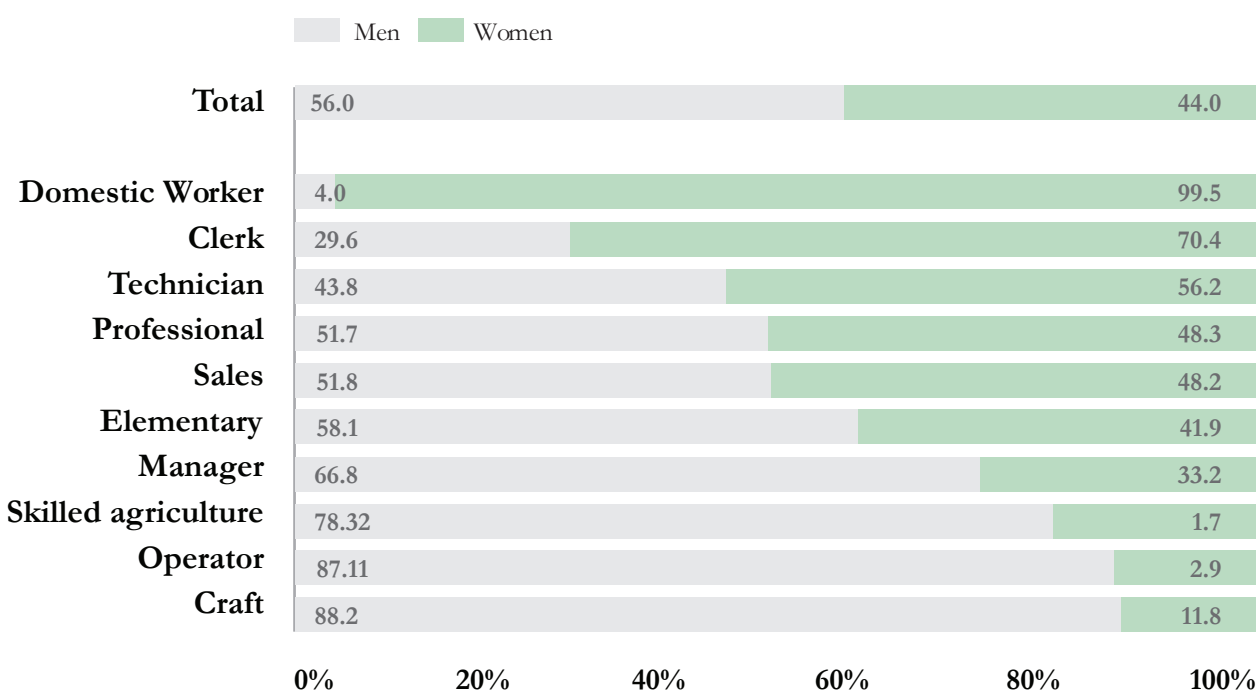
en. Both craft and related trades and machine operators occupations recorded the largest shares above 80% for men (Statistics South Africa, Labour Market dynamics in South Africa, 2022).

3.1.5 Youth

The unemployment rate for youth in South Africa is considerably higher than the average unemployment rate.

South Africa has a very high youth unemployment rate. Unemployment rates for youth aged 15 to 24 and 25 to 34 stand at 58.0% and 38.3%, respectively (Statistics South Africa, 2023). These unemployment rates negatively impact young women and individuals living in disadvantaged geographic areas.

Figure 4: Employment Shares by Occupation and Gender, 2022



Source: Statistics South Africa, Labour Market dynamics in South Africa, 2022, p.40

3.1.6 Labour Force Participation

Post-Apartheid labour force participation has steadily increased, with growth attributed to predominantly new black job seekers. The most important change in labour supply has been the increase in women's participation, although there is still a gap of around 10% between men and women.

Labour force participation has been increasing since Apartheid ended. The labour force grew by 6 million individuals between 1995 and 2004, which continued beyond this period (Oosthuizen, 2006). In 2015, there were more than 21 million participants in the labour force, reflecting the cumulative growth of nearly 10 million individuals since 1995. The expansion of the labour force in the post-apartheid era is primarily attributed to new job seekers, predominantly black work seekers who accounted for 87% of the increase in the size of the labour force between 1994 and 2004, and 85% between 2005 and 2015 (Oosthuizen 2006; Adams and Yu 2022; Festus, Kasongo, Moses, and Yu 2016). These individuals are increasingly women, residing in urban areas, possessing some level of secondary education (either incomplete or with a matric qualification), and predominantly under 35 (Festus et al., 2016).

In contrast, the number of white people in the labour force declined by 10% between 2009 and 2019. This may be due to emigration (Adams & Yu, 2022).

Black adults' labour force participation rate seems to gradually align with other demographic groups. In the third quarter of 2023, the labour force participation rate among Black South Africans exceeded 59%, reflecting a year-on-year change of 2.3% compared to the third quarter of 2022. Conversely, the labour force participation rate among Indian/Asian South Africans experienced a decline, dropping from 61% in the previous year to just below 60%.

According to Statistics South Africa (2023), the labour force participation rate for women stood at 54.3% compared with 64.9% for men, a gap of 10.6 percentage points. The most important change in labour supply over recent years has been the increase in women's labour force participation rate, often referred to as labour force feminisation (Casale & Posel, 2002). Over ten years (2003-2023), there has been a 4% increase in women's labour force participation rate, rising from 50.3% in Q2:2013 to 54.3% in Q2:2023. Despite this increase, the

report notes that women still exhibit a lower likelihood of participating in the labour force compared to men.

Labour force participation rates are higher for urban dwellers. The labour force is mainly concentrated in the three provinces of Gauteng, KwaZulu-Natal, and the Western Cape, which accounted for over 60% of the labour force between 1995 and 2019 (Oosthuizen 2006; Adams and Yu 2022; Festus, Kasongo, Moses, and Yu 2016). This is consistent with the fact that these three provinces are home to South Africa's largest metros.

3.2 Dimensions of employment

3.2.1 Spatial Employment Situation

Gauteng, KwaZulu-Natal, Western Cape, and Eastern Cape collectively have the highest share of overall employment, with Gauteng contributing the most to employment growth, expanding by over 2 million jobs between 1995 and 2015 (Oosthuizen 2006; Adams and Yu 2022; Festus, Kasongo, Moses, and Yu 2016). The Western Cape has consistently had the lowest unemployment rates between 1995 and 2005 as well as 2009 and 2019. The province with the second lowest unemployment rate is Gauteng. KwaZulu-Natal, even though home to one the biggest metros, has had higher unemployment rates compared to Gauteng and the Western Cape (Adams &

Yu, 2022).

Table 6 below provides a breakdown by province.

The data indicate that the number of employed individuals increased in eight provinces between Q2:2023 and Q3:2023. Notable employment gains were observed in KwaZulu-Natal (up by 152,000), Limpopo (up by 70,000), North West (up by 61,000), and Mpumalanga (up by 44,000). Only Free State recorded employment losses, declining by 3,000 during the same period. North West exhibited the most significant quarter-to-quarter percentage change in employment, with an increase of 6.9% (Statistics South Africa, Labour Market dynamics in South Africa, 2023).

Table 4: Unemployment Rate by Province

	Official unemployment rate					Expanded unemployment rate				
	Jul-Sep 2022	Apr-Jun 2023	Jul-Sep 2023	Qtr-to-qtr change	Year-on-year change	Jul-Sep 2022	Apr-Jun 2023	Jul-Sep 2023	Qtr-to-qtr change	Year-on-year change
	Per cent			Percentage points		Per cent			Percentage points	
South Africa	32,9	32,6	31,9	-0,7	-1,0	43,1	42,1	41,2	-0,9	-1,9
Western Cape	24,5	20,9	20,2	-0,7	-4,3	29,5	25,3	25,6	0,3	-3,9
Eastern Cape	42,4	39,7	38,8	-0,9	-3,6	50,6	43,3	43,9	0,6	-6,7
Northern Cape	26,4	26,9	26,3	-0,6	-0,1	45,9	43,3	42,0	-1,3	-3,9
Free State	33,8	36,7	38,5	1,8	4,7	40,8	44,0	44,7	0,7	3,9
KwaZulu-Natal	30,6	31,0	29,4	-1,6	-1,2	46,4	46,7	44,7	-2,0	-1,7
North West	39,0	36,8	38,6	1,8	-0,4	53,3	53,5	51,2	-2,3	-2,1
Gauteng	33,7	34,4	33,7	-0,7	0,0	39,0	39,3	39,4	0,1	0,4

Source: Statistics South Africa, 2023, p.8

3.2.2 Urban and Rural Unemployment

Unemployment rates tend to be higher in rural areas than urban areas due to factors including the legacy of apartheid spatial policies where ‘homelands’ were often located in rural areas, a lack of government focus on these areas, and the limited success of economic decentralisation policies.

The varied histories of provinces during apartheid appear to have left a lasting impact on unemployment rates.

3.2.3 Employment and Education Level

Education level has a significant influence on the unemployment rate. The unemployment rate for people with tertiary education is considerably lower than those without secondary education.

The South African labour force is getting more educated, with more people completing secondary education and a decline in the proportion of individuals without any formal education (Oosthuizen, 2006). However, the labour force members who hold post-matric qualifications still make up the smallest proportion of the total labour force, even though the numbers have more than doubled from over 1 million to 2.1 million between 2009 and 2019 (Adams & Yu, 2022).

Individuals with education levels below matric face the highest unemployment rates compared to individuals with tertiary education, who experience the lowest unemployment rates.

In the third quarter of 2023, individuals with educational attainment levels below matric experienced an unemployment rate of 38.8%. Conversely, graduates exhibited a much lower unemployment rate of 8.5% (Statistics South Africa, 2023).

In 2019, both the 15 to 24 years and 25 to 34 years age groups held a 52.6% share employed in semi-skilled labour, while the highest age cohort, 55 to 65, had a 38% share employed in semi-skilled roles. High-skilled employment demonstrated an age skew, with the oldest cohort having a 30% share employed in high-skilled positions, while the youngest cohort, 15 to 24 years, had a 14.4% share employed in high-skilled roles (Adams & Yu, 2022).

3.2.4 Employment in Formal and Informal Sector

South Africa’s large formal sector accounts for over two-thirds of employment, with the smaller informal sector accounting for 18.8%.

South Africa has a large formal sector, accounting for 68.5% of employment in 2022, compared to informal sector employment, which accounted for 18.8% in the same year (Statistics South Africa, Labour Market Dynamics in South Africa, 2022).

Informal sector employment is higher in Limpopo, Mpumalanga, and the Eastern Cape. In contrast, Gauteng and Western Cape exhibited the highest share of formal sector employment (Statistics South Africa, Labour market dynamics in South Africa, 2018).

The proportion of individuals employed in the formal sector was predominantly highest among graduates, comprising over 96.6% in 2017 and 94.6% in 2022. They were followed by those with other tertiary qualifications, accounting for 90.5% in 2017 and 88.5% in 2022. Conversely, the highest proportion of individuals employed in the informal sector was observed among those with educational attainment below matric level, comprising 24.5% in 2017 and increasing to 27.6% in 2022 (Statistics South Africa, Labour Market dynamics in South Africa, 2022).



3.3 Sectoral Employment

This report uses the term sector in two ways. The first is to represent the three traditional economic sectors. Primary (agriculture and mining), secondary (manufacturing) and tertiary (services). In addition, the term “sector” is commonly used in South Africa to refer to the 10 main industry classifications: agriculture, mining, manufacturing, utilities, construction, trade, transport, finance, community and social services, and private household.

Data on employment in these sectors is collected primarily in the Quarterly Labour Force Survey (QLFS) and the Quarterly Employment Survey (QES). The former gathers data on the formal and informal sector, while the latter includes only formal-sector employment. The QLFS is the basis of most labour market analysis. As a nationally representative survey, it is useful for understanding high-level trends. However, its relatively small sample size means that caution must be exercised when using it to analyse industries and sectors at the local level. This is a significant constraint to local economy analysis and planning, especially regarding the green transition sectors.

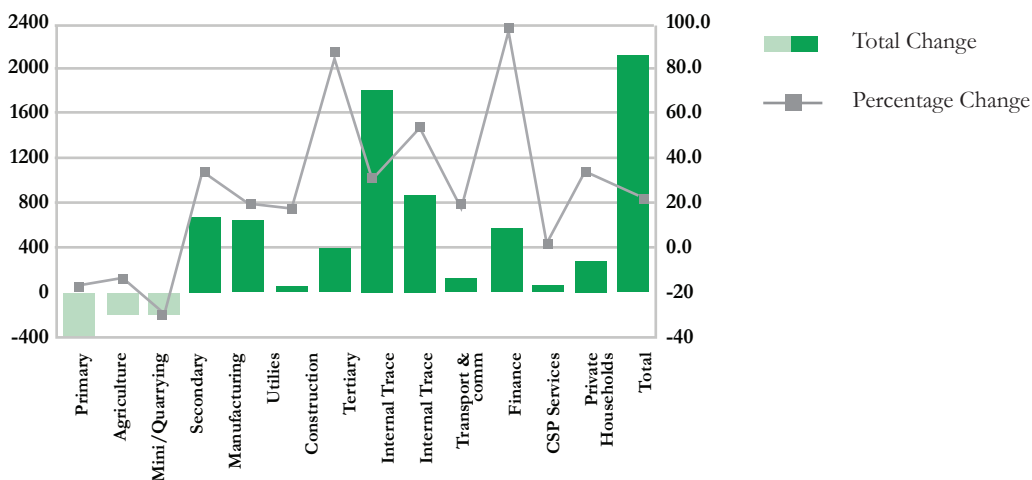
3.3.1 General

Beginning in the 1970s, South Africa saw a shift from the primary and secondary sectors to the tertiary sector, which was responsible for most of the employment expansion.

Examining reports from overlapping periods reveals that since the end of apartheid, the bulk of the employment expansion happened in the tertiary sectors, which added 1.8 million jobs in the first decade after apartheid. The most substantial absolute increases in employment were observed in the internal trade and finance sectors. Additionally, the construction sector experienced rapid expansion, constituting the third-largest increase in absolute terms and the second largest in percentage growth (Festus, Kasongo, Moses, and Yu 2016; Statistics South Africa, Labour market dynamics in South Africa, 2018).

The sectoral shift in the output structure of the South African economy, which began in the 1970s and continued through the mid-1990s, involved a transition from primary and secondary activities to tertiary sector activities. This shift persisted beyond 1995 and characterised

Figure 5: Employment Expansion by Sector, 1995-2004



Source: Oosthuizen, 2006, p.27

the present-day economy (Oosthuizen 2006). Between Q2:2023 and Q3:2023, the number of employed persons increased in six out of 10 industries. The most significant increases in employment were observed in finance, with an increase of 237 000 jobs, followed by community and social services, which saw an increase of 63 000 jobs. However, decreases in employment were noted in the manufacturing sector, with a decline of 96 000 jobs, as well as in the finance, transport, and utilities industries, with decreases of 68 000, 7 000, and 6 000 jobs, respectively (Statistics South Africa, Labour Market dynamics in South Africa, 2023).

In the metals sector, the gold mining industry has significantly declined, with the number of people employed decreasing from 410 000 in 1993 to 110 000 in 2018. However, employment in other metallic minerals mining, such as PGMs and iron ore, has grown from 15 000 to 250 000, and machinery and equipment employment has also increased (Makgetla, et al., 2019).

In 2017, 785 000 people were employed in industrial agriculture, 300 000 in food processing, and 80 000 in wine and alcoholic beverage production. Industrial agriculture and food processing contributed 5% and 2% of total employment, respectively. Employment increased by 25% from 2010 to 2018, with 1.7 million people engaged in agricultural production in 2018, but farming activities decreased (Makgetla et al., 2019).

3.3.2 Green Sector Labour Market Trends

Given the focus of this ELMA on the possibilities of a just transition, this section presents key trends in labour demand in the green sectors of the South African economy. It presents a broad overview of the green economy labour market trends before examining the critical sectors featured within the Just Transition Framework, green hydrogen, vehicles, and agriculture sectors, through the lens of the transition.

3.2.1 Green Jobs: an overview of the green jobs' growth trajectory in South Africa

South Africa has a comprehensive and progressive social partnership on the green economy, which forecasts a potential addition of 300 000 green jobs. The most active sectors will likely be energy, transportation, and agriculture.

In 2011, representatives from the South African government, business, organised labour and the community constituency signed the Green Economy Accord, which has been described as one of the most comprehensive social partnerships on green economy in the world.

Table 3 below, produced in 2013, highlights the long-term implications for the growth of green jobs and illustrates that the green economy has implications for many sectors of the economy. The table also gives us an illus-

Table 5: Employment by Industry, 2023

Industry	Apr-Jun 2022	Jan-Mar 2023	Apr-Jun 2023	Qtr-to-qtr change	Year-on-year change	Qtr-to-qtr change	Year-on-year change
	Thousand				Per cent		
Total*	15 562	16 192	16 346	154	784	1,0	5,0
Agriculture	874	888	894	7	21	0,8	2,4
Mining	407	413	444	31	36	7,5	8,9
Manufacturing	1 507	1 654	1 558	-96	51	-5,8	3,4
Utilities	104	135	129	-6	25	-4,3	24,4
Construction	1 177	1 201	1 304	104	128	8,6	10,8
Trade	3 163	3 269	3 361	92	198	2,8	6,3
Transport	906	992	986	-7	80	-0,7	8,8
Finance	2 460	2 667	2 599	-68	139	-2,6	5,7
Community and social services	3 821	3 902	3 965	63	144	1,6	3,8
Private households	1 124	1 056	1 093	37	-30	3,5	-2,7

*Note: Total includes 'Other' industries.

Due to rounding, numbers do not necessarily add up to totals.

Note: Utilities refers to Electricity, gas and water supply.

Trade refers to Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods; hotels and restaurants.

Finance refers to Financial intermediation, insurance, real estate and business services.

Source: Statistics South Africa, 2023, p.2

trative idea of the size and scope of this emerging sector. When considering the green job potential, it is essential to explain that not all green jobs will be new; some will involve ‘reskilling’ or changing work practices as new green skills are introduced into existing jobs is essential. These job projections have since increased over the years based on different scenarios such as baseline scenarios (no significant changes), policy-driven scenarios, climate change mitigation scenarios and high investment scenarios. Recent projections, for example, estimate that 500 000 jobs are expected in the renewable energy sector by 2050 under the 1.5°C scenario, with solar technologies forming the bulk of the jobs (approximately 245 000

jobs in both 2030 and 2050) (IRENA, 2023). Further projections in nascent industries such as green hydrogen predict the creation of 20 000 jobs annually by 2030 and an estimated 30 000 jobs annually by 2040 (DSI, 2021).

Table 6: Employment estimates by green economy categories and segments

Broad green economy category	Segment	Technology/product	Long-term net direct employment	Long-term net direct manufacturing employment	
Energy generation	Renewable (non-fuel) electricity	Wind power	Onshore wind power	5156	2105
			Offshore wind power		
		Solar power	Concentrated solar power	3014	608
			Photovoltaic power	13 541	8463
		Hydropower	Marine power	197	0
			Large hydropower	272	111
	Micro/small hydropower		100	0	
	Fuel-based renewable electricity	Waste-to-energy	Landfills	1178	180
			Biomass combustion	37 270	154
			Anaerobic digestion	1429	591
			Pyrolysis/gasification	4348	2663
	Liquid fuel	Biofuels	Co-generation	10 789	1050
Bioethanol			52 729	6641	
	Biodiesel				
Energy generation subtotal			130 023	22 566	
Energy and resource efficiency	Green buildings	Insulation, lighting, windows	7 340	838	
		Solar water heaters	17 621	1225	
		Rain water harvesting	1275	181	
	Transportation	Bus rapid transport	41 641	350	
	Industrial	Energy-efficient motors	-566	4	
		Mechanical insulation	666	89	
Energy and resource efficiency subtotal			67 977	2686	
Emissions and pollution mitigation	Pollution control	Air pollution control	900	166	
		Electrical vehicles	11 428	10 642	
		Clean stoves	2783	973	
		Acid mine water treatment	361	0	
	Carbon capture and storage		251	0	
	Recycling		15 918	9016	
Emissions and pollution mitigation subtotal			31 641	20 797	
Natural resource management	Biodiversity conservation and ecosystem restoration		121 553	0	
	Soil and land management		111 373	0	
Natural resource management subtotal			232 926	0	
Total			462 567	46 049	

Source: Borel-Saladin & Turok, 2013, p.2.

The Green Economy Inventory (PAGE, 2017) was based on a Rapid Evidence Assessment of Green economic activity in South Africa from 2010 to 2016. It provides insight into the characteristics of green economy initiatives, including their contribution to job creation, skills development and finance. The findings correlate with Table 3 above, with energy, transportation and agriculture listed as the most active sectors, with initiatives in solar and bioenergy, non-motorised transport and planning, and farming. It further found that 60% of green economy initiatives are in the Gauteng, Western Cape and KwaZulu-Natal provinces

The JET-IP identifies three priority **areas** that will support the economy in the future: the electricity sector, New Energy Vehicles (NEV), and Green Hydrogen. These are discussed below.

3.3.2.2 Renewable Energy

The expansion of renewable energy, such as solar and wind, is expected to create a significant number of job opportunities in both technical and non-technical priority occupations. However, these opportunities need to be approached with caution, as many are expected to be short—to medium-term and low-skilled.

The rise of renewable energy has been influenced by domestic and international push and pull factors that together have and continue to drive aspects of supply and demand. Domestically, the rise in renewable energy demand has been influenced by Eskom’s decreasing generation of capacity due to the continued prevalence of “loadshedding, increased cost of electricity, declining costs to solar, and the introduction of small-scale embedded generation (SSEG) tariffs in municipalities” (SAPVIA 2023, p. 33). At an international level, the increasing political, environmental sustainability and economic imperatives influenced trade and the overall buy-in for energy efficiency, sustainable and renewable energy.

The introduction of the JET IP and supporting working policy documents such as the Renewable Energy Independent Power Producer Procurement Programme (2011), the Renewable Resource Plan (2019) and the South African Renewable Energy Master Plan (2023)

collectively have focused on increasing a “diversified energy mix that includes renewable energy, distributed generation and battery storage” (World Economic Forum, 2023). PWC (2021) identified solar and wind as integral to the energy mix in the country, intending to grow their energy output to 50% and 20%, respectively, by 2030. These projections are further substantiated by the Integrated Resource Plan (IRP) of 2019 that projected approximately 41% of South Africa’s installed capacity in 2030 will come from renewable energy. This diversified energy mix will have implications for labour demand.

While no comprehensive data exists on energy related employment, the following demand illustration from TIPS, 2022 outlined in the table below is a compilation of different datasets that provide an indication of employment assessments measuring current and projected employment for South Africa within the electricity sector.

Table 7: Selected energy employment figures, with a focus on electricity

Actor	Unit	Methodology/formula	Latest Figures (2020/21)	Publication
DMRE (IRP)	Headcount/jobs	Total number of jobs (headcount)	Total net employment increased by 2030 (2020 baseline year) based on allocated MW per technology - +50 000 (Solar) +60 000 (Wind)	Department of Energy, 2018; DMRE 2019
Eskom	Headcount/jobs	Total number of people employed per year	As of 31 March 2020: 44 772 As of 31 March 2021: 42 749 Cumulative headcount, reflective of annual jobs created from new build projects (2007 - 2021): 189 000	Eskom Holdings SOC Ltd, 2021
IRENA	Headcount/jobs	Estimates are derived from primary data (typically government reports) and fed into the Cambridge E3ME macroeconomic model IRENA has dedicated country focal points which provide country-specific data	Total jobs Solar PV: 2021 Wind: 18 840	IRENA and ILO, 2021
Statistics South Africa	Headcount/jobs	Persons employed	Electricity Sector (June 2021): 56 000 employees Loss of 1000 jobs registered from 2020 to 2021 in the electricity sector	Statistic South Africa, 2021

South African Photovoltaic Industry Association (SAPVIA)	Full time Equivalent (FTE)	230 person-days of work (equivalent to 365 days, minus non-productive days)	<p>Solar PV Job Intensity: 39 FTE per MW for SSEG</p> <p>17 FTE jobs per MW for utility-scale</p> <p>Total FTE under different scenarios: IRP 2019 (Solar PV): 35 000 FTE</p> <p>Accelerated scenario (using the I-JEDI Model, up to 2030): 38 000 FTE</p> <p>High road scenario (using the I-JEDI Model, up to 2030): 40 000 FTE</p>	Fourie, 2021
TIPS	Headcount/jobs	Persons employed	<p>Total employed persons:</p> <p>Electricity Generation (Eskom only): 12 000</p>	Patel et al. 2020

Source: TIPS 2024, p. 7.

While the table provides an indicative number of jobs it is essential to recognise the limitations to trends in the sector

- FTEs and job years do not indicate how many people depend on these value chains for employment

Concerning renewable energy value chains, a headcount is needed to allow for comparability for the sector to better understand FTE employment for local value chains. As the energy mix changes, many job opportunities are anticipated in the sector for both technical and non-technical occupations. There have been considerable increases in the registration threshold from 1 MW to 100 MW, contributing to the increase in the renewable energy market share in the energy mix. Numerous interventions are catalysing employment demand in the sector:

- The proposed amendments to the Electricity Regulation Act (ERA) of 2006 will enable a waiver of generation licence for large electricity generation projects and will facilitate the “development of large-scale privately owned renewable energy plants” (Green Cape 2024, p. 7)
-
- The Integrated Resource Plan (IRP) of 2019 waived the 100 MW licence-exemption threshold that aims to encourage and increase private power generation capacity and “distributed generators and proposed a feed-in tariff for self-generating households and businesses” (World Economic Forum, 2023). This has created exponential growth opportunities for Independent Power Producers (IPPs) and jobs underpinned by power purchase agreements (PPAs) with “private offtakers, either through on-site installations or using wheeling” (Green Cape 2024, p. 8)
- The localisation requirement of Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) of 40% South African ownership has enabled knowledge sharing between local developers and foreign operators. Since REIPPPP’s (2011) inception, it has generated “over 18 000 jobs in manufacturing, installation and maintenance” and has increased the capacitation and development of domestic renewable manufacturing industries. This

has positively impacted the overall economic growth and development. However, the state needs a concerted effort to develop domestic manufacturing capabilities of renewable energy technologies and associated components (Cobenefits, 2022).

SAPVIA projects that the sector has the potential to create “98 000 new direct jobs on average in the short term, almost 255 000 in the medium term and around 462 000 employment opportunities in the long term” (2021, p.9). Moreover, the local manufacturing industry “could add and support an average of 5 539 FTE jobs over the next nine years and attract R9.4 billion worth of local spend annually” (SAPVIA 2021, p. 130). Regarding the long-term feasibility of the sector, the Co-benefits (2019) Future Skills and Job Creation through Renewable Energy in South Africa report projects that an additional 1.6 million jobs are estimated to emerge in the transformation of the power sector by 2050.

In response to the DMRE regulation, Renewable Energy Independent Power Producer Procurement Programme (REI4P) (IPP, 2023) set two critical interventionist mechanisms:

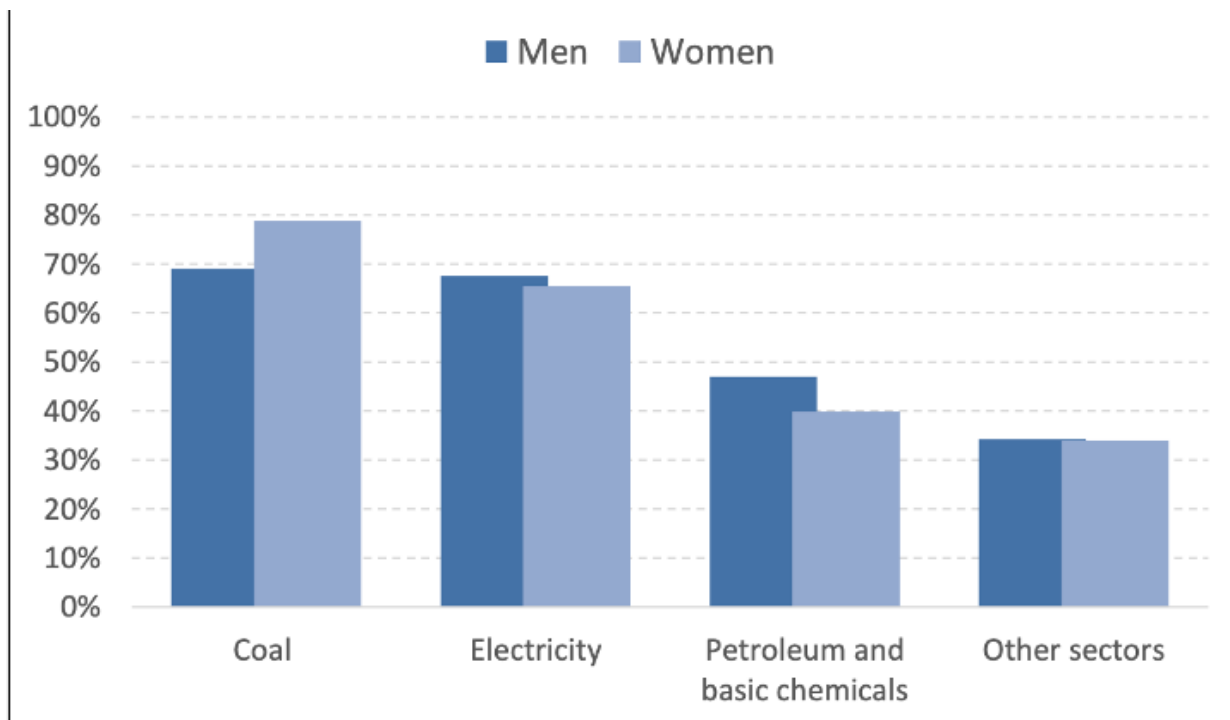
- 20% of employment-generated projects are geographically tied and sourced where the projects are implemented
- 25% of all materials used in the construction phase be sourced locally

Table 8: Employment per area during construction of each solar facility

	Construction workers			
	Highly skilled	Medium skilled	Low skilled	Total
Per 100-240MW Solar Facility				
Anticipated % workers from the local municipal area	2%	30%	60%	
Number from the local municipal are	1 - 7	3 - 54.6	66 - 109	100 - 166
Anticipated % of workers from the rest of the province	23%	40%	40%	
Number from the rest of the province	13 - 21	44 - 72.8	44 - 72.8	101 - 167
Anticipated % of workers from the rest of South Africa	65%	30%	0%	
Number from rest of SA	36 - 59	33 - 54.6	0 - 0	69 - 144
Anticipated % of workers from overseas	10%	0%	0%	
Number from overseas	36 - 59	33 - 54.6	0 - 0	69 - 144
Total	55 - 91	110 - 182	110 - 182	6 - 9

Source: Van Zyl and Kinghorn, 2023, p.24.

Figure 6: Percentage of employees that reported having a permanent position in the coal mining sector in 2017



Source: Makgetla et al., 2019, p.28.

There are, however, several concerns and constraints regarding renewable energy that need to be raised.

Terblanche (2023) and Van Zyl and Kinghorn (2023) have shown that the employment avenues created by solar and wind projects are short to medium term and are concentrated in low-skill areas. This contrasts with the mining sector, shown in Figure 13 below, where a large percentage (81%) of the labour expected from the mining sector comes from a permanent and secure employment history. This raises serious foreseeable socio-economic and political concerns that have the potential to impact job market stability, induce household socio-economic instability and political stability and, negatively impact economic growth and development in the long term.

Reflecting on these shifts in the labour market, the South African Energy Skills Roadmap (SANEA, 2023) identifies 90 priority occupations required for renewable energy, including but not limited to solar and wind. The majority of the identified occupations are technical (54%) and most of the technical occupations are engineering related. The balance of occupations is non-technical (46%) such as lawyers, business developers, human resources personnel, economist and financial specialists which shows that non-technical occupations are also cardinal for the transition (See Annexure 3, for lists of occupations generated from the studies). The majority of the occupations would require some form of reskilling or upskilling where necessary. The short to long term skills provisioning for the emerging renewable energy sector through a government led initiative is supported by the South African Renewable Energy Technology Centre (SARETC) established in 2015 in partnership with the Department of Higher Education and Training (DHET) through the National Skills Fund (NSF), the German Ministry for Economic Cooperation and Development through the South African National Energy Development Institute (SANEDI) and Green Cape. The establishment of SARETC was done as a means of cultivating local green skills in response to the demand.

3.3.2.3 Green Hydrogen

The emergence of the green hydrogen sector in South Africa is expected to create a substantial number of jobs annually. However, infrastructure constraints, policy and regulation gaps, high production costs, and a shortage of the necessary skills may constrain the ability of the sector to create em-

ployment.

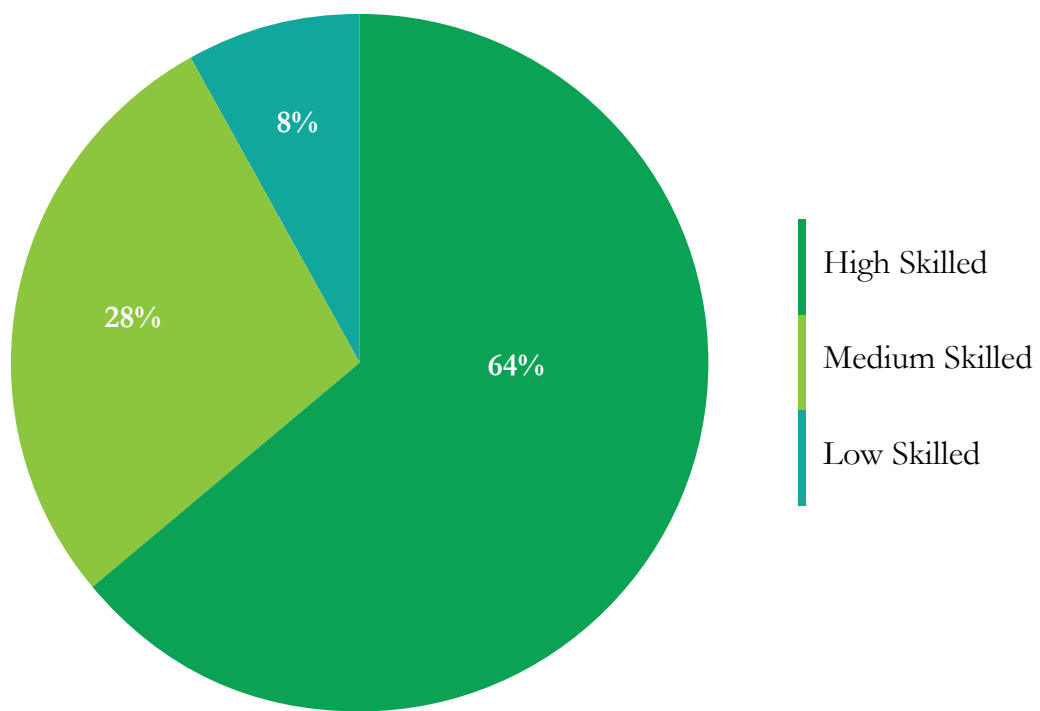
Green hydrogen is a nascent industry that presents substantive environmental, social and economic benefits for South Africa. The global growth in hydrogen demand, its wide variety of applications and decreasing technology costs make green hydrogen an attractive investment opportunity. In conjunction with increased demand for hydrogen, countries are shifting away from a dependence on fossil fuels such as coal, which is a crucial export for South Africa. Currently, the country produces grey hydrogen, with a global market share of 2%, and with South Africa having the majority (75%) of global Platinum Group Metals (PGMs) reserves, there is an objective to double the global market share to 4% by 2050 through green hydrogen production (DTIC, 2022).

The potential for employment generation arising from investing in the green hydrogen economy is significant and spans various sectors. The production and export of hydrogen will create jobs in infrastructure development, logistics, and engineering. Fuel cell manufacturing and Fuel Cell Electric Vehicle (FCEV) production will stimulate employment in advanced manufacturing, research and development (R&D), and automotive sectors. Further, supporting renewable energy adoption can boost employment in renewable energy infrastructure, while the development of new hydrogen-powered industries opens positions in emerging technology sectors and supply chains. These opportunities can contribute to significant job creation and economic growth, particularly in regions transitioning to a green economy.

The Hydrogen Society Roadmap (DSI, 2021) highlights the sector's potential to create 20 000 jobs annually by 2030 and an estimated 30 000 jobs annually by 2040. To ensure these employment opportunities are created, the current workforce will require reskilling and upskilling to participate in the green hydrogen economy (See Annexure 3 for the comprehensive list of occupations that were identified).

Most of these jobs will likely be skilled jobs that require tertiary education or professional training (CHIETA, 2023). CSIR (2024) has further noted 138 occupations that will be required for the green hydrogen sector, with the majority requiring high-skill levels (Figure 7).

Figure 7: Skill levels of green hydrogen occupations in demand.



The low demand for low-skilled level occupations may present potential employment constraints linked to an inability to meet the principles of a just transition that aims to ensure that the shift to a low-carbon economy benefits all segments of society, including those currently employed in high-carbon industries and those with lower skill levels. Fewer opportunities for low-skilled levels could create a vicious cycle in which economic disparities are exacerbated, communities are excluded and resist the transition, and sustainable and inclusive economic development is hindered. The analysis of employment generation in the emerging sector further highlights gaps regarding the lifecycle of the jobs that will be created, which has the potential to impact livelihood security.

Some potential barriers to the uptake of green hydrogen in South Africa include (CHIEFTA, 2022; DSI, 2021):

- Infrastructure — Linked to the country facing water and electricity supply shortages
- Gaps in policy and regulation are presented through grid unreliability, limited green electricity on the grid, high cost of electrolyser scale up, lack of clear targets and strategies at the sector level, and an apparent lack of hydrogen transport and storage regulation
- Economic viability—Significant investments would be required that may not be easily accessible for initial investments (in renewable energy infrastructure), production costs (which are particularly high for green hydrogen), and market demand and regulation.
- Skills and Expertise: there is a shortage of skilled workers capable of designing, operating, and maintaining green hydrogen production facilities. This is evident from the labour supply side, where limited courses are on offer to meet projected demand.

3.3.2.4 New Energy Vehicles

The transition to electric vehicles presents significant opportunities for job creation in South Africa. However, this potential needs to be supported by strategic investments in education, training, and infrastructure, combined with supportive regulatory frameworks. Constraints and concerns for employment include South Africa’s dependence on the EU export market, large skills gaps, the need to re-skill

a number of high-skilled occupations, and the challenges around electrifying private passenger vehicles.

The demand landscape within the automotive industry is transforming with the rise of New Energy Vehicles (NEVs). The automotive sector employs over 500, 000 people directly, and the sector has seen a rise of 18.8% with NEV sales (merSETA, 2023, p9). It is estimated that 120 000 jobs will be created across the automotive value chain by 2035 (DTIC, 2018). The transition to NEVs presents significant opportunities for job creation in South Africa; however, this potential needs to be supported by strategic investments in education, training, and infrastructure, combined with supportive regulatory frameworks.

The employment opportunities created will most likely lie in component manufacturing and infrastructure for NEVs (Moshikaro et al., 2022). Infrastructure entails the construction of charging stations for NEVs. An estimated 4 000 charging stations are needed to service the projected number of NEVs on the road in South Africa by 2035, off a current base of roughly 350 (Naamsa, 2023). Further, the growth of the EV sector is likely to result in job growth in the waste economy (in particular battery recycling) due to the high value of materials. Although, these are not regarded as core occupations in the automotive industry itself.

Several labour market opportunities are present as the NEV sector’s growth has the potential to stimulate innovation and diversification within South Africa’s automotive and related industries. Presenting opportunities for job creation across the various sub-sectors that include manufacturing, research and development, engineering, construction, and maintenance. The South African Automotive Masterplan (SAAM) 2035 aims to increase Electric Vehicles (EVs) to stimulate innovation and diversification that have the potential to create job opportunities in areas such as construction, maintenance and services (GreenCape, 2023). South Africa is also in the prime position to leverage its expertise and resources in automotive manufacturing to position itself as a hub for electric vehicle production and exportation (DTIC, 2023).

The move to NEVs also presents several labour market constraints. South Africa's dependency on the EU export market puts 100 000 automotive sector jobs at risk and has the potential to further destabilise component and regional automotive hubs (The Presidency, 2023). Moshikaro et al. (2022) note that the transition to EVs further puts 17 occupations at risk of elimination across the automotive value chain. The loss of these occupations can disrupt the sectoral workforce dynamics and negatively impact the livelihoods, job security and future employment prospects of skilled workers. Additionally, 64 high-skilled and medium-skilled occupations are 'transforming,' requiring adaptation to the demands of NEV technology through upskilling and reskilling. Further, 51 occupations will emerge due to the transition, highlighting the need to ensure supply adequately matches the demand.

3.3.2.5 Agriculture

Demand for skills and employment in agriculture is expected to grow as the sector expands to meet the needs of a just transition. However, a lack of progress regarding Black small-scale farmer development is considered a constraint.

In quarter 4 of 2023, agriculture employed 24.3% of the South African labour force, "making the sector essential in the employment of South Africans" (National Agricultural Marketing Council 2024, p. 6; StatSA 2023). Table 9 indicates that employment for agriculture per province and highlights that the market share growth can be attributed to a 29.3% labour employment increase spread across provinces such as the Free State, Northern Cape, North West and KwaZulu-Natal (NAMC 2024).

The sector continues to be dominated by men, however. The NAMC (2024) report indicates that the industry ratio between men and women was 628 000 and 292 000, respectively. Figure 9 illustrates employment by gender. The data indicated that in the fourth quar-

ter, "the number of women decreased by 7000 (2.4%), while the number of men decreased by 28 000 (4.3%) compared to the previous quarter" (NAMC 2024, p.). These period shrinkages to the market are attributed to climate change and the industry-informed long-standing practice of seasonal employment.

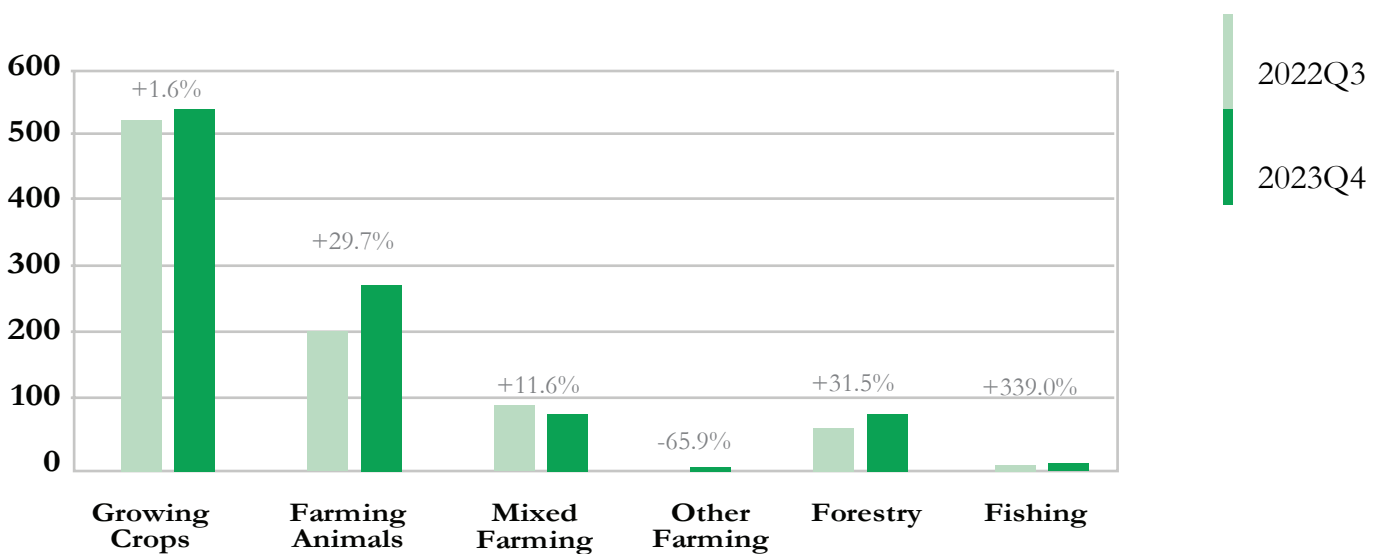
Figure 8 illustrates agricultural jobs by subcategory. It highlights that the bulk of the sector's job increase was attributed to animal production, forestry, and crop production, with a combined tally of 83 500 jobs.

Figure 9: Agricultural jobs by subcategory

Employment by Agriculture per Province	Oct-Dec 2022	Jul - Sep 2023	Oct-Dec 2022	Qtr -to Qtr change	Year on Year Change	Qtr -to Qtr change	Year on Year Change
Total Agriculture*	860	956	920	-35	60	-3.7%	7.0%
Western Cape	223	238	2234	-4	11	-1.8%	5.0%
Eastern Cape	89	136	96	-40	7	-29.4%	7.9%
Northern Cape	52	52	58	5	6	10.0%	11.1%
Free state	90	65	73	9	-17	13.5%	-18.5%
KwaZulu-Natal	130	150	153	4	24	2.5%	18.1%
North West	44	51	53	2	8	3.3%	18.8%
Gauteng	33	39	38	-1	5	1.5%	14.5%
Mpumalanga	92	87	86	0	-5	-0.5%	-5.8%
Limpopo	102	138	129	9	21	-6.8%	19.9%
Thousand						Percent	

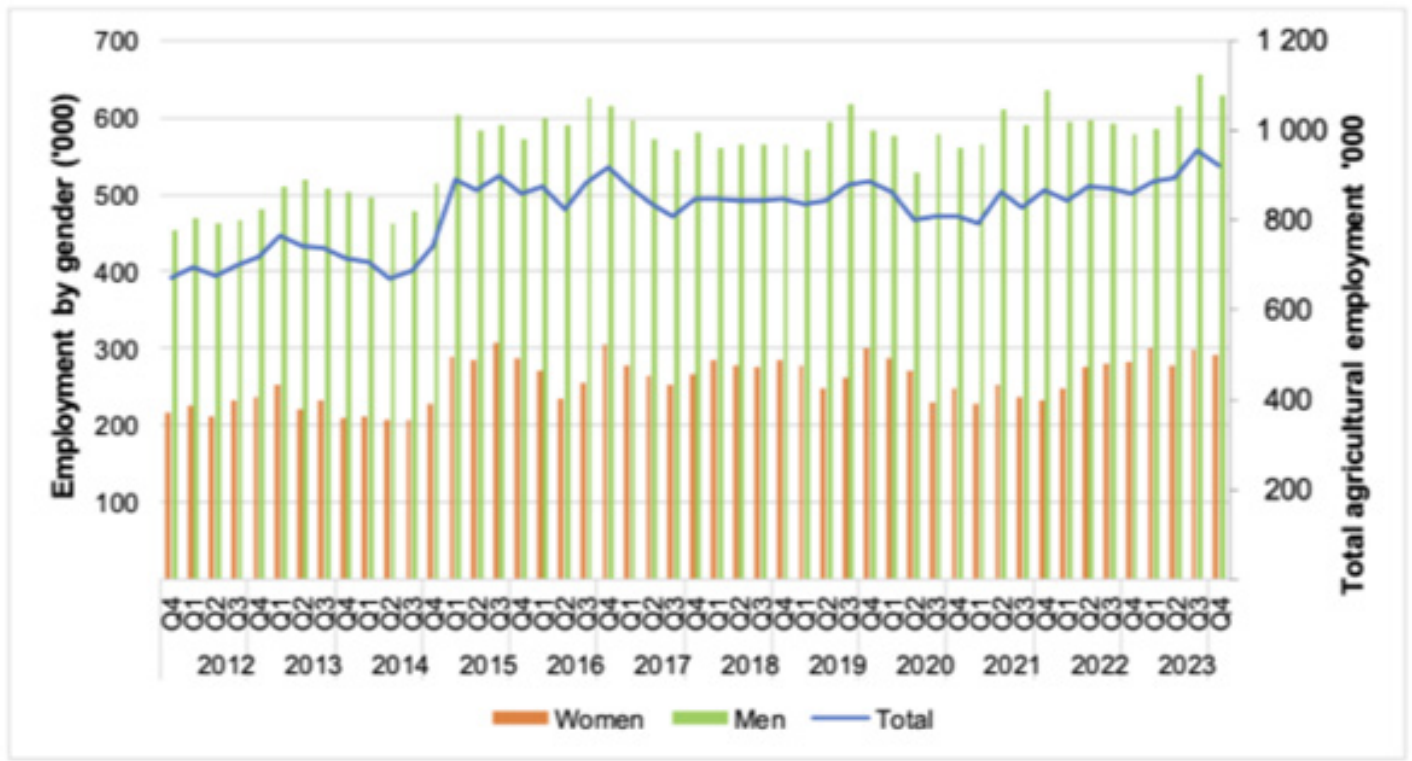
Source: NAMC, 2024, p. 5.

Figure 8: Agricultural jobs by subcategory



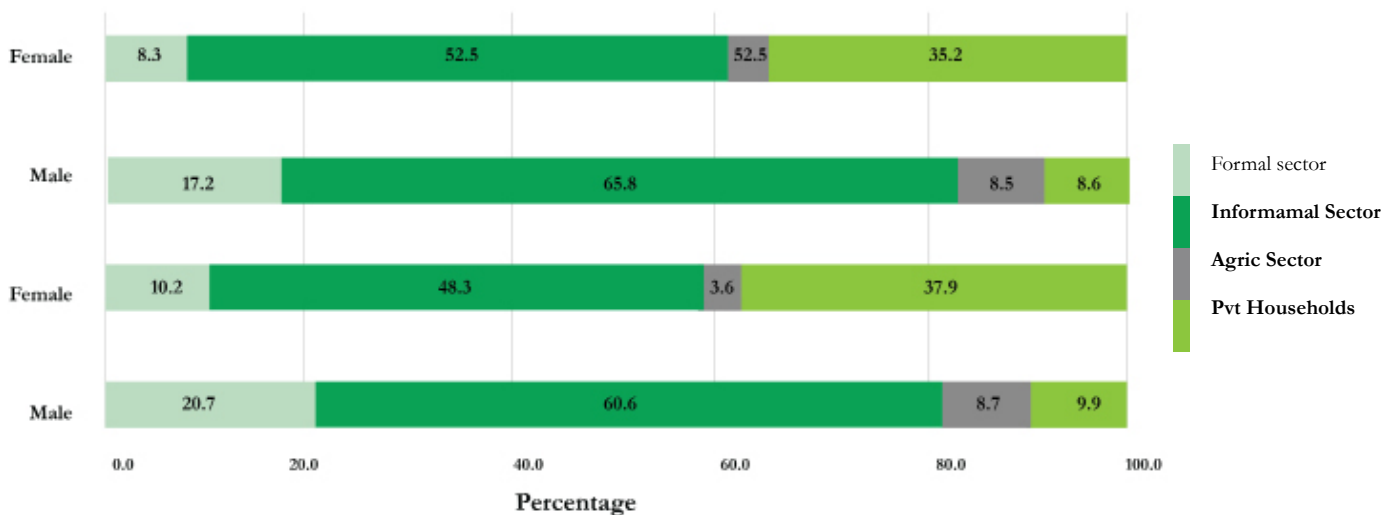
Source: BFAP, 2024, p. 2

Figure 9: Employment by Gender



Source: NAMC, 2024, p. 6.

Figure 10: Percentage distribution of informal employment by sector and sex, 2013 and 2019

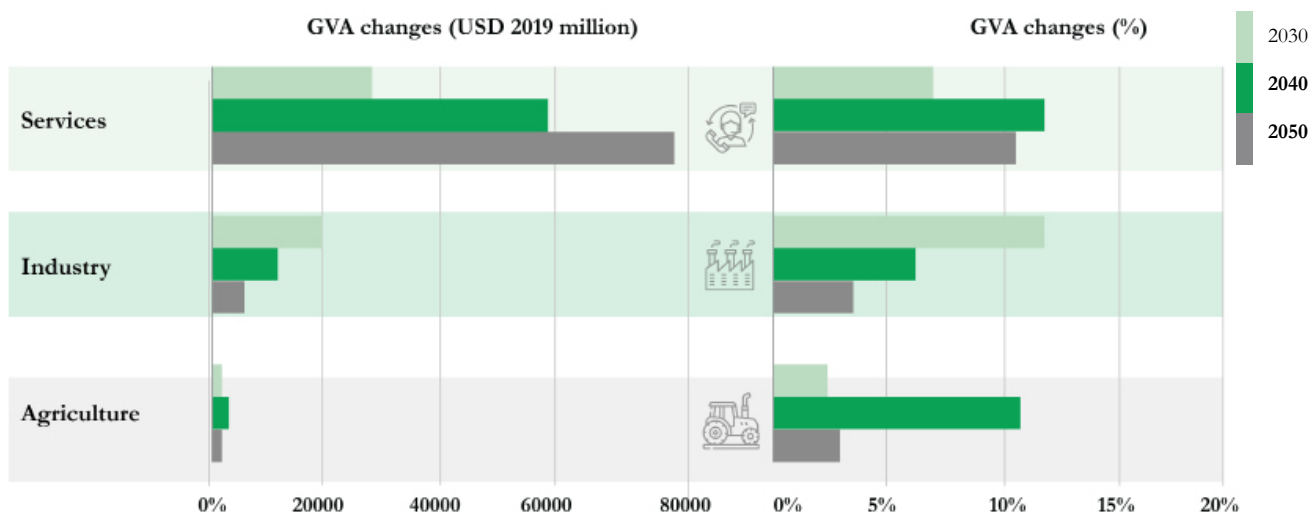


Source: QLFS, Q3:2013 and Q3:2019 (StatSA 2019, p. 12)

The agricultural sector, however, is expected to grow over time, considering, according to NAMC, that overall agriculture in “South Africa in quarter 4, employed about 24.3% of the employed pool, making the sector essential in the employment of South African

citizens” (2024, p. 6). Comparatively speaking, the gross value added and planned energy scenarios, respectively, indicate growth of 3.6% in 2030, followed by a 13.9% increase in 2040 and a 4.3% increase in 2050, as indicated in Figure 11 below.

Figure 11: Gross value-added evolution between planned energy scenarios and 1.5 C Scenario in US\$ 2019 million (left panel), in percentage (right panel), by sector.



Source: IRENA, 2023, P. 9.

With regards to labour market opportunities, the AgriSETA Sector Skills Report of 2022 to 2023 finds that top-end skills on reduced energy and water consumption pollution and waste, protecting and restoring biodiversity and ecosystems, and water harvesting and saving techniques are in demand in the sector (AgriSETA, 2022). In addition, making organic fertilisers, pests, and disease control techniques for small-scale farmers is in need in the Agricultural sector. These plans are based on the assumption that effective mechanisms exist for recognising prior learning and aligning skills development systems with the anticipated labour force needs of the future.

farmer development which continues to be characterised by “low levels of productivity, weak capabilities, and limited access to non-farm and cash-cropping activities” (FAO 2017; Jayne et al. 2021). Various strategies are required to address this such as “investment in equipment – especially for irrigation and storage, along with technical know-how (through extension services to advise on soil and disease management);” (Kaziboni and Roberts 2022, p. 8) access to credit lines and extension services (Stiko et al. 2018); and “access to inputs that can withstand harsh weather conditions, including improved seed varieties that are drought resistant, heat and flood tolerant” (FOA, 2013). In addition, investments are required in water management, irrigation and improved storage infrastructure (Newell et al. 2019; Ramachandran Nair et al. 2019; World Bank 2021).

One of the constraints in the sector is that despite South Africa’s impressive agrarian political economy, little traction has been gained as it pertains to black small-scale

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3.3.3 High Level Synthesis related to JET sectors demand

This section summarises: Where might the jobs be created? How many jobs will be created? And, Implications for occupations and for the skills that will be needed.

3.3.3.1 Renewables (Wind and Solar)

The growth in demand for jobs in renewable energy industries depends on South Africa's path on its decarbonisation journey to 2050.

- IRENA (2023) estimates that jobs in the renewable

energy sector in South Africa will increase from around 23 900 in 2023 to 83 700 by 2030 and 128 400 by 2050 under the Present Energy Scenario (1.5°C to 2°C). Under the 1.5°C scenario, it is estimated that 500 000 jobs could be created by 2050, with around half of these in solar technologies, particularly solar PV and concentrated solar power (CSP). In this scenario, IRENA predicts that wind energy would create 21,000 jobs.

- The Global Wind Energy Council (2022) estimates that installing 1GW of onshore wind capacity could on average create 130 000 jobs in development, construction and installation over a five-year period and 12 000 jobs annually during a 25-year operations and maintenance phase. Based on projections of wind generation in South Africa reaching 16 GW by 2030 (off a base of 3-4 GW) and up to 23 GW by 2040-45, there is both opportunity for employment creation but also pressure to ensure there is the necessary skills base to realise this opportunity.
- Based on EU solar PV industry trends, most employment is in technology deployment. While the EU solar industry is growing, 80% of the 465 600 jobs are in technology deployment. Manufacturing accounts for 44 200 people, operations and maintenance for 40 000, and recycling for 14 000. As the peak of demand for new deployment is reached, demand for operations/maintenance and recycling skills may increase.
- The scope of employment creation in South Africa will depend on the global and local demand and level of upstream localisation for producing lithium-ion batteries (LIBs) and vanadium redox flow batteries (VRFBs). It will also depend on the extent of the localisation, whether it is full manufacturing or assembly and manufacturing of modules, casings, cooling components and battery management systems (B&M Analysts, 2023). Downstream, the scope of recycling and re-using batteries will be an area of increasing numbers of jobs, but this will only manifest in the medium to long term.
- Lower numbers in permanent employment are expected in operations, for example:
 - Small solar farms (1-10 MW): typically employ 1-5 permanent staff

- Medium solar farms (10-50 MW) typically employ 5-15 permanent staff
- Large solar farms (50+ MW) typically employ 15-30 permanent staff
- Jobs will further be created in the following areas: project management and administration; education and training; sales and marketing; and finance and investment.

3.3.3.2 Green Hydrogen

- While the job creation statistics vary and are very dependent on the commercialisation of and investment in the technology, it is estimated that 20 000 to 40 000 new jobs will be created by 2030 and 2040 respectively in South Africa—an estimated total of 370 000 to 650 000 jobs across the green hydrogen value chain by 2050 from exports and local demand (DSI, 2021; dtic, 2022a; Nyathi, 2023; Pillay, 2023; Salma & Tsafos, 2022; Sookhun, 2022)
- The types and numbers of jobs will vary depending on the area of emphasis, e.g. 14 500-31 800 jobs could be created per year for renewable energies and electrolyzers, or 55 000 rural farming jobs associated with the production of sustainable aviation fuel (Covary et al., 2023).
- The green hydrogen commercialisation strategy estimates these jobs will require upskilling. It will need to be incentivised through various mechanisms including in R&D and importing skills in very specialised areas (dtic, 2022b)
- The potential occupations and skills required for green hydrogen are listed in annex 3.

3.3.3.3 NEVs

- Currently the vehicle manufacturing sector employs 116 683 people directly, 239 000 indirectly, and another 214 309 induced jobs (White Paper 2023)
- SAAM 2035 projects doubling employment to 224 000 by 2035—thus, 112 000 new employees due to the industrial strategy
- New infrastructure will be required, such as charging stations for NEVs (approximately 4 000 by 2035). These jobs lie largely in the construction industry

and petrol station attendants must be upskilled/re-skilled as charging station attendants

- There is likely job growth in the waste economy (battery recycling)
- At least 64 high-skilled and medium-skilled occupations are considered to be ‘transforming,’ such as:
 - In the auto assembly segment, technicians and engineers must reskill for installing charging units and lithium-ion batteries
 - In the auto retail segment, occupations such as sales managers, marketing executives, and insurance investigators will require training to learn new electric vehicle specifications and operations
 - In the infrastructure segment, occupations requiring training will be medium-skilled and mostly service station personnel.
- Approximately 51 occupations (Annexure 3) have been identified as emerging occupations in the sector. Some would be more technical in nature such as electrical, mechanical and engineering focused, while others would be sales personnel, charging point operators and marketing-related jobs, for example:
 - A conversion specialist, to convert internal combustion engine vehicles to new electric vehicles
 - A battery repairer to replace battery cells in damaged batteries
- In addition, upgrading the electrical grid to support increased demand from EV charging will be required together with a need for project management and administration; education and training; sales and marketing; distribution and logistics; and finance and investment.

3.3.3.4 Agriculture

In quarter 4 of 2023 the agriculture sector employed 24.3% of the South African labour force (StatSA 2023). As a shift to a just transition takes place, jobs are likely to be created in the following areas:

- Renewable energy integration on farms seen through the installation of solar panels and wind farms
- Jobs in organic crop and livestock production, focusing on environmentally friendly practices to de-

- develop and manage local food supply chains
- Jobs in implementing and managing conservation tillage, crop rotation, and other soil conservation techniques
- Installation and maintenance of efficient irrigation systems, including drip and micro-irrigation
- Processing and marketing: jobs in processing and marketing value-added agricultural products such as organic foods, artisanal goods, and eco-friendly packaging
- A list of some potential agricultural-related occupations that could play a key role for the just transition can be found in Annex 3

The analysis of the four sectors shows that data on required occupations and skills varies in detail and quality. While a more detailed analysis of occupations required is listed in Annex 3, the changing occupational demand was explored for the four key just transition (JT) sectors (renewable energy, green hydrogen, NEVs and agriculture). These occupations were mapped against the 2024 list of Occupations in High Demand (OIHD) to establish how this list has integrated the occupations emerging within the context of the just transition. The key insights emerging from the list are that:

- The NEV sector has 17 at-risk occupations, 64 transforming occupations, and 51 emerging occupations. The mapping of these occupations against the list of high-demand occupations indicates that one occupation (diesel mechanic) is at risk, 37 transforming occupations, and one emerging occupation (electrician) appear in the OIHD list.
- Of the 52 potential occupations identified for the green hydrogen sector, 17 appear in the occupations in OIHD list. These include chemical engineers, civil engineers, electrical engineers, electricians, energy engineers, environmental engineers, human resource managers, industrial designers, manufacturing technicians, mechanical engineers, metallurgists, and project managers. Some examples of green hydrogen occupations that are not in high demand include environmental lawyers, equipment installers/repairers, fitters and turners, fuel cell engineers/technicians, fuel cell fabrications and testing technicians, green hydrogen specialists/researchers, green hydrogen analysts, green

hydrogen laboratory assistants, green hydrogen marketing practitioners, and green hydrogen solution architects. /researchers, green hydrogen analysts, green hydrogen laboratory assistants, green hydrogen marketing practitioners, and green hydrogen solution architects.

- Seven of the 20 occupations identified for the solar sector appear in the occupations in high demand lists. Examples include mechatronics technicians, electricians, welders, toolmakers, solar PV Installers, electricians, carpenters, and energy efficiency technicians. Six of the 15 identified for wind appear in OIHD, with core occupations for the sector, such as a wind turbine technician, not included in the occupations in high demand lists.
- 15 of the 38 occupations identified for the agriculture sector are in the OIHD list. Some of these occupations include biotechnologists, agricultural farm managers, chemists, truck drivers, policy and planning managers, data management managers, hydrologists, food and beverage scientists, management accountants, policy analysts, marketing practitioners, data scientists, software developers, mechanical engineering technicians, and diesel mechanics. Some agricultural occupations not in high demand include agronomists, horticulturists, bio-resource engineers, agricultural economists, plant pathologists, nursery managers, and animal bio-scientists.

Certain occupations overlap with others in more than one sector due to the requirement for renewable energy across sectors and the use of machinery for different types of work in different sectors. For example, the diesel mechanic is in high demand and required both in the automotive and agricultural sectors. Electricians are also needed to work with a variety of electrical appliances in different sectors.

The implications of this changing demand, concerning JET, for skills required include technical skills (linked to manufacturing, renewable energy, energy efficiency and gride management), environmental skills (linked to sustainable agriculture, ecological restoration and climate science), innovation and research, and social and economic skills.

While this provides an overview of occupations, there is still a more detailed understanding of the occupations

that may be required as well as any specialist knowledge or upskilling that may be required and when. What is also missing is the volume of skills required i.e. the detailed demand as well as the geographical location of that demand. For emerging technologies like NEVs and green hydrogen there is high uncertainty around the timing and full-scale commercial production, impacting on skills anticipation and planning.

Table 10: Constraints and Opportunities of Labour Demand

3.4 Summary of Constraints and Opportunities

Aspect	Constraints	Opportunities
Employment and labour force participation	Extremely high unemployment	Pool of available labour – many people unemployed but willing to work
Spatial and sectoral employment patterns	Some provinces are very hard hit by unemployment	Regional opportunities for employment growth as part of the low-carbon transition
Labour market trends	Infrastructure for sectors Manufacturing job losses in heavy industry	High growth in communication, finance and insurance services Successful automotive sector Potential for fruit production
Green Economy Sectors – general		Awareness of climate change and need for Just Transition and new projects being planned
RE – Solar and Wind	insufficient manufacturing capabilities as a result, domestic markets being disproportionately reliant on import markets, drastically limiting domestic market capabilities, upskilling, reskilling and cost-effective market opportunities and competitiveness.	Potential for new jobs
Green Hydrogen		Potential for new jobs after reskilling and upskilling
Electric Vehicles	Some occupations at risk	Some new occupations – potential for new jobs



4. Labour Supply

This chapter provides an overview of South Africa’s skills formation system and educational architecture including schools, TVET, universities, and other training. It also focuses on the skills and institutions required to support green jobs.

4.1 Overview and Key Issues

The transformation of education and training has been a policy priority since 1994 and has been supported by significant spending. However, this has not resulted in the desired outcomes, and thus, South Africa does not have the skilled and experienced workforce required by the labour market. Key challenges include the legacy of apartheid, which continues to shape the workforce, issues with improving the responsiveness of the education system to changing skills requirements, and a discouraged young population with large numbers not in education, employment, or training.

The country’s workforce continues to be defined and shaped by the legacy of the apartheid with two-fold problems: the problem of growing the low skills and capability of the labour force, which was inherited from the low base, and reducing unemployment (Department of Forestry, Fisheries and Environment, 2014).

There is a consensus in the literature about the paradigm shift in the global labour markets owing to the international trends, i.e. the fourth industrial revolution, meant to improve efficiency in production, climate change, COVID-19, migration, and demographic transitions which affect the nature of work and social life profoundly have a direct effect on domestic labour markets (Department of Employment and Labour, 2021).

The size, shape, type of task, and skills intensities of work, coupled with work restructuring are altering the existing occupations and creating new forms of work and industries (Department of Employment and Labour, 2021). The country’s economy demands a skilled and experienced workforce, yet the majority of those looking for employment are not well educated nor equipped with the necessary skills demanded by employers in the labour market.

Although the South African government continues to be committed to ensuring the supply of labour responds to employers’ demand through new policy regime(s), legislative, and regulatory mechanisms, most young people are discouraged by the labour market and are not building their skills base through education and training institutions—they are not in employment, education, or training (NEET) (Department of Employment and Labour, 2021). The country’s skills plan aims to ensure that skills are not a constraint on economic development and, has designed interventions and actions that address occupational shortages and skills gaps in the labour market (and the skills that have been identified thus far with respect to the JET, were outlined previously (section 3.3.3). At the same time, the specific challenges in this regard are discussed below). The skills plan focuses specifically on the implementation of the economic reconstruction and recovery plan (ERRP), thus maximising employment opportunities for new entrants to the labour market, as well as supporting the preservation of existing jobs and the creation of new jobs (Skills Development Act, 1998; Promulgation of the National Skills Development Plan (NSDP), 2019; Department of Higher Education and Training, 2022, 2023b). The current economic and business environment demands workers who can undertake complex and ambiguous work requiring their unique human abilities, creativity, innovation, and value judgment. On the other hand, the transition to clean energy for it to be just, South Africa has to ensure that the current workforce in the coal belt is protected and that the skills ecosystem is prepared not only to respond to current demands but those required to transition to a more just and resilient energy system.

The need to transform education and training to expanding access has been a policy focus for the country post 1994.

4.2 Framework and Permeability of Education and Vocational Training

4.2.1 Overview of the skill formation system

South Africa's skills formation system is characterised by several institutions in the education system and includes workplace skills and experience formation. It is governed by a complex set of regulatory tools and policies.

The country's education provision system is overseen by two ministries, the Departments of Basic Education (DBE) and Higher Education and Training (DHET) (Kgobe & Baatjes, 2014). The DBE oversees primary and secondary education provision. DHET is responsible for post-school education and training which includes universities and private higher education institutions, Technical and Vocational Education and Training (TVET) colleges (public and private), community education and training (CET) colleges, and adult education centres, as well as the skills levy institutions (Department of Higher Education and Training, 2014).

Figure 15 below shows the different institutions that offer education and training, the institutions that regulate and coordinate the system, and the institutions where employment happens. Workplaces are both places where structured training, workplace experience, and ongoing learning about work happen and where demand for expertise and qualifications is shaped.

The system is complex, and there is a complex set of regulatory tools and policies that shape the functioning of these institutions in various ways. What follows provides a high-level overview of the ways in which education and training is provided, shaped by qualification policy.

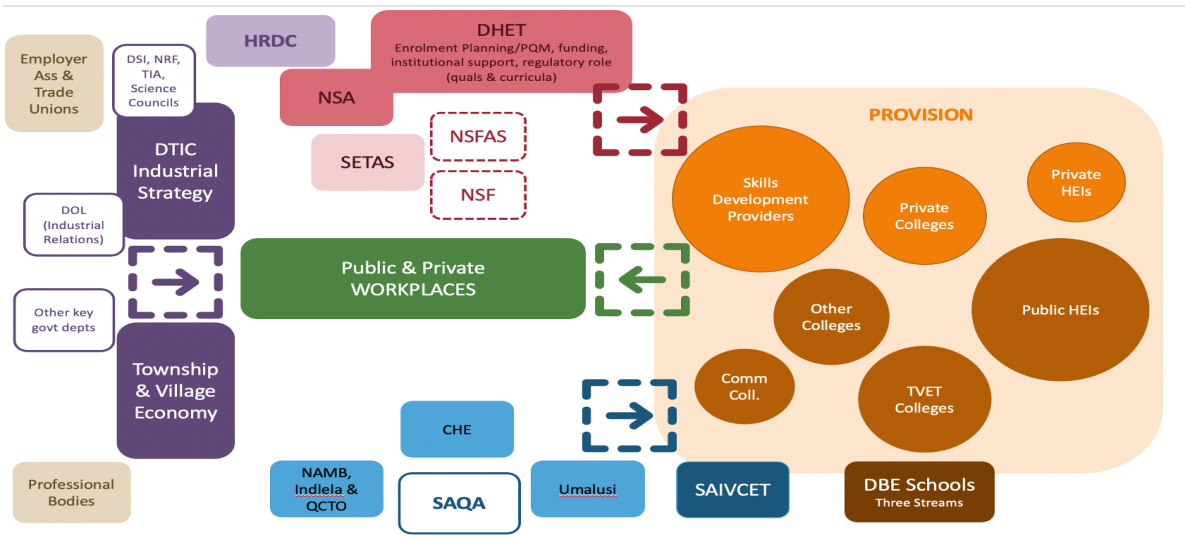
The structure of NQF consists of three sub-frameworks, as shown in Figure 13 below, each administered by a quality assurance council.

The system has good databases that produce data about student output against qualifications, separated for the three sub-sectors. However, this data is not very simple for planning purposes, particularly at a disaggregated level required for planning changes within occupations for a green transition. And the complex set of qualifications in the TVET system means that making sense of the output data is particularly difficult, which is why it is

discussed in some detail below.

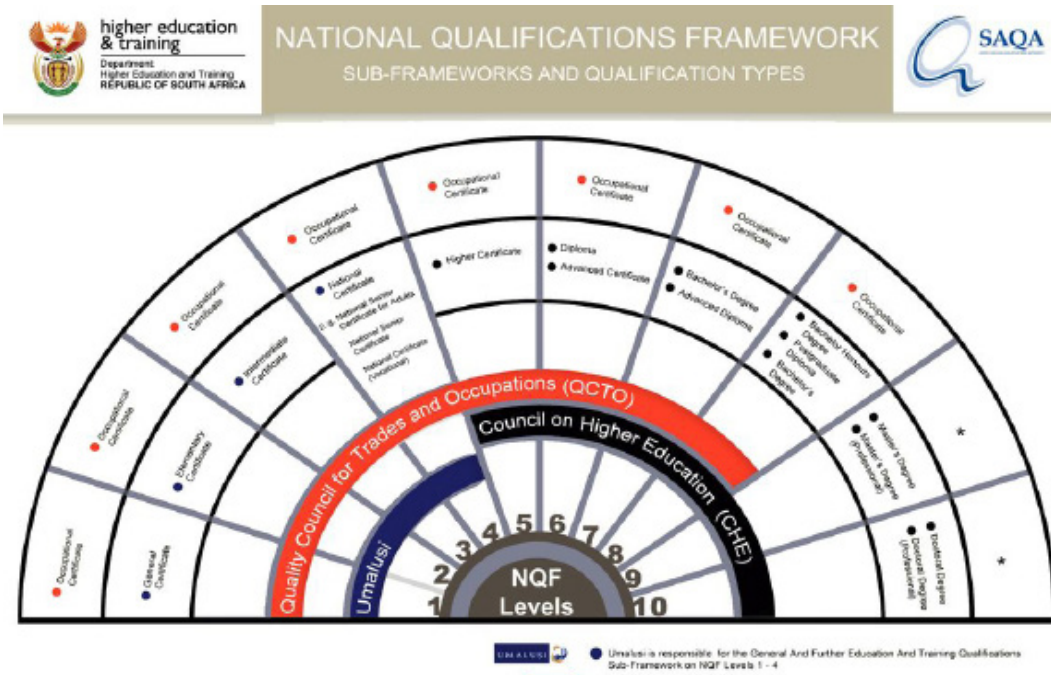
The Department of Higher Education and Training's Labour Market Intelligence Project, led by the Development Policy Research Unit of the University of Cape Town, prepares regular analysis of educational supply data in relation to demand in the economy, at a high level. These reports can be found [here](#).

Figure 12: South Africa's skill formation system.



Source: Allais (2021)

Figure 13 South Africa's National Qualification Framework



4.2.2 School System

Access to basic education in South Africa is universal. South Africa spends a significant portion of GDP on education, however, there are key challenges around the poor quality of education and a high school dropout rate.

South Africa has achieved significant improvements in access to education, but the quality of education remains a major concern (Mlachila & Moeletsi, 2019; Statistics South Africa, 2019). Access to education at the primary level is almost universal and has been expanding at the secondary level. Learners drop out of school for various reasons, i.e. poor academic performance, illness and disability, and lack of interest in education.

Secondary school (six years in total) is divided into lower and upper secondary. Lower secondary goes up to Grade 9 and is compulsory. Students are taught subjects including languages, mathematics, life orientation, arts and culture, economic and management sciences, and physical and life sciences. Upper secondary, which is not mandatory, starts at Grade 10 up to Grade 12 (Macha & Kadakia, 2017). Learners are able to choose between an academic (general) or technical route and take a minimum of seven subjects. Those who select the technical route are enrolled in a technical secondary school – although the number of these schools is limited (Macha & Kadakia, 2017; Tibane, 2018).

The output of the school system

A large percentage of the age cohort does not complete senior secondary school.

The largest percentage of individuals who complete the matric go from school to work, or from school to unemployment.

About 20% of the matric cohort proceeds to tertiary education.

Internationally, there is debate about what should be included in the school curriculum from the perspective of preparation for work. In South Africa the most recent manifestation of this debate is the so-called ‘three streams model’, which suggests a general, technical vocational, and occupational matric.

4.2.3 Technical and Vocational Education and Training

The TVET sector is a stated priority for the South African government, but it does not receive appropriate funding. The sector is weak and has been subject to continuous policy reform in terms of institutional structure, governance funding, qualifications, and curricula.

Three main problems which shackle the functioning of the TVET colleges are a confusing and conflicting set of qualifications, contradictory institutional, governance, and funding models, and unrealistic and conflicting policy goals. The governance and funding mechanisms, which shape the colleges’ institutional form and institutional capacity, often get in the way of economic responsiveness, even when explicitly designed to facilitate it. The TVET colleges have been forced to operate as bifurcated institutions, with components under two contradictory institutional models: an ‘entrepreneurial’ component and a component controlled by state bureaucracy.

Because these three sets of issues are intertwined and part of how TVET colleges have been reinvented in numerous ways over the past 30 years, some background and history are given below, to facilitate insight into the complexities of the system.

²The section draws extensively on Allais (2023), a diagnostic report produced for the National Planning Commission.

4.2.3.1. The qualifications issue:

There are four main TVET qualification types: the National Certificate Vocational (NCV); the 'Nated' (National Education) qualifications including the N diploma; the National Senior Certificate (Technical); and occupational certificates (at various levels). The NCV and Nated qualifications, as well as occupational certificates, are primarily offered mainly public and some private TVET colleges, while universities of technology offer higher occupational certificates.

The output of the vocational education system

While many of the vocational education programmes offered by the TVET Colleges are intended to enable learners to complete qualifications at the level of senior secondary education, most learners have completed senior secondary school.

The technical vocational education and training system is weak with a large number of different types of qualifications creating poor information for labour markets.

The qualifications differ in duration, nature of assessment arrangements, and a range of other factors. The discussion below focuses on the provision mix of the public TVET colleges in relation to these qualifications to provide a high-level overview of the issues and to assist in making sense of the numbers. Note that some private colleges are similar to public colleges, while others are totally different but use the word 'college' in their name. National data sets tend to not have good statistics on private, particularly on student enrolments and graduations. What is also unknown is whether or not, and why, they are chosen above public institutions, and in what circumstances.

4.2.3.2. Changing institutional forms

By the end of apartheid, South Africa had 152 technical colleges. These colleges were initially developed to offer three-month theory courses to mainly white men and some 'coloured' men. They had formed an integral component of the apprenticeship system, offering courses that were the theory component of apprenticeships (Badroodien, 2004; McGrath, 1996). These courses, referred to as the 'Nated' qualifications, still exist in colleges today.

After the creation of the 'skills-levy' institutions under the then Department of Labour in 1996, the Depart-

ment of Labour decided to close the apprenticeship system, and replace it with learnerships, to be delivered by private providers with the workplace component implemented in companies, against new qualifications developed through the newly introduced National Qualifications Framework (NQF). These qualifications and their smaller components (called unit standards at the time) had no prescribed curriculum, but instead comprised learning outcomes. The belief was that employer involvement in prescribing learning outcomes would ensure relevance; much research has shown the many fallacies of this idea (Allais, 2012; Gamble, 2002; Wheelahan, 2010).

The Department of Labour also renamed all short course provision 'skills programmes' and attempted to force these to be offered against 'unit standards' that made up the qualifications in the original NQF model, believing that this would assist individuals in acquiring credit towards qualifications. The implication for the colleges was that there was no longer a role for the 'Nated' qualifications.

In 2003 the colleges were merged into 50 further education and training colleges. The vision was that they would offer broad, knowledge-based, vocational qualifications that would prepare people for skilled employment and also offer a pathway into higher education for those who selected this route. A new qualification was developed for the institutions to offer in 2007, called the National Certificate (Vocational), which was intended as a vocational alternative to the National Senior Certificate offered in the last three years of the school system. The NCV was removed from the immediate needs of industry, failed to integrate workplace experience, and the demanding curriculum combined with poorly prepared students resulted in low throughput. However, its strength was that it had an adequately prescribed curriculum. Throughput numbers have been low.

The qualifications created through the NQF, and the quality assurance and accreditation systems set up through the SETAs and the South African Qualifications Authority (SAQA) were extremely complex and cumbersome, and were not designed with public provision in mind. These programmes remained outside of the FET college programme mix. The NCV became the core programme offering, with the Nated qualifications always being on the brink of being phased out, but never actu-

ally phased out as employers did not want to lose the apprenticeship system where it was still working. In recent years there was a spike in enrolments for the Nated, for a range of complex political, institutional, and funding-related reasons, but now this qualification is actually being phased out.

These different sets of qualifications, the Nated qualifications (formally theory for apprenticeships) and the new National Certificate (Vocational), as well as the new NQF qualifications, lived on together, in an uneasy co-existence, both funded, managed, and examined by the DoE, initially, and then by the DHET, when it was created in 2009.

The shift from 152 Technical Colleges to 50 FET colleges through the FET Colleges Act of 2006 gave the colleges substantially increased autonomy, creating councils with wide-ranging powers, including hiring lecturers directly. This was supposed to enable colleges to function as 'responsive providers'. In reality what happened was closer to 'managed' autonomy. Lecturers teaching on the Nated qualifications, and the NC(V) continued to be hired by the state, initially through the provinces and later through the DHET. Collective bargaining continued to take place through public sector bargaining processes. The state funded the two qualifications against learner enrolment targets projected by the state. Autonomy and responsiveness were, according to policy aspiration, to be realized by offering new qualifications that were being developed through the original NQF.

However, funding for these qualifications was supposed to come not from the DoE or its successor, the DHET, but rather through the SETAs, set up through a payroll levy in 1996. To offer these qualifications, colleges would have to be 'accredited' through the SETAs, as would any private provider—the logic of the Australian model was one of treating public and private entities the same.

So, two completely different institutional logics operated in the same institutions simultaneously: a bureaucratic delivery model and an aspirationally entrepreneurial model.

The qualifications and quality assurance model of the original NQF quickly revealed itself to be a crisis, with hundreds of qualifications developed but never offered, and a log jam of institutions trying to get quality assured with no evidence of quality. Why and how this happened

has been the subject of policy review and much research (Allais, 2007, 2011; Departments of Education and Labour, 2002, 2007; Kraak, 1998; Lugg, 2007; Muller, 2000).

The qualifications framework was changed substantively in 2009, along with its institutional architecture (Allais, 2011). Three sub-frameworks were created, the logic of which was to allow the university system to determine an overarching set of qualifications for itself, overseen by a quality council for higher education, the Higher Education Quality Council (HEQC), created by expanding an existing higher education body. The general education system in turn would have its own set of qualifications and quality council, Umalusi, the latter also an existing body that oversaw examinations and certification for schools and colleges. A separate set of qualifications would be developed for 'trades and occupations', overseen by a newly created Quality Council for Trades and Occupations (QCTO). The newly created QCTO set about attempting to develop a set of what would in most countries be called vocational qualifications, but in South Africa are now called occupational qualifications, partly off the base of some of the qualifications that had been developed through the original qualifications framework, and partly through a complex set of systems that had been developed to engage employers in the design of new qualifications.

One issue that was unresolved in this configuration was the location and nature of vocational qualifications, some of which sit under Umalusi; some of which sit under the HEQC (many levels 5 and six certificates and diplomas are aimed at the world of work and considered part of vocational education in many countries). Some of which are now called occupational qualifications. This may have contributed to ongoing lack of clarity about the boundaries and goals of vocational education in South Africa. More recently the Department of Basic Education (DBE) has stepped into this space and added further complexity and potential for duplication with its envisaged 'Three Streams Model'.

In 2012, the colleges were renamed again, this time to Technical and Vocational Education and Training Colleges. The shift from FET to TVET was supposed to signal a stronger focus on the vocational side of their work. They have continued to offer the Nated qualifications and the National Certificate (Vocational), fund-

ed through the DHET. Many of them have valiantly engaged with occupational qualifications, often by setting up different centres or institutional units, because the logic of the qualifications remained different, and the funding flows remained different. Most recently the DHET has announced the phasing out of the first three Nated qualifications, the N1 to N3, and the QCTO is absorbing some of the others, the N4 to N6, into new occupational qualifications. How this will affect funding flows and modalities appears to be a work in progress.

So currently, in terms of qualifications, South Africa has layers of new qualifications without removing the previous ones, and a qualifications framework used as a regulatory mechanism. While there are policy goals—mainly through the National Development Plan—to expand enrolment, and in particular to focus on artisans, the actual labour market demand for TVET graduates in specific fields is not well established, and most people in TVET colleges are not studying to be artisans, nor do they have great employment prospects. Recently NSFAS eligibility expanded to include college students, leading to a rapid demand for places.

Colleges that serve students with weak educational achievement and generally from poor families have enormous expectations placed on them in the context of muddled governance and constant policy reform. The lecturers who teach in them are supposed to be entrepreneurially minded sellers of qualifications, designers of curricula and assessment, and, sophisticated navigators of a highly complex accreditation, qualifications, and quality assurance system, through a system based on contractualisation and competition. At the same time, teachers of a prescribed curriculum, leading to a national examination, through a state-funded system, managed by a national government department (Allais, 2013, 2023; Gamble, 2016).

This makes output data difficult to understand, but a brief overview is provided below.

In 2020, there were 128 163 registered students for report 191 (N3 and N6), and NCV 4 examination in TVET, of which 120 107 wrote the examination, and 104 310 completed (DHET, 2022). SETA-supported learning programmes declined by 46.7% during the 2020/21 financial year compared with registrations of 2019/2020 (222 210). The certifications number of SETA supported learning programmes during the period 2020/21 fi-

nancial year 126 725, which is 29.5% lower as compared with the 2019/20 financial year (DHET, 2022). Most certifications were for skill programmes (64.4%), followed by learnerships at 29.7% and internships at 5.8%.

TVET colleges overlap with schools because the bulk of their provision is at senior secondary level. Theoretically, they should offer vocational education to 15- to 19-year-olds. However, in terms of actual enrolments, most of their students are older—having completed senior secondary school. By 2018 only 11% of students were in the 15 to 19 range (NPC, 2020). This is one of the many complexities in the sector, and a cause of difficulties for the institutions, as teenagers' educational needs differ from those of young adults. A different way in which colleges overlap with schools is that the National Certificate (Vocational) offered by the colleges is not substantively different from the National Senior Certificate (Technical) offered by technical high schools. The enrolment numbers of both are small, and the reason there are two similar qualifications is historical. To add complexity to this picture, the Department of Basic Education, responsible for schools, has announced that it will create what it calls an 'occupational stream' starting from junior secondary school, creating further overlap in the provision of vocational education (NPC, 2020).

4.2.4 Universities

Universities are seen as the most vital part of the South African skills system, however, the sector still faces challenges around accommodating growing student numbers without expanding aspects such as funding, the capacity of lecturers, and infrastructure.

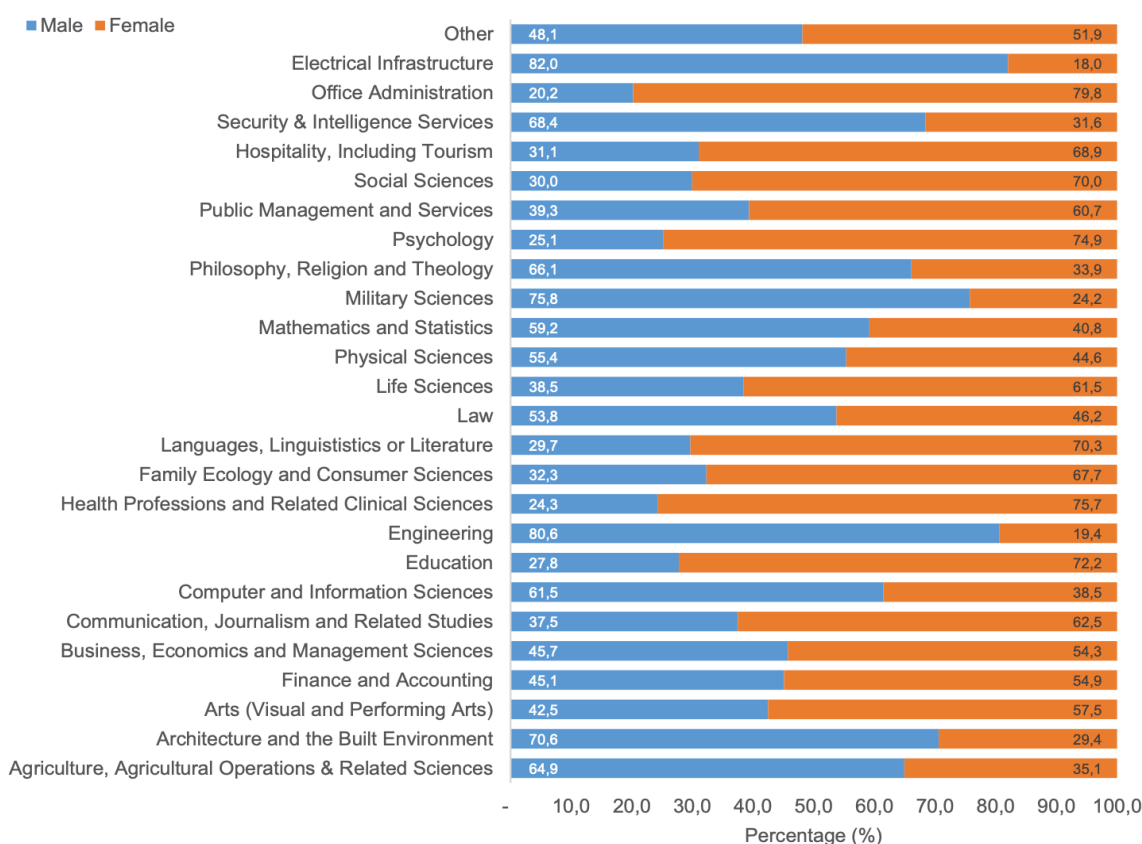
There are 26 higher education institutions in South Africa, of which 19 are traditional universities and 6 are universities of technology (University South Africa, 2020). Furthermore, the sector consists of a larger number of private higher institutions providing certificates, diplomas, and, to some extent, degrees.

Despite many challenges, universities are the strongest part of the South African ‘skills’ system. One major problem facing the sector is expansion without accompanying funding. The crisis of #FeesMustFall resulted

from years of substantial expansion of student numbers without accompanying expansion of funding. This led to institutions buckling under pressure, eroding quality in instances. The result of #FeesMustFall has been to shift funds away from institutions to individual students. This, in the context of rising demand for university education, is going to aggravate problems in the system, instead of alleviating them. The core problem—too many students for the capacity of lecturers and infrastructure—is simply getting worse, not better, which is likely to lead to a lowering of quality and the inability of universities to develop or improve research and postgraduate study.

Over 1.3 million students were enrolled at institutions of higher learning in South Africa in 2020 both in public and private Higher Education Institutions (HEIs), with the majority being in the public HEIs 1 094 808, while private HEIs had 219 031 (DHET, 2022).

Figure 14: Gender distribution across fields of Education.



Source: Stats SA, 2024, p. 54

The gender distribution across fields of education highlights certain trends and disparities in educational choices. While women dominate in fields such as office administration, social sciences, psychology, languages, health professions, and education, they remain underrepresented in fields traditionally associated with male-dominated industries. Fields such as electrical infrastructure, security and intelligence services, military sciences, engineering, architecture, and the built environment also continue to have a majority of male graduates. Efforts to promote gender equality and diversity by disrupting societal norms should focus on addressing these disparities by encouraging greater participation of women in traditionally male-dominated fields.

4.2.5 Other Formal, Non-Formal and Informal Training

4.2.5.1 Community Colleges

Community Education and Training (CET) Colleges, referred to in short as Community Colleges, are a newer type of college, created in 2015. They have a tiny budget allocation, and are similarly structured through a bureaucratic control model, with an aspiration for entrepreneurial institutional behaviour.

They were created out of 3 279 public adult learning centres that primarily offered adult literacy and second-chance matric (senior secondary school) qualifications. These centres mainly did not have a campus, but operated out of public schools and other institutions, often at night. Each province has a newly created institution called a Community Education and Training Administrative Centre, which has a council, and oversees a number of community learning centres, mainly still operating out of schools. The public adult learning centres mainly had staff on short-term part-time contracts; of which DHET is currently reviewing and developing a new staffing model.

The policy vision is to have campuses (learning centres) in every (geographical) community in South Africa that are differentiated based on the needs of each local community. Current plans indicate that campuses will be developed from under-utilised public buildings as well as through partnerships with schools, TVET colleges, universities, and organisations that have their own spaces e.g. churches, community halls, etc. A recent national budget shifted infrastructure budget from TVET col-

leges to Community Colleges for this purpose.

The intention seems to be that DHET will allocate funds to the nine provincial administrative centres, as well as develop policies and curricula. Policies include five-year projected enrolment plans—funding is primarily against learner enrolment per programme, including projected enrolments and planned expansion (Republic of South Africa, 2020). The policy envisages these colleges obtaining funds for ‘responsive’ provision from SETAs, the National Skills Funds (NSF), and private sources, and stipulates that ‘all such courses must be fully funded with no cross-subsidisation’.

In short, the institutional model is similar to the one which has hobbled the TVET colleges—a component that is bureaucratically controlled, but with even less autonomy at a ‘campus’ level, and a notion that somehow these institutions can also be entrepreneurial and responsive, obtaining completely separate funds for such work, and with no cross-subsidization between the two.

Community colleges enrolment figures remain very low with 142 538 students enrolled in 2020 (DHET, 2022). The CET requires significant improvement to meet the vision of 1 million students by 2030 (DHET, 2021, 2022).

4.2.5.2 Skills Development Providers

This is a category of skills providers could be termed ‘other’ and was created to make decisions about registration and accreditation systems, as opposed to a set of institutions that have a common set of characteristics. This category can hide significant differences requiring different forms of support and also include institutions with important resources that could be better utilised.

This category includes large workplace training institutions that provide formal training and the broader role of workplaces that train staff informally. These institutions are key as they could support wider provision and require different forms of support.

Some workplaces do not provide formal training but are critical for on-the-job training and workforce development. In most cases, they are not seen as skills development providers, although they are a crucial component of skills development.

This lack of distinction creates multiple challenges. Workplaces are quality assured using mechanisms sim-

ilar to those elsewhere in the system, burdening these workplaces rather than encouraging these forms of provision. In other cases, the requirement on programmes results in courses that are no longer affordable

These discussions also affect how funding flows, linked to accredited providers and qualifications. While the South African regulatory systems discussed below, were set up in large part to incentivise employers to train, there is no clear evidence to suggest that the incentives lead to more or better training than would have happened without them, and, in many cases, it is very difficult for employers to access funds for providers of their choice or workplace-based training.

There is very little cooperation and work across private and public provision. For example, the plumbing association runs training; colleges should be working with them. However, SETA funding mechanisms do not support or enable this. Coherent total numbers are difficult to obtain for this learning category, although the Nation-

al Learner Records Database is supposed to have them.

4.3 Provision Oriented to Green Jobs

With the transition to a green economy, there is a need to ensure the supply of appropriate skills and knowledge to meet demand. Education institutions and training providers are beginning to offer a variety of tailored courses including relevant modules in diplomas and university degrees. For example, a review of current courses across the post-school education system indicates that over 220 courses cover energy-transition topics (see Annex 2) – with renewable energy dominating at 62% (see Figure 15). This clearly illustrates the country’s emphasis on shifting to a more resilient energy system and, therefore, the increased demand for renewable energy technology courses, e.g. solar PV installation and energy efficiency (to reduce energy costs).

Figure 15: Total Courses Offered by Topic

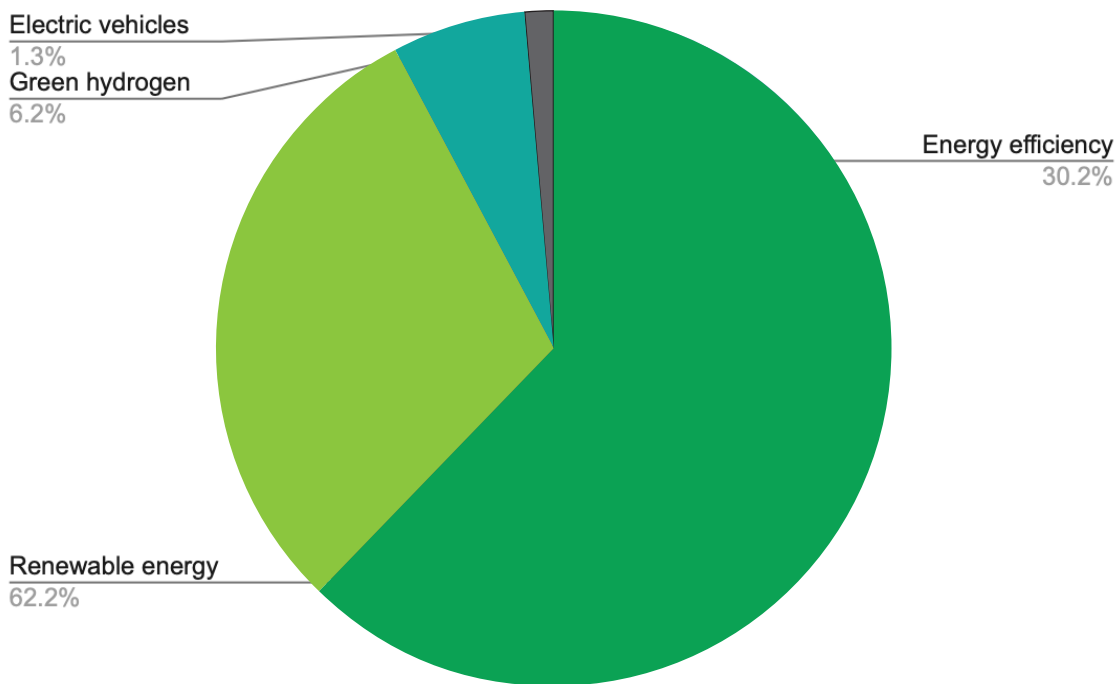


Figure 16 suggests that much of the energy-transition skills provisioning emphasis is occurring in Gauteng (45%) and the Western Cape (32%). While these are considerable nodes of economic activity, it is interesting to note that the number of courses offered in areas currently impacted (positively and negatively) by a shift away from fossil fuels is low, e.g. Mpumalanga and Limpopo (coal mines) and Northern Cape (solar PV expansion). This is a problem because this kind of training must be offered locally.

Figure 17 illustrates the total number of courses identified by provider type and course topic. It clearly shows the volume of courses offered by private providers who would fall into the ‘Skills Development Providers’ (or other) category discussed above.

Figure 16: Geographical Distribution of Total Courses Identified

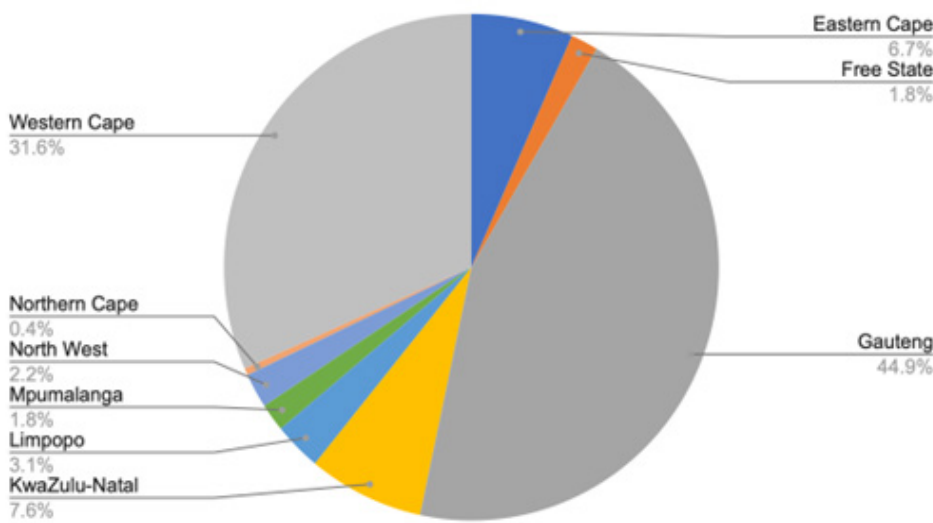
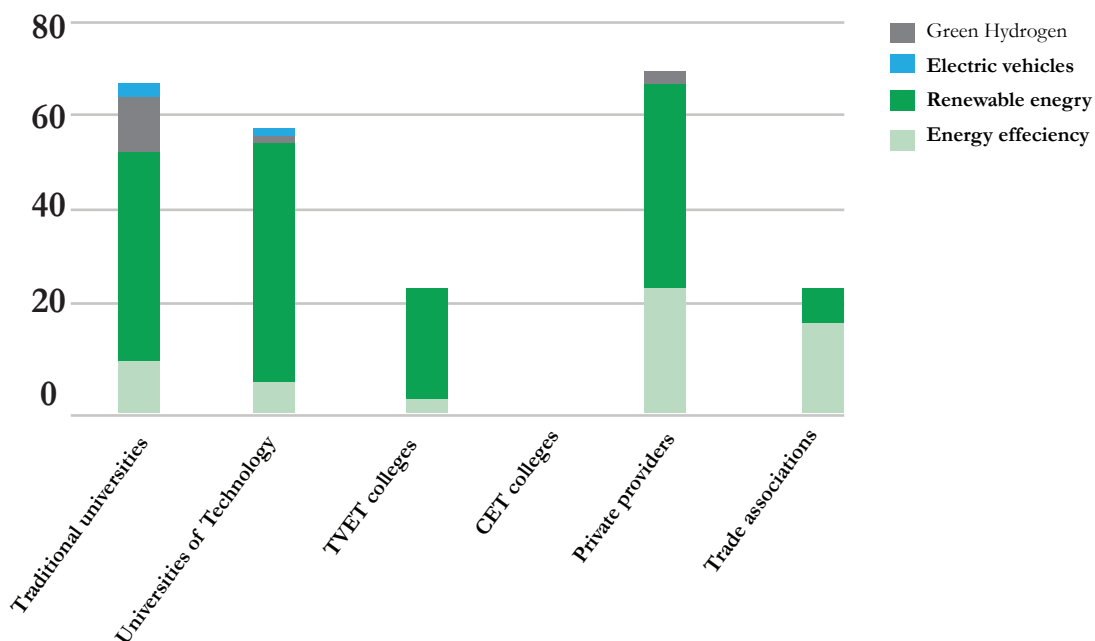


Figure 17: Courses Offered by Provider Type and Course Topic



Except for private providers, most courses are provided as a module within a degree, diploma or certificate course, with some examples of specialist courses beginning to emerge. These tend to be aligned with research centres such as Stellenbosch University’s Centre for Renewable and Sustainable Energy (CRSE), the University of Pretoria’s Centre for New Energy Systems (International Labour Organisation, 2022), the Cape Peninsula University of Technology’s (CPUT) South African Renewable Energy Technology Centre (SARATEC), Durban University’s Energy Technology Station (ETS), and the University of Witwatersrand’s African Energy Leadership Centre (AELC).

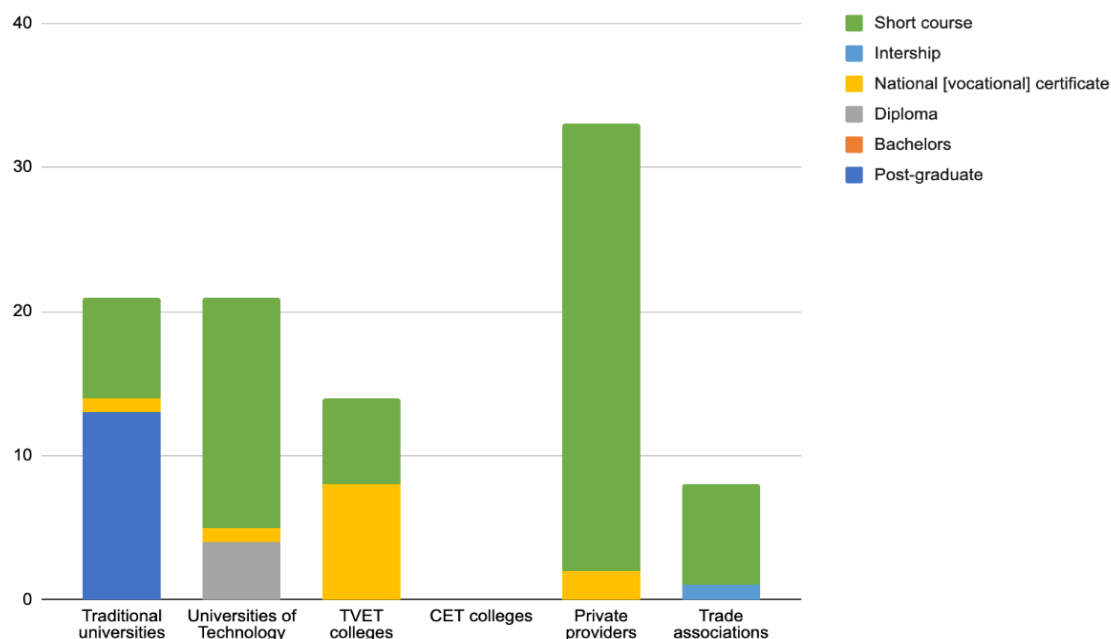
Of the total TVET colleges, 18 (37%) offer some form of energy-transition course or module, with the majority focused on renewable energy, notably through the Electrical Infrastructure Construction certificate or Solar PV technician and installation. It is interesting to note that offering green-energy courses is often done in collaboration with and with the support of EWSETA, who may then pilot a course for accreditation. A good example of this is the collaboration between EWSETA with Ehlanzeni, Gert Sibande and Nkangala TVET Colleges to train lecturers in renewable energy, to ensure they are adequately capacitated and knowledgeable to offer renewable energy courses.

With green hydrogen gaining serious traction in the

country (Presidential Climate Commission, 2023a), and is seen as an employment panacea (see Salgmann, Weidenhammer & Englert, 2023), this is also beginning to reflect in skills provisioning, with 11 courses being offered through traditional universities, a newly established Green Hydrogen Research Chair at the University of Johannesburg, and an EWSETA hydrogen course launched in 2023 for TVET colleges (SA Mechanical Engineer, 2023) (although uptake by the colleges is yet to be reflected).

Regarding the level of qualification offered, short courses dominate the energy-transition course offerings. Figure 18 shows the number of renewable energy courses offered by course type (see figure 17). While private providers offer most short courses, many other education and training providers are equally starting to offer short courses. Reasons for this may vary, but the most prominent being the ability to respond quickly to the demand to not only better understand the renewable energy market, opportunities and technologies more broadly, but for businesses to respond to the rapidly increasing need for solar and wind installation. However, in recent work carried out for the Food and Beverage Manufacturing Sector Education and Training Authority (FoodBev SETA, 2023), many of these courses are not accredited. This was indicated as problematic to both employees, and those seeking employment.

Figure 18: Levels of Qualification and Number of Courses Offered

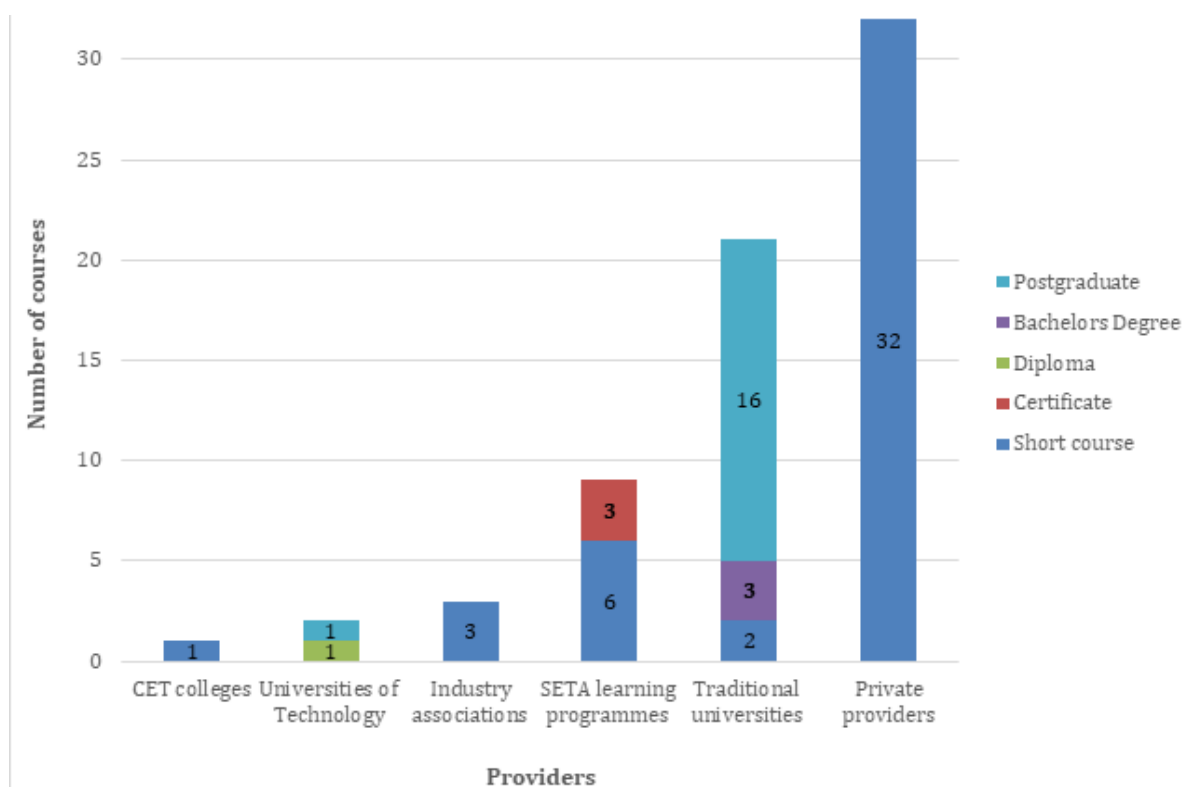


The transition of the agricultural sector is additionally evident from the supply side. At least 68 courses were found related to sustainable agriculture, such as climate-smart agriculture, agrometeorology, sustainable horticulture, sustainable agriculture, aquaponics and hydroponics. Further, the traditional agricultural courses have modules that promote a sustainable and resilient agricultural industry, such as horticulture, sustainable agriculture, ecology, agriculture and conservation. The majority of the sustainable agriculture courses are offered by private providers (47%) and traditional universities (31%), with most being short courses and postgraduate courses, as shown in Figure 19 below. The courses are mainly offered in Gauteng province as most private providers are there. The TVET institutions, however, tend to offer courses in primary agriculture, although there appears to be some transition in place with Boland TVET college, for example, launching a Centre of Vocational Excellence (CoVE) to encourage active participation in the growth and impact of VET, specifically in the field of climate smart agriculture.

There are some tracer studies in South Africa, but few are linked very specifically to qualifications and programmes aimed at supporting a green and just transition; therefore, it is not easy to say whether provision is sufficient at this point.

Some considerations related to worker capacity development need to be considered. Of coal miners most at risk in the transition, only 80% have matric, and around 38% have less than matric. However, the median pay for coal miners is around twice the national average for formal workers. Reskilling efforts are raising important challenges related to theoretical (formal) knowledge instead of practical knowledge.

Figure 19: Sustainable agriculture related courses by level of qualification



4.4 Constraints and Opportunities

Table 11: Constraints and Opportunities of Labour Supply

Aspect	Constraints	Opportunities
Schools	Mainly weak school system; challenges that hinder children from completing education	
TVET colleges	<ul style="list-style-type: none"> •Complexity and fragmentation of qualifications in TVET sector •Weak TVET provision •Funding •Low levels of women enrolled in STEM-related programmes 	<ul style="list-style-type: none"> •Improvements in education •Availability of short course provisions according to demand (?)
Universities	<ul style="list-style-type: none"> •Massification of universities without funding •Low levels of women enrolled in STEM at higher education 	<ul style="list-style-type: none"> •Relatively strong part of skills system •Capacity to reorient courses for green economy
Other formal, non-formal and informal training	<ul style="list-style-type: none"> •Fragmentation •Community colleges are very under-funded 	Strong workplace providers—could reorient courses to meet needs of green economy
Provision oriented to green jobs	<ul style="list-style-type: none"> •Geographical courses on green economy mostly in Western Cape and Gauteng – danger that students want to remain in regions •Many short courses—lack of integration into formal provision and regulation; dominance of private sector 	Good education/training in renewable energies and energy efficiency



5 Matching

Previous chapters have highlighted where there is likely to be emerging demand for workers. It has also provided an analysis of the readiness of the skills system to meet this demand. Critical to ensuring that supply can meet demand is that there is a mechanism that assists in translating the implications of emerging demand for supply and then ensures that individuals in the labour market (whether unemployed or employed) are aware of the skills needed by the economy. Furthermore, it is necessary to ensure that there is a system matching individuals with the requisite skills with jobs. The need for this is vital as the lack of information about opportunities makes it more difficult for providers to offer the relevant programmes and results in firms making poor hiring decisions; thus job matching for placement is seen as an important instrument (Carranza et al., 2021).

5.1 Information on Labour Market

5.1.1 Institutions for coordinating the alignment of skills supply and demand

Central to the matching process, targeted at enabling new entrants to access the labour market and for existing employees to navigate the labour market effectively, is the capacity to understand demand and to support efforts to put in place a system of provision that ensures that individuals have relevant labour-market skills.

Coordination as part of matching supply and demand

There are many national and sectoral structures for coordinating across education and the economy, as part of matching.

This requires coordination at a national level to strengthen the alignment between supply and demand, although this coordination is not very successful. Some key structures intended to coordinate and ensure dialogue about skills supply and demand are the Human Resource Development Council, the National Skills Authority, and NEDLAC. The Human Resource Development (HRD) Council was created in 2010 as a key structure to link different areas of government work and as well as to link

government work with different spheres of the economy. Led by the deputy president, the Council is supposed to guide and shape the human resource development agenda, provide a platform for dialogue and consensus building, identify skills blockages, and recommend solutions (Republic of South Africa, 2010, p. 10). Crucial here is the idea of ensuring that policies across government are aligned. However, there are no real mechanisms to create integration or to hold the different parts of that system to account. Further, the agenda of the council has tended to not be strategic but rather, to discuss all aspects of work of each department involved in some aspect of educational delivery that might be relevant, but with very little focus on interventions in the economy to create a requirement for skills, nor on industrial relations, which has a large impact on skill formation systems. In the main discussions are not at a strategic level. The HRDC is currently developing a new 'Master Skills Plan' in an attempt to bring better coordination to the system.

The National Skills Authority (NSA) has responsibility for reviewing the skills development legislative framework to support the integration of education and training and determine the national priorities of government and the development of the capacity of skills development stakeholders and system. The NSA is a stakeholder body with representatives from different social partners. There has been considerable debate over the past years as to how the role of the NSA relates to the work of the HRDC as both are stakeholder structures. Whilst the HRDC has a broader mandate this encompasses the work of the NSA. This reinforces the confusion of mandates and, despite these structures, there continue to be challenges in ensuring that partners feel heard in these structures and carry a shared sense of purpose.

NEDLAC also includes the key partners. It is primarily responsible for facilitating negotiations around legislation. However, in the context of the Jobs Summit and, more recently, discussions around the Economic Reconstruction and Recovery Plan (ERRP), it also focuses on the role of skills in enabling jobs and economic recovery. This formal process is of course vital but can be adversarial rather than emphasising collective problem solving.

At a sectoral level, all the SETAs have representation from employers, unions, and government on their governing boards. This is intended to ensure that their systems and interventions meet the skill formation needs of their sectors. However, at a board level this representivity has led to vested interests dominating SETA agendas, as well as corruption at times. At the same time, the nature of the systems and tools used to collect employer data (reliance on workplace skills plans and annual training reports filled in by employers and then aggregated across sectors) has led to weak sectoral analysis of skills needs.

There are a number of more focused processes where dialogue and communication happens to ensure matching. For example, in the QCTO qualification processes, employer representatives are involved in curriculum, assessment, and overall design of qualification as well as qualification identification. These processes should, in theory, mean that the training content is exactly what employers want—and yet, in many instances, the desired fit between education and work does not seem to be built through these processes. In the Masterplan process, coordinated by D'TIC often in support of the relevant government department, the key players determine how best to drive industrial development in key industries and consider the key enabling factors in this regard. This includes incentives as well as, typically, a skills development component. The skills component, however, is often an add on and not integrated into the strategy or seen as integral to the decisions that are made concerning industrial transformation.

In sum, key problems with the use of labour market information for matching are:

- One problem is the coexistence of different regulatory tools trying to do similar things, some of which are in tension with each other—particularly BBBEE codes and skills incentives. A second case is that the same regulatory tools have different purposes and achieve none—a key case in point being the workplace skills plans, which neither provide good data on skills needs nor are useful in incentivising training, which are two key reasons for their introduction. A third is confused accountability lines, so the SETAs, which are supposed to have tripartite governance, are driven by national government targets or narrow provider interests based on representation on SETA boards.

- We have very poor ways of obtaining information on skills needs, and structures that are frequently unresponsive to employers' needs. On the provision side, there is confusion with the coexistence of different governance models in the college sector, which makes it difficult for these institutions to meet skills needs.
- The SETAs are forced to deal with several micro-level issues and engage with employers around templates that they don't control provided by DHET. This has steered them away from strategic engagement with sectors and high-level players. So they are not playing the crucial role that they could be playing, and instead are collecting questionable data. While they are described in policy as tripartite institutions, in practice, they account to the state primarily.

5.1.2 Labour Force Information (Skills Anticipation)

Notwithstanding the efforts of government and business to work together, South Africa is confronted by a challenge around skills for employment as it struggles to predict skills in demand (Lannoy et al., 2018).

Labour market information for skills

South Africa has a plethora of structures and forums to obtain labour market information, and coordinate the supply and demand of skills, at national, sectoral, and other levels. There are also complex systems for skills anticipation, which appear to go wrong at many points.

At a sectoral level, Workplace Skills Plans and Annual Training Reports are supposed to be central tools. Employers pay a levy on their payroll and receive a portion back from their SETA on submitting a Workplace Skills Plan, which outlines their skills gaps, and an Annual Training Report against this plan. These tools enable SETAs to gain insight into what training takes place.

The idea was that these plans would aggregate employers' priorities in each sector. Then, the SETA would know what skills are required across the sector and would be able to fund the necessary training. The challenge in relation to a rapidly changing context like the JET sectors is that the skills anticipation information is broad and general (as highlighted in section 3.3.3), and it does not produce detailed occupational data on how occupations

are actually changing, leading to much of the projections being done from broad fluffy and forecasting analysis.

While common sense has it that employers know what they need, in practice, there have been serious challenges with the approach to skills planning based on aggregating bottom-up data obtained from employers. Some problems are:

- **There are some specific problems with the tools, which could be addressed by simple redesign:**
 - The Workplace Skills Plans require the use of the Organizing Framework for Occupations (OFO), which, in the main, employers don't use for their organograms or workforce planning.
 - Skills needs can often be about experience in a particular specialisation, which is not accommodated in these plans.
 - Employers only list what they can achieve against their training plan and they think will be funded—because of how the tools are set up
 - They don't list training that is not accredited, and they therefore cannot claim, even if it is key to meeting their skills needs.
 - They tend not to include longer programmes because of the funding rules.
 - Sometimes, they list jobs that are important and where they will be hiring, even if these are not hard to train for or fill; further, hard-to-fill vacancies may not represent scarce skills—for example, the challenges may be experienced in remote or rural areas, or areas that are less desirable to live in.

Other problems include:

- The annual nature of the process may mitigate against both long-term planning and meaningful insights into how employers see skills needs.
- There are also examples of employers reporting skills gaps to obtain SETA funding, which they then use basically as a cheap wage subsidy where there are no real skills needs.
- Companies are not always good at predicting future needs, and even in current vacancies, they have limitations. They tend to focus on identifying deficits in staff—which is why a skill like 'critical thinking' comes up as a scarce skill but is very unhelpful for planning

The OFO as a key tool for matching supply and demand remains an ongoing challenge. The OFO is one of two occupational classification systems in South Africa. The South African Standard Classification of Occupations (SASCO) is used by Stats SA to classify occupations obtained through the Population Census, Causes of death, marriages and divorces, and the Quarterly Labour Force Survey (QLFS). The OFO (originally adopted by the then Department of Labour and now used by the Department of Higher Education and Training) is a coded hierarchical occupational classification system based on the International Labour Organisation's International Standard of Occupations. The reason why the OFO was developed separately from SASCO is the subject of much debate. However, the intention of the OFO was to standardise occupational definitions and their up-to-date associated practice requirements. Policymakers hoped that educational institutions could then use this to develop their training programmes. The intention was that employers would update occupations on the OFO through workplace skills plans, which would lead to occupational definitions providing an accurate reflection of the labour market. However, employers rarely make significant updates to the definitions of the OFO, and many sectors suggest that the OFO is not updated sufficiently to accommodate emerging occupations or to reflect jobs constituted by skills from across multiple occupations. This creates challenges for qualification development – which must be developed against occupations registered on the OFO and complicate reporting as employers are required to report against the OFO rather than in terms of how 'jobs appear in the real world'.

Labour force data from Statistics South Africa supplement information about the skills required by the sector gathered through the Workplace Skills Plan and the Annual Training Report. A challenge here is that the sectoral demarcation used by Stats SA does not correspond to the demarcation of the SETAs, coupled with discrepancies in the occupational frame used, making this analysis more complex.

Another challenge with sectoral planning to date is that an analysis of one sector does not necessarily provide an indication of potential shortages across the economy, given the reality that many occupations cut across sectors and many graduates from a qualification do not necessarily work in the related occupation. There are attempts to aggregate Sector Skills Plans to manage this,

but because of the challenges with the lower-level data, this is reproduced at an aggregated level. Of even more import is that much of this data speaks to the current realities of the data but does not assist in developing a picture of how the sector is transforming, particularly within the context of responses to digital and climate changes. Sector skills plans appear to provide very little strategic direction about how skill formation will be supported and shaped within sectors.

Coordination amongst employers and strong industry associations seem to support training in sub-sectors—but this does not appear to be something the SETA or the Sector Skills Plan engages with. Bias against private providers and non-accredited providers could be a factor here. There is little flexibility from SETAs in terms of what actually works for employers.

The main national planning process is the development of specific lists that categorize types of demand for skills. The OIHD is a key list that marks a shift away from the notion of skill scarcity to a notion of high demand, recognising that the skills that need to be prioritised for development could be skills that are currently scarce or skills that are not necessarily scarce but are very important for enabling larger numbers of new entrants to access the economy.

Within the list of OIHD there are two lists: Priority Skills and Critical Skills. The Critical Skills List is the basis for decisions around visas and enables individuals to work in South Africa because they have skills that are scarce and cannot be developed in time. The Priority Skills List highlights the skills where demand can be met through a short-term training intervention or where there is likely to be ongoing demand such that it can be met through shifting enrolment in certain programmes or the development and adaptation of qualifications and programmes.

They are developed using aggregated employer input through the Workplace Skills Plans (which, as already noted, is weak data), labour force analysis, research, and data from analysis of job seekers and job availabilities through the Department of Employment and Labour's employment services. One key set of research projects has been the two Labour Market Intelligence Projects, which have augmented the capacity to analyse these plans and consider the implications for skills in demand across the economy. There is some alignment between

the lists of occupations being generated by the JET sectors and the OIHD list.

As discussed, the extent to which the list of OIHD considers the level of unpredictability in the labour market and the changing nature of the economy has been highlighted previously. This problem is partly because the data that forms the input to these lists is based on current workforces, and educational planning tends to be long-term; therefore, there is frequently a disjuncture of time horizons.

The key problem is that lists should never be the main planning tool because we will never get them right at more than a very broad brushstroke level, and even then, much will be wrong. Skills planning has to be relational and ongoing, embedded in strong relationships at different levels that take focused decisions about the issues closest to them. So for example, the SETAs should have high-level engagement with strategic employers about the key needs and challenges in their sectors, the main trajectory of industries, how employers' training needs can best be supported, and how the levy funds should be most productively used. Colleges should work with individual employers at a local level to ensure that their offerings complement the on-the-job training employers are doing. None of these are static once-off discussions, but ongoing discussions require ongoing engagement and relationships.

Despite—or because of—the many places where engagement is institutionalised, employers argue that the skills which they need are not being created, and that the training that they do is inadequately recognised and supported by the system. At the same time, education institutions struggle to find work experience opportunities for their learners, and the state struggles with planning skills development. Further, despite these structures—which have as their stated purpose the involvement of stakeholders in decision making—there is little agreement on how funding can best be used to leverage changes in ways that support the objectives for skills development.

Employer engagement appears to be at the wrong levels, places, or focused on the wrong things.

There are recent examples of success emerging where tight and focused engagement is taking place such that employers and unions, for example, have a collective agenda for supporting workplace transformation through skills development, which is expressed in the masterplan

process. One such example can be found in the clothing and textile industry where DHET has actively played a role in the Masterplan process and social partners appear to be reaching agreement on key approaches including joint projects to support improved productivity.

Internationally, there are models in which skills levy funds go directly to employer-controlled providers instead of regulatory or intermediary institutions with an employer's voice.

Systems for translating labour market information to supply planning

Matching also goes wrong in the translation of labour market information to supply planning.

One problem here is the link between identifying skills gaps and the processes for translating workplace requirements into enrolment planning in education and training systems. Sometimes, there is a nod to the aggregate lists, but links do not work well. This is partly because the different systems are supposed to engage with each other, but the logic is different. There are also rigidities in the rules in place, including a lack of flexibility in curricula for TVET/occupational curricula. Another rigidity is the requirement for work placement for occupational qualifications, which the Quality Council on Trades and Occupations is currently reconfiguring. The QCTO is also introducing new regulations to address the need for short programmes. To date the national qualifications framework rules are that short programmes can only be accredited as a 'part qualification,' constituted by credits within a full qualification. The rationale for this is to address the proliferation of part qualifications that do not lead to a full qualification, as well as qualifications of varied sizes. However, it creates the unintended consequence of negating the possibility that industry associations can determine the need for a short programme that is accredited and that enables the graduate to access a specific opportunity in the workplace. The formal qualifications requirements lead to planning based on where qualifications exist rather than where demand is emerging. The section above on colleges has given an overview of the NQF from the perspective of vocational education, where it has had the most uneasy relationships and roles. It also plays an uneasy role in skills anticipation, which uses qualifications linked to occupations as de-

finied by the Organizing Framework for Occupations. Neither of these reflects how employers think about skills or workforce organisation.

A review of the qualifications framework is currently underway. Some of the challenges relate to how the framework has been conceptualised, but many relate to how qualifications are used in relation to planning and funding—which can't be changed by changing the framework. Some key issues that have been identified as needing attention through the review are:

- How qualifications from the three sub-frameworks articulate with each other, and related to this, the notion of 'parity of esteem', which has proven impossible to achieve through a framework and yet divisive
- The evaluation of foreign qualifications (and how this is linked to study and work permits)
- How the framework can be simplified

Funding and incentive tools do not work effectively to steer education interventions. REAL's research suggests a variety of perverse incentives—including workplaces that report doing less training because BBBEEE points require training against hiring and workplaces that report taking on trainees as free labour irrespective of and unconnected to skills needs. Requirements for formal qualifications and accreditation of providers have made it cumbersome for employers to obtain funds for immediate training needs. At the same time, requirements for accreditation make it difficult and often impossible for employers to use the providers they know and trust—for example, because they are international. This makes an absolute mockery of a 'demand-led' system.

The systems, institutions, and regulatory mechanisms described above, in general, make the work of education institutions more difficult and have not led to more 'responsive' provision.

5.2 Active Labour Market Measures

As highlighted in the introduction to this chapter, it is vital to ensure that there are measures that ensure that supply and demand are aligned. This requires focusing on matching demand with supply at a systemic level and ensuring that individuals can access and remain economically active in the labour market. As Morgan (2008) described, job matching requires assessing and evaluating

job seekers' characteristics and then establishing the extent to which they match job requirements.

South Africa's policies support active labour market programmes (ALMPs), which is reflected in the large number of ALMPs in the country; there are about 106 national programmes consisting of demand-led, supply-driven, and employment service-related programmes. These programmes are housed in over 20 national departments (Cunningham et al., 2022).

ALMPs support demand through a range of programmes. This includes offering financial and non-financial support to entrepreneurs to more than 260 000 beneficiaries annually, although little is known about the impact these entrepreneurial support programmes have on job creation or earnings (Cunningham et al., 2022).

There are also a range of employment subsidies, and specifically employment tax incentives, such as the Employment Tax Incentive Act No. 26 of 2013, which aims to reduce the cost of labour thereby encouraging companies to employ additional individuals. However, while some of these appear to create opportunities for young people to access the economy, Cunningham et al. (2022) argue that the programme has limited long-term effects on future employment, as beneficiaries are 25% likely to find employment after six months, and 8% almost to be in wage employment after a year or two years after leaving the programmes.

In addition, there are public employment programmes, which offer unemployed individuals temporary paid work to undertake socially useful activities. This includes the Expanded Public Works Programme (EPWP), the largest of these, benefiting about 938 688 over the 2020/21 financial year, which translates into a total of R9.3 billion in income support to participants.

Within the EPWP is the Community Workers Programme (CWP) which covers more than 280 000 beneficiaries annually, 28% of whom are youth. It is particularly the Public Employment Programmes (PEP) where 'green jobs' have been coupled with social protection for the marginalised. (Mohammed, 2017). For example, as part of EPWP, the Department of Public Works and Infrastructure has created 1875 employment opportunities in water energy efficiency, facilities management, waste management, and Welisizwe Rural Bridges. The Department of Transport has a road maintenance programme in provinces supported by the PES, and through this

programme 10 245 jobs were created.

It is noted that some of the above-mentioned ALMPs are used to support the just transition, for example:

- i. Employment Tax Incentive (ETI): The ETI is being used to incentivise hiring young workers in green jobs and companies in the renewable energy sector, for example, can use these benefits to employ young people.
- ii. The Energy and Water SETA (EWSETA) is key in developing programmes specifically aimed at upskilling/reskilling workers in renewable energy technologies (green hydrogen, wind and solar). They have further targeted women and the youth in affected areas such as Mpumalanga.
- iii. National Youth Development Agency (NYDA) is supporting a range of interventions in support of the green economy: this includes providing financial support and training for young entrepreneurs working on projects related to Waste Management, Energy (Renewable Energy and Energy Efficiency); Water and Wastewater Management; Integrated Agribusiness Development; Air Quality Management and Climate Change; and Professional Development and Training.

More recently the Presidential Employment Stimulus (PES) is another intervention that has enabled public employment in a rapid way in the country's history, supporting programmes that could potentially scale up within months to provide work opportunities. The PES was developed to support a range of opportunities to enhance skills and employability. More than 1.5 million work and livelihood support opportunities have been created for the unemployed since 2020. Of the participants, 83% are youth, and 66% are women. Phase 1 of this intervention started in 200/21 after receiving almost R13 billion of the Special Adjustment Budget. The PES is implemented by 11 national government departments, all nine provinces, and all metropolitan areas to create 800 000 temporary opportunities. Most of these opportunities were in the basic education department (school assistants), social development department (support to the early childhood development sector), and agriculture (relief for substance producers). For instance, the Department of Environment, Forestry, and Fisheries, through its entities such as SANParks and SANBI, has

scaled up its public employment programmes in natural resource management, creating 31 926 employment opportunities.

The PES also supports the implementation of the Presidential National Youth Service (NYS), which creates opportunities for young people to serve communities while developing skills and experience. The importance of these interventions is highlighted in numerous articles that indicate that South Africa has not been able to create enough employment opportunities for the existing labour supply (Lannoy et al., 2018).

There is also a range of ALMPs that focus on supply. This includes programmes that focus on training and second-chance programmes as part of supply-led programmes. The 50 colleges offer programmes to more than 650 000 learners and 21 SETAs related facilitated training to about 300 000 beneficiaries annually (Cunningham et al., 2022).

Further, there are programmes that directly support matching. The National Pathway Management Network of the Presidential Youth Employment Intervention (PYEI) is the key mechanism for connecting young people with opportunities. The Department of Employment and Labour leads the NPMN on behalf of the Presidency. The NPMN includes a range of partners, including SAYouth, run by Harambee, which has 4,437,406 million young people registered on the SA Youth platform between April 2020- March 2024. ESSA, which is another partner of the NPMN, is reported to have registered about 2 744 502 million young people between April 2020 and March 2024, and of these, 1 069 496 job seekers were registered during the 2022/2023 financial year (Department of Employment and Labour, 2023; Presidency, 2024).

Of importance is that 1 335 922 million earning opportunities were secured by young people via the NPMN during the same period, with women securing 70% of these earning opportunities during the same period. Specifically the Department of Employment and Labour (Department of Employment and Labour, 2023; Presidency, 2024) states that ESSA has supported work seekers to access a total of 84 636 registered work and learning opportunities, of whom 49 992 (59%) are women, 56 393 (67%) are youth and 566 (0.7%) are persons with disabilities (Department of Employment and Labour, 2023).

The Department of Employment and Labour (Department of Employment and Labour, 2023; Presidency, 2024) also indicates that employment counsellors were able to provide support to more than 325 914 work seekers, who were in distress due to unemployment.

The Presidency is supporting these initiatives through the Presidential Youth Employment Initiative. The PYEI also includes demand-led skilling which has created 115,699 as part of workplace experience opportunities; local ecosystem enablement to facilitate self-employment and enterprise which currently stands at 149, 371 enterprise support opportunities, and 68, 195 paid service opportunities holders on the NPMN (Presidency, 2024). It creates and aggregates learning and training opportunities and creates a single point of entry for the unemployed youth to view and access opportunities in the economy/labour market and other wide range of support services to enable pathways to the labour market.

There are also proposals to grow the funding for ALMPs. The Department of Employment and Labour, through its draft National Employment Policy, proposes re-activation programmes for discouraged and inactive job seekers through targeted interventions that could potentially shape investment, productivity, and employment outcomes at a sectoral, company, and job seeker level. Recently, the UIF announced its commitment to fund these interventions, and launches of these activities are being held across the country.

The country's UIF provision is not conditional on job-related search actions. In other words, beneficiaries of the funds are not expected to show evidence of job search activities, or job preparation programmes such as job training, work coaching, or regular visits to job search centres, which is usually the case in other highly developed countries, and this is seen as a passive labour market policy (Morne, 2021; Pignatti & Van Belle, 2018). Thus, the worker's transition to employment service centre counselling is seen to be weak.

More broadly, South Africa's ALMPs also include interventions to assist workers to be reskilled/upskilled to stay in their jobs or to access emerging opportunities through the Temporary Employer/Employee Relief Scheme (TERS), which replaced the Training Layoff Scheme. TERS is not a settlement agreement contemplated in the Labour Relations Act, 66 of 1995, but

an agreement signed by the trade union movement on behalf of workers. It is a framework for the country's response to international economic shocks/crises and serves as a 12-month solution for both employers and employees facing distress. TERS is a global phenomenon, not isolated to South Africa, where governments introduced a wage support scheme to avoid loss of income during retrenchments during economic shocks. In the context of South Africa, wage support or TERS enables employees to remain productive through training and upskilling to have a wide range of skills (CCMA Report, 2023; Institute for Economic Justice, 2018).

The scheme also allows employers the maximum period (during the reskilling period) to recover from distress and re-absorb the retrained/reskilled employees into other ordinary work at the end of the TERS or into specific roles in line with their training. The training is often provided by the Sector Education and Training Authority funded service providers either on (company) site or offsite and is linked to the company skills needs. Employees benefit 75% of their ordinary wage to a maximum of R241 110.59 annually, all of which are paid by the state through the Unemployed Insurance Fund (CCMA Report, 2023). Even during COVID-19, the Department of Employment and Labour introduced a specific and directed TERS for employers to benefit from a claim wherein they are unable to pay their staff, and for where employees are required to take a compulsory leave. There have been various conditions that needed to be met to benefit from the scheme.

Coordination of job institutions

While South Africa has no single department responsible for ALMPs, the Department of Women, Youth and Persons with Disabilities in the Presidency has a policy mandate and responsibility (Cunningham et al., 2022). This Department also holds responsibility for the National Youth Development Agency (NYDA), which is formally charged with the mandate of youth programmes through the NYDA Act. However, Section 75 of the constitution constrains it, making it unable to execute its mandate at the provincial level (Cunningham et al., 2022).

In addition, the Presidency is responsible for the Presidential Youth Employment Intervention (PYEI) through the Project Management Office, which creates a coordinative mechanism to address youth unemployment.

5.3 Passive Labour Market Measures

Passive Labour Market Policies (PLPMs) have the potential to support vulnerable people in moving closer to the labour market immediately and tend to be effective when complemented by employment benefits and tailored to the job-seeking group (Morne, 2021; Pignatti & Van Belle, 2018). For example, a combination of cash transfers (grants), employment search support such as counselling or coaching, and ALMPs may ease the burden of the country's social assistance and employment benefit systems (Morne, 2021).

Pignatti and Van Belle (2018) argue that cash transfer programmes, which remain passive programmes/policies in relation to labour markets, should be linked to public work programmes aiming to address income security and social protection programmes over time. In addition to other complementary measures, such as skills training to enhance opportunities to improve capabilities and break the poverty cycle. Banerji and Rawlings (2022) argue that a combination of social protection interventions and labour market policies, and programmes play an important role in helping individuals and societies to move out of poverty and destitution. Furthermore, PLMPs and ALPMs tend to operate in informal labour markets in developing economies and rarely interact/integrate with other public interventions, i.e. education systems, which potentially limits their reach and effectiveness (Pignatti & Van Belle, 2018). Yet interaction between passive and active labour market programmes has long-term and substantial effects on employment, unemployment and labour force participation. Thus, the spending on one form of policy, the more the other policy becomes effective, even the disincentive effects of PLMP disappear, in a sense that they become positive if sufficient expenditure has been incurred on ALMPs (Pignatti & Van Belle, 2018). Even though ALMPs often encompass a cash transfer imponent in developing countries, coordination of active and passive policies tends to be explicit in developed economies (Pignatti & Van Belle, 2018). Thus, complementarities of active and passive policies.

In South Africa, we have social assistance interventions to support the poor segments of the population. These include the grant system, such as social grants, representing a major intervention to address poverty, deprivation, and inequality among the country's population. The So-

cial Security Fund, such as the Unemployment Insurance Fund, is provided immediately after the loss of employment because of illness or otherwise and is the largest of the three funds (Compensation Fund and Road Accident Fund) in terms of claims. The Social Relief Distress Grant is for people in dire need who cannot meet their needs and is also meant to address economic shocks and natural disasters.

Writing on the relationship between Passive and Active Labour Market Policies and Programmes Meth (2010, p. 20) argues that social protection systems such as grants must be linked to economic activity to re-activate discouraged unemployed and inactive job seekers through targeted interventions, public spending is required to shift from passive labour market policies (PLMP) to active and meaningful interventions (Pignatti & Van Belle, 2018). Similar arguments are made in the South African context: that is, South Africa needs to find greater levels of integration between Passive and Active Labour Market Policies/Programmes as well as across ALMPs to support the economic inclusion of vulnerable groups (Banerji & Rawlings, 2022; Morne, 2021; World Bank, 2021).

Morne states that although passive labour market policy/intervention plays an important role in social relief, SRD, for instance, needs to be increased and converted into assistance or support for job seekers who are constantly engaged in job search and activation programmes (Morne, 2021). He continues to say that unlike other middle-income countries, South Africa's grant system is not linked to ALMPs so there is a limited focus on enabling people on the grant system to transition into work and self-sufficiency (Morne, 2021). This leads to the view that the UIF could be strengthened by, for example, making it conditional on job search activities to ease the burden, and this requires a stronger linkage between the country's UIF and public employment service systems.

The other regulatory challenge pertaining to public employment programmes, specifically public works, is that the bulk of construction work is allocated to local labour with little to no prospective for up-skilling capacitation and re-skilling pathways. To date, the critical skill capacitation programmes on offer lean towards company beneficiation, such as:

- On-site training so that workers can safely per-

form their duties

- Training by contractors to maintain BBBEE level, i.e. health and safety legislation training, first aid, firefighting, construction skills, basic electrical training, quality management, and legal compliance.

This area needs to be addressed if these public employment programmes are to enable progression and sustainable employment.

5.4 Sample of Interventions by Green Sector

Table 12: Sample of Interventions by Sector

Sector	Intervention	Activity	Implementer
Green Hydrogen	Hydrogen Fuel Cell System Practitioner Skills Programme	Creation of a skills programme for hydrogen system practitioners to be run by QCTO accredited providers.	EWSETA
		Expansion of the skills programme to a full qualification.	
	Installation, operation and maintenance of hydrogen and fuel cells	<p>Training of unemployed TVET graduates</p> <p>To date, 25 unemployed graduates have undergone the six-week training. Partnerships are being sought to extend the training to more graduates as part of creating skills to support the hydrogen economy.</p>	<p>DSI</p> <p>EWSETA</p> <p>Bambili Energy</p> <p>University of Pretoria</p>
New Energy Vehicles	EV Safari Vehicles	Development of electric safari vehicles in Mpumalanga	EPVA
	Shifting the TRANsport Paradigm for South Africa (STRAPSA)	Building capacity and knowledge on electric transportation through technical assistance, targeted at key institutions and decision-makers.	UK PACT and uYilo eMobility Programme
Electricity Sector	Renewable Energy Training Facility - Komati Power Station	Construction of a 100 MW solar plant.	Eskom
		Construction of a 40 - 70 MW wind power plant.	SARETEC
		Educate, reskill and upskill Eskom Komati Power Station staff, and qualifying beneficiaries from the surrounding communities.	GEAPP
	Renewable Energy Specialisation Skills Development Programme	Develop skills in renewable energy among 100 unemployed women and 15 Technical and Vocational Education and Training (TVET) lecturers in Mpumalanga.	EWSETA Power Africa

Table 13: Sample of Interventions by Development Agency

Organisation	Project title	Project focus	Rand amount
GIZ	Just SA	The project supports the implementation of pathways towards a just transition in South Africa. It includes green energy skills training for coal workers and youth in Mpumalanga.	15 million Euros
UK Government	Contribution to the High Gear Initiative	Development of industry competency models for new energy vehicles (NEVs) in South Africa through the National Association of Automotive Component and Allied Manufacturers' (NAACAM's) High Gear initiative.	US\$1.8 million
Council for Scientific and Industrial Research (CSIR)	Energy Industry Support Programme	In partnership with EWSETA the projects focus on capacitating SMMEs with the skills, knowledge and resources to participate in the transitioning energy sector.	R9.35 million
Global Energy Alliance for People and Planet (GEAPP)	Komati Training Facility	To reskill workers at the Komati power station and communities in the surrounding Mpumalanga region.	R38 million
Power Africa		Designed and implemented training sessions to empower energy sector decision makers and change agents to create conditions for a just energy transition.	
		Trained 64 leaders from 18 municipalities in Mpumalanga Province, on how to integrate JETP into their municipal plans and how to recognise opportunities related to the energy transition	
		34 women representing municipalities, the national electricity utility, government departments, and NGOs completed training on renewable energy planning and business opportunities in new energy value chains, empowering them to lead the transition.	

UK PACT (Partnering for Accelerated Climate Transitions)	Shifting the TRANsport Paradigm for South Africa (STRAPSA)	Skills enhancement of key institutions and decision-makers. The aim, for uYilo, is to provide the empowerment necessary to enhance and sustain climate actions on accelerating emission reductions within the transport sector in South Africa.	£3 million
GIZ	South African-German Energy Programme – Capacities for the Energy Transition (SAGEN-CET)	The project supported the development of university courses and academic executive education in the areas of power sector reform and green hydrogen. It has further supported expanding coursework and training opportunities for PV installation at SARETEC.	14 million euros

Table 14: Sample of SETA Interventions

Organisation	Rand amount	Project title	Project focus	Implementation date
EWSETA		Renewable Energy Specialisation Skills Development Programme	The Electrical Engineering Renewable Energy Specialisation Skills Development Programme is seeing 100 woman artisans in electrical engineering being upskilled in renewable energy, over a six-month period. The programme upskill 15 technical vocational education and training (TVET) college lecturers from the Gert Sibande, Nkangala and Ehlanzeni TVET in Mpumalanga, which will help the colleges attain accreditation to offer a National Qualification Framework Level 3 qualification in electrical engineering for renewable energy.	April 2023
MERSETA	R20 million		MerSETA contributed R20 million to a partnership with Nelson Mandela Metropolitan University to support research and development in renewable energy and new technologies, the development of an electrical car, as well as a solar-powered golf cart.	
	R200 000		A partnership between MerSETA and the British Council towards the development of a curriculum for solar heating and green awareness. The implementation was the Northlink TVET College in collaboration with GWent College in the UK	
	R2 565 000		An agreement between the MerSETA and East London Industrial Development Zone. The agreement includes training of the first 20 electrical apprentices with additional specialisations in renewable energy (green artisans).	
		Green Skills Programme	A collaboration between Nepoworx and MerSETA to implement a nationwide green skills capacity-building programme targeted at unemployed youth to be trained as solar photovoltaic (PV) service technicians, to potentially be employed either at photovoltaic farms or roof-top solar PV installations.	Oct 2022 - Feb 2023

CHIETA	R10 million	The Green Hydrogen Bursary Fund	A collaboration between the EWSETA and CHETA for a two-year Green Hydrogen Bursary Fund aimed at providing women and youth with the skills and opportunities needed to excel in the hydrogen economy and fostering collaboration in research and development programmes, skills training initiatives, and the implementation of future-oriented qualifications.	July 2023
NSF	R105 million	SARATEC	This fund established and equipped Saretec, including its operational fees for three years. Saretec is a renewable energy technology centre at Cape Peninsula University of Technology.	January 2016
CSETA		Solar Water Heating Programme		

5.5 Constraints and Opportunities

Table 15: Constraints and Opportunities of Matching

Aspect	Constraints	Opportunities
Information on Labour Market	<ul style="list-style-type: none"> • Coordination of labour market information not very successful • Coexistence of different regulatory bodies • Poor ways of obtaining information on skills needs • Occupational Framework not yet existent • Lack of coordination amongst employers • Lack of good internal management of some institutions – too many micro-level issues 	<ul style="list-style-type: none"> • Variety of institutions • Good labour force data
Active Labour Market Measures	Many, but fragmented, and very inadequate in relation to very high demand	
Passive Labour Market Measures	Labour market protection is weak relative to demand	<ul style="list-style-type: none"> • Minimum wages have been implemented • Social grants and relief
Sample of Interventions by Green Sector	Many small interventions, fragmentation	Number of interventions in green sector



6. Recommendations: Plans, Projects and Possibilities

The Just Transitions Framework for SA states that “addressing climate change means strengthening adaptation measures to improve the resilience to immediate events.” The ability of South Africa to implement a just transition depends on the provision of finance, technology and capacity-building support by developed countries. The successful implementation of plans also depends on concerted collective efforts from the different sectoral stakeholders. This effort should be geared towards establishing a balance between maximising the benefits of the transition and minimising and mitigating the risks, threats and trade-offs (i.e. job losses) associated with the transition.

Sustainability transitions are complex change processes when established rules, norms, physical infrastructure and other aspects of current socio-technical systems shift towards more sustainable and just practices. What is clear from this analysis is that there is an enormous possibility in the green transition, many good policies and plans, and a huge number of dynamic projects. However, little coordination has created a landscape of ad hoc, fragmented implementation at a national level. Importantly, if South Africa does not engage with the deeper systemic issues and address the silo implementation and weak coordination infrastructure, the country remains in danger of heralding a technological transition that leaves its people behind. What makes planning difficult in this fragmented landscape is a lack of clarity into which changes are actually happening or going to happen in the short or medium term and which remain aspirational.

This chapter makes recommendations based on the job-creation constraints and opportunities identified in each part of this ELMA study. The recommendations consider framework conditions, labour demand, labour supply, and the need to match demand and supply. They include sector-specific recommendations focusing on the imperative for a just transition.

The recommendations are intended to support inter-

national donor organisations as well as public- and private-sector institutions in South Africa that are engaged in analysing, preparing and adapting development measures designed to improve the employment environment. Most of the proposed recommendations are indirect measures that could facilitate the creation of jobs by improving framework conditions, enhancing skills or the responsiveness of the skills system, or improving the business environment to support the competitiveness of the private sector.

One additional category is the time scale over which the strategies are expected to have an impact:

- Short term: one to two years to create potential employment effects
- Medium term: three to five years to create potential employment effect
- Long term: more than five years to create potential employment effects

Many of the structural challenges associated with framework conditions require long-term approaches, while development projects supported by international donors normally last only two to four years. For this reason, the recommendations offered here focus mainly on short—and medium-term approaches, but with a view to interventions that could improve systems and conditions in the longer term.

Each recommendation sub-chapter contains a list of recommendations and some approaches to be presented in detail. The prioritised recommendations were selected based on the following five main criteria:

- Short-term impact: The potential for concrete results in a relatively short period following the recommendation’s implementation.
- Ease of implementation: The ease of implementing the actions entailed by the recommendation, based on actor availability, time and resource availability, and cooperation among the different actors involved.

- **Actors involved:** The efficiency and expected contribution of the actors involved in the implementation, as well as the likelihood that they will be able to work with one another productively.
- **Relevance to the current situation:** The relevance of the recommendation given South Africa's present socioeconomic circumstances.
- **Sustainability:** The ease of sustaining the efforts associated with the recommendation over the longer term and maintaining momentum in future years.

Because of these criteria, many interventions focus on the skills system—as part of the labour supply. However, a key overarching analytic point when thinking about job creation in South Africa is that while there are problems on the supply side and many weaknesses with our matching systems, fixing these will not solve unemployment and under-employment in South Africa. At best, it will ameliorate some of its effects on small numbers of people. Nonetheless, the interventions are conceptualised so that, supported by substantial economic changes needed for a just transition, they could start to contribute to shifting the underlying problems. What is crucial for this is a focus on systems thinking.

Overarching all of this is an imperative for different types of development work. We need to see institutional development and engagement beyond technological development. We need to build institutional relationships. We need to see more proactive work with institutions to support them in a few key priorities emerging from skills anticipation. This means a focus on institution-building. The best approach is to identify strong institutions with potential to change or expand and support them in targeted interventions. It could include different levels of support—macro framework, systemic (skills anticipation, few key sectors, ensuring good programmes are available), and local ecosystem models (pilot demonstration projects). For example, some public employment programmes are working quite well. Some of the presidential employment stimulus programmes are as well. Further, there is a range of programmes funded by government. People who leave those programmes need to be career-pathed into opportunities—such as teacher education programmes for the Department of Basic Education teaching assistants or support for employment options in other roles in schools for these young people.

Finding ways of foregrounding the 'just' in just transition is an absolute priority for all interventions, as it is the most difficult to achieve and most likely to be overlooked.

6.1 Areas of the Labour Market

6.1.1 Framework Conditions

It is not news that the framework conditions are not conducive to growth and employment. One key part of this is large infrastructural problems. The discussion below provides recommendations regarding framework conditions that could be key leverage points for the just transition, including renewable energy, new energy vehicles, green hydrogen, and agriculture.

1. Focus on critical infrastructure and enabling policies and programmes to address the most pressing priorities (especially transport and specifically rebuilding the road to rail system) ports, electricity, and water.

2. While there has been a focus on coordination to take forward the imperatives of the Just Transition, there is a need for more integrated policy and implementation to centralise skills within economic and technological planning (rather than having skills as an add-on at the end). This requires:
 - Supporting the strengthening of current mechanisms to collate and disseminate information on current and imminent pipeline JET investments to support improved planning and transparency in the system.
 - These mechanisms will also allow for stronger monitoring of progress against milestones, creating the space to determine the technical support needed to support the delivery of projects in the anticipated time frame and costs.

3. Ensure appropriate standards and 'license to practice' requirements for new and emerging sectors are in place. For example, the formalisation of the hydrogen sector through the establishment of standards and labels is necessary to ensure quality and safety and to bolster investor confidence and market legitimacy. In another example, licensing to install solar panels coupled with associated qualifications or short courses is important for individuals and the public.

4. Build incentives and enablers vital to supporting key sectors of the green economy's rollout as planned. For example, given the importance of regulatory and policy facilitators in driving the green hydrogen sector and making immediate capital expenditures feasible, there is a need to incentivise hydrogen uptake.

5. Ramp up carbon pricing, in scope and value and integrate it into a coherent climate framework

6. Establish and maintain a public knowledge-sharing platform for open access to information (official documents, public announcements, policies) on just transition for all vulnerable groups. Utilise these platforms to conduct open and public engagement processes on key national just transition decisions and re-ignite community grassroots structures in affected areas.

7. Establish structured firm and sector-level social dialogue in new value chains, e.g. renewable energy and hydrogen.

8. As mentioned throughout this report, analysis and policymaking are constrained by key gaps in the data, a lack of coordination between databases, inconsistent classification of industry and sector, and a lack of local data on labour demand and supply. Addressing these data challenges is essential to supporting improved economic planning in terms of the green economy sectors.

Table 16: Recommendations Framework Conditions

Topic	Approach	Actors	Intervention Level	Time Perspective
Economic Development				
Structural Reforms	Fix and strengthen enabling infrastructure such as transport, ports, electricity, and water	Government ministries, development partners, industry	Macro/meso	Short/medium term
Policy	Support the development of robust and transparent monitoring, evaluation and learning frameworks.	Government ministries, development partners	Macro	Short/medium term
Policy	Integrate Just Transition planning into all development imperatives and policies and ensure it centralises skills. Green Industrial policy to align fully with Climate policy	All national and provincial departments and their entities	Macro and meso	Short/medium term
Policy	Incentivise the uptake of green technologies	Government ministries, development partners, industry	Macro/meso/micro	Short/medium term for design, implementation and impact is long term.
Regulation	Draft quality standards for the green economy	Government ministries, supported by industry	Macro/meso	Short/medium term for design, implementation and impact is long term.
Funding	Encourage donor community to take a systems approach to funding interventions, as opposed to short-term, project-level funding	Donor/development community	Macro/meso	Short/medium term
Employment				

Jobs for the poor	Provide active support for participation of vulnerable stakeholders (capacity development), financial and technical assistance	Government	macro	Short /medium
	Extend improved social protection to all including a National Social Security Fund			
SMMEs	Ensure small business development and entrepreneurship support is climate smart and inclusive	Government	Macro	

6.1.2 Labour Demand

1. The green economy's systemic, structural, and institutional design must, at a conceptual and implementation level, be able to respond progressively to socioeconomic challenges and areas of concern. This is relevant mainly to creating innovative, resilient, and alternative forms of work, especially for communities affected by high unemployment, inequality, and the decline of traditional industries like coal mining. This can be achieved through the development of renewable energy projects (including community-based projects), support for green entrepreneurship, expansion of accessible green skills education and training, and the promotion of sustainable agriculture practices (to improve food security, create jobs and protect the environment). Further, there is a need for some examples of new climate adaptive streams of work that could be investigated, e.g. community-based water quality monitoring practitioners who are crucial to support both communities and municipalities to help monitor and manage water quality, agroecology streams of work to drive a more integrative and inclusive approach to food system development; support of restoration enterprises that can generate new jobs and create new workstreams for workers who may lose jobs. Work on pollution remediation and ecosystem rehabilitation fits within the rubric of climate jobs, as it helps to address the growing vulnerability of communi-

ties to climate change impacts. These generate developmental pathways that allow for occupational (inter-intra points of leveraging) transitions and development and the ability to create new avenues for employment. This requires:

- Centralising just transitions in sectoral plans e.g. masterplans for traditional value chains through decarbonisation of energy supply and transport and to optimise production processes (energy, water, waste, carbon) for low carbon and climate resilience.
- Responsive, economy-wide labour demand planning requires analysing the jobs required to support shifting technologies and the enabling processes. It is suggested that the initial focus of this demand-side planning should include:
 - A focus on design, construction and installation-related jobs will be high, as will demand for jobs linked to renewables.
 - Operations, maintenance, and evaluation jobs will be needed in later phases, albeit in lower numbers, to ensure that installed infrastructure and the associated system are effectively managed and maintained.
 - There could also be jobs created if industrial policy is effectively implemented and support is provided to downstream industries related to renew-

ables.

- Policy-related jobs (including policy development, management and implementation; research and analysis; and topic specialists) are critical short-term occupations, although again in small numbers.
- Financial and governance-related jobs - as the sector begins to transition it requires financial support and investment.
- Social scientists (e.g. anthropologists, sociologists, gender specialists, community development coordinators, environmental education and inclusivity specialists, social workers, and trade union officials) demand for which will grow over time, with initial emphasis on dealing with affected communities, whether due to mine closures or the citing of new renewable and clean energy facilities.

2. Priority must also be given to finding policies and projects that incentivise the just component of the transition (or finding the points of justice in each intervention). This requires:

- Pro-active, innovative, and responsive work to identify value chains that can advance the Just Transition. This could be supported through the development and, in some instances, surface of already existing, contextual and internationally viable good practices that speak to the imperatives of JET as a means to reduce emissions.
- From the preliminary analysis of value chains, which needs to be deepened in further research, there are opportunities for SMMEs to be built and supported. Active ongoing analysis of value chains must ensure that as regulations come on stream (around solar installations and so forth) they must ensure that small players can still compete. The extent to which spaces are being created for SMMEs should be built into the monitoring and evaluation being set up by the PMU.
- Interventions must be accompanied by engaging community educational programmes to challenge misinformation and change perceptions.

Table 17: Recommendations Labour Demand

Topic	Approach	Actors	Intervention Level	Time Perspective
Economic development				
Value chains	Identify value chains that can advance the Just Transition.	Government ministries, development partners, industry	Macro/meso	Short/medium term
Policy	Actively ensure that SMMEs are enabled and incentivised to compete in the green economy	Government ministries, industry	Macro/meso	Short/medium term
Employment				
Planning	Formalise responsive, economy-wide labour demand planning for employment opportunities that support shifting technologies and enable the green economy	Government ministries, development partners, industry	Macro/meso	Short/medium term

6.1.3 Labour Supply

1. Ensure sophisticated anticipatory skills development systems that work with labour market intelligence. In particular, information from the tracking mechanisms (discussed previously) will provide insight into the opportunities arising across several sub-sectors of energy and water (i.e. just energy transition, the green economy, renewable energy, and innovative technological advancements), which will support skills planning

2. There is a need for a sustained focus on developing education and training providers so that they can flexibly respond and provide training interventions that address gaps identified to meet both immediate and medium to long-term demand. This includes:

- Identifying quick and responsive funding mechanisms - including through the levy system (SETAs and NSF), such as, for example, future rounds of job boosts supported by the NSF and National Treasury could be utilised to support these immediate skills needs as well. funding from development partners - to enable education and training providers to respond with training offers to up-skill/reskill individuals to work on these investments. This includes strategic allocations to key institution-building programmes such as infrastructure, hiring and training of lecturers, and allocating bursaries.
- The development of the requisite vocational skills development interventions by cultivating strategic private-public partnerships. Ensure that learning programmes are in place and funded in higher education institutions to ensure the capacity to manage/design projects and interventions and deploy experienced individuals from elsewhere to ensure skills transfer.
- Augment existing curricula—This includes updating and adapting current (e.g., engineering, physical and social science, business science and administration, public sector management, and law) courses and curricula to cover topics such as renewables, clean energy, energy efficiency, and climate change.
- Focus on strengthening skills system innovations across the energy value chain and its associated ecosystem, i.e., not relegating them to a narrow band of technical skills only.

3. Moving towards a just transition requires rethinking municipalities' structures and skills. This requires a strong focus on their capacity to support these changes.

- For example, decentralisation of the energy system will significantly impact the district and local municipal workforce. Activities that were once the domain of Eskom will become the responsibilities of local governments, e.g., energy planning, integration, distribution, trade, and maintenance. Upskilling the current workforce and employing more energy-related staff will be critical. This will require human resource practitioners within the local government to be knowledgeable of these new job demands and associated skills requirements.
- This decentralised approach also requires focusing on building providers in local ecosystems where projects are being implemented.

4. Additional initiatives to ensure a dedicated focus on skills required for the green economy:

- Energy efficiency: Identify key sectors and key occupations. Fast-track and review the Energy Systems skills programme and possibly expand it to include energy systems integration, battery installation, and energy management and optimisation so energy efficiency practices are built into broader energy transition.
- Develop a structured programme for electricians to get apprenticeships in organisations focussing on energy efficiency and renewable energy
- Support foundational skills development – the pipeline from basic education is poor and this is impacting the throughput of students in the relevant STEM courses at tertiary education level.

Table 18: Recommendations Labour Supply

Topic	Approach	Actors	Intervention Level	Time Perspective
Skills system				
Skills anticipation	Strengthen the skills anticipation system so the labour market can capitalise on new green economy opportunities	Government ministries, development partners, industry	Macro/meso	Short/medium term
Skills providers	Develop the capacity of academic and education and training institutions so they can flexibly and timeously respond to the skills demands of the green economy	Government ministries, development partners, academic institutions, industry	Meso/micro	Short/medium term
Skills development	Fast-track and expand the Energy Systems Skills Programme	Government ministries, education and training providers	Macro/meso	Short term
Skills development	Develop a structured renewable energy programme for electricians to get apprenticeships in organisations	Government ministries, education and training providers, industry	Meso/micro	Short/medium term
Skills development	Support foundational skills development in basic education to ensure throughput of students equipped for STEM subjects at tertiary level	Government ministries, schools	Macro/meso	Medium term
Capacity building				
Local government	Build capacity of municipalities (by re-thinking structure, up/re-skilling and employing experts) to enable them to support the decentralised elements of the Just Transition	Government ministries, municipalities, development partners, industry	Macro/meso	Short/medium term

6.1.4 Matching

Workers in jobs that are at risk and young people who have not yet been employed require different matching interventions, and thus, a differentiated matching strategy built on the information provided through the skills anticipation systems is needed. This includes:

- Mechanisms that link emerging demand and supply will enable matching platforms to source the relevant individuals and flag where gap training is required so that individuals have the requisite skills to access these opportunities.
- Using current matching systems for youth (the National Pathway Management Network and in particular SAYouth) and working to ensure that they can support young people to transition from learning to earning opportunities in the green economy and can track the extent to which new programmes enable young people to access, and remain in, the labour market.
- Building capacity in the National Pathway Management Network to support young people in local communities in understanding the services and opportunities available.
- Ensuring similar capacity is in place to support workers in transitioning to jobs and remaining in the labour market (Employment Services of South Africa with the support of the UIF).

2. Implementing these interventions to support transitions needs to focus specifically on the barriers that make it difficult for women to access these opportunities and on establishing mechanisms that create the conditions for women's full involvement in the labour market.

3. Scale up public employment in key green areas to assist in building capacity and skill.

Table 19: Recommendations Matching

Topic	Approach	Actors	Intervention Level	Time Perspective
Collaboration				
Skills anticipation	Support organisations and programmes working on JET topics to collaborate and share information and project pipelines so that skills requirements can more easily be anticipated and prepared for by matching mechanisms	Government ministries, development partners, industry, education and training providers	Macro/meso	Short/medium term
Matching system capacity building				
Green economy transitions	Ensure matching systems in the NPMN, particularly SA Youth, are used, and appropriately support young people to transition from learning to earning in the green economy	Government ministries, development partners, SA Youth	Meso/micro	Short/medium term
Green economy transitions	Build capacity of SA Youth and others in the NPMN to enable them to track the transitions of young people in the labour market and thus monitor the effectiveness of green economy labour market initiatives	Government ministries, development partners, SA Youth, NPMN	Meso/micro	Short/medium term

Topic	Approach	Actors	Intervention Level	Time Perspective
Local communities	Build capacity of NPMN to better support young people in local communities to access local services and opportunities, and to enable understanding of mismatches in community skills provision	Government ministries, municipalities, NPMN	Macro/meso	Short/medium term
Up/re-skilling	Build capacity of ESSA to support matching of workers with up/re-skilling opportunities to ensure they are able to remain in the labour market	Government ministries, education and training providers, NPMN	Macro/meso	Short/medium term
Gender				
Women	Remove barriers that make it difficult for women to access green economy	Government ministries, development partners, industry	Macro/meso	Short/medium term
Skills				
Skills development	Scale up public employment programmes in key green areas to build skills and capacity	Government ministries, development partners	Macro/meso	Short/medium term

6.2 Next Steps

This document will be shared with key role players to reflect on the findings. This will create a basis for these role players to determine their own as well as collective

responses to the recommendations and in doing so to create a basis for a plan to be mapped out outlining key actions to be implemented and indicating the role player that is leading the specific action.

ANNEX 1: GLOSSARY

Active Labour Market Measures	<p>Active labour market policies (ALMP) address inefficiencies in the matching process to re-integrate the unemployed into the labour market. Inefficiencies in labour markets are manifold, e.g. regional frictions between vacancies and jobseekers, mismatch between labour demand and supply owing to discrepancies between competencies of job seekers and required skills, and unemployment due to business cycle movements. ALMP include</p> <ul style="list-style-type: none"> • Career guidance: information, counselling, placement • Job search: information, counselling, placement • Measures for recruiting staff: apprenticeships, subsidised work contracts, publicly funded trainings/skills development • Measures for retaining staff: continuing education and training, career development
Age-based Dependency Ratio	<p>The age-based dependency ration is defined as the total population in the inactive age-groups (typically under 15 and over 65 years) divided by the total working-age population, typically 15-64 years old. This indicator describes demographic structures and assesses their pressures on the labour market to create jobs (see also actual dependency ratio).</p>
Deficit of Productive Employment	<p>The deficit of productive employment includes those who are in the labour force but do not have productive employment. It encompasses two categories: the working poor and the unemployed.</p>
Discouraged Workers	<p>Discouraged workers are persons not currently in the labour market who want to work but do not actively “seek” work because they think they will not find any (e.g. they view job opportunities as limited, or they do not seek work because they have restricted labour mobility, or face discrimination, or structural, social or cultural barriers (also called the “hidden unemployed”). Discouraged workers are a subgroup of the inactive labour force. These potential workers are generally considered underutilised regardless of their reasons for being discouraged.</p> <p>If the measured labour force grows when unemployment is rising, the presence of discouraged workers is implied (although demographic pressures should also be taken into consideration). People who were not counted as unemployed (because they were not actively searching for work) may change their minds and look for work when the odds of finding a job improve.</p>
Domestic Credit to Private Sector	<p>Domestic credit to the private sector refers to financial resources provided for the private sector, such as loans, purchases of non-equity securities, trade credits, and other accounts receivable that establish a claim for repayment. For some countries, these claims include credit to public enterprises.</p>
Domestic Savings Rate	<p>The domestic savings rate share of domestic savings as a percentage of GDP</p>
Economically Active Population	<p>all persons of either sex who furnish the supply of labour for the production of goods and services during a specified time-reference period (see also working-age population)</p>

Employed	Employed are all persons above a specific age who, during a specified brief period, either one week or one day, were either in paid employment or self-employment, employers, own account workers, or unpaid family workers
Employment by Sector	<p>This indicator disaggregates employment into three broad sectors – agriculture, industry and services – and expresses each as a percentage of total employment.</p> <p>The indicator shows employment growth and decline on a broad sectorial scale while highlighting differences in trends and levels between developed and developing economies. Sectorial employment flows are an important factor in the analysis of productivity trends because within-sector productivity growth needs to be distinguished from growth resulting from shifts from lower to higher productivity sectors.</p>
Employment Service Providers	Employment service providers are required to improve the matching situation, and most countries have public employment services to fulfil this role. The services offered differ according to the institution, but in general, the provider will support the job seeker in getting a job. This includes the job search, review of the CV, training on interview skills, on-the-job training, and sometimes even modifying the workplace to meet your needs.
Employment-to-Population Ratio	Employment-to-population ratio is defined as the proportion of a country's working-age population that is employed (the youth employment-to-population ratio is the proportion of the youth population – typically defined as persons 15 to 24 years – that is employed). A high ratio means that a large proportion of a country's population is employed. In contrast, a low ratio means that a large share of the population is not directly involved in market-related activities because they are either unemployed or out of the labour force.
Foreign Direct Investment (FDI)	<p>Foreign direct investment is an investment made by a company or entity based in one country into a company or entity based in another country. Foreign direct investments differ substantially from indirect investments such as portfolio flows, when overseas institutions invest in equities listed on a nation's stock exchange. Entities making direct investments typically have a significant degree of influence and control over the company into which the investment is made.</p> <p>Open economies with skilled workforces and good growth prospects tend to attract larger amounts of foreign direct investment than closed, highly regulated economies.</p>
Gazelles	Gazelles are – unlike the majority of SMEs - fast growing businesses (sustained annual growth rate of 20% over a three to four year time period) with high employment creation (positive net new jobs) .

Gini Coefficient	The Gini coefficient, also called the Gini index or Gini ratio, is a measure of statistical dispersion intended to represent the income or wealth distribution of a nation's residents and is the most commonly used measurement of inequality. The Gini coefficient measures the inequality among values of a frequency distribution (for example, income levels). A Gini coefficient of zero expresses perfect equality, where all values are the same (for example, where everyone has the same income). A Gini coefficient of one (or 100%) expresses maximal inequality among values (e.g. for a large number of people, where only one person has all the income or consumption, and all others have none, the Gini coefficient will be very nearly one).
Gross Capital Formation Rate	Gross Capital Formation rate (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods firms hold to meet temporary or unexpected fluctuations in production or sales, and incomplete goods. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation.
Income Distribution	The Gini index is a convenient summary measure of the degree of inequality based on either income or expenditure. It measures the inequality among values of a frequency distribution (for example levels of income). A Gini coefficient of zero expresses perfect equality, where all values are the same (for example, where everyone has an exactly equal income). A Gini coefficient of one (100 on the percentile scale) expresses maximal inequality among values (where only one person has all the income)
Informal Economy	The Informal economy forms part of the market economy. It covers informal employment both in informal enterprises (small unregistered or unincorporated enterprises) and outside informal enterprises. Informal entrepreneurs and workers share one important characteristic: they are not recognised or protected under existing legal and regulatory frameworks. The informal economy does not include the criminal economy or the reproductive or care economy.
Informal Employment	Informal employment includes all remunerative work, i.e. both self-employment and wage employment, that is not registered, regulated or protected by existing legal or regulatory frameworks, as well as non-remunerative work undertaken in an income-producing enterprise. Informal workers do not have secure employment contracts, worker's benefits, social protection or workers' representation.
Labour Force	The labour force is the sum of the number of persons employed and the number of unemployed. The fact that the unemployed are part of the labour force needs to be stressed because the terms "labour force" and "employment" are sometimes mistakenly used interchangeably.

Labour Force Participation Rate	<p>The Labour force participation rate is calculated by expressing the number of persons in the labour force as a percentage of the working-age population. The indicator for labour force participation rate plays a central role in the study of the factors that determine the size and composition of a country's human resources and in making projections of the future supply of labour. The information is also used to formulate employment policies, to determine training needs and to calculate the expected working lives of the male and female populations and the rates of accession to and retirement from economic activity – crucial information for the financial planning of social security systems.</p> <p>The indicator is also used for understanding the labour market behaviour of different population categories. According to one theory, the level and pattern of labour force participation depend on employment opportunities and the demand for income, which may differ from one category of persons to another. For example, studies have shown that women's labour force participation rates vary systematically, at any given age, with their marital status and level of education. There are also important differences in the participation rates of the urban and rural populations, and among different socioeconomic groups.</p> <p>Malnutrition, disability, and chronic sickness can affect the capacity to work and are therefore also considered major determinants of labour force participation, particularly in low-income environments. Demographers also closely study the relationship between fertility and female labour force participation. This relationship is used to predict the evolution of fertility rates from the current pattern of female participation in economic activity.</p> <p>It is related by definition to other indicators, such as the employment-to-population ratio, which is equal to the labour force participation rate after the deduction of unemployment from the numerator of the rate.</p>
Labour Market Information System	Systems, mechanisms or processes for gathering, organising, providing and analysing information about the state of the labour market, occupations and jobs, including key changes taking place within the employment, jobs and occupations
Labour Productivity	Labour productivity is defined as output per unit of labour input. Two measures are used, e.g. in ILO KILM, GDP per person engaged and GDP per hour worked. Labour productivity is a key measure of economic performance, because economic growth in a country or sector can be ascribed either to increased employment or to more effective work by those who are employed. The latter can be described through data on labour productivity. An understanding of the driving forces behind it, in particular the accumulation of machinery and equipment, improvements in organisation as well as physical and institutional infrastructures, improved health and skills of workers ("human capital") and the generation of new technology, is important in formulating policies to support economic growth.
Micro, Small, and Medium Enterprises (MSME)	There is no universal definition. The choice of MSME definition could depend on many factors, such as business culture, the size of the country's population, industry, and the level of international economic integration. However, a combination of different characteristics is usually used, e.g. number of employees, annual turnover, investment level, and so forth. A common basis for the definition is employment with variation in defining the upper and lower size limit. Despite this variance a large number of sources define an MSME to have a cut-off range of 0 to 250 employees.

NEET	NEET is a part of the working-age population that is not in Employment, Education, or Training. It encompasses the unemployed, discouraged, and inactive.
Paid Employment Jobs	Paid employment jobs are those jobs where the incumbents hold explicit (written or oral) employment contracts which give them a basic remuneration. This is not directly dependent upon the revenue of the enterprise for which they work. Persons in these jobs are typically remunerated by wages and salaries but may be paid by commission from sales, by piece rates, bonuses or in-kind payments. Often also referred to as “wage and salaried workers”.
Passive Labour Market Measures	Passive labour market policies (PLMP) have been introduced to safeguard people from poverty and income loss due to unemployment. Thus, instead of addressing inefficiencies in the matching process, PLMP aim to compensate for socially unacceptable labour market outcomes. Unemployment insurance, minimum wages, and social protection measures provide a floor for income protection related to meeting minimum needs.
Poverty	Poverty can result when individuals are unable to generate sufficient income from their labour to maintain a minimum standard of living. The extent of poverty, therefore, can be viewed as an outcome of the functioning of labour markets. An estimate of the number of people in poverty in a country depends on the choice of the poverty threshold. However, what constitutes such a threshold of minimum basic needs is subjective, varying with culture and national priorities. Definitional variations create difficulties when it comes to making international comparisons. Therefore, in addition to national poverty measurements the ILO KILM indicator presents data relative to the World Bank international poverty lines of US\$1.25 and US\$2 per person per day.
Productive Employment	Productive employment encompasses those who are in the labour force and who are neither unemployed nor working poor. Hence, the concept of productive employment stands for employed persons, whose income is sufficient to permit them and their dependants a level of consumption above the poverty line.
Qualitative Analysis	In the present context, qualitative analysis is defined as a structured report of observer impressions concerning the underlying reasons for the country-specific employment situation.
Rentier State	The usage is based on the concept of ‘rents’, based on the ownership of land or resources. Rents are different from wages which must be laboured for. As important oil producer, Nigeria is considered to be a rentier state. Rewards of income and wealth for the rentier do not come as the result of work but rather are the result of chance or situation.
Self-Employment Jobs	Self-employment jobs are those jobs where the remuneration is directly dependent upon the profits (or the potential for profits) derived from the goods or services produced (where own consumption is considered part of the profits). The incumbents make the operational decisions affecting the enterprises or delegate such decisions while retaining responsibility. (In this context “enterprise” includes one-person operations.)
Technical and Vocational Education and Training (TVET)	Technical and Vocational Education and Training is a comprehensive term referring to those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life.

Total Employed according to their status of employment	Indicators of status in employment distinguish between four important and useful categories of the employed – (a) wage and salaried workers, (b) employers, (c) own-account workers, and (d) contributing family workers. Categorisation by employment status can help in understanding both the dynamics of the labour market and the level of development of countries. Over the years, and with the growth of the country, one would typically expect to see a shift in employment from the agriculture to the industry and services sectors with a corresponding increase in wage and salaried workers and decreases in self-employed and contributing family workers previously employed in the agricultural sector.
Tracer Studies	A survey, in written or oral form, of graduates from educational institutions will take place sometime after graduation or at the end of the training.
Underemployment	Underemployment is underutilisation or inefficient use of a worker’s skills, qualifications or experience, or where the worker cannot work as many hours as he or she is willing to do.
Unemployed	Underemployed are all persons above a specified age who, during the reference period, were “without work”, i.e. not in paid employment or self-employment, “currently available for work”, i.e. available for paid employment or self-employment during the reference period and “seeking work”, i.e. have taken specific steps in a specified reference period to seek paid employment or self-employment.

Unemployment Rate	<p>The unemployment rate is calculated by taking the unemployed (equals the number of persons who are during a specified reference period without work but currently available for work and seeking work) as a percentage of the total labour force, which itself is the sum of the total persons employed and unemployed in the group. It should be emphasised that the labour force or the economically active portion of the population serves as the base for this statistic, not the total population. This distinction is not necessarily well understood by the public. Indeed, the terms “labour force” and “employment” are sometimes mistakenly used interchangeably.</p> <p>The overall unemployment rate for a country is a widely used measure of its unutilised labour supply. If employment is taken as the desired situation for people in the economically active population (the labour force), unemployment becomes an undesirable situation. Still, short-term unemployment can be desirable and necessary for ensuring adjustment to economic fluctuations. Unemployment rates by specific groups, defined by age, sex, occupation or industry, are also useful in identifying groups of workers and sectors most vulnerable to joblessness.</p> <p>The unemployment rate tells us the proportion of the labour force that does not have a job but is available and actively looking for work. However, this indicator says nothing about the economic resources of unemployed workers or their family members. Its use should, therefore, be limited to measuring labour utilisation and an indication of the failure to find work. Other measures, including income-related indicators, would be needed to evaluate economic hardship.</p> <p>That is why, paradoxically, low unemployment rates may well disguise substantial poverty in a country. In contrast, high unemployment rates can occur in countries with significant economic development and low incidence of poverty. These results occur because of well-developed social protection schemes and available savings or other means of support which enable workers to afford better to take the time to find more desirable jobs.</p> <p>A useful purpose served by the unemployment rate in a country, when available on at least an annual basis, is the tracking of business cycles. When the rate is high, the country might be in recession, economic conditions might be bad, or the country might somehow be unable to provide jobs for the available workers. The goal, then, is to introduce policies and measures to bring the incidence of unemployment down to a more acceptable level. What that level is, or should be, has often been the source of considerable discussion, as many consider that there is a point below which an unemployment rate cannot fall without the occurrence of intense inflationary pressures. Because of this supposed trade-off the unemployment rate is closely tracked over time.</p>
Value Chain Development	<p>Value chain development is an economic development concept that helps to improve the system around a certain product or service. A value chain is defined by a particular product and its markets, with the community of value chain operators including all enterprises that add value to the product on its way from raw material to the final consumer. Value chain development aims at strengthening the functioning of markets, improving access to jobs and influencing the distributive outcome of market processes.</p>
Vulnerable Employment	<p>Vulnerable employment is defined by labour market status and includes those who are working on their own account or as contributing family workers (unpaid family workers).</p>
Working Age Population	<p>The working age population is the population above a certain age – often aged 15 and older – prescribed for the measurement of economic characteristics (see also economically active population). Typically the working-age population is defined between 15 and 65 years old.</p>

Working Poor	<p>The group refers to employed persons, whether for wages, on their own account or as unpaid family helpers, whose income is insufficient to bring themselves and their dependents out of poverty. A simplified method to obtain an approximate number of working poor (see ILO (2012a), p. 41): Working poor = total employed population aged 15+ multiplied by headcount poverty rate</p>
Youth Unemployment	<p>According to ILO, data on youth unemployment could be presented in the following ways: (a) the youth unemployment rate; (b) the youth unemployment rate as a percentage of the adult unemployment rate; (c) the youth share in total unemployment; and (d) youth unemployment as a proportion of the youth population.</p> <p>When analysed in isolation, these measures should be analysed together; any of the four could paint a distorted image. For example a country might have a high ratio of youth-to-adult unemployment but a low youth share in total unemployment. The presentation of youth unemployment as a proportion of the youth population recognises the fact that a large proportion of young people enter unemployment from outside the labour force. (Youth are defined as young people aged between 15 and 24, part of the labour force.)</p>

ANNEX 2: LIST OF IDENTIFIED RENEWABLE ENERGY, GREEN HYDROGEN AND ELECTRIC VEHICLE COURSES

Table 20: List of Identified Courses on Renewable Energy, Green Hydrogen and Electric Vehicle

Education provider	Provincial location (HQ)	Energy efficiency	Renewables (general)	Renewables (solar)	Renewables (wind)	Renewables (storage)	Green hydrogen	Electric vehicles	Course type
Traditional universities									
Nelson Mandela University	Eastern Cape		Renewable Energy Engineering						Higher Certificate
Nelson Mandela University	Eastern Cape		Renewable Energy Finance and Policy						Short course
Nelson Mandela University, AMTC	Eastern Cape		Renewable Energy Technology						Short course
Nelson Mandela University, AMTC	Eastern Cape				Wind Energy Technology & Systems				Short course
Rhodes University	Eastern Cape		Environmental Biotechnology [Biogas]						Masters/PhD
University of Fort Hare	Eastern Cape		Bioenergy						Postgraduate
University of Johannesburg	Gauteng		Applied Renewable Energy						Short course

University of Johannesburg/Resolution Circle	Gauteng	Energy Efficiency Audit Technician							National Certificate
University of Johannesburg, Green Hydrogen Research Chair	Gauteng						Green Hydrogen		Postgraduate
University of Johannesburg	Gauteng		Introduction to Biogas Technology						Short course
University of Johannesburg	Gauteng		Sustainable Energy						Masters
University of Johannesburg	Gauteng							Transportation Electrification	Short course
University of Pretoria	Gauteng		Classical & Renewable Power Systems & Electricity Policy						Masters/PhD
University of Pretoria	Gauteng	Electrical Engineering (Energy management module)							Postgraduate
University of Pretoria	Gauteng	Electrical Engineering (Energy optimisation module)							Postgraduate

University of Pretoria	Gauteng	Electrical Engineering (Energy systems & optimisation module)						Bachelors
University of Pretoria	Gauteng		Electrical Engineering (Renewable energy module)					Postgraduate
University of Pretoria	Gauteng	Energy Efficiency & Demand Side Management						Masters/PhD
University of Pretoria	Gauteng	Energy Efficiency & Management in Buildings						Masters/PhD
University of Pretoria	Gauteng					Hydrogen Fuel Cells Systems		Short course
University of Pretoria	Gauteng	Industrial Energy Optimisation						Masters/PhD
University of Pretoria	Gauteng	Transport Efficiency						Masters/PhD
University of South Africa	Gauteng		Hydropower for Civil Engineers (module)					Honours
University of South Africa	Gauteng		Sustainable Energy					Honours

University of South Africa	Gauteng		Sustainable Energy Sources & Technologies (module)						Honours
University of the Witwatersrand	Gauteng		Advanced Theory & Practice of Construction: Renewable resources (module)						Honours
University of the Witwatersrand, SEERU	Gauteng		Clean/Renewable Energy Production						Postgraduate
University of the Witwatersrand, AELC	Gauteng	Decarbonising Energy (module)							Masters
University of the Witwatersrand	Gauteng						Electrical Engineering: Electric and hybrid vehicles (module)		Postgraduate Diploma
University of the Witwatersrand	Gauteng		Electrical Engineering: Renewable Energy (module)						Honours
University of the Witwatersrand	Gauteng	Energy Efficiency & Renewable Energy for Buildings (module)							Masters
University of the Witwatersrand, AELC	Gauteng		Energy Transitions						Doctorate

University of the Witwatersrand	Gauteng	Environmental and Energy Economics					Masters
University of the Witwatersrand	Gauteng		Future Electrical Energy Technology				Postgraduate
University of the Witwatersrand	Gauteng	Sustainable and Energy Efficient Cities					Masters
University of KwaZulu-Natal	KwaZulu-Natal			Mechanical Engineering (Solar Energy Thermodynamics)			Postgraduate
University of KwaZulu-Natal	KwaZulu-Natal					Power Electronics 2	Post grad module?
University of Venda	Limpopo			Computational Physics for Solar Energy Harvesting			Masters/PhD
University of Venda	Limpopo			Physics: Renewable Energy			Honours
University of Venda	Limpopo			Renewable Energy: Solar energy			Masters/PhD
University of Venda	Limpopo		Renewable Energy: Biomass				Masters/PhD

University of Venda	Limpopo		Agriculture & Rural Engineering: Renewable Energy Sources & Technologies (module)						Bachelors
North West University, CRCED	North West	Energy Management							Postgraduate
North West University	North West			Photovoltaic Installation (Solar PV)					Short course
North West University	North West			Solar Technician					?
Stellenbosch University, CRSE	Western Cape			Advanced Photovoltaic Systems					Short course
Stellenbosch University, CRSE	Western Cape			Chemical Engineering: Bioenergy (module)					Masters
Stellenbosch University	Western Cape								Electric Mobility
Stellenbosch University, CRSE	Western Cape					Energy Storage Systems			Short course
Stellenbosch University, CRSE	Western Cape		Engineering (Renewable & Sustainable Energy)						Postgraduate Diploma
Stellenbosch University, CRSE	Western Cape						Green Hydrogen Project Engineering		Short course

Stellenbosch University, CRSE	Western Cape						Chemical Engineering: Green Hydrogen Project Engineering (module)		Masters
Stellenbosch University, CRSE	Western Cape						Chemical Engineering: Green Hydrogen Technologies (module)		Short course
Stellenbosch University, CRSE	Western Cape		Hydro & Ocean Energy						Short course
Stellenbosch University, CRSE	Western Cape						Hydrogen in the Energy System		Short course
Stellenbosch University, CRSE	Western Cape		Renewable Energy Systems						Short course
Stellenbosch University, CRSE	Western Cape		Renewable & Sustainable Energy Studies						Masters
Stellenbosch University, CRSE	Western Cape			Solar Thermal Energy Systems					Short course
Stellenbosch University, CRSE	Western Cape				Wind energy				Short course
University of Cape Town	Western Cape	Energy Efficiency and Sustainability							Short course

University of Cape Town	Western Cape		Finance, Contracts and Risk Mitigation for Private Power Investment in Africa						Short course
University of Cape Town	Western Cape	Integrated Energy Systems							Short course
University of Cape Town	Western Cape						Fuel to Hydrogen		Postgraduate
University of the Western Cape	Western Cape					Energy Storage & Fluid Treatment			Postgraduate
University of the Western Cape	Western Cape						Green Hydrogen		Postgraduate
University of the Western Cape	Western Cape						Hydrogen Fuel Cell Vehicles		Postgraduate
University of the Western Cape	Western Cape		Renewable & Sustainable Energy						Masters
Universities of Technology									
Central University of Technology	Free State		Renewable Energy for Subject Advisors and STEM Teachers						Short course
Central University of Technology	Free State		Renewable Energy Technologies						Higher Certificate

Tshwane University of Technology	Gauteng		Electrical Engineering: Renewable Energy (module)						National Diploma
Tshwane University of Technology	Gauteng						Hydrogen Energy		Postgraduate
Tshwane University of Technology, TICE	Gauteng			Solar Technology					Short course
Vaal University of Technology	Gauteng	Electrical Engineering: Energy Management & Energy Efficiency (modules)							Postgraduate Diploma
Vaal University of Technology	Gauteng	Electrical Engineering (Power): Energy Management (module)	Electrical Engineering (Power): Alternative Energy (module)						Diploma
Vaal University of Technology	Gauteng	Engineering: Energy Efficiency (incl. Renewable Energy module)	Engineering: Energy Efficiency: Renewable Energy (module)						Masters

Durban University of Technology, ETS	KwaZulu-Natal	Building Energy Audit & Training Programme (BEAT)							Short course
Durban University of Technology, ETS	KwaZulu-Natal			Design, Installation & Maintenance of a PV System					Short course
Durban University of Technology, ETS	KwaZulu-Natal			Installation & Maintenance of a Solar Water Heater					Short course
Durban University of Technology	KwaZulu-Natal	Introduction to Energy Auditing & Assessment							Short course
Durban University of Technology, ETS	KwaZulu-Natal			Planning Large Scale Grid-Connected Photovoltaic					Short course
Durban University of Technology, ETS	KwaZulu-Natal			Small Scale Grid-Connected Photovoltaics					Short course
Durban University of Technology, ETS	KwaZulu-Natal			Solar Photovoltaic Installation					Short course
Durban University of Technology, ETS	KwaZulu-Natal			Solar Photovoltaic Fundamentals					Short course
Durban University of Technology, ETS	KwaZulu-Natal			Solar Thermal Fundamentals					Short course

Durban University of Technology, ETS	KwaZulu-Natal				Wind Energy for Engineers and Technicians				Short course
Mangosuthu University of Technology	KwaZulu-Natal		Electrical Engineering: Project Management in Renewable Energy (module)						National Diploma
Mangosuthu University of Technology	KwaZulu-Natal		Electrical Engineering: Renewable Energy Systems (module)						National Diploma
Mangosuthu University of Technology	KwaZulu-Natal			Electrical Engineering: Solar Cells & Photovoltaic (module)					National Diploma
Mangosuthu University of Technology	KwaZulu-Natal				Electrical Engineering: Wind Technologies (module)				National Diploma
Cape Peninsula University of Technology, SARETEC	Western Cape			Basics of Solar PV Systems					Short course
Cape Peninsula University of Technology	Western Cape	Energy: Energy Efficiency & Management (modules)							Masters

Cape Peninsula University of Technology	Western Cape	Horticultural Sciences: Environmental Studies (module)							Diploma
Cape Peninsula University of Technology, SARETEC	Western Cape		Mechanical Engineering: Renewable Energy						Advanced Diploma
Cape Peninsula University of Technology, SARETEC	Western Cape				Operation & Management of Wind Farms				Short course
Cape Peninsula University of Technology	Western Cape							Smart Energy: E-mobility & Transportation	Postgraduate
Cape Peninsula University of Technology	Western Cape	Smart Energy: Energy Efficient Agriculture & Human Settlement							Postgraduate
Cape Peninsula University of Technology, SARETEC	Western Cape			Solar PV Installer					Short course
Cape Peninsula University of Technology, SARETEC	Western Cape			Solar PV Green Card Assessment					Short course
Cape Peninsula University of Technology, SARETEC	Western Cape			Solar PV Small Grid-Tied System Basic Design					Short course

Cape Peninsula University of Technology, SARETEC	Western Cape				Wind: Basic Safety Training				Short course
Cape Peninsula University of Technology, SARETEC	Western Cape				Wind Energy for Engineers and Technicians				Short course
Cape Peninsula University of Technology, SARETEC	Western Cape				Wind Energy for Generalists				Short course
Cape Peninsula University of Technology, SARETEC	Western Cape				Wind Farm Project Development				Short course
Cape Peninsula University of Technology, SARETEC	Western Cape				Wind Turbine Service Technician				Short course
TVET colleges									
In GWe TVET college	Eastern Cape		Renewable Energy						Short course
Port Elizabeth TVET College	Eastern Cape		Renewable Energy						National Certificate (Vocational)
Goldfields TVET College	Free State		Renewable Energy & Technologies						National Certificate
Maluti TVET College	Free State		Renewable Energy Technologies (module)						National Certificate (Vocational)
Ekurhuleni East TVET College/ SANEDI	Gauteng	Energy Performance Certificate (EPC) Practitioner Skills Programme							Certificate

Ekurhuleni East TVET College	Gauteng			IRM: Plumbing & Solar Water Heating					Short course
Ekurhuleni West TVET College/Resolution Circle	Gauteng	Energy Efficiency							Short course
Ekurhuleni West TVET College	Gauteng	Energy Management							Short course
Ekurhuleni West TVET College	Gauteng			PV Solar Installer					Short course
Umfolozi College	KwaZulu-Natal		Electrical Infrastructure Construction: Renewable Energy Technology						National Certificate (Vocational)
Capricorn TVET College	Limpopo	Energy Efficiency		Solar Energy Fundamentals					Short course
Vhembe TVET College	Limpopo		Electrical Infrastructure Construction: Renewable Energy Technology						National Certificate (Vocational)
Ehlanzeni TVET College/RES4Africa/EWSETA	Mpumalanga		Renewable Energy (train-the-trainers)						Short course
Gert Sibande TVET College/RES4Africa/EWSETA	Mpumalanga		Renewable Energy (train-the-trainers)						Short course

Capricorn TVET College	Limpopo	Energy Efficiency		Solar Energy Fundamentals					Short course
Vhembe TVET College	Limpopo		Electrical Infrastructure Construction: Renewable Energy Technology						National Certificate (Vocational)
Ehlanzeni TVET College/RES4Africa/EWSETA	Mpumalanga		Renewable Energy (train-the-trainers)						Short course
Gert Sibande TVET College/RES4Africa/EWSETA	Mpumalanga		Renewable Energy (train-the-trainers)						Short course
Gert Sibande TVET College	Mpumalanga		Electrical Infrastructure Construction: Renewable Energy Technology						National Certificate
Nkangala TVET College/RES4Africa/EWSETA	Mpumalanga		Renewable Energy (train-the-trainers)						Short course
Vuselela TVET College	North West		Electrical Infrastructure Construction: Renewable Energy Technology						National Certificate (Vocational)
Northern Cape Rural TVET College	Northern Cape								
Boland College	Western Cape		Renewable Energy & Sustainable Farming Programme						Short course

College of Cape Town/SANEDI	Western Cape	Energy Performance Certificate (EPC) Practitioner Skills Programme							Certificate
False Bay College	Western Cape			Solar PV Technician					Short course
Northlink TVET College	Western Cape			Solar Thermal Renewable Energy Technology					
West Coast College	Western Cape		Renewable Energy						National Certificate (Vocational)
West Coast College	Western Cape			Solar PV Technician					
CET colleges									
No relevant courses identified									
Private colleges/ other training academies etc									
East London IDZ	Eastern Cape		Renewable Energy Training						Short course
MSC Artisan Academy	Eastern Cape			Design & Operation of Photovoltaic Systems					Short course

MSC Artisan Academy	Eastern Cape			Install & Maintain PV Rooftop Systems					Short course
MSC Artisan Academy	Eastern Cape			Solar Thermal Systems Technology					Short course
MSC Artisan Academy	Eastern Cape				Understanding Wind Energy Technology				Short course
SP Wind	Eastern Cape				Basic Safety Training				Short course
SP Wind	Eastern Cape				Basic Technical Training				Short course
Africa International Training Facilities	Gauteng			Solar Plumbing Inspector					Short course
Africa International Training Facilities	Gauteng			Solar Plumbing Installer					Short course
BSI Group	Gauteng	ISO 50001: Energy Management Implementation							Short course
BSI Group	Gauteng	ISO 50001: Energy Management Requirements							Short course
BSI Group	Gauteng	ISO 50001: Energy Management Internal Auditor							Short course

Gert Sibande TVET College	Mpumalanga		Electrical Infrastructure Construction: Renewable Energy Technology						National Certificate
Nkangala TVET College/RES4Africa/EWSETA	Mpumalanga		Renewable Energy (train-the-trainers)						Short course
Vuselela TVET College	North West		Electrical Infrastructure Construction: Renewable Energy Technology						National Certificate (Vocational)
Northern Cape Rural TVET College	Northern Cape								
Boland College	Western Cape		Renewable Energy & Sustainable Farming Programme						Short course
College of Cape Town/SANEDI	Western Cape	Energy Performance Certificate (EPC) Practitioner Skills Programme							Certificate
False Bay College	Western Cape			Solar PV Technician					Short course
Northlink TVET College	Western Cape			Solar Thermal Renewable Energy Technology					

BSI Group	Gauteng	ISO 50001: Energy Management Lead Auditor							Short course
BSI Group	Gauteng	ISO 50001: Energy Management Lead Imple- menter							Short course
BSI Group	Gauteng	ISO 50001: Energy Management Masterclass							Short course
BSI Group	Gauteng	ISO 50001: Energy Management Requirements On-demand							Short course
DQS Academy	Gauteng	ISO 50001 Energy Management: Foundation							Short course
DQS Academy	Gauteng	ISO 50001 Energy Man- agement Lead Implementer							Short course
Ekurhuleni Artisans Skills & Training College	Gauteng			Solar Power					Short course
IMSIMBI Training	Gauteng		Renewable Energy Work- shop Assis- tant						Short course

Initiative for Social Performance in Renewable Energy (INSPIRE)	Gauteng		Introduction to Social Performance Practice (for RE)						Short course
Institute for Capacity Development	Gauteng				Fundamentals of Wind Energy				Short course
Lilovattech	Gauteng			Beginner & Intermediate Solar Installation					Short course
Lilovattech	Gauteng			Full practical training					Short course
NCPC-SA	Gauteng		Biogas End-user						Short course
NCPC-SA	Gauteng		Biogas Systems Optimisation						Certificate
NCPC-SA	Gauteng	Compressed Air System Optimisation							Short course
NCPC-SA	Gauteng	Energy Management 101 (EM101)							Short course
NCPC-SA	Gauteng	Energy Management System Implementation							Short course
NCPC-SA	Gauteng	Energy Performance Measurement Indicators (EnMPI)							Short course

NCPC-SA	Gauteng	Fan System Optimisation (FSO)						Short course
NCPC-SA	Gauteng	Large scale Cooling & Industrial Refrigeration System Optimisation						Short course
NCPC-SA	Gauteng	Motor System Optimisation (MSO)						Short course
NCPC-SA	Gauteng	Pump System Optimisation						Short course
NCPC-SA	Gauteng	Steam System Optimisation						Short course
merSETA/ Nepoworx Renewable Energy Institution	Gauteng			Solar Photo-voltaic Service Technician				National Occupational Certificate
PtX.Academy	Gauteng					Renewable Power to X Basic Training		Short course
SABS Training Academy	Gauteng	Introduction to Energy Efficiency Management Systems ISO 50001						Short course

SABS Training Academy	Gauteng	ISO 50001: Understanding and Implementation of Energy Efficiency Management Systems							Short course
SGS South Africa	Gauteng	ISO 50001: Energy Management Systems: Internal Auditor							Short course
Sinetech	Gauteng			Solar Design & Installation Course					Short course
The Knowledge Academy	Gauteng	ISO 50001 Energy Management Systems							Short course
We Train You	Gauteng					Battery Maintenance			Short course
We Train You	Gauteng	Industrial Energy Efficiency and Savings							Short course
Kwena Mining & Construction College	North West						Hydrogen Technology		Short course
Africa Skills Private College	Western Cape			Solar PV Service Technician					Short course?
Green Solar Academy	Western Cape			Compliance for PV Systems					Short course
Green Solar Academy	Western Cape			Financing of PV Systems					Short course

Green Solar Academy	Western Cape			PV Mounter					Short course
Green Solar Academy	Western Cape			PV Sol Design School					Short course
Green Solar Academy	Western Cape			PVA Prep Course					Short course
Green Solar Academy	Western Cape			Solar 101					Short course
Green Solar Academy	Western Cape			Solar Power Designer for Commercial PV systems					Short course
Green Solar Academy	Western Cape			Sunrise (Solar PV basics)					Short course
Green Solar Academy	Western Cape			SuperSolar-School					Short course
Industry Training Centre	Western Cape				GWO Blade Repair				Short course
Nepoworx	Western Cape			PV Greencard					Short course
Nepoworx	Western Cape			Solar PV Designer Software					Short course
Nepoworx	Western Cape			Solar PV Fundamentals					Short course
Nepoworx	Western Cape			Solar PV Project Finance					Short course
Nepoworx	Western Cape			Solar PV System Mounter					Short course
PQRS Solar PV Training	Western Cape			Commercial Solar PV Design and Installation					Short course

PQRS Solar PV Training	Western Cape			Solar PV Products and PV Systems					Short course
PQRS Solar PV Training	Western Cape			Solar PV Exceed					Short course
PQRS Solar PV Training	Western Cape			Solar PV Excel					Short course
PQRS Solar PV Training	Western Cape			Solar PV Sales					Short course
SBS Training	Western Cape	Introduction to Energy Audit and Energy Management							Short course
Solar Training Centre SA	Western Cape			SF Food & Energy (Agri-voltaic) Course					Short course
Solar Training Centre SA	Western Cape			SSEG Technical & Financial Course					Short course
Solar Training Centre SA	Western Cape			STC Installers Course					Short course
Terra Firma Solutions	Western Cape			Solar PV Feasibility Assessment					Short course
Terra Firma Solutions	Western Cape			Solar PV Installation					Short course
Terra Firma Solutions	Western Cape			Solar PV Operations and Maintenance					Short course

Industry/Sector associations									
Association of Energy Engineers (AEE)	Gauteng	Certified Energy Manager							Short course
Association of Energy Engineers (AEE)	Gauteng	Certified Energy Auditor							Short course
Electrical Contractors Association (ECA)	Gauteng			Solar PV					Short course
Institute of Energy Professionals Africa (IEPA)	Gauteng	Business Energy Professional							Short course
Institute of Energy Professionals Africa (IEPA)	Gauteng	Energy Auditor							Short course
Institute of Energy Professionals Africa (IEPA)	Gauteng	Energy Manager							Short course
Institute of Energy Professionals Africa (IEPA)	Gauteng	Energy Performance							Short course
Institute of Energy Professionals Africa (IEPA)	Gauteng	Industrial Energy Professional							Short course
Institute of Energy Professionals Africa (IEPA)	Gauteng	Lighting Efficiency Professional							Short course
Institute of Energy Professionals Africa (IEPA)	Gauteng	Measurement & Verification Professional							Short course
Institute of Energy Professionals Africa (IEPA)	Gauteng		Renewable Energy Professional						Short course

South African Institute of Electrical Engineers (SAIEE)	Gauteng				Anatomy of Wind Turbines				Short course
South African Institute of Electrical Engineers (SAIEE)	Gauteng		Fundamentals of Developing Energy Plants						Short course
South African Institute of Electrical Engineers (SAIEE)	Gauteng			Photovoltaic Solar Systems					Short course
South African Wind Energy Association (SAWEA)/ EWSE-TA	Gauteng				Wind Industry				Internship
Southern African Energy Efficiency Confederation (SAEEEC)	Gauteng	Business Energy Professional							Short course
Southern African Energy Efficiency Confederation (SAEEEC)	Gauteng	Energy Auditor							Short course
Southern African Energy Efficiency Confederation (SAEEEC)	Gauteng	Energy Manager							Short course
Southern African Energy Efficiency Confederation (SAEEEC)	Gauteng	Energy Performance Certificate (EPC)							Short course
Southern African Energy Efficiency Confederation (SAEEEC)	Gauteng	Fundamentals to Energy Management							Short course

Southern African Energy Efficiency Confederation (SAEEC)	Gauteng	Industrial Energy Professional							Short course
Southern African Energy Efficiency Confederation (SAEEC)	Gauteng	Lighting Efficiency Professional							Short course
Southern African Energy Efficiency Confederation (SAEEC)	Gauteng		Renewable Energy Professional						Short course
Southern African Energy Efficiency Confederation (SAEEC)	Gauteng			Solar PV Greencard Installer					Short course

SETA learning programmes									
EWSETA	Gauteng		Electrical Engineering: Renewable Energy						National Certificate
EWSETA	Gauteng		Electrical Engineering: Renewable Energy						National Certificate
EWSETA	Gauteng		Hydro Power Plant Operator						National Occupational Certificate
EWSETA	Gauteng		Hydro Power Plant Process Controller						National Occupational Certificate

EWSETA	Gauteng						Hydrogen Fuel Cell System Practitioner		
merSETA	Gauteng			Hot Water System Installer (Solar Water Installer)					National Occupational Certificate
merSETA	Gauteng			Solar Photovoltaic Stand-alone Service Technician					Higher Occupational Certificate
merSETA	Gauteng			Solar Photovoltaic Stand-alone Systems Installer					National Occupational Certificate
merSETA	Gauteng			Solar Photovoltaic Stand-alone Systems Mounter					Part Qualification
merSETA	Gauteng				Wind Turbine Service Technician				National Occupational Certificate

ANNEX 3: OCCUPATIONAL CHANGES/ POTENTIAL OCCUPATIONS IN THE NEW ENERGY VEHICLES, RENEWABLE ENERGY, GREEN HYDROGEN AND AGRICULTURE SECTORS

Source: Moshikaro et al., 2020

Table 21: Occupations at Risk of Elimination as the Automotive Sector Shifts to New Energy Vehicles

High-Skilled	Medium-Skilled
<ul style="list-style-type: none"> • Fuel Manager • Petroleum Draughtsperson • Petroleum Transfer Technician • Petroleum Distribution Agent 	<ul style="list-style-type: none"> • Diesel Mechanic • Diesel Injector • Diesel Fuel Injection Technician • Diesel Fuel Injection Mechanic • Diesel Fitter Mechanic • Field Service Technician (diesel) • Field Service Technician (diesel) • Field Service Technician • Fuel Injection Mechanic • Automotive Engine Fitter • Engine Management and Fuel Injection System Mechanic • Diesel Electrical Fitter • Diesel Mechanic

Source: Moshikaro et al., 2020

Table 22: Transforming Occupations in the New Energy Vehicles Sub-Sector

High-skilled	Medium-skilled
<ul style="list-style-type: none"> • Engineering Manager • Industrial Engineer • Industrial Engineering Technologist • Production Engineer • Production Engineering Technologist • Mechanical Engineer • Metallurgical Engineer • Metallurgical Engineering Technologist • Draughtsperson • Manufacturing Technician • Industrial Engineering Technician • Environmental Engineering Technician • Engineering Supervisor • Production/Operations Supervisor (Manufacturing) • Maintenance Planner • Engineering Supervisor • Production/Operations Supervisor (Manufacturing) • Maintenance Planner • Environmental Engineering Technician • Engineering Supervisor • Production/Operations Supervisor (Manufacturing) • Maintenance Planner • Environmental Engineering Technician • Engineering Supervisor • Production/Operations Supervisor (Manufacturing) • Maintenance Planner • Quality Systems Manager • Sales and Marketing Manager • Sales Manager • Director of Marketing • Customer Service Manager • Advertising and Public Relations Manager • Insurance Investigator • Insurance Loss Adjuster • Vehicle Damage Quantifier • Commercial Sales Representative • Sales Representative (Building and Plumbing Supplies) • Sales Representative (Personal and Household Goods) • Commercial Services Sales Agent • Motor Vehicle Examiner • Retail Buyer • Engineering Manager • Industrial Engineer 	<ul style="list-style-type: none"> • Metal Machinist • Mechatronics Technician • Welder • Toolmaker • Metal Machinist • Fitter and Turner • Automotive Engine Mechanic • Mechanical Fitter • Automotive Parts Salesperson • Vehicle Mechanic • Service Mechanic • Automotive Mechanic • Motor Mechanic • Motor Mechanic • Motorcycle and Scooter Mechanic • Motorcycle/Motorbike Technician • Scooter Mechanic • Automatic Transmission Mechanic • Automotive Mechanician • Mechanical Service Advisor (Vehicles) • Garage Mechanic • Auto Engineer/Mechanic • Brake and Clutch Mechanic/Repairer/Fitter • Service Station Attendant • Petroleum Transfer Technician • Service Station Salesperson • Computer Engineering Mechanic/Service Person • Engineering Production Systems Worker • Metal Machinist • Mechatronics Technician • Welder • Toolmaker • Metal Machinist • Fitter and Turner • Automotive Engine Mechanic • Mechanical Fitter • Automotive Parts Salesperson • Vehicle Mechanic • Service Mechanic • Automotive Mechanic • Motor Mechanic • Motor Mechanic • Motorcycle and Scooter Mechanic • Motorcycle/Motorbike Technician • Scooter Mechanic

Source: Moshikaro et al., 2020

Table 22: Transforming Occupations in the New Energy Vehicles Sub-Sector

High-skilled	Medium-skilled
<ul style="list-style-type: none"> • Mechanical Engineer • Mechanical Engineering Technologist • Engineering Supervisor • Engineering Foreman • Mechanical Engineering Technician • Engineering Manager • Industrial Engineer • Mechanical Engineer • Mechanical Engineering Technologist • Engineering Supervisor • Mechanical Engineering Technician 	<ul style="list-style-type: none"> • Automatic Transmission Mechanic • Automotive Mechanician • Mechanical Service Advisor (Vehicles) • Garage Mechanic • Auto Engineer/Mechanic • Brake and Clutch Mechanic/Repairer/Fitter • Service Station Attendant • Petroleum Transfer Technician • Service Station Salesperson • Computer Engineering Mechanic/Service Person • Engineering Production Systems Worker • Metal Machinist • Mechatronics Technician • Welder

Table 23: Emerging Occupations in the New Electric Vehicles Sub-Sector

Emerging Occupations	
High-Skilled	Medium-Skilled
<ul style="list-style-type: none"> • Electronic and electrical equipment assembler • Electric powertrain engineer • Modelling engineer • Group Manager, Chassis & Electric Vehicle Structures • Zero Emissions- Battery Electric Vehicle Engineer • Field Engineer - Electric Vehicle Market • Mechanical Engineer - Battery Electric Vehicle - High Voltage Battery Enclosure Job • Electric Vehicle Engineer • Electric Vehicle Build Engineer • Mechatronics Engineer - Autonomous and Electric Vehicles • Mechanical Engineer - Electric Powertrain • Programme Manager, Electric Vehicle Implementation • Senior Director – Vehicle Integration • Electric Propulsion Engineer • Advanced Electric Vehicle Architect • Vehicle Engineer - Hybrid • Staff Thermal Engineer - Autonomous and Electrical Vehicles • Electric powertrain engineer • Modelling engineer • Group Manager, Chassis & Electric Vehicle Structures • Zero Emissions- Battery Electric Vehicle Engineer • Field Engineer - Electric Vehicle Market • Mechanical Engineer - Battery Electric Vehicle - High Voltage Battery Enclosure Job • Electric Vehicle Engineer • Electric Vehicle Build Engineer • Mechatronics Engineer - Autonomous and Electric Vehicles • Mechanical Engineer - Electric Powertrain • Electric Vehicle Charging Electrical Engineer • Director of Electrification and Micro grids Engineers • Business Development Manager Electric Vehicle Charging • Hardware Development Engineer for Automotive Applications • Vehicle Mechanical Test Engineer II, Battery Electric Vehicles (BEV) • Engineering Technical Leader - Electric Drivetrain & Controls • Electric Motor Core Thermal Engineer • Manager - Electric Mobility • EV Test Engineer • Head of Electrical Design • EV Electrical Engineer • EV Business Development Manager Electric Propulsion Control System Integration Engineer 	<ul style="list-style-type: none"> • Electromechanical equipment assemblers • Electricians • Electrical contractors • Sales Executive – Electric Vehicle Products • Sales Specialist - Electric Vehicle Charging Products • LIB repair specialists • Vehicle conversion specialists • Site planners/Urban planners • Distributors • Charging point operator • E-mobility service provider • Salesperson and marketing • Smart grid Specialist • Distributors • Charging point operator • E-mobility service provider • Salesperson and marketing • Smart grid Specialist • Salesperson and marketing • Smart grid Specialist • Energy Efficiency Specialist • System architect of electrified powertrain system for EV • -motor Application Development Programme Leader • Electric Machine Mechanical Design • High Voltage Vehicle Technician • Sales Executive – Electric Vehicle Products • Sales Specialist - Electric Vehicle Charging Products • LIB repair specialists • Vehicle conversion specialists • Site planners/Urban planners • Distributors • Charging point operator

Source: Moshikaro et al., 2020

Table 24: Required occupations for the renewable energy sector

	Manufacturing/Assembly	Installation	Operations and Maintenance
Solar PV	<ul style="list-style-type: none"> • Mechatronics Technicians • Electricians • Welders • Glaziers • Toolmakers • Production Operators/Assembler • Production Process Controller 	<ul style="list-style-type: none"> • Solar PV Technician • Solar PV Installer • Solar PV Mounter • Electrician • Electrical Assistant • Energy (Battery) Storage Installer • Construction Supervisor • Construction Plant Operator • Crane Operator • Roofer • Carpenter 	<ul style="list-style-type: none"> • Solar PV Technician • Electrician • Energy Efficiency Technician (Energy Audit Technician) • Energy Performance Certificate Practitioner
Wind	<ul style="list-style-type: none"> • Mechatronics Technicians • Electrician • Welders • Toolmakers • Machinist • Production Operators/Assembler • Production Process Controller 	<ul style="list-style-type: none"> • Wind Turbine Technician • Rigger/Assistant Rigger • Electrician • Welder • Fitter • Construction Supervisor • Construction Plant Operator • Machine Operator and Assembler • Crane Operator 	<ul style="list-style-type: none"> • Wind Turbine Technician • Electrician • Plant Operator
Battery	<ul style="list-style-type: none"> • Process Operators • Process Technicians 	<ul style="list-style-type: none"> • Battery manufacturing technicians • Electricians • Fitters • Electrical Instrumentation Technician 	<ul style="list-style-type: none"> • Battery Assembly Technicians

Table 25: The potential occupations and skills required for green hydrogen

Occupations identified	Skills/knowledge identified
<ul style="list-style-type: none"> • Automotive fuel cell power electronics engineer • Chemical engineer • Civil engineer/technologist/technician • Green hydrogen business development manager • Cost engineer • Electrical engineer/technician • Electrician • Electrolysis engineer • Electronic technician • Emissions reduction manager • Energy engineer/technologists • Energy storage engineer/technician • Environmental engineer/technician • Environmental lawyer • Equipment installer/repairer • Fitters & turners • Fuel cell engineer/technician • Fuel cell fabrication & testing technicians • Green hydrogen specialist/researcher • Green hydrogen analyst • Green hydrogen laboratory assistants • Green hydrogen marketing practitioner • Green hydrogen solution architect • Human resource manager • Human rights/justice lawyer • Hydrogen energy system designer/technician • Hydrogen pipeline construction worker • Hydrogen systems safety investigator • Hydrogen systems sales consultant • ICT systems developer • Industrial chemist • Industrial designer • Investment analyst 	<p>Technical skills</p> <ul style="list-style-type: none"> • [Green] Ammonia production • Circular economy • Digital/ICT • Electrolysers • Fischer-Tropsch skills • Fuel cells/fabrication • Green architecture and future cities planning • Green chemistry • Green hydrogen manufacturing strategy implementation/skills development roadmap skills • Green hydrogen compression • Green hydrogen energy storage/systems • Green hydrogen distribution • Green hydrogen production • Green hydrogen project management • Green hydrogen safety • Green hydrogen transportation • Green skills researcher/specialist • Operating electrolytic systems • Sustainable aviation fuels • Systems integration • Waste hydrogen recovery • Water and brine treatment systems <p>Core skills</p> <ul style="list-style-type: none"> • Communication • Creativity • Critical thinking • Emotional intelligence • Entrepreneurial • Negotiation • People management

<ul style="list-style-type: none"> • ICT systems developer • Industrial chemist • Industrial designer • Investment analyst • Machinist • Maintenance manager • Manufacturing technician • Marine engineer • Materials handler • Mechanical engineer/technician • Metallurgist • Mineral economist • Natural capital specialist • PEM membrane electrolyser specialist • Product assembler • Production/Operations manager/supervisor • Project manager • Renewable energy engineer • SHEQ practitioner/manager/inspector • Stock controller • Teachers/educators (basic/tertiary) • Testing technician • Welders 	<p>Core skills</p> <ul style="list-style-type: none"> • Communication • Creativity • Critical thinking • Emotional intelligence • Entrepreneurial • Negotiation • People management • Problem solving • Teamwork
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Table 26: List of agriculture-related occupations that could play a key role for the just transition

Occupations identified
<ul style="list-style-type: none">• Agronomist• Horticulturist• Bio-Resource Engineer• Agricultural Economist• Animal bio-scientist• Biotechnologist• Technical advisor/sales• Farm manager• Nursery manager• Microbiologist• Plant pathologist• Packhouse/operations manager• Fish and Game warden• Agricultural Inspector• Renewable Energy Systems Engineer• Chemist• Industrial Production Manager• Recycling Coordinator• Truck driver• Hazardous Materials Workers• Compliance officers• Green Marketer• Policy and planning manager• Research and development manager• Agricultural farm manager• Data management manager• Application development manager• Hydrologist• Food and beverage scientist• Agricultural engineering technologist• Management accountant• Policy analyst• Marketing practitioner• Data scientist• Software developer• Mechanical Engineering technician• Industrial machinery mechanic• Diesel mechanic

ANNEX 5: ARTISAN THROUGH PUT

Table 1: Registrations vs completions

2023 - 2024	REGISTRATIONS	COMPLETIONS	% COMPLETE
Q1	2275	1234	54,2%
Q2	3596	2177	60,5%
Q3	3171	1098	34,6%
YTD	9042	4509	49,9%

Table 2: Analysis by gender

	REG- ISTRA- TIONS FEMALE	COMPLE- TIONS FEMALE	% COM- PLETE	REG- ISTRA- TIONS MALE	COMPLE- TIONS MALE	% COM- PLETE
Q1	656	310	47,3%	1619	924	57,1%
Q2	1075	691	64,3%	2521	1486	58,9%
Q3	1077	280	26,0%	2094	818	39,1%
YTD	2808	1281	45,6%	6234	3228	51,8%

Table 3: Analysis by race

	Q1	Q2	Q3	YTD
African registrations	1870	2880	2660	7410
African completion	1044	1774	957	3775
% Complete	55,8%	61,6%	36,0%	50,9%

Coloured registrations	169	229	274	672
Coloured completion	52	163	51	266
% Complete	30,8%	71,2%	18,6%	39,6%
Indian registrations	31	146	44	221
Indian completion	19	63	14	96
% complete	61,3%	43,2%	31,8%	43,4%
White registrations	205	341	193	739
White completions	119	177	76	372
% Complete	58,0%	51,9%	39,4%	50,3%

Table 4: Analysis by age

	REG- ISTRA- TION YOUTH	COM- PLE- TION YOUTH	% COM- PLETE	REG- ISTRA- TION ADULT	COM- PLE- TION ADULT	% COM- PLETE
Q1	1733	924	53,3%	542	310	57,2%
Q2	2831	1603	56,6%	765	574	75,0%
Q3	2738	821	30,0%	433	277	64,0%
YTD	7302	3348	45,9%	1740	1161	66,7%

Table 5 Analysis by disability

DISABILITY	REGISTRA- TIONS	COMPLE- TIONS	% COM- PLETE
Q1	12	1	8,3%
Q2	33	0	0,0%
Q3	26	2	7,7%
YTD	71	3	4,2%

Table 6: Analysis by Province Registrations

PROVINCE	REGISTRA-TIONS Q1	REGISTRA-TIONS Q2	REGISTRA-TIONS Q3	REGISTRA-TIONS YTD
GAUTENG	558	838	760	2156
KWA-ZULU NATAL	467	925	656	2048
MPUMALANGA	414	538	292	1244
LIMPOPO	256	496	454	1206
WESTERN CAPE	162	175	308	645
NORTH WEST	186	198	171	555
NORTHERN CAPE	76	98	143	317
FREE STATE	105	72	121	298
EASTERN CAPE	45	136	115	296
UNSPECIFIED	6	120	151	277
TOTAL	2275	3596	3171	9042

PROVINCE	COMPLE-TIONS Q1	COMPLE-TIONS Q2	COMPLE-TIONS Q3	COMPLE-TIONS YTD
GAUTENG	334	557	329	1220
LIMPOPO	242	438	240	920
KWA-ZULU NATAL	186	408	111	705
MPUMALANGA	203	302	156	661
NORTHWEST	99	109	98	306
WESTERN CAPE	83	131	18	232
FREESTATE	48	110	40	198
NORTHERN CAPE	19	61	52	132
EASTERN CAPE	11	54	44	109
UNSPECIFIED	9	7	10	26
TOTAL	1234	2177	1098	4509

ANNEX 6: REFERENCES

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ANNEX 7: RESOURCE PERSONS

Table 27: Resources Persons

Institution	Contact	xxx



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